3  STRUCTURE PLAN
3.1 STRUCTURE PLAN SUMMARY

The key elements of the proposed Structure Plan for Koombana North are as follows:

- Five mixed use Development Sites, with maximum building heights of four to six stories;
- Provision for ground floor activation, via opportunities for retail and commercial development;
- Development of a high quality, pedestrian-orientated public realm for the benefit of the wider Bunbury community, visitors and tourists and residents alike;
- Enhancement of the existing Koombana Bay and Plug foreshore areas, with provision for active and passive recreation opportunities;
- High amenity residential development on upper levels, that capitalises on the high natural and functional amenity of the subject site;
- Provision for the possible future Perth to Bunbury railway, immediately adjacent to the subject site;
- Creation of a visually attractive and iconic built form and landscape gateway to the existing Bunbury CBD; and
- Connection of the proposed development with the Bunbury CBD and existing Marlston Waterfront development area.

In addition to the statutory Structure Plan map included within Part 1 – Structure Plan Statutory Provisions of this report, a Concept Master Plan (refer Figure 14) has been prepared to provide an illustration of the development intent. This graphical representation is indicative only; however, it does demonstrate the intent for how the public spaces will be developed and the relationship of the public/private interface between the public spaces and development site of the Koombana North subject land.

3.1.1 SUMMARY TABLE

A summary of the key elements of the Structure Plan are outlined in Table 13 below.

<table>
<thead>
<tr>
<th>TABLE 13: STRUCTURE PLAN SUMMARY TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total area covered by the Structure Plan</strong></td>
</tr>
<tr>
<td>Development Site yield</td>
</tr>
<tr>
<td>Estimated number of dwellings</td>
</tr>
<tr>
<td>Estimated population (assuming 1.8 persons per dwelling)</td>
</tr>
<tr>
<td>Estimated possible Non-Residential (Retail and Commercial) floor space</td>
</tr>
<tr>
<td>Estimated possible Food and Beverage Retail floor space</td>
</tr>
<tr>
<td>Proposed Local Open Space (%)</td>
</tr>
</tbody>
</table>
3.2 LAND USE

The predominant land use identified for the Koombana North Precinct is residential. It is intended that the upper levels of each of the proposed Development Sites will accommodate a variety of residential housing types. The Structure Plan also requires the development of non-residential facilities at the ground level, however, these facilities may also be developed at the upper levels.

3.2.1 RESIDENTIAL LAND USE

3.2.1.1 RESIDENTIAL DENSITY

The ‘R-AC 0’ coding is identified for the Koombana North precinct in the Part 1 – Structure Plan Statutory Provisions. The R-AC 0 code can be applied for multiple dwelling developments within mixed use and activity centres and is therefore considered appropriate for the Koombana North precinct. The application of the R-AC 0 coding provides for the applicable development standards to be specified in an approved Structure Plan. The development standards, relating to plot ratio, private open space requirements, setbacks and building heights, are specified in the Part 1 – Structure Plan Statutory Provisions.

3.2.1.2 BUILDING HEIGHT

The maximum building heights that apply to the proposed Development Sites, as outlined in Part 1 – Structure Plan Statutory Provisions, are detailed in Table 14 below.

<table>
<thead>
<tr>
<th>Site</th>
<th>Stories</th>
<th>Maximum Building Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Top of External Wall (m)</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>22.5</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>22.5</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>15.5</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>22.5</td>
</tr>
</tbody>
</table>

These proposed building heights reflect the outcomes of the Taskforce process and have been calculated using a maximum podium building height of 5m and floor to floor height of 3.5m for upper stories.

The maximum heights shall be measured from the ground level at the southern boundary of Development Sites 1 and 2, adjacent to Holman St. For Development Sites 3, 4 and 5, the maximum building height shall be measured from the ground level on the southern boundary adjacent to Koombana Drive. The height at these boundaries will represent the maximum horizontal height plane for the whole of each of the Development Sites.

The proposed building heights will provide for an appropriate built form transition on entry into the Bunbury CBD. The heights for proposed Development Sites 3, 4 and 5 provide for a stepped height increase moving west along Koombana Drive. This gradually increasing built form height profile coordinates with the heights of the existing Mantra hotel site (7 storeys) and Silos redevelopment (9 storeys).
3.2.1.3 LOT PRODUCT TYPE, MIX AND YIELD

The development of the Koombana North precinct is envisaged to provide a wide variety of dwelling types, which will consequently contribute to the diversity of the housing stock available in the Bunbury CBD and across the wider Bunbury region. The ultimate yield and product mix will be determined by the type of development pursued by each proposed site by a particular developer and will be subject to the market conditions at the time. For example, one developer may opt to provide the minimum amount of car parking bays required under the R-Codes in order to maximise the development yield, whereas another developer may choose to provide additional bays for each dwelling to improve their marketability and consequently provide less dwellings. On this basis, the ultimate lot yield and product mix will be determined during the construction and development phase.

Table 15 below outlines one of the possible residential development scenarios for the Koombana North precinct, with a mixture of one, two and three bedroom apartments proposed. The proposed mix of apartments in this scenario complies with the requirements of the R-Codes, which broadly requires there to be a minimum of 20% and maximum of 50% of one bedroom dwellings and a minimum of 40% of two bedroom dwellings. A range of different size dwellings are proposed for the one and two bedroom units, ranging from 60m² to 110m². The possible development scenario also assumes that a limited number of larger apartments will be provided. These larger format apartments would likely be provide as penthouse-style units at the upper levels of each building.

<table>
<thead>
<tr>
<th>Site</th>
<th>Stories</th>
<th>Residential Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 Bedroom (60-74m²)</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>% of Total</td>
<td></td>
<td>29%</td>
</tr>
</tbody>
</table>

The delivery of a variety of housing types, in accordance with the requirements of the R-Codes, will contribute to the diversity of housing available in Bunbury. This diversity of housing product provides the opportunity for members of the Bunbury community to ‘age in place’. For example, young singles and couples may choose to live in one of the smaller apartments before upgrading to a larger apartment when having a family and then potentially downsizing back to a smaller unit when their children leave home. This diversity enables people to maintain the social connections that they foster in their local community throughout the course of their lives, without the need to break these connections by moving suburb to accommodate their changing household size needs.
3.2.1.4 VIEWS

Each of the proposed Development Sites will benefit from the opportunity to capitalise on attractive water and parkland views, as outlined in Figure 15. Sites 1 and 2 will be able to capitalise on views to the north over Koombana Bay, the outer harbour and the Indian Ocean. Portions of Sites 2 and 3 will have views to the east towards the harbour. Sites 3, 4 and 5 will all benefit from views of the Leschenault Inlet and the existing Bunbury CBD area.

In addition, new view lines from the centre of the development site (i.e. the extension of Holman St) will be provided through the built form out to the surrounding areas, including Koombana Bay and the Leschenault Inlet. These views will be provided at both the ground floor and upper levels, given the building setbacks at both levels.

The development of each of the proposed sites will also not adversely affect the existing vistas to the Marlston Waterfront and Bunbury CBD from the eastern side of the Plug on approach to the CBD along Koombana Drive.

Figure 15 – Views & Vistas

3.2.2 NON-RESIDENTIAL LAND USE

The Part 1 – Structure Plan Statutory Provisions mandate that the ground floors of all of the proposed Development Sites are constructed to accommodate non-residential uses. The possible uses could include festival/hospitality retail (i.e. restaurants and/or cafes), convenience and tourism-based retail and offices. In addition, the upper levels of the Development Sites may be used for non-residential purposes, in accordance with the land use permissibility of TPS 7 and to the satisfaction of the City of Bunbury.
3.2.2.1 POSSIBLE NON-RESIDENTIAL DEVELOPMENT SCENARIO

In preparing the Koombana North Structure Plan, consideration has been given to the amount and location of non-residential floorspace that could be developed. The following areas have been identified for the non-residential component of a possible development scenario (and have been used to inform other aspects of the planning for the Koombana North precinct, such as car parking provision and traffic modelling):

- 280m² Net Leasable Area (NLA) – Restaurant/Cafe
- 900m² NLA – Retail; and
- 2835m² NLA – Commercial (Office etc).

These floorspace areas equate to the total net leasable area of the ground floor building envelopes of the five proposed Development Sites. A reduction factor of 25% has been applied to the gross site area to account for lobbies, stairs, lifts, service areas and other areas not typically included in NLA calculations, based on extensive architectural industry experience.

3.2.2.2 PREFERRED LOCATIONS FOR RETAIL DEVELOPMENT

It is acknowledged that the provision of certain types of land uses will serve to attract visitors to the Koombana North precinct and consequently contribute to the activation of the public realm. Furthermore, the delivery of a mixture of residential and non-residential uses can serve to improve the safety of an area, with people using the site at all times of the day and therefore providing ‘eyes on the street’ for passive surveillance. The activity generated from uses that attract people to a place can also in turn serve to improve the economic viability of retail outlets in the place. With the growth of activity can come the growth of economic sustainability to the extent where additional retail outlets can be opened which serve to attract more people to a particular place. Whilst this may not occur in all circumstances and may be limited by other external factors (i.e. population within a defined catchment), it demonstrates that the strategic delivery of the first attractors to a new space can serve to kick-start its development and evolution.

In the Koombana North precinct, there are some logical key sites that are the preferred locations for retail land uses in the initial phase of development. These sites are outlined in Figure 16 and discussed in further detail below.

It is noted that the locations identified in Figure 16 are not included with the Part 1 – Structure Plan Statutory Provisions and are therefore not mandatory. Figure 16 does, however, provide some guidance as to the preferred locations for these facilities and should be considered by a developer in the preparation of a Development Application for any of the Development Sites within the precinct.
CAFE/RESTAURANT

The preferred location for a cafe and/or restaurant is at the western end of Development Site 1. This area will benefit from high visual exposure from Holman St to the south and from the Marlston Waterfront and foreshore to the north. It will also benefit from north-south pedestrian movement between Holman St (and the possible future railway station) and the Ski Beach foreshore area. The site also has the benefit to capitalise on views over Koombana Bay, with the potential for alfresco seating space to be provided which is sheltered from the wind by the proposed built form.

The alternative preferred location for a cafe and/or restaurant is on the eastern corner of Development Site 2. This site would be well sheltered by the built form from the prevailing south-westerly wind. This site also benefits from views over Koombana Bay, parts of the Leschenault Inlet and the existing Marlston Waterfront.

RETAIL

A number of areas are identified as preferred locations for retail facilities (i.e. shops). The north-western corner of Development Site 1 is likely to be a highly active corner, with pedestrians accessing the Ski Beach from Holman St and people walking and cycling east and west to and from the Marlston Waterfront. Convenience and tourism related shops may occur in this location, selling and hiring beach-related items.

Areas either side of the pedestrian connection between Development Sites 4 and 5 are also identified as preferred locations for retail development at the ground floor. This pedestrian thoroughfare will benefit from high pedestrian traffic between Holman St and the Koombana Drive landscape entry and parking area in the first instance and the possible future railway platform in the future. It is anticipated that these areas might accommodate convenience-based retail shops serving local residents and visitors and potentially train patrons.
RETAIL AND COMMERCIAL

The southern boundaries of Development Sites 3 to 5 are the preferred locations for retail and commercial facilities fronting Koombana Drive (and the possible future train station platform). It is considered possible that offices and shops may be developed along here, given the high visual exposure along this frontage from Koombana Drive. Temporary vehicle access would be provided as part of a landscape entry treatment to this area in order to provide suitable access for businesses here to support their economic viability.

3.2.2.3 EMPLOYMENT PROVISION

As outlined above in Section 3.2.2, the Koombana North Structure Plan provides the flexibility for non-residential facilities to be developed and to evolve with the precinct as it develops and grows. The likely development of shops, cafes and offices will largely be a function of the local and regional economic climate and is likely to vary accordingly across the construction and development phases and ultimate life of the Koombana North Precinct. As such, it is not possible to calculate how many new employment opportunities will be created as a result of the development.

It is envisaged, however, that a number of new jobs will be created with the establishment of new retail outlets and shops. These jobs will likely be in the hospitality service field, in support on new restaurants and/or cafes. It is also anticipated that convenience and tourism-related shops may occupy new tenancies in the precinct, providing further retail service-based employment opportunities. In addition, the potential development of office space will provide areas for professional organisations, with an associated potential professional workforce. It is anticipated that the demand for non-residential floorspace will increase with the delivery of the possible future railway and that this will in turn generate further employment opportunities within the Koombana North precinct and wider Bunbury region.

It is also foreseen that future residents of the Koombana North Precinct may pursue home-based business opportunities, both before and after the delivery of the potential railway. The Structure Plan provides for people to live and work in the one area with a consequent reduced reliance on fossil fuels and private vehicles and an increased sense of engagement with their local community. Employment opportunities will also be created during the civil and built form construction stages.
3.3 MOVEMENT NETWORKS

SKM has undertaken a thorough analysis of the existing movement networks in the vicinity of the Koombana North Precinct and assessed the impact of the proposed development on these existing networks. The Transport Assessment Report is included as Appendix I.

3.3.1 VEHICLE TRAFFIC

3.3.1.1 DAILY TRIP GENERATION FOR KOOMBANA NORTH

SKM has applied the following daily trip generation rates to the proposed land uses for the Koombana North Precinct:

- Residential: 5 trips per dwelling
- Retail: 30 trips per 100m² NLA
- Office: 10 trips per 100m² NLA
- Cafe: 60 trips per 100m² NLA

The vehicle trip generation associated with the residential, retail, and commercial land uses is shown in Table 16. At full development, a conservative estimate of total vehicle trip generation by Koombana North is approximately 1,330 trips per day.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Current Yield</th>
<th>Calculation</th>
<th>Daily Trip Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>121 units</td>
<td>121 x 5</td>
<td>605</td>
</tr>
<tr>
<td>Retail</td>
<td>900 m²</td>
<td>(900/100) x 30</td>
<td>270</td>
</tr>
<tr>
<td>Commercial (Office)</td>
<td>2835 m²</td>
<td>(2835/100) x 10</td>
<td>284</td>
</tr>
<tr>
<td>Cafe</td>
<td>280 m²</td>
<td>(280/100) x 60</td>
<td>168</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>1,327</td>
</tr>
</tbody>
</table>

The residential and commercial trip generation rates can be considered relatively high for a mixed use development located within one kilometre of a city centre and with reasonable access to walking and cycling facilities (even in lieu of there being local transit currently available). For example, residential apartments that have a trip rate of five trips per unit would typically assume a car drive mode share of about 70%, which is relatively high (i.e. 3.5 trips per person X average occupancy rate of 1.8 persons per dwelling X 1.15 allowance for visitor trips X 70% car driver trips = 5 vehicle trips per day).
3.3.1.2 POTENTIAL NEARBY GENERATORS OF TRAFFIC

The City of Bunbury has identified a number of potential traffic generators in close proximity to the Koombana North site and these generators have been considered in the preparation of the Structure Plan. It is noted that it is not reasonable nor practical to consider the development of every possible future traffic generator in the area, given the 30 year planning horizon and the uncertainty regarding the nature and scale of development that may ultimately be realised. The additional traffic generating uses considered are as follows (with further discussion of each below):

- The Ski Beach on the northern boundary of the Koombana North Precinct;
- The development of Lot 850 (corner of Casuarina and Koombana Drives); and
- The potential future Perth-Bunbury rail service.

SKI BEACH

The majority of traffic generated by beachgoers typically occurs on weekends. Notwithstanding this, some trips can be generated during the AM and PM peak periods. Using the trip generation rates contained in the 8th Edition of the ITE Trip Generation Handbook, the ITE code of a ‘beach park’ (i.e. contains a beach and other facilities such as toilets, picnic facilities etc) was used to derive the trips associated with the adjacent beach area, located north of the development site. Calculations are based on a 9,000 m² (2.22 acres) stretch of beach using the trip rates contained in Table 17.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Daily Trip Rate (per acre)</th>
<th>No. of Acres</th>
<th>Total Daily Trip Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beach Park</td>
<td>29.81</td>
<td>9000 m² / 4046.85 = 2.22</td>
<td>2.22 X 29.81 = 67 TRIPS</td>
</tr>
</tbody>
</table>

LOT 850

It is anticipated that the development of Lot 850 will obtain vehicle access from Holman St and the development of this site has therefore been included in the trip generation calculations to assess the impact of the Koombana North Precinct. There are currently no development plans for this site, however, for the purposes of assessing potential future impact, an example development has been included in the assessment using the trip generation rates contained in Table 18. These rates are the same as those applied to the Koombana North development and are based on the following assumptions:

- Six storey development, based upon a 21m maximum building height (from the City of Bunbury’s LPP – Building Height)
- 10% of the ground floor is developed for cafe/restaurant – 330m² NLA
- 40% of the ground floor is developed for retail – 1,310m² NLA
- 50% of the ground floor is developed for commercial – 1,640m² NLA
TABLE 18: CALCULATED TRIP GENERATION FOR LOT 850

<table>
<thead>
<tr>
<th>Development Precinct</th>
<th>Land Use</th>
<th>Current Yield</th>
<th>Calculation</th>
<th>Daily Trip Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot 850</td>
<td>Residential</td>
<td>200 units</td>
<td>200 X 5</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Retail</td>
<td>1310 m²</td>
<td>(1310/100) X 30</td>
<td>393</td>
</tr>
<tr>
<td></td>
<td>Commercial (Office)</td>
<td>1640 m²</td>
<td>(1640/100) x 10</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td>Café</td>
<td>330 m²</td>
<td>(330/100) x 60</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>1,755</td>
</tr>
</tbody>
</table>

PERTH TO BUNBURY RAIL SERVICE

The potential traffic associated with the possible future Perth to Bunbury rail services has not been quantified or included as part of the traffic generation calculations for the Koombana North site. This is primarily due to the uncertainty regarding the actual delivery of the rail within a 30 year timeframe and the uncertainty regarding the details associated with the potential service (i.e. frequency, patronage etc). As identified in the City of Bunbury’s Integrated Transport Strategy, it is anticipated that a change in travel mode split is likely to have occurred prior to the commencement of a fast rail service (if provided). It considered more appropriate to undertake a detailed assessment of the anticipated traffic generation associated with the rail service nearer to the time of detailed planning and construction, when there is more information available regarding the details of the rail service.

3.3.1.3 PEAK HOUR GENERATION & DISTRIBUTION

The assumed peak AM and PM forecast vehicle trips have been calculated for the Koombana North development site, using industry-accepted standards, and are outlined in Table 19.

TABLE 19: PEAK HOUR GENERATION - AM & PM

<table>
<thead>
<tr>
<th>Land Use</th>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>68</td>
</tr>
<tr>
<td>Retail</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Commercial</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Beach</td>
<td>5%</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

Note: Traffic associated with Lot 850 is included in the Residential, Retail and Commercial calculations.

The directional movements of the traffic are influenced by the nature of the applicable land uses within the development site during the morning and afternoon peak hours. These factors have been considered for the subject site and the traffic distribution in Table 20 determined accordingly.
<table>
<thead>
<tr>
<th>Peak Hour</th>
<th>Land Use</th>
<th>North</th>
<th>South</th>
<th>East</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>AM in</td>
<td>5%</td>
<td>1</td>
<td>40%</td>
<td>5</td>
<td>15%</td>
</tr>
<tr>
<td>Residential</td>
<td>0%</td>
<td>0</td>
<td>50%</td>
<td>78</td>
<td>10%</td>
</tr>
<tr>
<td>Beach</td>
<td>5%</td>
<td>0</td>
<td>40%</td>
<td>1</td>
<td>15%</td>
</tr>
<tr>
<td>AM out</td>
<td>Residential</td>
<td>5%</td>
<td>6</td>
<td>40%</td>
<td>46</td>
</tr>
<tr>
<td>Retail/Commercial</td>
<td>0%</td>
<td>0</td>
<td>50%</td>
<td>20</td>
<td>10%</td>
</tr>
<tr>
<td>Beach</td>
<td>5%</td>
<td>0</td>
<td>40%</td>
<td>1</td>
<td>15%</td>
</tr>
<tr>
<td>PM in</td>
<td>Residential</td>
<td>5%</td>
<td>6</td>
<td>40%</td>
<td>51</td>
</tr>
<tr>
<td>Retail/Commercial</td>
<td>0%</td>
<td>0</td>
<td>50%</td>
<td>23</td>
<td>10%</td>
</tr>
<tr>
<td>Beach</td>
<td>5%</td>
<td>0</td>
<td>40%</td>
<td>1</td>
<td>15%</td>
</tr>
<tr>
<td>PM out</td>
<td>Residential</td>
<td>5%</td>
<td>2</td>
<td>40%</td>
<td>13</td>
</tr>
<tr>
<td>Retail/Commercial</td>
<td>0%</td>
<td>0</td>
<td>50%</td>
<td>92</td>
<td>10%</td>
</tr>
<tr>
<td>Beach</td>
<td>5%</td>
<td>0</td>
<td>40%</td>
<td>2</td>
<td>15%</td>
</tr>
</tbody>
</table>

**Table 20** demonstrates that the dominant traffic movement will be to and from the south, in the direction of the Bunbury CBD via Casuarina Drive. Observations found an existing median break along Casuarina Drive and provision of a right turning pocket (with room for five cars) allowing access to Holman Street. It is proposed this intersection will continue to function adequately under these arrangements with priority control and no specific need for channelisation on Holman Street. This assessment is on the basis of observed traffic counts for Casuarina Drive and the likely profile of traffic seeking to access the development during peak periods.

### 3.3.1.4 LINK ASSESSMENT

The majority of development traffic is forecast to ingress/egress via Blair Street southwards towards central Bunbury. Under a conservative scenario, it is anticipated 80% of development traffic could distribute via this route. The addition of this traffic to Blair Street may increase daily traffic flows south of Koombana Drive from 9,600 to about 10,400 trips per day. This is acceptable for a district distributor road. However, in practice, a higher percentage of traffic is likely to distribute west via Koombana Drive, particularly if additional development unfolds east of the Plug, reducing development traffic on Blair Street. Minor flows can be anticipated to distribute west, via Koombana Drive, north via Casuarina Drive or east via Clifton Street. The additional development traffic is therefore not anticipated to compromise the function of these streets.

The daily traffic forecast to ingress/egress from Koombana North at Holman Street (3,150 vehicles per day) is within the carrying capacity of a slow-speed, single carriageway street. The current geometry of Holman Street is appropriate and includes a trafficable width of 5.5 metres and embayed car parking to support shared parking arrangements, including public access to the foreshore.
3.3.1.5 INTERSECTION ASSESSMENT

Analysis of the following intersections has been carried out using SIDRA software by SKM:

- Holman Street/Casuarina Drive T-intersection; and
- Blair St/Clifton St/Casuarina Drive/Koombana Drive roundabout.

Full details regarding the methodology used to assess the capacity of these intersections and the detailed outcomes of the SIDRA analysis can be viewed in Appendix I. A summary is also provided in Section 3.3.1.6 below.

3.3.1.6 SUMMARY OF TRAFFIC IMPACTS

The findings of the link assessment indicate that the forecast development traffic can be accommodated within the existing network geometry without adversely impacting street function.

The results of the SIDRA analysis presented in Appendix I demonstrate that the key intersections within the study area are estimated to operate effectively in the 2030 horizon year with the addition of development traffic for Koombana North, Lot 850 and the Ski Beach during both peak hour periods.

The results provide a robust estimate of the likely traffic impact of the development on local network operation, assuming a 1% increase in background traffic per annum in an area that has historically shown little growth in traffic levels. The traffic generation assumed for the development is also considered to provide a very conservative forecast.

The proposed development of the Koombana North Precinct, with the addition of traffic generated from the Ski Beach and Lot 850, will not have a detrimental impact on the operation of the local road network and the capacity of the Holman Street/ Casuarina Drive intersection will not be exceeded.
3.3.2 VEHICLE NETWORK

3.3.2.1 HOLMAN STREET EXTENSION

The Structure Plan proposes the extension of Holman St as a shared low speed vehicle and pedestrian space, incorporating additional on-street parking for visitors to the Koombana North Precinct. This represents the only new permanent road reserve proposed as part of the development of the subject land.

The extension of Holman St will provide vehicle access to the proposed Development Sites and will incorporate a turning head at the eastern end of the proposed reserve. An 18m diameter cul-de-sac head has been nominally identified for turning movements, in accordance with the relevant Australian Standard; however the ultimate form of this turning area will be determined during the detailed landscape and engineering design phases. It is likely that paving detail will emphasise the priority given to pedestrians in this shared space over that of vehicular circulation.

As noted, the proposed road reserve for the extension of Holman St varies, with an approximate width of 30m at the western boundaries of Development Sites 1 and 4 and an approximate width of 24m at the eastern end in the location of the indicative cul-de-sac head. The Structure Plan also identifies indicative vehicle access locations to each of the Development Sites from the extension of Holman St. The exact location and form of these vehicle access points (and crossovers) will be assessed and agreed to during the Development Application phase.

It is acknowledged that space will need to be provided for service vehicles to unload supplies for the non-residential facilities within the Koombana North Precinct. Given the scale and size of the proposed development, there is an opportunity to provide shared service and loading spaces. Furthermore, these spaces could be provided as loading bays at specific times throughout the day, so as to enable co-use of these areas as public parking bays outside of delivery hours. The demand for servicing/loading bays will depend, to a large extent, on the requirements of the non-residential facilities developed. As such, it is intended that the amount, location and status of designated loading bays be determined during the civil construction and/or Development Application phases, to the satisfaction of the City of Bunbury. It is noted that the City of Bunbury, as the future authority responsible for the management of the Holman Street road reserve extension, has the discretion to amend the status of parking spaces as it considers necessary and can opt to designate additional parking spaces as servicing areas as demand warrants.

The Structure Plan layout seeks to maintain the majority of the existing public parking in the Holman St reserve. Some existing bays, however, will need to be removed in order to extend the carriageway through to the eastern part of the Koombana North Precinct. A single indicative 6m carriageway is proposed to connect the existing parking area and the proposed extension of Holman St. This is proposed purposefully to ensure that there is only one pedestrian crossing point across the extension of Holman St. As discussed in Section 3.4.4.2 below, the Structure Plan proposes a major north-south pedestrian connection along the western boundaries of Development Sites 1 and 4. As such, the indicative carriageway layout is intended to limit pedestrian crossing of Holman St to a single location. If a loop-style system was to be proposed, then pedestrians would have to cross the extension of Holman St twice. Given the prominence given to the pedestrian in the Koombana North Precinct, it is considered that the proposed indicative carriageway layout serves to maximise pedestrian safety in this shared space environment with only the single crossing.
It is noted that the parking bays currently in the central island Holman St will ultimately need to be reconfigured and potentially removed when the Perth to Bunbury railway station is constructed. The Public Transport Authority (PTA) has identified bus turning and parking requirements that would be associated with the train station and allow for intermodal connections. The Structure Plan provides sufficient space to accommodate the future requirements of the PTA in this regard, as discussed in Section 2.4.4.3. It is noted that the ultimate requirements associated with the train station will be determined at a point in the future when a decision to construct the railway is made. The requirements will be determined collaboratively between the City of Bunbury (as the responsible authority for the Holman St road reservation) and the PTA.

3.3.2.2 KOOMBANA DRIVE

POSSIBLE TEMPORARY LANDSCAPE ENTRY AND PARKING AREA

The Structure Plan makes provision for the potential construction of a temporary one-way parking area off the existing Koombana Drive carriageway (in the location of the possible future railway station). This potential parking area could provide additional visitor parking for the non-residential uses to be developed at the ground floor on the southern side of proposed Development Site 3, 4 and 5. This area is identified as a preferred location for cash-in-lieu payments (to address any possible parking shortfalls for each of the Development Sites) to be used to provide additional public parking.

The parking aspect of this area is preferably located adjacent to the southern frontages of the Development Sites 3, 4 and 5 and would incorporate two lanes of parallel parking embayments on either side of a 6m single direction carriageway. Left-in only access would be provided travelling east along Koombana Drive. Left-out egress would be provided at the eastern part of the proposed one-way street, in front of Development Site 3. The ability to also provide a right-out exit in this location would require further consideration and agreement with the City of Bunbury’s traffic engineers and may necessitate the provision of median treatments in this location.

The parking bays and one-way street will ideally be positioned adjacent to the edge of the proposed Development Sites. This would provide sufficient space in the area between the proposed one-way street and the existing Koombana Drive to install high quality landscaping. The landscape vision for this area is discussed in further detail in Section 3.4.4.7.

Should this temporary landscape entry and parking street be developed, then it is envisaged that it would be in place until such time as the development of the Perth to Bunbury fast rail service, with the parking area to be replaced with the station platform.

FUTURE DUPLICATION

The existing Koombana Drive may be upgraded in the future, with the provision of a second carriageway. With the location of the possible future railway station identified in the northern portion of the existing Koombana North reserve, any duplication of the carriageways for Koombana Drive (and road bridge over the Plug) will need to occur to the south of the existing carriageway and bridge. This possible upgrade may occur in the future, when traffic volumes warrant the increase to the capacity of the road.
3.3.3 VEHICLE PARKING

Car parking is a matter of high importance in the development of an area such as the Koombana North Precinct, given the mixture of residential and non-residential uses proposed, the wide catchment from which visitors will be attracted, the proximity to the existing CBD and the possible development of the future Perth to Bunbury railway. The combined impact of these elements requires careful assessment to determine what car parking facilities need to be provided in order to meet the anticipated demand for car parking for the development area.

The strategy for the provision of car parking in the Koombana North Precinct is broadly guided by the following key principles:

- All private residential parking is to be provided onsite for each Development Site;
- Non-residential and residential visitor parking is to be provided in the vicinity of the site in which it is serving. This may include at-grade in the public realm or within the basements of the Development Sites; and
- Where the required provision cannot be achieved, cash-in-lieu will be provided to the City to contribute to the development of additional car parking facilities to serve visitors to the Koombana North Precinct.

3.3.3.1 RESIDENTIAL PARKING

It will be the requirement of the developers responsible for the delivery of the built form on the proposed Development Sites to provide sufficient onsite car parking for the number of proposed dwellings. Where this cannot be achieved, cash-in-lieu may be paid for any shortfall. The rate of provision shall be in accordance with the R-Codes and will be considered at the Development Application stage.

It is noted that the rates of provision for development that is not within close proximity to transit, as outlined in Acceptable Development 3.1 of Clause 7.3.3 of the R-Codes, are to be used in calculating the specific requirements for a Development Site with the Koombana North Precinct.

A preliminary assessment of the residential car parking provision has been undertaken, on the basis of the possible development scenario outlined in Section 3.2.1.3 above. The differential rates of provision for different sized dwellings, as outlined in the R-Codes, have been used to calculate the overall residential parking requirement. In addition, a preliminary assessment of the possible underground basement car parking layout has been undertaken for each Development Site (assuming the subterranean basements are confined to the extent of the proposed Development Site lot boundaries). Table 21 below outlines the proposed car parking requirements for each Development Site, based on the proposed residential product mix, under this possible development scenario.

The calculations outlined in Table 22 consider the construction of single and double basement car parks.
### TABLE 21: RESIDENTIAL CAR PARKING PROVISION SCENARIO ASSESSMENT

<table>
<thead>
<tr>
<th>Site</th>
<th>Stories</th>
<th>1 BR</th>
<th>2 BR</th>
<th>3 BR</th>
<th>Total</th>
<th>Without Transit</th>
<th>1 Basement</th>
<th>2 Basements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>7</td>
<td>15</td>
<td>3</td>
<td>25</td>
<td>31</td>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>7</td>
<td>15</td>
<td>3</td>
<td>25</td>
<td>31</td>
<td>19</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>4</td>
<td>19</td>
<td>24</td>
<td>30</td>
<td>54</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>7</td>
<td>10</td>
<td>3</td>
<td>20</td>
<td>24</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>9</td>
<td>19</td>
<td>4</td>
<td>32</td>
<td>39</td>
<td>32</td>
<td>59</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>35</td>
<td>69</td>
<td>17</td>
<td>121</td>
<td>149</td>
<td>136</td>
<td>248</td>
</tr>
</tbody>
</table>

It is noted that proposed Development Sites 3 and 4 can be suitably parked onsite within a single basement, however Development Sites 1, 2 and 5 have an under provision to varying degrees. These potential shortfalls can be addressed at the Development Application stage, with a prospective developer having the option of choosing: to develop fewer dwellings, reduce the ultimate height of development, provide a second basement for car parking and/or cash-in-lieu.

Residential visitor parking may be provided as part of the public realm or onsite on each of the proposed Development Sites. The provision of residential visitor parking as presented in Section 3.3.3.2 below.

### 3.3.3.2 NON-RESIDENTIAL AND VISITOR PARKING

It is proposed that non-residential and residential visitor parking be provided at-grade within the public realm or onsite as part of the delivery of the built form for each of the Development Sites. Where the calculated provision requirement cannot be achieved, cash-in-lieu will be paid for an equivalent of the shortfall of car parking bays.

### CALCULATED REQUIREMENTS

The calculated requirements for non-residential and residential visitor parking under the possible development scenario outlined in Section 3.2.1.3 are outlined in Table 22. All parking (vehicle and bicycle) reductions, discounts and reciprocal arrangements are yet to be agreed to by the City of Bunbury and are to be negotiated with the City in the consideration of individual Development Applications. The floorspace areas identified are net figures, reflecting the total size of the ground floor building envelopes of the five proposed Development Sites. A reduction factor of 25% has been applied to the gross site area to account for lobbies, stairs, lifts, service areas and other areas not typically included in NLA calculations, based on extensive architectural industry experience.
A total of 207 bays are calculated as being required for non-residential and residential visitor parking purposes, of which four are required as Disabled Bays. A reduction factor of 25% has been applied to the calculated residential visitor parking requirements for the Koombana North precinct. This percentage reduction has been derived based primarily on the operational reality of parking, whereby parking bays will be used for different uses of the development, which have different peak times and demand profiles. Visits to non-residential land uses (i.e., offices, retail outlets etc) typically occur during the day, whereas visits to residential properties generally occur after working hours. In addition, the reduction also reflects the likely use of some of the non-residential facilities of the Koombana North Precinct by future residents of Development Sites 1 to 5. Parking spaces would not be required in these instances, as residents will be able to comfortably walk to these facilities.

**NEW PARKING BAYS**

A preliminary assessment has been undertaken of the potential proposed new bays, at-grade in the public realm, which may be provided as a result of the development of the site. The outcomes of this assessment are summarised in **Table 23** and it is noted that these numbers are indicative only and subject to detailed planning.

<table>
<thead>
<tr>
<th>Description/Location</th>
<th>Number of Bays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holman St Extension</td>
<td>6</td>
</tr>
<tr>
<td>Proposed Public Car Park (North-South Spine)</td>
<td>21</td>
</tr>
<tr>
<td><strong>TOTAL NEW BAYS (AT GRADE)</strong></td>
<td><strong>27</strong></td>
</tr>
</tbody>
</table>

A total of 27 new bays are identified to be provided in the public realm as part of the development of the Koombana North Precinct. It is evident that there is a calculated shortfall of parking for residential visitors and for proposed non-residential facilities. As presented in **Section 3.3.3.1**, the extent of the shortfall will not be known until the details of a development proposal (i.e., number of dwellings, amount and type of non-residential floorspace) for an individual Development Site are known. Furthermore, the potential shortfall can be addressed in a number of ways, including the payment of cash-in-lieu or the construction of a second car park basement. As such, the ultimate provision of parking shall be considered and determined by the City of Bunbury at the Development Application stage.
EXISTING AND ADDITIONAL POTENTIAL PARKING BAYS

It is proposed that 48 of the existing 54 bays in Holman St be retained as part of the Koombana North Precinct development. It is noted that this parking appears to be currently underutilised and it is likely that it would be used by visitors to the subject site, given its close proximity to the site.

In addition to the existing Holman St bays and the new proposed parking bays in the extended Holman St reserve and the new North-South Spine, some new additional bays may be provided in the Koombana Drive road reserve adjacent to the southern boundary of Development Sites 3, 4 and 5. Approximately 25 bays could be provided off Koombana Drive, however it is noted that this figure is indicative and the actual provision may vary with the progression of detailed engineering design. As outlined in Section 3.3.2.2, this is one of the preferred locations for cash-in-lieu payments (where required to meet parking shortfalls for the Development Sites) to be used.

Figure 17 below illustrates the spatial distribution of the new and existing car parking bays.

CASH-IN-LIEU

It is evident that there is likely to be an overall shortfall in the provision of parking for the Koombana North Precinct, should the development scenario in Sections 3.2.1.3 and 3.2.2.1 be pursued and realised. In addition, the parking calculations undertake are based on a hypothetical development scenario. It is likely that a cash-in-lieu payment (or other appropriate arrangements with the City of Bunbury) will need to be made to the equivalent of the parking shortfall.
The construction cost of parking bays should be set at an agreed fee for the purposes of cash-in-lieu payments and linked to the WA buildings inflation index. All cash-in-lieu payments should be provided into a trust account with funds available solely for transport improvements, which may or may not include provision of future additional public parking in the vicinity that would be of benefit to the development. Non-residential visitors parking is preferably provided on-street, thereby supporting shared use.

Should cash-in-lieu payments be required for development within the Koombana North Precinct, then it is suggested that these monies be spent on the construction of bays in the vicinity of the site. It is noted that there are currently no formal on-street parking bays provided along Casuarina Drive and cash-in-lieu payment could be made to retrofit bays in this location. In addition, the existing pavement of Holman St appears excessively wide to that required for two way traffic movement. As such, there may be the potential for additional on-street parallel bays to be provided within a widened northern verge adjacent to the Mantra. These possible areas are highlighted in Figure 17.

It is also noted that the payment of cash-in-lieu amounts are not typically calculated using the full amount of the shortfall of parking bays. SKM advises that a proportion of the shortfall of bays is typically used to determine the cash-in-lieu payment amount. This is due to the fact that the parking provided with cash-in-lieu funding is likely to be located in the vicinity of the generating use and is likely to serve a wider catchment. For example, if the calculated shortfall of bays for a particular Development Site was 20 bays, then an amount of bays less than 20 would typically be multiplied by the agreed per bay cash-in-lieu amount to determine the total cash-in-lieu payment required. All cash-in-lieu payment requirements are to be agreed to with the City of Bunbury.
3.3.4 PEDESTRIAN & CYCLISTS

3.3.4.1 PATH NETWORK

The development of the Koombana North Precinct will see the creation of a number of new pedestrian and cyclist paths through and around the subject site. The proposed path network seeks to link in with the existing path network of the area. In doing so, not only does it connect the Koombana North site with the surrounding areas but it also connects these other areas with the Koombana North Precinct acting as an effective thoroughfare for pedestrians and cyclists. This exposure will serve to support the economic viability of non-residential uses in the development area, as discussed in Section 3.2.1. The proposed path network is outlined in Figure 18, which outlines where new paths are proposed and existing paths are proposed to be upgraded as part of the development of the Koombana North Precinct.

The existing path that runs parallel to the Ski Beach, along the northern side of the proposed Development Sites 1 and 2, will be upgraded and will connect the site to the Marslan Waterfront to the north and the area east of the Plug across the old railway bridge. The existing paths to the west of the Plug will be upgraded, linking the Ski Beach area to south of Koombana Drive to the Leschenault Inlet.

The Koombana North Precinct will also be linked to the existing path on the southern side of Holman St, with portion of this existing path being upgraded as part of the Koombana North development works. This connection to Casuarina Drive, and the existing informal pedestrian path through Lot 850, will connect the site with the existing CBD core area.

New paths are proposed along the southern boundary of Development Sites 3 to 5, which will provide pedestrian and cyclist access to the non-residential uses along this frontage. This pathway will also provide an interface between the built form and the possible future railway platform when ultimately constructed.

Figure 18 – Path Network Plan
A new north-south path along the western edge of Development Sites 1 and 4 will provide access from the possible future railway station to the Ski Beach. It is likely that this will be a high traffic pedestrian and cyclist connection through the site and therefore provide pedestrian traffic to support non-residential facilities.

A number of secondary pedestrian and cyclist linkages will be provided through the Koombana North site. The extension of Holman St will be a shared pedestrian, cyclist and vehicle space, with priority given to safe and efficient non-vehicular movement. Pedestrian and cyclist connections will also be provided between Development Sites 1, 2, 3 and 4, providing for a highly permeable urban environment.

3.3.4.2 BICYCLE PARKING

In addition to parking for private vehicles, access to the development will be enhanced through the provision of bicycle parking facilities. Bicycle parking for office employees should also be accompanied by the appropriate provision of end of trip facilities such as lockers and showers.

The minimum provision of one bicycle space per residential dwelling, in accordance with the R-Codes, will apply to all development within the Koombana North Precinct. However, the provision of additional bicycle parking spaces (i.e. one space per dwelling) is strongly encouraged. The provision of additional bicycle spaces, in excess of the minimum requirements of the R-Codes, may potentially be used to justify reduced vehicle parking on site, to the satisfaction of the City of Bunbury. These arrangements shall be discussed with and agreed to by the City of Bunbury in determining Development Applications.

The recommended rates of provision of bicycle parking spaces for the Koombana North Precinct are outlined in Table 24, based on the combined assumed residential and non-residential development scenarios.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Parking Requirements</th>
<th>Cycle Spaces Required</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private Cycle Parking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential occupant</td>
<td>1 space per 3 dwellings</td>
<td>41</td>
</tr>
<tr>
<td>Commercial (Office) employee</td>
<td>1 per 50 m² NLA</td>
<td>57</td>
</tr>
<tr>
<td>Café employee</td>
<td>1 per 50 m² NLA</td>
<td>6</td>
</tr>
<tr>
<td>Retail employee</td>
<td>1 per 100 m² NLA</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total Private Cycle Bays</strong></td>
<td></td>
<td><strong>113</strong></td>
</tr>
<tr>
<td><strong>Visitor Cycle Parking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential visitor</td>
<td>1 space per 10 dwellings</td>
<td>13</td>
</tr>
<tr>
<td>Commercial (Office) visitor</td>
<td>1 per 100 m² NLA</td>
<td>29</td>
</tr>
<tr>
<td>Café visitor</td>
<td>1 per 50 m² NLA</td>
<td>6</td>
</tr>
<tr>
<td>Retail visitor</td>
<td>1 per 100 m² NLA</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total Visitor Cycle Bays</strong></td>
<td></td>
<td><strong>57</strong></td>
</tr>
<tr>
<td><strong>Reduction factor of 25% for visitor parking</strong></td>
<td><strong>43</strong></td>
<td></td>
</tr>
</tbody>
</table>
A 25% reduction for visitor (residential and non-residential) bicycle parking shall apply to the Koombana North Precinct. As outlined in Section 3.3.3.2, the reduction is proposed in response to the likely differential times of use across the course of the day. Visits to non-residential land uses (i.e. offices, retail outlets etc) typically occur during the day, whereas visits to residential properties generally occur after working hours. Future residents of Koombana North are also likely to visit other parts of the precinct on foot and are therefore not likely to generate a demand for bicycle parking.

All private residential bicycle parking is required to be provided onsite. It is likely that this will be in secured areas in the basement car park areas of each Development Site. Bicycle parking for non-residential and residential visitors will be provided in the public realm. The exact location and design of these facilities will be determined during the detailed landscaping design phase.
3.3.5 PUBLIC TRANSPORT

3.3.5.1 POSSIBLE FUTURE TRAIN STATION

The Koombana North Structure Plan identifies the location of the possible future Perth to Bunbury rail station in the northern portion of the existing Koombana Drive road reserve. The Structure Plan mandates that the built form at the ground level orientate to the future railway station. In addition, the finished floor levels for the ground floors of these buildings at this interface is required to coordinate with the levels of the future platform, as advised by GHD. Figures 19 and 20 outline the interim and ultimate interface between the southern boundary of Development Sites 3-5 and the possible future train station platform.

Figure 19 – Interim indicative cross-section of interface between southern boundary of Development Sites 3-5 and possible future train station

Figure 20 – Ultimate indicative cross-section of interface between southern boundary of Development Sites 3-5 and possible future train station

The timing for the construction and delivery of the railway is unknown at this time, however it is not anticipated that it will be developed in the medium-term. The decision to construct the rail will ultimately be made by the State Government.
3.4 PUBLIC REALM

3.4.1 PUBLIC OPEN SPACE PROVISION

Public Open Space (POS) will be provided in accordance with the requirements of Liveable Neighbourhoods, which requires that a minimum of 10% of the Net Developable Area be provided as POS. Table 25 below outlines the provision of POS in accordance with Liveable Neighbourhoods, demonstrating the provision of 12.9% of land for credited POS.

<table>
<thead>
<tr>
<th>PUBLIC OPEN SPACE SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Site Area (Lot 505)</td>
</tr>
<tr>
<td>Deductions</td>
</tr>
<tr>
<td>Future Railways Reservation</td>
</tr>
<tr>
<td>Total Deductions</td>
</tr>
<tr>
<td>Net Subdivisible Area</td>
</tr>
<tr>
<td>Required Public Open Space (10%)</td>
</tr>
<tr>
<td><strong>Public Open Space Requirements</strong></td>
</tr>
<tr>
<td>Unrestricted public open space – minimum 80%</td>
</tr>
<tr>
<td>Restricted public open space – maximum 20%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td><strong>PUBLIC OPEN SPACE PROVISION</strong></td>
</tr>
<tr>
<td>Unrestricted Public Open Space</td>
</tr>
<tr>
<td>POS 1</td>
</tr>
<tr>
<td><strong>Total Unrestricted Public Open Space</strong></td>
</tr>
<tr>
<td>Restricted Public Open Space</td>
</tr>
<tr>
<td>Drainage (1:5 ARI)</td>
</tr>
<tr>
<td><strong>Total Credited Restricted Public Open Space</strong></td>
</tr>
<tr>
<td><strong>Total Credited Public Open Space</strong></td>
</tr>
<tr>
<td>Percentage of Public Open Space Provided (Unrestricted and Restricted POS Contribution)</td>
</tr>
</tbody>
</table>

Figure 21 below outlines the variety of public spaces provided across the Koombana North Precinct.
Figure 21 – Public Realm Provision

POS 1 is proposed for the foreshore area immediately abutting the existing Plug Waterways reserve and the eastern edges of proposed Development Sites 2 and 3. The creation of this POS reserve will ensure that east-west public access will be provided through the two Development Sites to and from the Plug foreshore reserve. The easternmost portion of this proposed POS reserve will be landscaped in a holistic manner, as outlined in Section 3.4.4.5 below.

3.4.2 PUBLIC REALM PROVISION

In addition to POS Area 1, additional Reserves for Recreation will be provided in the development of the Koombana North Precinct, but will contribute to the calculation of the overall minimum 10% provision, as detailed in Table 25. One of these proposed reserves is located between POS 1 and the extension of the Holman St road reserve (between Development Sites 2 and 3). The status of this area as a public reserve for recreation will ensure that uninterrupted east-west public access from Holman Street to the Plug is guaranteed.

The second of these uncredited reserves is proposed in the north-west corner of the Koombana North Precinct. This reserve will be bounded by the existing Regional Open Space (ROS) reservations to the west (tennis courts) and north (existing Ski Beach foreshore). The reserve will therefore form an extension of these existing reservations and will serve to provide a transition between these and the proposed future built form of Development Site 1. Landscape enhancement works are also likely to occur in the Ski Beach foreshore reserve and the proposed Reserve for Recreation will consequently form part of a larger landscape precinct. The landscape character vision for this area is outlined in further detail in Section 3.4.4.1 below.
In addition to the provision of POS 1 and the additional uncredited Reserves for Recreation, four Pedestrian Access Ways (PAWs) will be provided to facilitate pedestrian movement through the Koombana North site. These areas, totalling 648m², will be fully publically accessible and are an integral public realm element of the overall development vision and design for the site. The development vision for these PAWs is outlined in Section 3.4.4.6 below.

Whilst not strictly a future POS reservation, the extension of Holman St and the Koombana Drive landscape entry and temporary parking areas represent key elements of the future public realm. These areas will be landscaped to a very high standard, will be fully publically accessible and will serve to celebrate the existing and foster a new sense of character for the area. When these areas are considered, the extent of the public realm in the Koombana North precinct area exceeds the total amount of developable area proposed for Development Sites 1 to 5.

3.4.3 LANDSCAPING VISION FOR PUBLIC SPACES

The landscape vision for the Koombana North Precinct is to create an inspiring and innovative public domain that enables evolution of use while successfully linking the development to its surrounding current and future key activity areas. Figure 22 provides a graphical representation of public realm landscaping vision for Koombana North. LandCorp will be responsible for the implementation of the landscape vision in the development of the Precinct.

This public domain will introduce a progressional sequence of landscape elements that provide a distinct visual and physical connection between the broader key activity areas and the development. Recognition of the strong industrial, maritime, cultural and environmental heritage of the area will provide opportunity for creation of a vibrant and iconic place.

The key overall public realm design objectives are as follows:

- To introduce a progressional landscape that provides an integrated and evolving sequence of elements and experiences to reinforce Bunbury’s rich industrial, maritime, cultural and environmental heritage;
- To provide a movement regime that establishes a sequence of linked destinations that creates strong east-west and north-south pedestrian links through the site;
- To use indigenous and appropriate coastal species that are drought tolerant and climatically suited to the harsh and variable coastal conditions;
- To provide thermal comfort for pedestrians with the protection from the harsh cold winds in winter and capturing the cool sea breeze in summer;
- To respond to the harsh microclimatic conditions of Bunbury by introducing and designing innovative solutions for human comfort within the public open space environments. For example, creating protected areas through the use of built form, screens, earthworks and planting;
- To introduce an integrated public art programme that responds to the progressive landscape and the innovative opportunities that draws on the character and language of the existing environment;
- To maximise the visual benefits of many water related outlooks within and outside the site, through view corridors and open vistas;
- To celebrate the harbour and surrounding coastal and inlet scenery;
• To create a world class quality landscape environment that responds to the proposed built form and uses;
• To create urban spaces will that relate to the human scale and maximise pedestrian comfort; and
• To incorporate best practise Water Sensitive Urban Design (WSUD) principles.

3.4.4 DESCRIPTION OF FORM AND FUNCTION

A number of Landscape Character Precincts have been identified for the proposed Koombana North development site, as outlined in Figure 23. Each precinct has its own function and form, consequently, different landscape treatments will be used for each. The details of each proposed Landscape Character Precinct are outlined below.

Figure 23 – Landscape Character Precincts
3.4.4.1 SKI BEACH

To enhance the beachfront north of the proposed development, the adjacent proposed mixed use Development Sites have been designed to give great activation to this highly important area of the public domain. The potential for non-residential development to occur at the ground floor provides complementary activity opportunities for beach goers, allowing them to frequent a possible variety of cafes, restaurants and retail outlets in a north-facing environment that is sheltered from the prevailing south-westerly wind. The upper storeys are also likely to be activated with residential uses, ensuring good passive surveillance, and making the best use of the view potential from this location across Koombana Bay.

Pedestrian linkages to the east over the Plug are to be enhanced, and a distinct transition between the formal urban landscape and the informal coastal landscape will occur at the foreshore precinct.

The landscape design intent focuses on reinforcing the role of the foreshore pedestrian promenade. The key landscape design elements of the parkland are:

- A beach promenade paved walkway, which incorporates the converted railway bridge. The landscape along this walkway will include varied paving patterns, sections of boardwalk and feature walls. Sections of this pavement will be opened up to the beach to provide access to the boardwalks;
- The interface between the foreshore park and the existing dunal system to be contoured and rehabilitated;
- Seating and outdoor shower facilities to be provided;
- The landscape will use indigenous and appropriate species that are resistant to the coastal conditions; and
- The landscape will integrate with the adjacent built form development and the proposed outcomes from the Leschenault Masterplan.
SKI BEACH
3.4.4.2 THE NORTH-SOUTH SPINE

The North-South Spine is the primary pedestrian connection from the possible future Perth to Bunbury train station to the new Ski Beach. It provides a direct visual and physical connection and plays an integral role as a path finder throughout the site.

The North-South Spine creates the axis for a strong visual connection from the south of Koombana Drive and the Leschenault Inlet, to effectively link both water bodies. Additional on-street parking to be provided on Holman Street will further emphasise the importance of the Ski Beach and ensure additional convenience for beach-goers.

The North South Spine will be reinforced by the following landscape mechanisms:

- Avenue of Norfolk Pines (these may be transplanted from onsite following viability review);
- Paving design and furniture selections to be robust and climatically appropriate;
- Pedestrian lighting for way-finding and security;
- Priority pedestrian crossing given at the extension Holman Road;
- A possible iconic artwork as an orientation marker at the beach end of the pedestrian spine; and
- A terminus space at the beach end of the spine, providing a meeting place and viewing promontory.
Some of the existing public car parking will be reconfigured to allow for interim bus access and turn-around, taxi-waiting and public parking for the beach users, visitors to the retail and commercial and non-residential facilities and patrons of the possible future railway. The orientation of the northern arm of the car park allows for safe beach access and limits the numbers of vehicles needing to cross the North-South pedestrian spine.

The Western Plaza provides a civic space that is sheltered from winds. The intent is for the space to provide a waiting and meeting space and, in the future, train users. Its northern orientation and central location make it ideal for this purpose.

The key landscape considerations associated with this plaza space are:

- Provision of shelter from sun and rain;
- Provision of seating;
- High levels of lighting to ensure safety;
- Good surveillance from surrounding built form development overlooking the space;
- Possible iconic artwork as an orientation marker; and
- Incorporation of rain gardens and WSUD principles.
3.4.4.4 HOLMAN STREET EXTENSION

This shared space will be framed by new built form. It will be a landscaped plaza space providing access and parking for the adjacent Development Sites. It will provide pedestrian linkages to the Pedestrian Access Ways (PAWs) to the north and south and to the pedestrian bridge at the eastern edge of the site.

The key landscape considerations associated with the Holman Street extension plaza are:

- The space is to read as a shared low speed vehicle/pedestrian zone;
- It will be predominantly a hard space, with paving detail responding to buildings and pedestrian access, rather than vehicle circulation;
- Provision of trees for shade and to provide intimacy of scale;
- Provision of covered areas for shelter from the rain at building interface;
- Landscape treatments to reinforce PAW access to the north and south;
- Landscape treatments to frame views out of the space to the surrounding public realm, including Koombana Bay and the Leschenault Inlet.
3.4.4.5 THE PLUG WALK

The Plug Walk area is both a refuge space and a linkage space. It is an area to be retained as a soft, landscaped space that is sheltered from the winds, providing an informal picnic/gathering space and access to the Plug for recreational fishing. It provides an important link to the area south of Koombana Drive, via the existing pedestrian path under the traffic bridge.

The key landscape considerations associated with the Holman Street extension plaza are:

- Improved pedestrian connection to the eastern pedestrian bridge;
- Provision of disabled access, via ramps;
- Provision of improved, safe access for recreation; and
- The space has existing vegetation that provides stabilisation to the embankment and shelter from prevailing winds. Retention of this vegetation is anticipated, provided passive surveillance objectives are not compromised.

- The landscape will integrate with the adjacent built form development and the proposed outcomes from the Leschenault Masterplan.
3.4.4.6 PEDESTRIAN ACCESS WAYS

The PAWs form an important function within the development as both pedestrian link and view corridors. They ensure that the development has a high level of permeability that enhances its focus on pedestrian movement, while creating multiple view corridors both into and out of the development.

The key landscape considerations associated with the PAWs are:

- Improved pedestrian connection throughout the site;
- Provision of multiple access points to key activation areas;
- Opportunities for public art/wayfinding structures to draw people through the Koombana North Precinct;
- Ensuring that Crime Prevention Through Environmental Design (CPTED) outcomes are achieved (e.g. via lighting, surveillance) in the construction and development of the PAWs; and
- Introduction of spatial variety ensuring a variety of landscape experiences.
3.4.4.7 KOOMBANA DRIVE AND TEMPORARY ACCESS PLAZA

The upgraded frontage of Koombana Drive has the potential to dramatically enhance the entry experience to the Bunbury CBD. High quality built form combined with considered landscape and public art will ensure this area achieves its potential to become a significant landmark entry for the City.

Development fronting Koombana Drive will require activation and, with the proposed train station not yet delivered, temporary parking is proposed to activate this interface. Design of this area will be cognisant of the constraints concerning its future use, but will deliver an attractive and valued interface that enhances this entry into the CBD.

The key landscape considerations associated with the Koombana Drive and the Temporary Access Plaza are:

- The space is to read as a considered and well-designed forecourt to the development;
- Treatment adjacent to the built form will be predominantly a hard space, with paving detail responding to buildings and pedestrian access, rather than vehicle circulation. Treatments will also be cognisant of the potential future train station;
- A gradual transition from urban form to softer landscape treatment adjacent to Koombana Drive, reinforcing the existing landscape treatments in place;
- Landscape treatments to frame views out of the space;
- Provision of planting areas to increase visual amenity and minimise any possible impacts of carparking; and
- Opportunity for Iconic Public Art to reinforce roundabout treatment and enhance eastern gateway concept.

3.4.5 MANAGEMENT OF PROPOSED PUBLIC SPACES

Management of all of the proposed public spaces will ultimately fall to the local authority and as such the City of Bunbury will be engaged throughout the design and implementation process. The use of the public realm for alfresco dining opportunities will be the subject of lease arrangements with the City of Bunbury.
3.5 BUILT FORM

A Podium-style built from typology is proposed for the Koombana North Precinct, in accordance with that identified in the Bunbury Waterfront Taskforce Report. This typology is characterised by built form incorporating activated frontages (shops, cafes, offices, visible entrances, glazing etc) at the ground floor, with low-rise development above setback from the edge of the activated frontages below and is outlined in Figure 24. For the Koombana North Precinct, the podium height will be one storey for all Development Sites, with additional development ranging from three to five levels above. This results in overall building heights of four to six stories as detailed in Section 3.2.1.2.

The setting back of upper level development serves to reduce the dominance of the built form on the pedestrian environment at the ground level. The essence of this built from typology is to provide for low-rise upper level development that does not adversely impact on the pedestrian-scale of the public realm. In this way, upper levels can capitalise on the attractive views of Koornbana Bay, the Leschenault Inlet and the Indian Ocean whilst not impacting on the key public assets of the Ski Beach and Plug foreshore, the extension of Holman St and the Koombana Drive forecourt area.
3.5.1 GROUND FLOOR BUILT FORM

3.5.1.1 SETBACKS & PUBLIC REALM INTERFACE

A nil ground floor setback is desirable for all Development Sites. However, minor variations are permissible to provide a forecourt, building articulation, alfresco dining or other features that adds amenity and interest to the streetscape. As noted in Section 3.3.2 above, only non-residential land uses will permissible on the ground floor, in accordance with the land use requirements of TPS 7 and at the discretion of the City of Bunbury.

The Part 1 – Structure Plan Statutory Provisions for Koombana North encourage active frontages to the public realm be provided at the ground floor for all proposed Development Sites. This may include the development of certain types of high activity non-residential land uses (such as shops and cafes), the strategic placement and design of building entrances and the extensive use of glazing. The Structure Plan also prohibits the development of extensive blank walls to the public realm at the ground floor level. The incorporation of these measures will serve to maximise opportunities for passive surveillance and create a more visually attractive built environment for the enjoyment of visitors and residents alike.
3.5.1.2 COLONNADE BUILT FORM & AWNINGS

The Koombana North Structure Plan mandates that suitable cover be provided to the public realm in the immediate ground level surrounds of all of the proposed Development Sites. The continuous cover of these areas may be achieved via the use of awnings or colonnade-style built form (i.e. awning with pillars). The provision of these facilities will provide shelter for pedestrians from inclement weather in winter and will provide shade from the hot summer sun.
3.5.1.3 PODIUM HEIGHT

The Part 1 – Structure Plan Statutory Provisions specifies that the maximum height of built to boundary walls shall be 5m for development within the Koombana North Precinct. This effectively establishes the maximum height of the ground floor podium and has been determined on the basis of an approximate podium building height of 4.5m, with an additional 0.5m provided for railing where a terrace is provided at the first floor.

The Part 1 – Structure Plan Statutory Provisions provide for a higher maximum podium height (i.e. 7-7.5m) on the northern boundaries of Development Sites 3, 4 and 5 adjacent to Holman St. This is due to the level differences between the future railway platform and the extension of Holman St and the intention for the podium to maintain a consistent horizontal height plane across each Development Site. The consistent horizontal plane approach also applies to Development Sites 1 and 2, although it is acknowledged that the anticipated level change between the northern and southern boundaries is minimal.
3.5.2 UPPER LEVEL BUILT FORM

3.5.2.1 SETBACKS

A minimum 3m setback is required for upper levels from the edge of the ground floor podium. This is a minimum setback and the ultimate upper level setbacks realised may be greater than this, depending on the detailed design prepared by an individual developer for each Development Site. In addition, minor protrusions beyond this upper level setback are permitted for outdoor living areas and balconies. The Part 1 – Statutory Provisions specify that balcony protrusions are permissible, where these protrusions meet the following criteria:

- Assist in the articulation of the building façade, in a complimentary contemporary architectural form;
- Are commensurate in scale/composition of the building;
- Are designed as an integral part of the building elevation and do not appear as an “add on” structure; and
- Contribute to the sense of safety and liveness of the street by designing for passive surveillance and visual engagement between the public and private realms.

It is evident from the criteria above that any proposed balcony protrusions into the minimum 3m setback must demonstrate enhancement of the built form experience with the Koombana North Precinct. Any proposed balcony protrusions into the minimum 3m setback are to presented at the Development Application stage for consideration and determination by the City of Bunbury.

WIND MITIGATION

As noted in Section 3.5 above, the upper level setback serves to reduce the perception of dominance of the built form on the public realm. This setback, when considered with the provision of awnings, can also serve to mitigate against the effects of the prevailing winds on the public realm at the ground level.

When prevailing wind hits the face of a building, it typically splits into two with half travelling upward and half travelling towards the ground. The portion that moves downwards can accelerate rapidly until meeting a horizontal plane and creating localise turbulence. In the circumstance where the upper and ground floor levels have a consistent frontage (i.e. the same setback), this process occurs at the street level and can significantly affect the amenity of the public realm. In the circumstance of Koombana North, where podium-style development is to prevail, this turbulence will occur at the upper edge of the podium and its impact on the public realm will therefore be significantly reduced. The 3m upper level setback proposed, couple with the protection provided provide by mandatory awnings, will adequately mitigate against the potential negative effects on the pedestrian environment at street level.

3.5.2.2 BULK, MASSING & SCALE

The existing entry to the Bunbury CBD along Koombana Drive is characterised by a reasonably abrupt change in scale, as the generally low scale parkland landscape east of the Plug is contrast against the built form bulk and height of the Mantra Hotel and Silo Apartments sites and the dominant Bunbury Tower. The location of the Koombana North Precinct between these two areas of differing form provides a unique opportunity to deliver a more subtle transition between the two zones.
As noted in Section 3.2.1.2, the proposed maximum building heights for Development Sites 3 to 5 increase from four to six storeys moving west towards the CBD from the Plug. This provides the opportunity for a more gradual built form scale transition on entry to the CBD and is considered to represent an improvement to the current sudden transition from the Plug to the Mantra and Silos. It is noted, however, that this built form transition is desirable but is not guaranteed under the framework of the Structure Plan.

The essence of the podium-style typology is that it minimises the perceived impact of the building bulk and scale on the public realm whilst still enabling development to occur at the upper levels. This typology is ideal for the Koombana North Precinct, as maintains the potential for upper level development that capitalises on the surrounding natural amenity of the site and the views over water to the north, south and east. The prominence of the location as a gateway to the Bunbury CBD lends itself to upper level building bulk to enable creation of a landmark built form entry. Finally, the absence of any other existing residential development in the immediate surrounds provides the opportunity for upper level to height to be provided, without adversely overshadowing or impacting upon the views of existing residents. The Koombana North site is therefore considered ideal for sensitive built form development, with any perceived building height impacts on the public realm minimised through the adoption of the podium-style built form typology.

The relationship between the existing and proposed built form is graphically illustrated in Plates 1 to 4 below.

Plate 1 – Perspective from south-west
3.5.3 OTHER BUILT FORM CONSIDERATIONS

3.5.3.1 ICONIC BUILT FORM & LANDMARK ELEMENTS

There are a number of key locations situated at the termination of key view lines in the Koombana North Precinct. These sites consequently benefit from high visual exposure and are the logical locations for the incorporation of additional built form measures to reflect their visual importance. Landmark locations can contribute to the creation of the local character and can perform a way finding function for both locals and visitors alike.

Landmark locations are identified on the eastern edge of Development Sites 2 and 3 and are designed to emphasise the importance of this built form facade upon entry to the Bunbury CBD. An additional location is identified on the north-west corner of Development Site 1, to capitalise on the visual prominence of this corner from the existing Marlston Waterfront area.

The Part 1 – Structure Plan Statutory Provisions provide for one or more of a number of architectural features to be used for the designated landmark locations and include glazing, building materials, building height (within the building height restrictions), and major openings to the satisfaction of the City of Bunbury. Any proposed landmark built form elements should be considered and presented at the Development Application stage.
3.5.4 SHADOW ANALYSIS

A shadow analysis of the proposed built form has been undertaken for the Koombana North Precinct, with the shadow impacts for midday 21 June shown in Figure 25. It can be seen that there is limited overshadowing, with a small portion of the lower levels of proposed Development Site 3 overshadowed by the upper levels of Development Site 2.

![Figure 25 – Shadow Analysis](image)

It is noted that Clause 7.4.2 of the R-Codes, regarding overshadowing of adjacent properties, does not apply for development with a density coding above R60. The anticipated density of development of the Koombana North Precinct exceeds R60, so the requirements of this clause are not considered applicable. Notwithstanding this, the overshadowing impacts are limited, as outlined above.

3.5.5 NOISE ATTENUATION REQUIREMENTS

Noise attenuation measures will be required for future buildings affected by noise from Koombana Drive and the possible future rail service. Detailed noise modelling has been undertaken by LGA to assess the extent of these noise impacts and determine the necessary mitigation measure required in order to achieve acceptable indoor noise levels in noise-sensitive areas (i.e. bedrooms, living rooms). This modelling has identified the requirement for mitigation measures to be incorporated into the future built form for Development Sites 3, 4 and 5. Specifically, measures are required for the southern facades fronting Koombana Drive and the southern portions of the PAWs between Development Sites 3, 4 and 5. Further information regarding the modelling undertaken and the necessary mitigation measures is provided in Appendix B.
3.6 WATER MANAGEMENT

A draft Local Water Management Strategy has been prepared by Strategen to accompany the Structure Plan and is included as Appendix J. A summary of the key aspects of the proposed drainage regime are outlined below.

3.6.1 LOCAL WATER MANAGEMENT STRATEGY SUMMARY

3.6.1.1 KEY GUIDING PRINCIPLES

Events up to the 1 in 1-year Average Return Interval (ARI) event account for 99.5% of all stormwater runoff and, as such, the key focus for the drainage system is will be the treatment of events up to the 1 in 1 year ARI event, as identified by the Decision Process for Stormwater Management in Western Australia. The development will maintain pre-development flows off the site in events up to the 1 in 1 year ARI event.

The key guiding principles of the LWMS are to:

- facilitate implementation of sustainable best practice in urban water management;
- encourage environmentally responsible development;
- provide integration with planning processes and clarity for agencies involved with implementation;
- facilitate adaptive management responses to the monitored outcomes of development;
- minimise public risk; and
- reduce potable water use.

3.6.1.2 KEY DRAINAGE CONTROLS

The site will be developed in a water sensitive manner, with the following drainage controls:

- use of a vegetated retention basin and underground infiltration cells to treat stormwater and maintain pre-development flows off the site in the 1 in 1 year ARI event;
- maintaining road serviceability by ensuring that all drainage is piped off the site in events up to and including the 1 in 10 year ARI event; and
- use of additional Best Management Practices such as underground infiltration cells and soakwells to treat and infiltrate stormwater on-site where practicable.

Each of these drainage control measures are discussed in further detail below.
VEGETATED RETENTION BASIN

Treatment and infiltration for the 1 in 1 year ARI event will be provided through the use of a stormwater treatment basin and underground infiltration cells within the central section of the site. Flow will enter the basin through a bubble up pit in the base. The basin and stormwater cells have been designed to contain the infiltrate the 1 in 1 year ARI event. Lots will be required to manage their own flows in the 1 in 1 year event, with overflow into the basin and infiltration cells allowed in the larger events. The system will provide adequate storage to meet the City of Bunbury requirement of 1 m³ of stormwater storage per 65 m² of impervious area. The basin will be vegetated with appropriate native species to allow for nutrient stripping and will be designed to integrate with the urbanised environment.

PIPED DRAINAGE

A new piped drainage connection is proposed to link the vegetated drainage basin and the City’s existing drainage infrastructure located to the south of Koombana Drive (1650mm diameter Luciana Park Drain). The development has been designed to maintain serviceability of Casuarina Drive and Koombana Drive in the 1 in 10 year ARI event. Flows in the 1 in 10 year ARI event will be directed towards the vegetated basin identified above. The basin will overtop in such an event, with the overflow entering the new drainage outlet connection and flowing under Koombana Drive into the Luciana Park Drain. This system will be designed to prevent flooding of roads within and adjacent to the development.

In the 1 in 100-year ARI event, stormwater will overtop the basin and the outlet pipe. Additional flows will be transferred via overland flow.

The Luciana Park Drain is considered to have adequate capacity to accommodate these proposed additional flows.

BEST MANAGEMENT PRACTICES

A summary of the design elements and requirements for Best Management Practice for the Koombana North Precinct are provided in Table 26 below.
<table>
<thead>
<tr>
<th>Category</th>
<th>Principles</th>
<th>Objectives</th>
<th>Development Design Elements and Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water use</td>
<td>Consider all potential water sources in water supply planning. Integrate water and land use planning. Sustainable and equitable use of all water sources having consideration for the needs of all users, including community, industry and the environment.</td>
<td>Minimise the use of potable water where drinking water quality is not essential, particularly for outside buildings.</td>
<td>Apartments offer many opportunities for water saving measures as these are usually furnished by the developer. The strata agency control of irrigation and water supplies also provides opportunities to consider water conservation and efficiency measures at a building scale through design guidelines. Measures that will be considered to manage water use at Koombana North at the UWMP stage will include:  • mandating provision of low water use appliances such as showers and dishwashers  • requiring use of water efficient planting and irrigation  • building-scale alternative water supplies, such as irrigation and toilet flushing systems that include a rainwater or greywater portion.</td>
</tr>
<tr>
<td>Groundwater and surface water flows</td>
<td>Retain natural drainage systems and protect ecosystem health. Protect development from flooding and water-logging. Implement economically viable stormwater systems. Post development annual discharge volume and peak flow rates to remain at pre-development levels or defined environmental water requirements</td>
<td>For ecological protection, 1 in 1-year ARI volume and peak flow rates maintained at or below predevelopment conditions. Where there are identified impacts on significant ecosystems, maintain or restore desirable environmental flows and/or hydrological cycles.</td>
<td>Pre-development flows will be maintained off the site in events up to the 1 in 1-year ARI event. Finished levels will be designed to prevent impacts due to groundwater level rise due to storm surge and sea level rise. Basements below the groundwater level will be designed to be impervious to prevent groundwater entry. The development will comply with the CoB requirement for 1 m3 of stormwater storage per 65 m2 of impervious area.</td>
</tr>
<tr>
<td>Groundwater and surface water quality</td>
<td>Maintain or improve groundwater and surface water quality. Where waterways/open drains intersect the water table, minimise the discharge of pollutants from groundwater. Where development is associated with an ecosystem dependent upon a particular hydrologic regime, minimise discharge or pollutants to shallow groundwater and receiving waterways and maintain water quality in the specified environment.</td>
<td>Implement current known best management practice as detailed in the Stormwater Management Manual for Western Australia (DoW 2004 – 2007) and Decision Process for Stormwater Management in Western Australia (DoE &amp; SRT 2006), with an emphasis on a treatment train approach including nutrient input source control, use of bioretention systems, and maintaining 1 in 1-year ARI post development discharge volumes and peak flow rates at pre-development levels.</td>
<td>Best Management Practices (BMPs) have been implemented through the development to minimise pollution, including a stormwater treatment basin and potentially oversize soakwells, underground storage cells and the use of permeable pavement for non-vehicle traffic areas to reduce flows. The use of vegetated treatment structures on the site is constrained by the high density nature of the development, with little area available for swales or other vegetated treatment systems.</td>
</tr>
<tr>
<td>Disease vector and nuisance insect management</td>
<td>Reduce the health risk from mosquitoes, retention and detention treatments should be designed to ensure that between the months of November and May, detained immobile stormwater is fully infiltrated within a time period not exceeding 96 hours.</td>
<td>Permanent water bodies are discouraged, but where accepted by DoW, must be designed to maximise predation of mosquito larvae by native fauna to the satisfaction of the local government on advice of Departments of Water and Health.</td>
<td>Detained stormwater will be fully infiltrated within 96 hours Permanent water bodies are not proposed.</td>
</tr>
</tbody>
</table>
3.6.1.3 URBAN WATER MANAGEMENT PLAN

An Urban Water Management Plan (UWMP) will be required for the Koombana North precinct, as a condition of subdivision approval. The UWMP will include:

- reporting on additional groundwater level data from data loggers;
- analysis of the additional groundwater level data to refine the estimate of peak groundwater levels and design groundwater level;
- detailed landscaping design for the proposed for the POS and details on how this will be managed, including irrigation volumes and methods;
- additional information regarding design guidelines that encourage WaterWise design, such as provision of low water use appliances, low water use landscaping and consideration of at a lot scale;
- details of any information to be provided to householders regarding water conservation;
- detailed drainage design, including confirmation of pipe sizing and locations, basin design and landscaping;
- confirmation of Best Management Practices to be utilised, sizing and locations;
- design guidelines and requirements for lot scale drainage systems;
- confirmation of finished levels for roads and ground floors of buildings, taking into consideration storm surge levels; and
- design requirements for basements constructed below the design groundwater level.

Further detail regarding the proposed water management regime for the Koombana North Precinct can be viewed in Appendix J.
3.7 CIVIL ENGINEERING & INFRASTRUCTURE REQUIREMENTS

Koombana North project engineers, TABEC, have undertaken an assessment of the existing servicing infrastructure in the vicinity of the subject site and have identified where infrastructure upgrades to will be required to service the development. The outcomes of TABEC’s assessment and the recommended upgrades are outlined in detail below.

3.7.1 DEVELOPMENT SITE LEVELS & EARTHWORKS

3.7.1.1 DEVELOPMENT SITE LEVELS

The Koombana North Structure Plan requires that the ultimate Finished Floor Levels (FFL) for all Development Sites appropriately coordinate with the adjacent public realm edge. This ensures that an appropriate interface can be delivered between the private and public realms and that access and opportunities for passive surveillance can be achieved. The preliminary indicative site levels are outlined in Figure 26.

The minimum FFL for the southern boundary of Development Sites 3, 4 and 5 (as measured at the east-west mid-point of the sites) are as follows:

- Site 3 – 6.5m AHD;
- Site 4 – 5.8m AHD; and
- Site 5 – 5.2m AHD.

These heights are proposed to ensure that the FFL for these sites coordinates with the ultimate height of the possible future railway platform, as advised by GHD and outlined in Section 2.4.4.3. This requirement will provide for the seamless transition from the ground floor of the buildings on this edge with the future platform when constructed.

The built form on Development Sites 3, 4 and 5 will also need to ensure that an appropriate FFL level is provided at the northern boundary to ensure that a suitable level interface with the extension of Holman Street can be achieved. As outlined in Figure 26, there is a reasonable level difference between the northern and southern boundaries of Development Sites 3 (2.3m), 4 (2m) and 5 (1.8m). This level change is to be accommodated in the ground floor of the built form, as outlined in Figure 24.

Level Development Sites, that match the level of the surrounding public realm, will be created during the earthworking and civil construction phase. The edges of Development Sites 3, 4 and 5 will match in with the specified levels on the northern (Holman St) and southern (railway platform) boundaries. The details of the proposed earthworks will be presented to the City of Bunbury for its assessment in the earthwork and civil design and approval phases following subdivision approval.
3.7.1.2 SITEWORKS

GENERAL

Siteworks for the Koombana North site will include the clearing of existing vegetation, stripping of topsoil and the removal of all organic material from site. The topsoil may potentially be reused in POS areas for landscaping purposes only. Following clearing, the site will be proof compacted, with a minimum 10 passes with smooth drum roller. Any weak areas that deform excessively will be over excavated, and material replaced with appropriate clean structural fill or limestone. The earthworks activities will involve some cut to filling and the sand material excavated from site may be used as structural fill.

It is also noted that all uncontrolled fill shall be excavated from within the areas where filling is proposed or where the proposed development site are located. Due to the basement levels proposed, the material is required to be excavated in any case.

Minimum development levels will be achieved with reference to the Coastal Stability and Setback Review report (refer Appendix A). This report provides advice on the total design water level which includes the 100 year annual return interval water level and additional allowances for sea level rise, based on the SPP 2.6 recommendation of 0.9m for the 100 year planning horizon. The extreme water level and the full allowance for sea level rise is described in Appendix A as 2.5m AHD. Based on preliminary earthworks models to date, the minimum finished floor level (excluding potential basement level car parking) would be approximately 3.8m AHD. However, it is noted that basement construction below 2.5m AHD for car parking purposes is very likely.

BUILDING FOUNDATIONS

Piled building foundations are recommended, due to the number of storeys proposed, with the piles to be driven into the high strength basalt rock below the surface. The building piles are nominally 600mm diameter with the number and spacing to be confirmed based on building design.

The pile design parameters and construction methodologies should be considered further by the building’s structural engineers. The risk design factors relating to the site itself and knowledge of ground conditions should be considered in relation to design and installation methods.

It is also proposed that each building footprint would contain one or two storey basement levels for car parking purposes. Due to the nature of sand materials on site and tight construction area, it is expected that temporary construction support such as sheet piling for ground excavation will be required.

The Geotechnical Report (refer Appendix E) estimates foundation levels to vary between approximately 0.5m to 1.0m AHD for the construction of basement levels across the five building sites. This is expected to involve dewatering and it is very likely that ground water levels may be higher than these levels. The base of these excavations should be adequately proof compacted prior to the construction of the building proceeding.

Buoyancy uplift pressures will also need to be considered in the building design and there will be a requirement to tie the structure to the basement slab to prevent uplift pressures. It is also recommended that basements are constructed to be impermeable to groundwater.
PRELIMINARY INDICATIVE SITE LEVELS
Koombana North
A Landscape Project
3.7.2 EXISTING INFRASTRUCTURE

3.7.2.1 WASTE WATER

The Water Corporation of WA is responsible for the operation of existing wastewater services in the City of Bunbury.

The site falls within the existing catchment area of the Casuarina Drive pump station which is located on the north of Holman Street at the intersection of Casuarina Drive. Existing development surrounding this area is gravity fed to this location and there is a pipe invert in Holman Street at 0.61m AHD. At this invert, there is sufficient cover for a new waste water main extension along Holman Street and lot connections to be provided to all development within the Koombana North precinct.

Based on the proposed zoning and development intent for Koombana North, the Water Corporation has advised that there does not appear to be any significant constraints relating to waste water servicing. The pump station was originally sized to cater for this area of land and there is sufficient capacity to accommodate the proposed Koombana North development.

The Casuarina Drive waste water pump station is operating at approximately 5 hours/day and the only constraint is emergency overflow storage capacity. However, on site land area is available to the Water Corporation and it is the Corporation’s responsibility to develop operational overflow storage when required.

3.7.2.2 WATER SUPPLY

AQWEST is responsible for providing scheme water in the City of Bunbury and manages the existing mains surrounding the Koombana North site. There is presently a 150mm main which runs along the southern road reserve boundary of Koombana Drive. This main crosses the Leschenault Inlet and connects to services on the eastern side of the Leschenault Inlet. It also extends around to Blair Street, connecting to the 200mm water mains which service the Bunbury CBD.

There is a 200mm water main in the western road reserve of Casuarina Drive and this services the existing development on both sides of Casuarina Drive, including the Marlston Hill area. There is a small 50mm PE water main located in Holman Street.

3.7.2.3 POWER SUPPLY

The proposed Koombana North development will be serviced with power from an existing 22kV high voltage (HV) cable located on the southern side of Koombana Drive. This would result in the requirement of two 150mm ducts to be bored under Koombana Drive to allow the HV cable to be extended in a HV ring arrangement.

A requested load of 2500kVA has been required from Western Power for the Koombana North precinct. Preliminary advice from Western Power at the date of Feasibility Report indicates there is capacity for the 2500kVA of load to serve this development. Should additional power be required, supply will be dependent on other development planned in the surrounding area.
3.7.2.4 GAS SUPPLY

There is existing medium pressure gas distribution infrastructure in close proximity to the Koombana North site. A 150mm PVC main is located along the northern Koombana Road reserve; however this deviates more centrally within the road reserve for the crossing over the Plug. There is also an existing 100mm PVC main in Holman Street along the southern road reserve boundary. WA Gas Networks have advised that there appears to be sufficient capacity in the current assets based on modelled requirements.

3.7.2.5 TELECOMMUNICATIONS

There are fibre-optic communication cables currently located in the Koombana Drive road reserve and also extending along Casuarina Drive. However, with the National Broadband Network (NBN) rollout, the subdivider is responsible for providing pit and pipe infrastructure for the fibre to be installed. It is noted that Bunbury is within the footprint of the NBN rollout and fibre is due to commence being installed in existing development areas in Bunbury within three years.

The communications design may require the inclusion of a Fibre Distribution Hub (FDH) within road reserves. FDHs are unpowered street side cabinets which are used to provide an optical connection point between the distribution and local network.

The NBN Co will only typically pull fibre through greenfield subdivisions with 100 lots or more, however, given that the Koombana North project is likely to include more than 100 units, it is expected that a developer agreement could be struck with the NBN Co to ensure this project receives NBN fibre. As part of the developer agreement conditions, the NBN Co will take over ownership of the assets upon completion and ensure that fibre is ready 3 months prior to the first occupancy for a new development.

3.7.2.6 STORMWATER DRAINAGE

As noted in Section 3.6.1.2 above, there is an existing 1,650mm diameter drainage pipe (Luciana Park Drain) located to the south of Koombana Drive and which discharges into the Leschenault Inlet, via a gross pollutant trip.
3.7.3 INFRASTRUCTURE UPGRADES REQUIRED

3.7.3.1 WATER SUPPLY

AQWEST have advised that the Koombana North project is readily serviceable from the surrounding potable water reticulation infrastructure. There are no significant upgrades required and there appears to be sufficient capacity in the existing system. While the most appropriate service connection locations will be resolved during detailed design phases, it is likely that a new water reticulation main extension along Holman Street will be required to provide connections to the five building sites within Koombana North from the internal road extension. Alternatively, if required, the three southern building footprints could be serviced from bored connections under Koombana Drive to the existing 150mm main.

3.7.3.2 POWER SUPPLY

The installation of Western Power infrastructure to service this development in a single stage will include all HV power cabling, including the provision of a 35mm HV cable to each of the five proposed Development Sites. Two switchgears will also be required, which are likely to be located in POS or sites provided by road reserve boundary extensions.

The subdivision power requirements will include a 630kVA transformer on each lot and will be installed at the time of building construction. The developer of each site is to apply to Western Power for the installation of their transformers, with the exact location will be determined at the detailed built form design stage. It is also noted the end user can apply to Western Power to upgrade their transformer, up to a maximum of 1,000kVA, as required.

Street lighting will also be installed, in accordance with Western Power and the City of Bunbury’s requirements, to adequately light the extension of the Holman Street. Power connections will also be provided to POS areas for landscaping purposes, including lighting, as necessary and other public facilities.

3.7.3.3 GAS SUPPLY

The current gas main can be extended within the Holman Street extension during construction subdivision works to provide connection locations to each of the five proposed Development Sites in this project.

3.7.3.4 SEAWALL

As noted in Section 2.3.5.3 above, the construction of a seawall in the vicinity of the northern boundary of the site has been identified as a required measure to protect development within the subject site from extreme storm events.

The seawall will be located on the northern side of the proposed foreshore promenade on the northern side of proposed Development Sites 1 and 2, as depicted indicatively on the Structure Plan. The seawall is to be buried at the back of the beach profile, with the beach material modifying the wave climate and enabling the reduction in size of the required seawall and the elevation of its toe above current normal water levels.
The seawall will match in with the existing block wall beachfront treatments and the proposed beach access at the western end of the site and the abutment to the rail/pedestrian bridge over the Plug at the eastern end, extending as part of the foreshore promenade. The seawall will match with this formation, completing the protective element of the works. A pathway extends under the bridge and separates the elevated formation from the Plug seawalls. Essentially, the existing pathway and Plug seawall elements provide protection to the toe of the old railway formation that makes up the bridge abutment and the POS at the western boundary of the site.

In addition, the area between the proposed seawall and the foreshore dune is to be filled with sand to provide storm buffer sand storage for the beach. Adding sand to the existing foreshore berm will reduce the future recession of the beach during extreme events including sea level rise. An indicative cross-section for the proposed buried seawall is shown in Figure 27 below.

![Figure 27 – Indicative Buried Seawall Cross-Section](image)

The installation of a buried seawall is represents a conservative approach to protection of the Koombana North development. The design and finished level and alignment of the rock seawall across the Ski Beach will be progressed during detailed design phases for the project.

### 3.7.3.5 ROADS & FOOTPATHS

#### ROADS

The proposed additional road construction for the Koombana North project involves the extension of Holman Street. This will involve the removal of the current turnaround loop and the reconfiguration of some of the existing street parking. The Structure Plan provides for vehicle access to each of the five Development Sites from the extension of Holman St.

The Structure Plan also makes provision for the construction of a temporary one-way parking area off the existing Koombana Drive carriageway (in the place of the future railway station). This parking area will provide additional visitor parking for the possible non-residential uses that may be developed at the ground floor on the on the southern side of proposed Development Site 3, 4 and 5.

The extension of Holman Street and the proposed parking street off Koombana Drive will be designed and constructed in accordance with the City of Bunbury’s engineering standards, in relation to pavement thickness and width. The new Holman Street road reserve will be sufficient to accommodate the utilities on standard alignments, as specified in the utility provider’s Code of Practice.
FOOTPATHS

As detailed in Section 3.3.4.1, there will be multiple pedestrian linkages throughout the Koombana North site. The ultimate detailed design for these areas will incorporate both the civil engineering and landscape requirements. The Koombana Bay Ski Beach foreshore area will be connected via the Ski Beach with the existing surrounding pedestrian network (i.e. Marlston Waterfront and east across the Plug). There will also be paved pedestrian connections from the Holman Street extension cul-de-sac head through to the promenade between the Development Sites.

The detailed civil engineering design will outline the physical aspects of these pedestrians linkages, including levels and material finishes. The extension of Holman Street may be constructed in raised sections to ensure slow vehicle movements are maintained for high pedestrian safety, given the shared pedestrian/vehicle nature of this space. A mixture of paving and road treatments may be included in the design to delineate the carriageway areas.

All footpath and pedestrian treatments will be designed in accordance with the City of Bunbury’s guidelines and to the appropriate accessibility standards.

3.7.3.6 STORMWATER DRAINAGE

The proposed road reserve area (i.e. Holman St extension and cul-de-sac and north-south spine parking area) and impervious areas such as paved verges within the Koombana North Precinct site will be serviced with piped drainage. The drainage network will be constructed to the City of Bunbury’s engineering standards and in accordance with the approved Local Water Management Strategy and Urban Water Management Plan.

The extension of Holman St will be longitudinally graded toward the west to follow the current Holman Street over land flood path design. The road is currently graded west to Casuarina Drive and then south towards Koombana Drive, for discharge into the Leschenault Inlet.

Due to the presence of groundwater levels relatively close to the surface, there is limited opportunity for underground storage and drainage infiltration. It is, however, proposed to treat the minor storm events on site, with above ground nutrient stripping and compensation. A small drainage area is proposed on the western edge of the Structure Plan which has sufficient capacity to cater for the 1 in 1 year event from road reserves. The drainage facility may require a tiered retaining wall to provide adequate storage volume and will incorporate some landscape measures, which will be determined at the detailed drainage and landscape design stage.

The adoption of ‘Best Management Practices’, which promote the dispersion and immediate infiltration of runoff, are proposed to be utilized where possible. These measures may include the use of porous paving for roads and car parking and the routing of runoff into medians, rain gardens, soak wells and road side swales. The applicability of these measures to the Koombana North Precinct will be assessed further during the detailed design phases.

Storm water collected in the piped network which exceeds the 1 in 1 year event will overflow the basin and it is proposed that a connection be provided to Council’s existing 1,650mm drainage pipe crossing the area south of Koombana Drive for discharge into the Leschenault Inlet. A drainage easement is to be provided along the length of the westernmost pedestrian connection of the Structure Plan, to link the onsite treatment and nutrient stripping area on site with Council’s existing drainage infrastructure to the south.
3.7.4 INDICATIVE DEVELOPMENT STAGING

It is presently LandCorp’s intention to create new serviced titles for all proposed Development Sites in the initial phase of development, as outlined in Figure 28.

As part of the initial development phase, Holman St will be extended and civil services will be provided to all five proposed Development Sites, given the relative efficiency of service installation at the one time. The initial phase of development will also include the creation of the drainage area adjacent to proposed Development Site 5 and the drainage connection to the south via the westernmost PAW.

The initial development phase will see the construction of additional beach parking in the north-south spine and the construction of the seawall within the foreshore area to protect the development area. The various public realm areas, including the Ski Beach, the north-south spine, the Holman St reserve (both existing and proposed extension) and the PAW between proposed Development Sites 1 and 2 will also be constructed and landscaped during the initial development phase. The new pedestrian paths constructed in the first stage of development will be connected to the surrounding path network at this time.

The creation of Development Sites 3, 4 and 5 is likely to occur in the second phase of development. This phase will also include the construction of the Koombana Drive landscape entry and parking street and the landscaping of the PAWs between Development Sites 3, 4 and 5 and to the west of Site 5. The construction of the PAW/footpath along the southern boundary of Development Sites 3, 4 and 5 is also identified to occur in the second phase of development.
It is noted that this staging is indicative only and assumes that the Perth to Bunbury fast rail service is not likely to be developed in the medium term. The staging outline is therefore subject to change in the future at the time of implementation. The exact staging will be heavily influenced by the market conditions at the time of development and may see the two broad stages identified above divided into a number of smaller sub-stages with the incremental release of the Development Sites to the market. The progressive staging and delivery of the various aspects of the public realm will be considered further, should the option of developing smaller sub-stages be pursued. Finally, it is noted also that the staging of development may alter significantly should a decision to construct the Perth to Bunbury fast rail service be made in the short to medium term future. The development staging strategy for the site would be thoroughly revisited if this was to occur.