

TURQUOISE COAST DEVELOPMENT

JURIEN BAY

Development Plan 2

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1.0 INTRODUCTION

Jurien Bay is the primary centre on Western Australia's Central Coast, 200km north of Perth and a similar distance from the next major centre further north, Geraldton. The town of Jurien Bay is expanding rapidly, that growth having been foreshadowed in the Central Coast Regional Strategy, a government planning strategy for the region.

A Structure Plan guiding growth into the future was endorsed in 2003, followed by a Development Plan over the first neighbourhood, given the estate name "Beachridge". This Development Plan covers the second neighbourhood of the future Jurien Bay.

The focus of this new neighbourhood is a large, artificial lagoon being created as a water playground. It is planned to provide 8ha of water within a riparian park totalling 15.6ha in area.

Not only will the lagoon be the focus of the neighbourhood, but it is expected to draw people from the Jurien Bay area in general as well as much further afield creating a vibrancy usually lacking in new estates. When the lagoon is combined with other design features, this new neighbourhood will be instantly recognisable, fulfilling a desire of the developers, Ardross Estates Pty Ltd, to create a unique environment and not simply transplant an anonymous suburb of Perth to Jurien Bay.

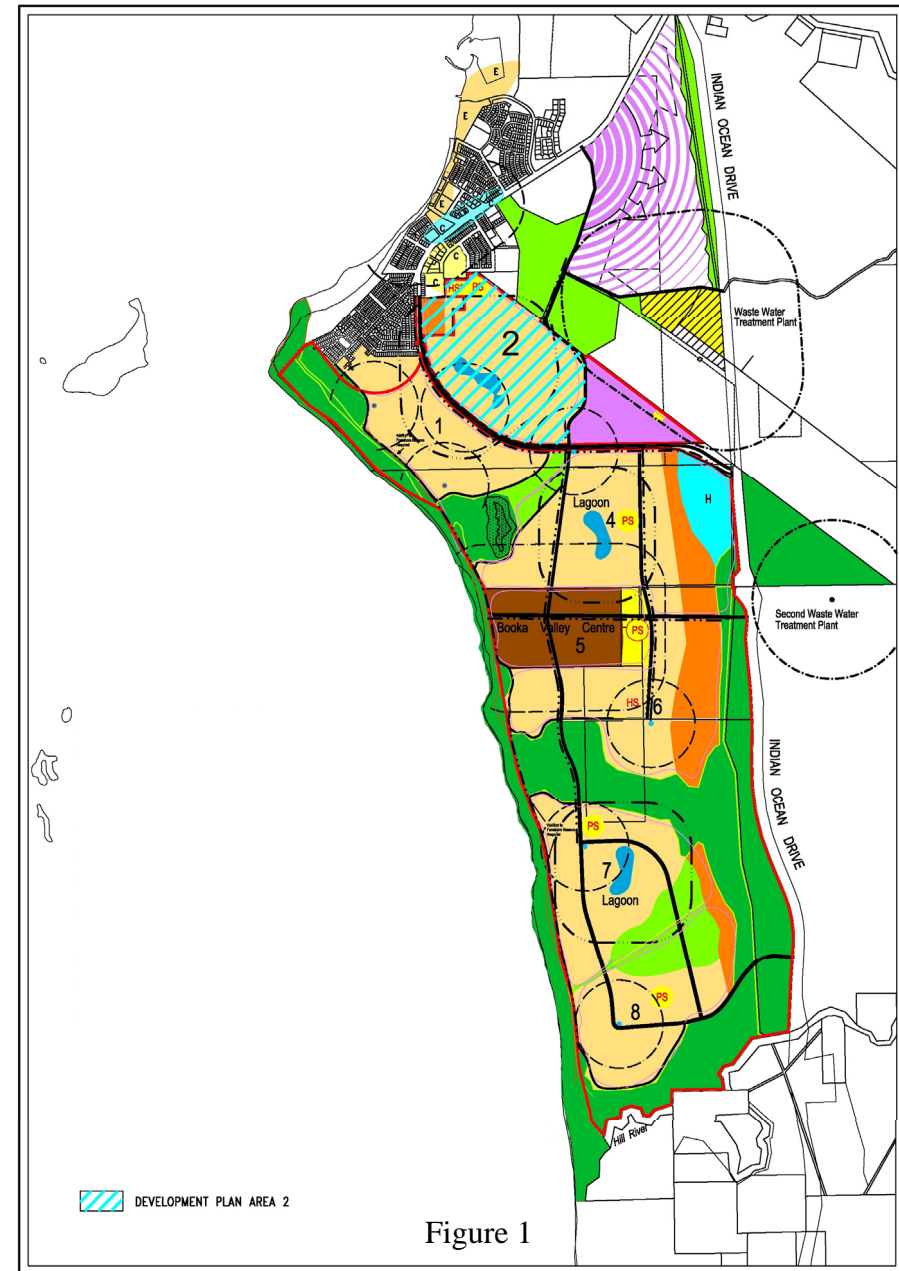
Consultants responsible for preparing the plan on behalf of Ardross Estates Pty Ltd include:

MGA Town Planners -	Planners
Sharni Howe Architects -	Architects
Desmond Brooks International -	Architects
Sinclair Knight Merz -	Engineers

2.0 AREA AND PURPOSE OF PLAN

This Development Plan applies to land identified in the Turquoise Coast Structure Plan as Development Area 2 (ODP 2), generally bounded on the west and south by Bashford Street, on the north by the existing town development of Jurien Bay and on the east by the town's golf course, an old stock route and a proposed north-south district distributor road. The Structure Plan was approved in November 2003, and is currently being modified to include Reserve 35716, Bashford Street within its area. **Figure 1** is a copy of the modified Structure Plan. ODP 2 occupies approximately 188.3ha and is highlighted on **Figure 1**.

The Development Plan has been prepared in accordance with Schedule 12 of proposed Town Planning Scheme No. 7. To this extent, the land is zoned "Special Development" under the Scheme and the Development Plan creates an overlay of more detailed local zoning and density patterns providing the context and rationale for the land use proposals. Flexibility is inherent in the Development Plan in accordance with paragraph 17 of Schedule 12 of Town Planning Scheme No. 7.



3.0 BACKGROUND

Part 5 of Appendix 7 of the Shire's Town Planning Scheme No 6 establishes the statutory background for the preparation and implementation of the Development Plan. In particular, the Development Plan is to deal with the following:

- (a) the definition of zones in accordance with the range of zones set out in the Scheme;
- (b) proposed residential densities within zones where residential use is permissible;
- (c) proposed transportation systems; road layout and vehicular traffic, cycle, and pedestrian networks; underpass locations; and public transport routes;
- (d) provision for major land uses including residential, shopping, resorts, commercial, office, educational, civic, employment centre, open space, recreational, waterways and community facilities;
- (e) indicative lot pattern and general location of any major building, and
- (f) the integration of land use and development.

In addition to the scheme provisions, the landowners, Ardross Estates Pty Ltd have entered a Memorandum of Understanding (MOU) with the Council and the Western

Australian Planning Commission (WAPC). The MOU is more particularly relevant to the Structure Plan but also has general application to the Development Plan. One aspect of the MOU which does directly affect the proposals of the Development Plan is the requirement for a variety of lot sizes and housing choice.

The Turquoise Coast site at Jurien Bay was referred to the Environmental Protection Authority (EPA) for advice under Section 16(j) of the Environmental Protection Act leading to the publication of a report for public comment. Various supplementary studies were completed resulting in the EPA releasing Bulletin 1031 in October 2001 detailing advice in respect of the project. This advice was summarised and staged in accordance with the planning process to form a Sustainability Chart within the Turquoise Coast, Jurien Bay Structure Plan. That chart is included here as **Table 1** with the elements relevant to the Development Plan phase of the planning process highlighted.

The focus of this Development Plan is clearly the proposed lagoon, a concept first floated in the Structure Plan dated November 2003. Three environmental agencies were given the opportunity to comment on the lagoon concept during the Structure Plan's approval process.

The EPA advised the following:

“ • **Lagoons** – The Plan indicates several possible “lagoons”. If these are to be pursued, a detailed report on their potential environmental impacts and the proposed management measures should be prepared for consideration by the relevant authorities, including advice from Water and Rivers Commission and CALM. If the relevant authorities consider that the detailed lagoons proposal may have a significant impact on the environment, then it should be referred to the EPA for the EPA to decide whether or not the proposal requires formal assessment.”

The Water and Rivers Commission supported the EPA’s comments while the Department of Conservation and Land Management (CALM) made no comment. In its submission, the Water Corporation, responsible for the preparation of a Water Management Plan, provided the following comment.

“ • **Saltwater Lagoons** – The use of an impervious membrane for the possible “lagoons” referred to on page 46 would be supported by the Corporation, subject to mitigation measures in design, construction and

management. These measures are required to ensure the water table is permanently isolated from the salt water in the lagoons and that no leakage will occur.

Consideration will need to be given to the nature and extent of the lining, monitoring to provide early detection of any leakage, operation and maintenance programs, and operators of the drainage system and their responsibilities in case of a breach of lining.

The Water Corporation’s Water Management Plan will be developed on the assumption that the lagoons are permanently isolated from underlying groundwater.

The saltwater lagoons are preferred to any proposal using surface expressions of the groundwater.”

A Working Paper separate to this Development Plan addresses engineering and environmental issues associated with the lagoon proposal.

Table 1 SUSTAINABILITY CHART

Issue	Structure Plan	Development Plan	Subdivision
General Biodiversity & Natural Environment	Identify biodiversity reserves	Establish reserve boundaries with higher degree of accuracy after carrying out detailed investigations. Develop management plans for adjacent reserves. Ascertain multi purpose POS which may retain some bushland to serve some biodiversity protection functions. Carry out visual impact studies.	Survey and vest reserves in Crown ownership at appropriate subdivision stage. Implement proposals of management plans.
Energy Efficiency & wise use of natural resources	Identify routes of efficient distributor road system. Identify trunk cycleway system. Identify public transport routes. Locate district scale destinations to maximise efficiency. Locate neighbourhood centres to take advantage of the “movement economy” and to be within efficient pedestrian/cycle catchments.	Establish efficient interconnecting local street systems. Plan for pedestrian/cycle systems at the local level including access to public transport routes. Detail neighbourhood centres and establish design guidelines. Design residential lots so that a high proportion have solar efficiency.	Construct infrastructure including roads, cycleways and footpaths, with a view to minimising the number and lengths of vehicle trips. Create neighbourhood centre sites. Create residential lots with regard to solar orientation. Implement any sustainability strategies that may have been developed (having regard for government initiatives on sustainability).
Water Use	Integrate with preparation of Total Water Management Plan.	Plan to minimise domestic and public water use. Plan to recycle waste water. Infiltrate stormwater as close to source as possible. Continue to develop Water Management Plan and integrate development with Water Management Plan.	Integrate water efficient landscaping packages. Implement water efficient landscaping packages. Design public spaces to take advantage of wastewater recycling opportunities. Implement drainage strategies minimising piped systems.
Waste Management	Acknowledge Shire of Dandaragan Water Management review.	Design lots and landscaping to limit green waste. Consider education programmes to limit waste and improve recycling.	Implement landscaping proposals and any waste minimisation programmes agreed on.
Relationship to Marine park	Development planning to be consistent with proposed Marine Park Zonings. Total Water Management Plan to duly regard water quality issues.	Design for all facilities including parking facilities at regional/district beaches to be sympathetic to the Marine Park. Design drainage systems to attenuate nutrient inputs and other potential pollutants.	Implement Development Plan proposals for parking and facilities. Implement drainage strategies.

4.0 CONTEXT ANALYSIS:

The Development Plan area lies immediately south of the existing Jurien Bay townsite. The Jurien Bay combined high/primary school abuts to the north. An old stock route including the Jurien Bay Golf Course provides the north-eastern boundary while Bashford Street borders the area on the south and west.

At its closest, the ODP area is approximately 600m from the coast north of Island Point while at its farthest, approximately 2.7km. Land adjacent to Bashford Street is approximately 1.1km from the coast south of Island Point while the stock route boundary of the land is about 2.3km away. In short, the Development Plan's relationship to the coast, the prime amenity value of the area, is diminished by distance and barriers such as Bashford Street.

Other facilities of the town are however in comparatively close proximity. These are identified on **Figure 2 – Key Land Uses** and include the town centre; the golf course, bowling green and recreation centre as well as civic uses and the existing schools as previously mentioned.

Jurien Bay's town centre is focused on Bashford Street, principally between Cook and Doust Streets where retailing

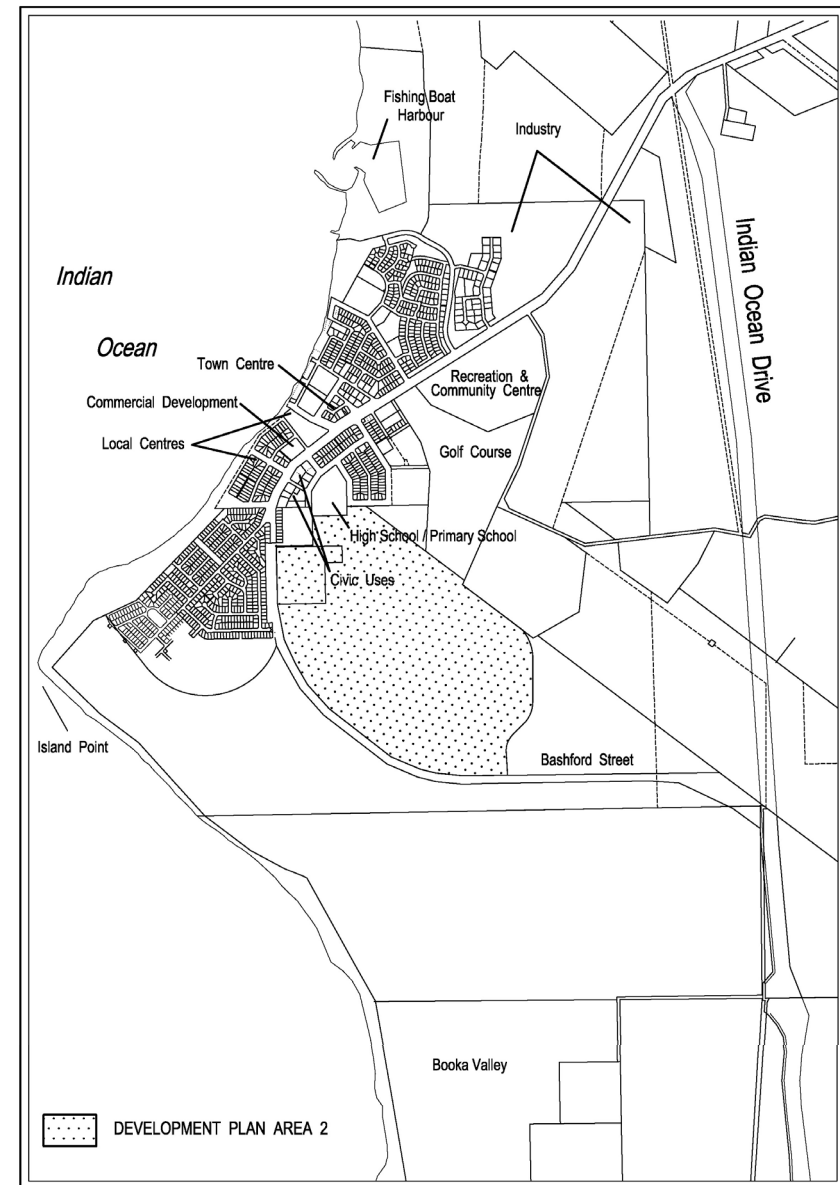


Figure 2 Key Land Uses

is concentrated. New retail development has had the effect of better linking the different elements of the town centre, particularly the town's hotel/motel.

Community uses are primarily located on the opposite (southern) side of Bashford Street and include the Shire of Dandaragan offices, Council chamber and library at the Bayliss Street corner, the town's police and fire stations, a new medical centre and the high and primary schools on a combined site south off Hamersley Street.

Local centres include a corner store at Grigson/Cook Streets and a shop associated with the caravan park at Heaton/Roberts Streets.

In addition to the commercial/community locations described above, other employment centres include the fishing boat harbour to the north of town. Industrial areas exist to the north of Bashford Street off Carmella Street and to the south of Bashford Street, east of the town's main recreation area.

Recreation activity is centred on an area of reserved land on the eastern side of town, south of Bashford Street. Facilities include a golf course, bowling club, tennis courts, an oval

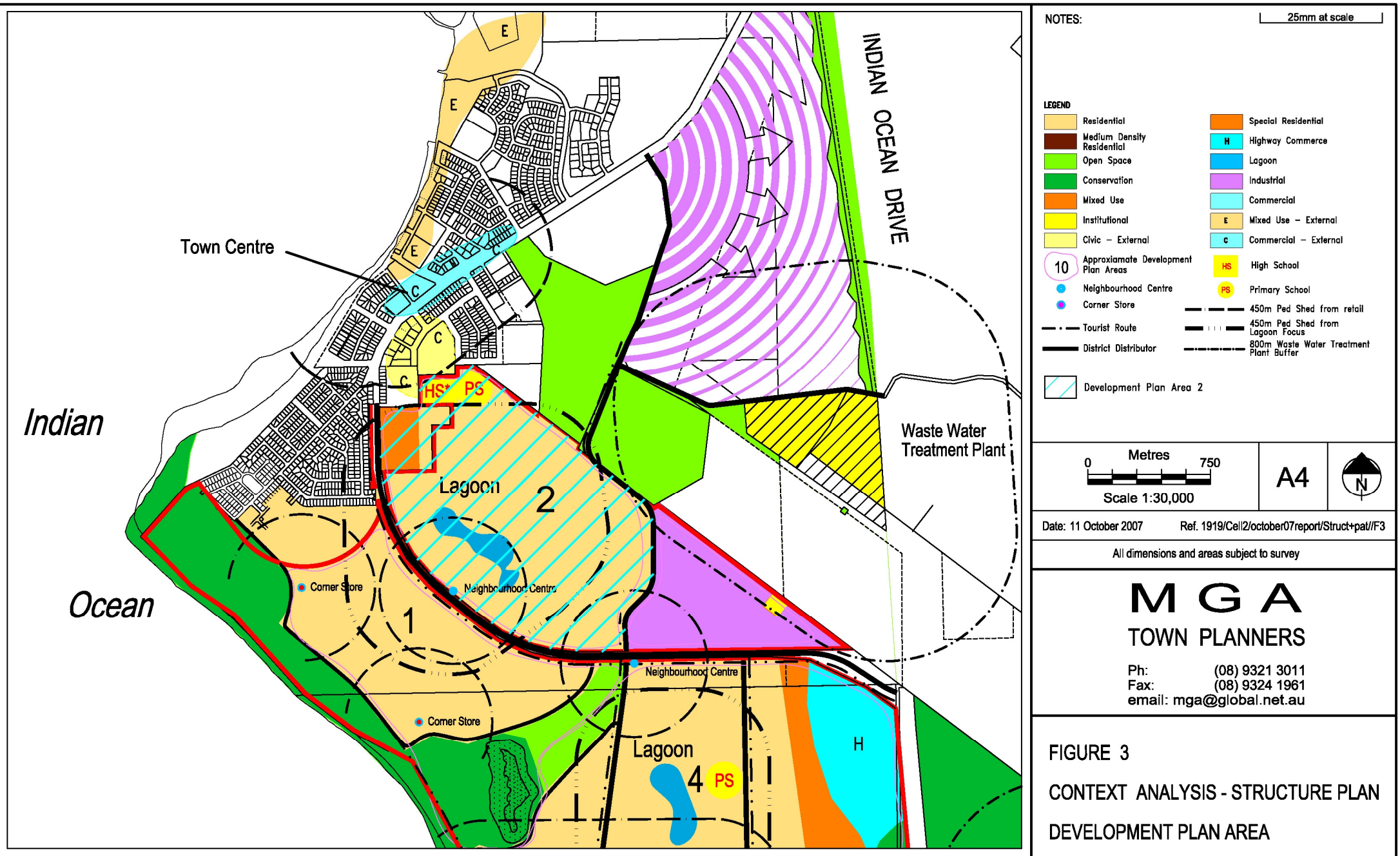
and a community centre with indoor meeting areas and basket ball court.

The Turquoise Coast Development, Jurien Bay Structure Plan establishes development principles for the expansion of Jurien Bay. **Figure 3** puts the Development Plan area into context with the approved Structure Plan. Key elements of the Structure Plan include Bashford Street's identification as a District Distributor Road and a further District Distributor is aligned down the eastern side of the Development Plan area.

The Jurien Bay Town Centre is shown to consolidate as the main commercial hub in conjunction with the civic area south of Bashford Street. The industrial area east of the Town is also intended to consolidate.

A section of stable coast at Booka Valley (see **Figure 1**) towards the centre of the Structure Plan area is identified as a Mixed Use area to accommodate a combination of residential, commercial and tourism uses but only to an extent and intensity secondary to the Town Centre.

A Neighbourhood Centre is identified centrally on the Development Plan area's frontage to Bashford Street. A



Neighbourhood Centre is also shown at the corner of Bashford Street and the main north/south District Distributor road, outside and to the south-east of the Development Plan area while the Jurien Bay Town Centre is comparatively close to the north.

The existing combined high school/primary school is shown to be split and accommodated on expanded school sites to the north of the Development Plan area.

5.0 SITE ANALYSIS

Figure 4 is a portion of aerial photographic coverage of the Jurien Bay area with contours and the Development Plan area boundary added.

Only the western portion remains under natural, heath vegetation with the balance having previously been cleared and pastured. There are 3 distinct landforms. Two of these are portions of beach ridge plains.

The first beach ridge plain occupies the north-western corner of the Development Plan area and comprises a series of low sand dune ridges on a south-west to north-east trend, generally up to 3.5 metres AHD in height, a relief of approximately 2 metres. The second beach ridge plain

comprises taller dunes on a north/south trend towards the east, tending to follow a north-west to south-east trend further west. These dunes are up to 12 metres AHD but more commonly 6 – 8 metres AHD, representing a relief of around 4 – 6 metres rising to 10 metres at the maximum.

The third landform is the low flat plain east of the beach ridge plains. Contour information indicates elevations in the range 1.5 metres to 2 metres AHD. **Figure 5** is a digital terrain model of the site better illustrating the current landform.

Soils are sandy, generally fine grained with little humus content. When loose, it is potentially wind erodable. Limestone exists at depth but is not likely to impact development.

Gradients on dune faces are often steep necessitating earthworking to permit development.

6.0 CONSTRAINTS

Reserve 41333 (refer to Figure 6) is vested in Airservices Australia for aviation purposes and contains an air navigational aid. The Reserve is located on the north-eastern



Figure 4

side of the Development Plan area, lying between the development land and the southern end of the Jurien Bay airstrip.

The navigational aid is situated towards the centre of the Reserve and requires a 300m critical clearance radius. No buildings are permitted within this radius and roads are also not supported as reflection from vehicles/machinery can distort signals.

Figure 6 shows that the 300m radius extends marginally into the Development Plan area and will require roads to be aligned so that they do not intrude upon the exclusion zone. Beyond the 300m radius, building height is controlled by a 2° elevation plane. This allows a building height of 10.4 metres above the base of the navigational aid, 300 metres from the aid. As the aid's base is at RL 2 metres, this translates to a building height above likely finished ground levels within the development area of 8 to 9 metres.

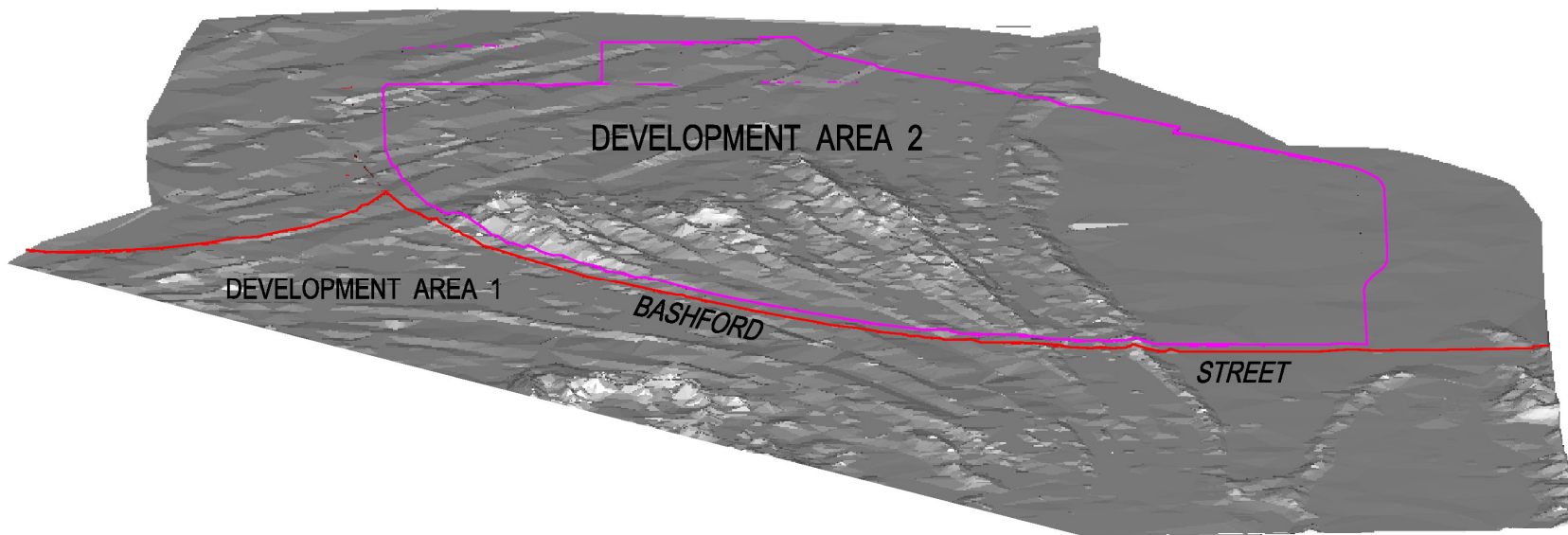


Figure 5

A building height limitation of 8 metres is more than sufficient to accommodate a standard, single storey building. At 350 metres from the navigational aid, the maximum building height increases by almost 2 metres. Height restrictions will need to be imposed on the development of future lots close to Reserve 41333 to protect the function of this important device however, in practice, the restriction is unlikely to be a severe limitation on development potential. The necessary height controls can be effected through adoption of a Detailed Site Plan.

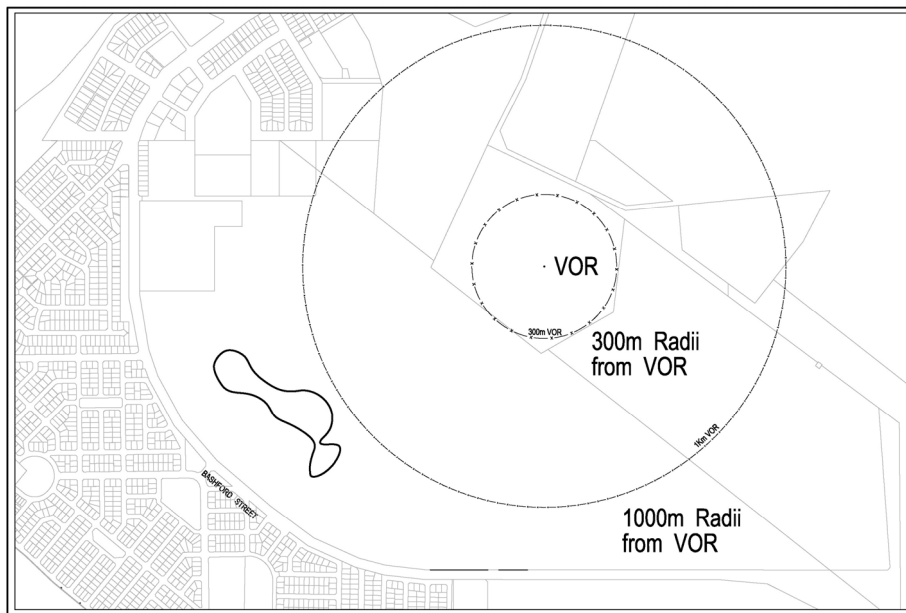


Figure 6

7.0 THE DEVELOPMENT PLAN

7.1 **Figure 7** shows the proposed structure of the Development Plan area. Features of the proposal include :

- walkable neighbourhood catchments of 450 m radius
- proposed commercial uses
- proposed street block layout
- proposed schools and community facilities proposed land uses including distribution of residential densities
- proposed transportation corridors, public transport and cycle/pedestrian networks (see **Section 12**)
- public open space.

7.2 Design Evolution

The Development Plan focuses on the proposed lagoon, a large body of saline (sea) water artificially held in the midst of the Plan area. Its location was generally identified within the Structure Plan for the Turquoise Coast development.

The lagoon is designed to bring the amenity of ocean beaches inland as well as enhancing water based recreation by creating a water body protected from winds and with fewer natural hazards such as the summertime “stingers” which frequent natural beaches.

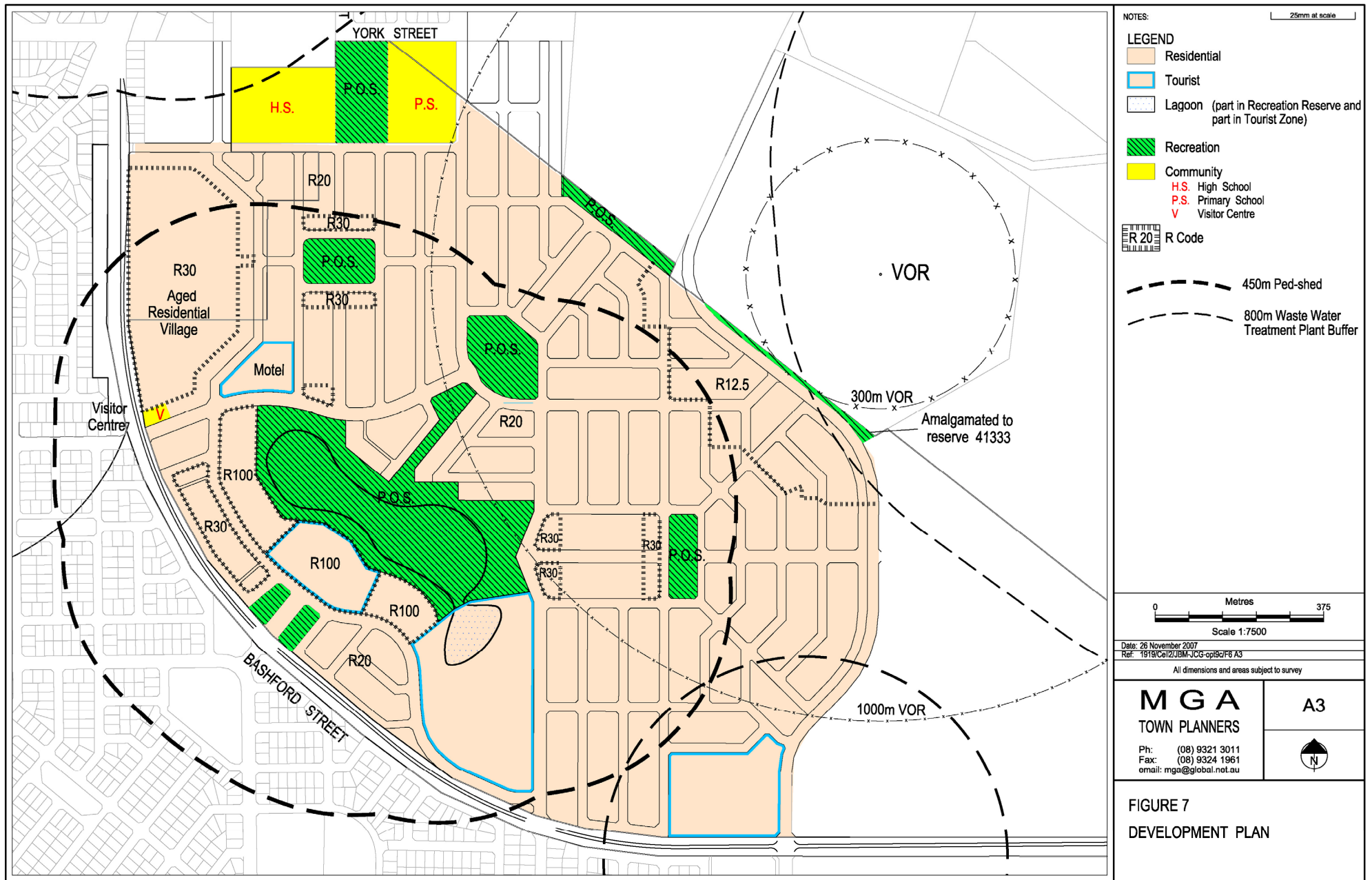


Figure 7

At 8ha, the lagoon will be a large body of water. There is no science to the decision to create a water body of this scale. The decision was primarily based on perceptions of what may appear to be a substitute “ocean” versus a pool or a creek. For example, the main bathing area at Cottesloe Beach from the groyne to the reef at the northern end is around 250-300 metres. An Olympic swimming pool is 50 metres long. With these images in mind, a lagoon of approximately 400 metres by 200 metres with a minimum width of about 100 metres was considered appropriate.

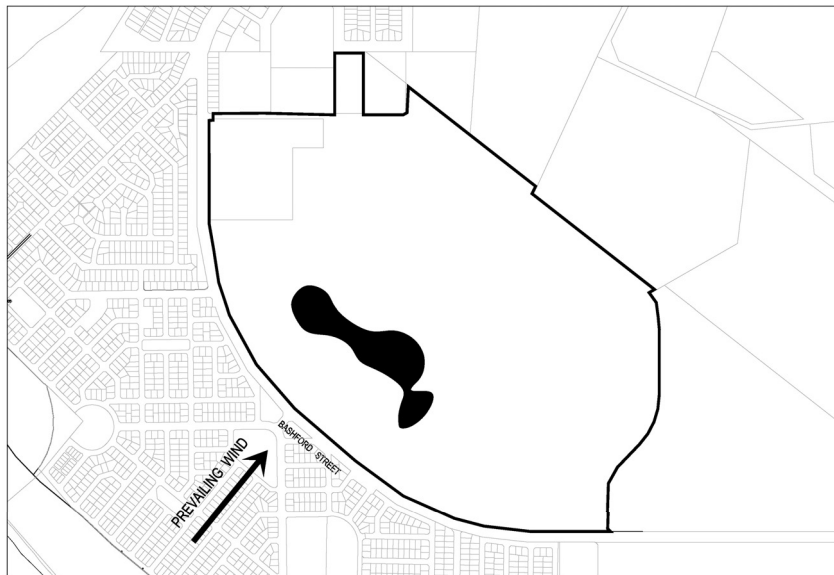


Figure 8

Orientation is based on science with the long axis being aligned normal to the prevalent south-westerly sea breezes. **Figure 8** therefore positions the lagoon within the Development Plan area.

As the focal point of the area, accessibility is critically important. Strong pedestrian/cycle linkages are therefore created and illustrated on **Figure 9**, combining with other open spaces. In most instances, these linkages have major destinations at their alternative ends increasing their validity as shown on **Figure 10**.

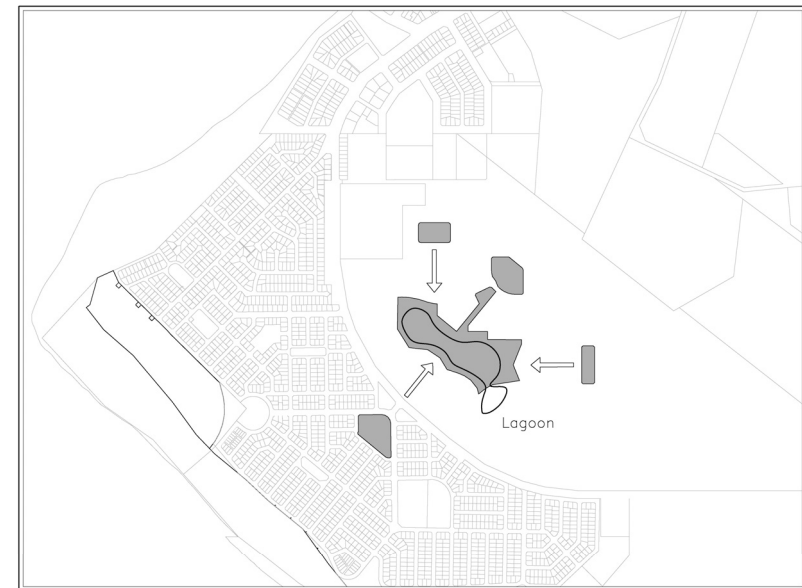


Figure 9



Figure 10

Accessibility by vehicles is also extremely important. The major artery through the area is Bashford Street and the lagoon is therefore slightly off-set towards this artery in acknowledgement of its significance as well as the desirability of maximising accessibility for those residents west of Bashford Street. Neighbourhood connectors skirt the lagoon area and link through to adjoining residential neighbourhoods as illustrated on **Figure 11**.

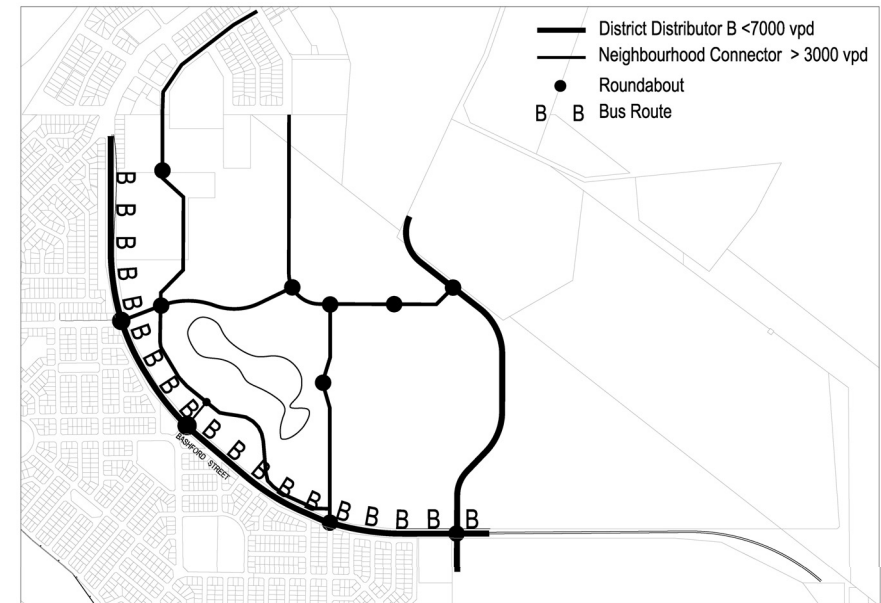


Figure 11

7.3 Lagoon Precinct

The lagoon precinct is designed to be the primary focus of the Development Plan area. It will be the precinct with the most intense activity and greatest variety of uses comprising not only the water body and associated margins but commercial, tourist and entertainment functions as well as higher density residential accommodation.

Figure 12 is an artist's plan view of the proposed lagoon and surrounding development. The elements of the plan can be

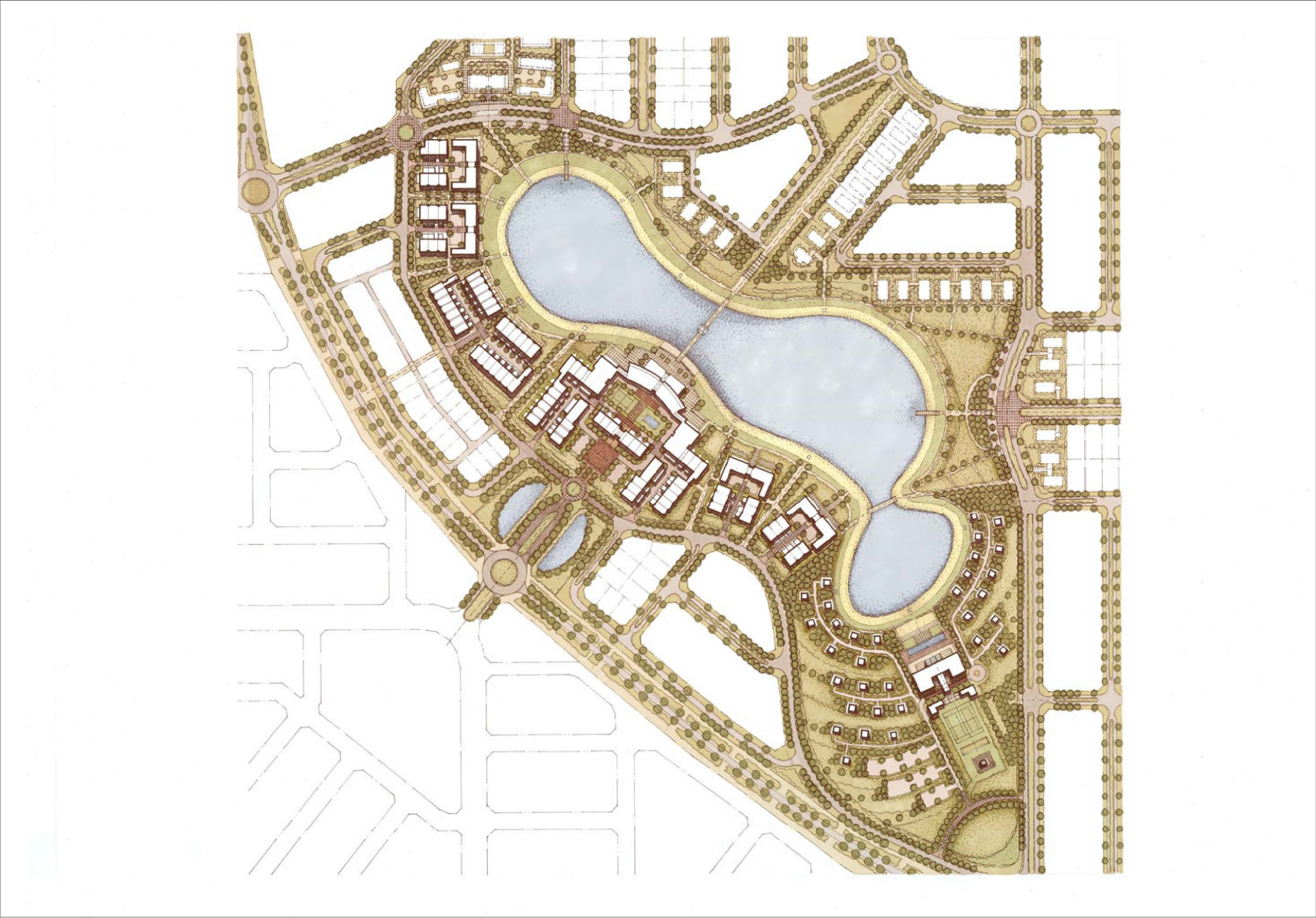


Figure 12

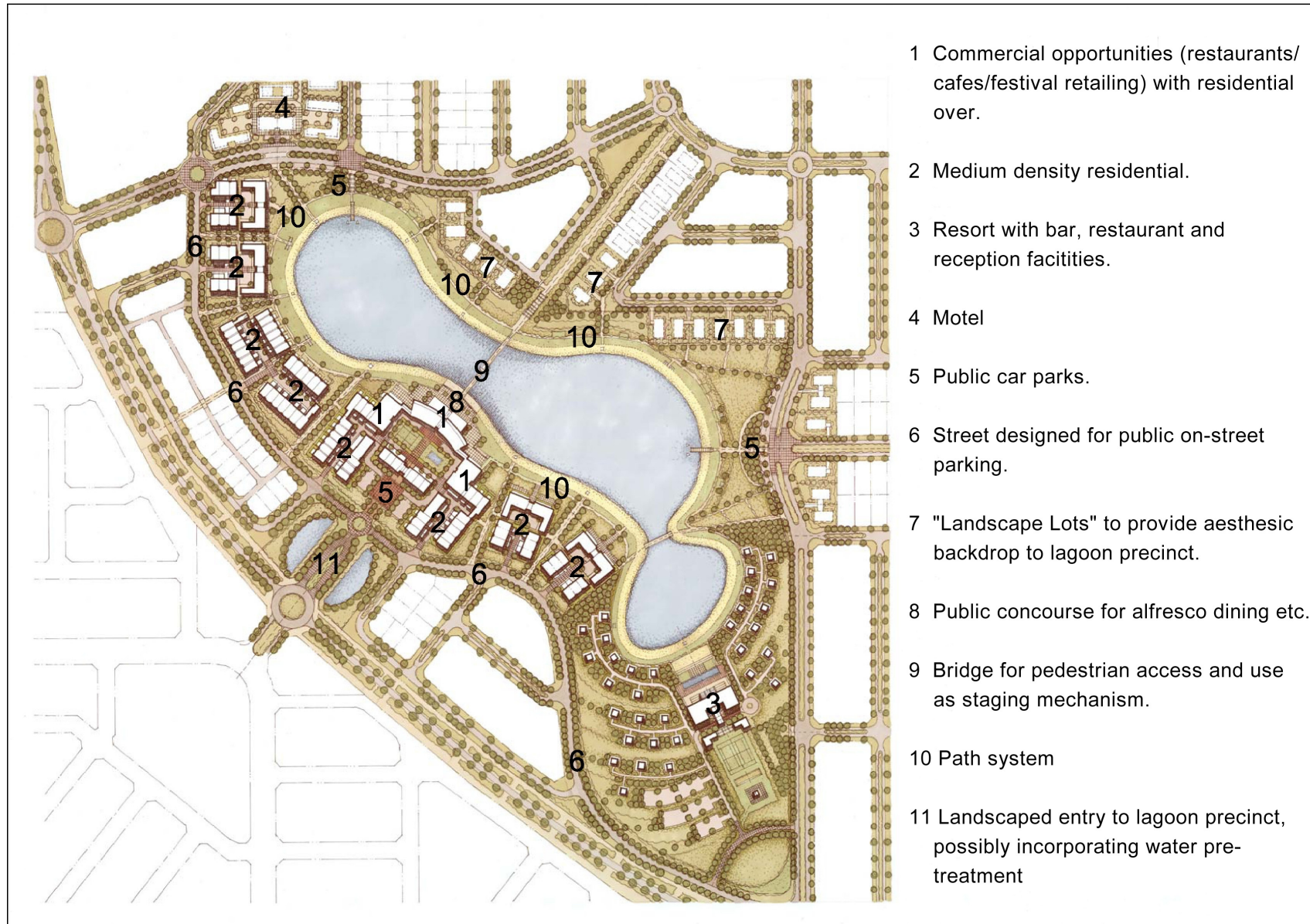


Figure 13

identified from the key at **Figure 13**.

The highest intensity of development and use is aligned along the southern and south-western shores of the lagoon as these are the most hospitable shores in view of the prevailing sea breezes. Grouping taller structures along these shores will provide greater wind protection to the lagoon area.

Principal public entry to the lagoon area is located centrally along the south-western shore. Pedestrian routes connect public parking with commercial tenancies and the forecourt leading to the water's edge and bridge across the lagoon.

A cross sectional view of the promenade and public space in front of a mixed use building adjacent to the lagoon is illustrated at **Figure 14**.

As indicated, a resort site is proposed on the southern shore of the public lagoon. It is envisaged that this site will be serviced by its own lagoon area which will be a visual extension of the public lagoon but totally independent for logistical and operational reasons. **Figure 12** shows how this development is proposed to integrate with the broader

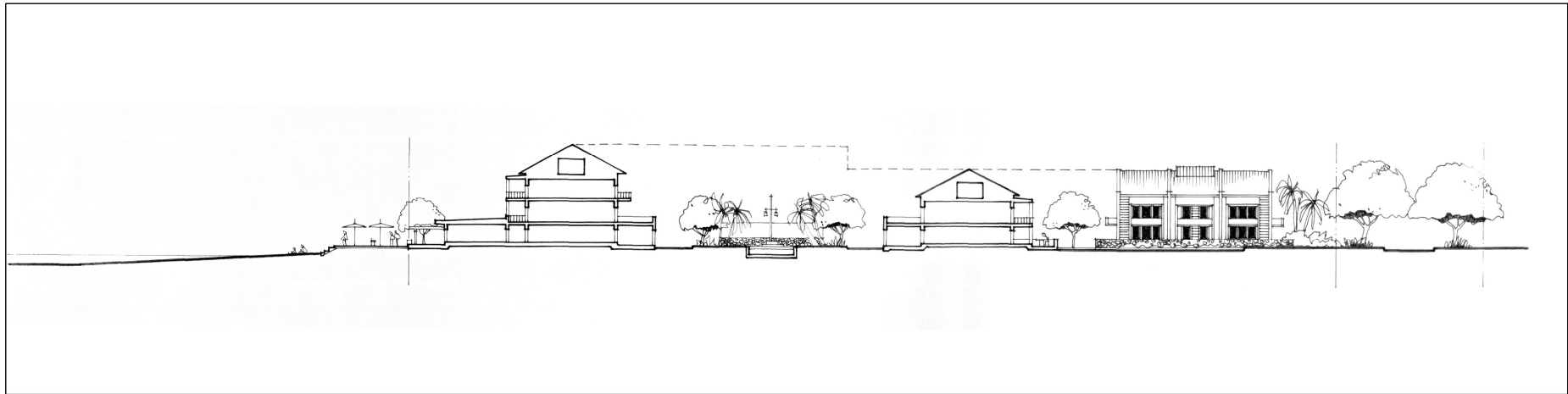


Figure 14

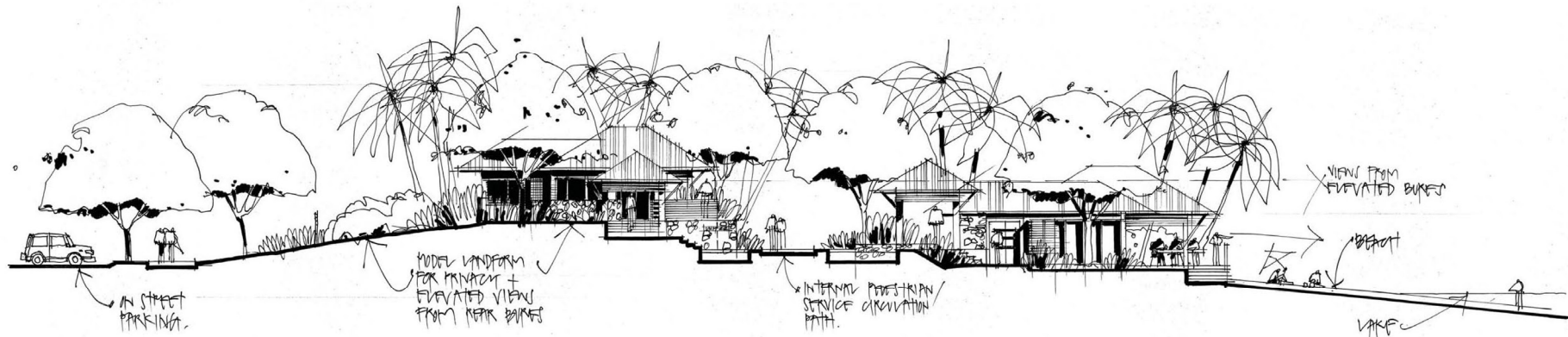


Figure 15

complex. A cross sectional view through proposed bures (independent accommodation units) is provided at **Figure 15** and an artist's impression of the resort is shown at **Figure 16**.



Figure 16

7.4 Increased Housing Density

Medium and higher density housing is generally located close to the primary activity centre (the lagoon precinct) to maximise accessibility. **Figure 17** identifies the areas of increased density.

In particular, it is envisaged that to provide public parking close to the lagoon precinct, there will be a broad boulevard aligned along the south-western shore between the lagoon precinct and Bashford Street. Building details previously

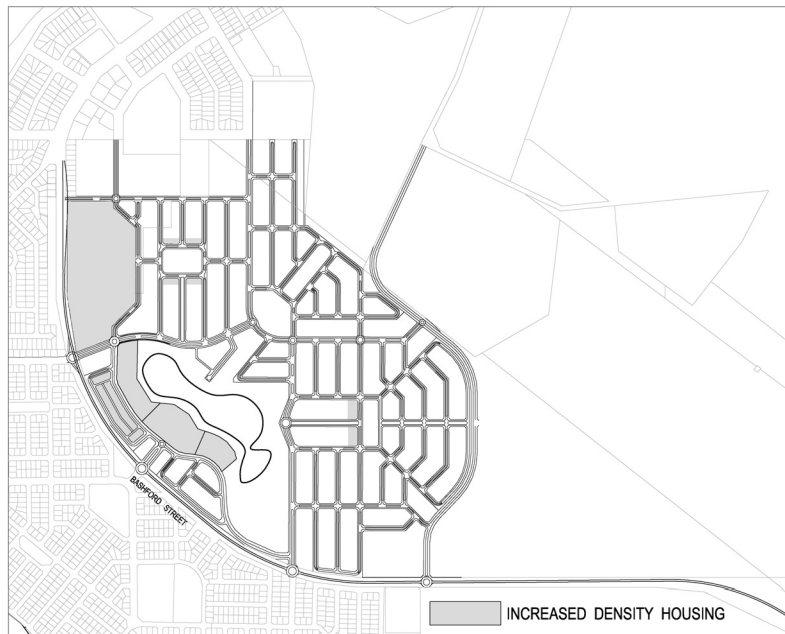


Figure 17

revealed show that the north-eastern side of this broad boulevard will be framed by buildings generally of two to three storeys in height. Medium density housing down the south-western side of the boulevard will enclose the public space on the other side. The vertical scale of medium density housing in this locality therefore assists the development aesthetically.

The issue of public parking is discussed in greater detail later.

7.5 Open Space

The prime recreation area is the proposed lagoon – a water based playground. It will provide year-round recreational opportunities. For approximately 8 months of the year the climatic conditions and water temperatures are likely to be sufficiently comfortable to allow for bathing and 12 months use for canoeing, windsurfing etc.. Other opportunities include walking, jogging and cycling, beach volley ball, picnicking and general kick - around activities extending its attraction to the full year.

Other kick-around spaces and linkages extend amenity to the residential neighbourhoods not immediately associated with the lagoon. On the north-eastern side of the Development

Plan area lies the Jurien Bay Golf Course. Strips of open space broaden the buffers between residential areas and fairways as currently, the fairways are constructed close to the site boundaries as may be seen from the aerial photograph at **Figure 4**. In places, housing lots are shown to “back-on” to the golf course area, forming a small golf course estate similar in principle to Joondalup, The Vines or Meadow Springs.

Most open spaces will include water wise landscaping with lawned areas being restricted because of the scarcity of fresh groundwater supplies for reticulation. This constraint limits the use of open space for active recreation pursuits requiring large areas of lawn. In response to these concerns, the Plan accommodates active open space on a reserve joined with the high and primary schools where it can serve school needs as well as those of the broader community. It is envisaged that the reserve will be jointly developed and managed by Council and the Education Department.

Commission policy requires 10% of the gross residential area of any subdivision development be set aside as POS. In this case, the Development Plan area already contains Reserve 35716, a recreation area of 12.484ha created on Plan

of Survey 12410 from Victoria Location 8837 and vested in the Crown under Section 20A of the Town Planning and Development Act.

Figure 18 shows the subdivisions which have been developed and/or approved from Location 8837 as well as identifying POS areas. To date, 195.8172ha of Location 8837 has been or is approved for residential subdivision and 28.2177ha has been ceded or is required to be ceded as POS. These areas of POS are also identified on **Figure 18**. On this analysis, the subdivision of Location 8837 has a current POS credit of 9.6064ha.

A proposal to relocate Reserve 35716 to encompass the lagoon and surrounds is being progressed. POS areas proposed within the Development Plan are identified on **Figure 19** and total 23.634ha, including the relocated Reserve 35716. The Development Plan occupies some 188.3046ha including Reserve 35716. From this area, 6.5821ha is shown for school use and deducted from the total area for the purposes of POS assessment. Other areas may potentially be regarded as deductions such as the motel, caravan park and resort sites but, because the Tourist Zone which applies to these areas also allows residential uses, they are included within the subdivisible area for the purposes of

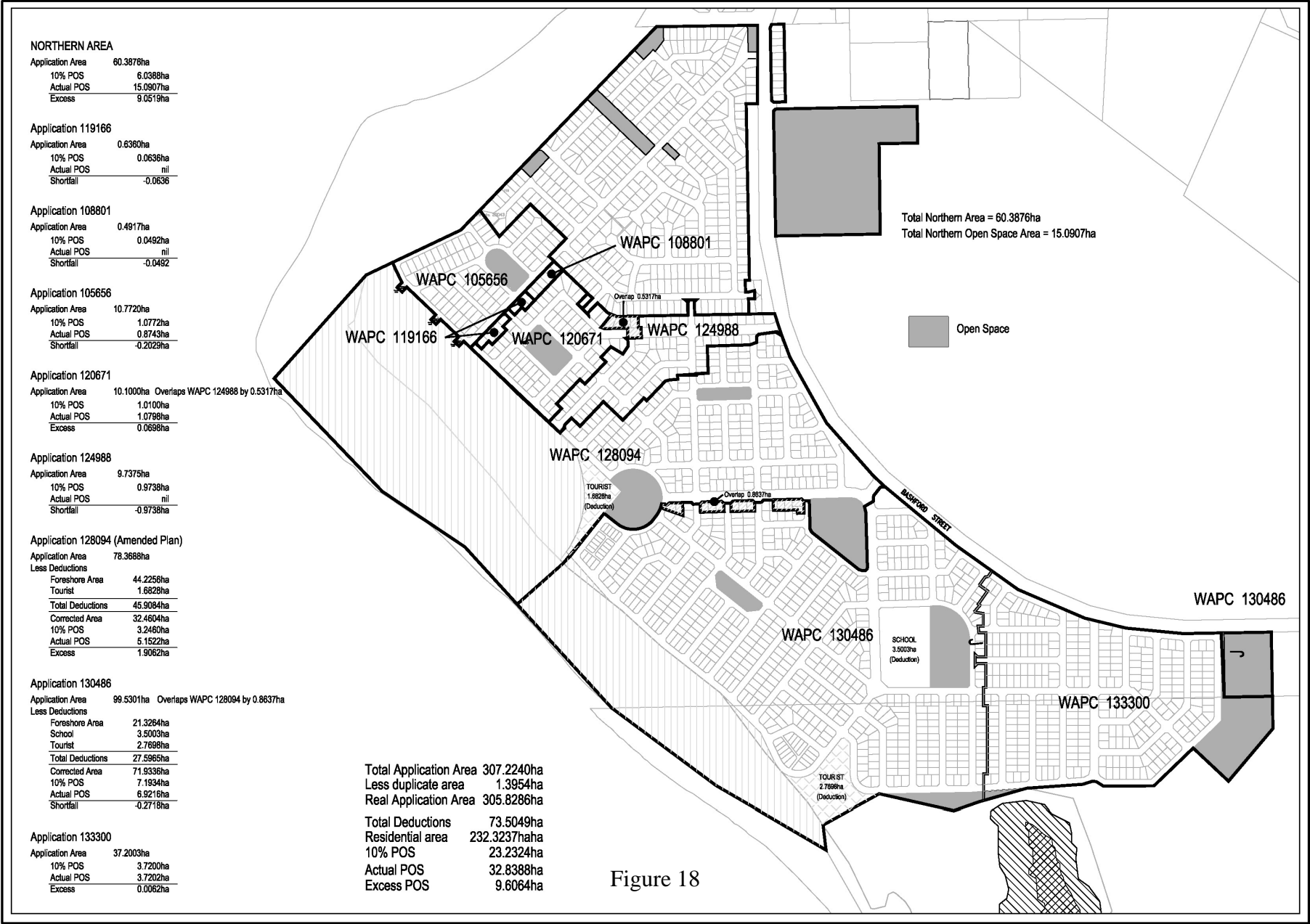


Figure 18

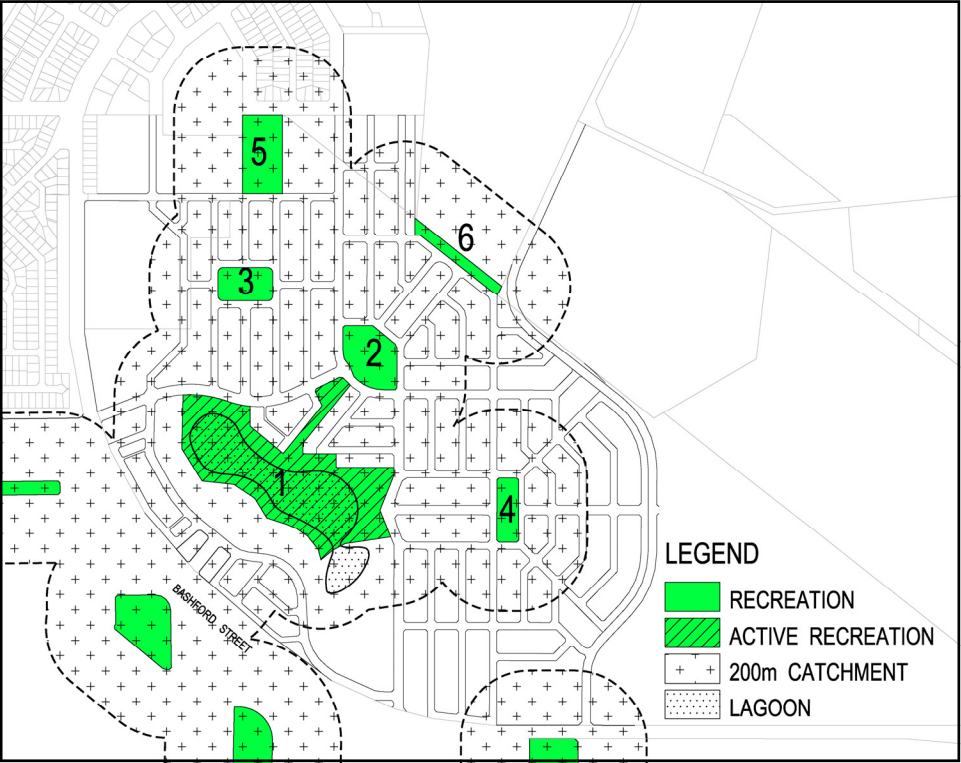


Figure 19

this assessment.

A POS schedule is provided at **Table 2** showing that 11.2% of the development area of 181.7225ha is provided as POS.

Table 2 - POS SCHEDULE

	Ha
Total (including Reserve 35716)	188.3046
Schools	6.5821
Development Area	181.7225
POS Areas (including Reserve 35716)	
Area 1	14.8983
Area 2	2.3937
Area 3	1.1456
Area 4	1.5704
Area 5	2.6746
Area 6	0.9514
Total POS	23.634

As discussed, the subdivision of the whole location is in credit by 9.6064ha as a result of the early vesting of Reserve 35716 which measures some 12.48 ha. The total POS area therefore needs to be reduced by 2.8736ha for the purposes of this assessment, meaning that 20.7604ha is actually provided from this Development Plan area, equivalent to 11.4% of the subdivisible area.

Figure 19 also comments on the distribution of open space, showing that nearly all housing is within 200m of recreation land.

7.6 **Walkability**

The lagoon is clearly the major focus of the area, particularly for recreation and social interaction between members of the new community. **Figure 7** shows the coverage of a 5 minute (450 metre) walkable catchment around the facility. It is estimated that approximately 1,000 lots will ultimately fall within this catchment. Buildings adjacent to the lagoon are proposed to house retail, office and entertainment functions as well as residences.

Figure 7 also scribes 450 walkable catchments around other existing and proposed facilities within or near the Development Plan area.

8.0 THE LAGOON

A more detailed technical feasibility of the lagoon's design and operation is to be provided in due course and only a preliminary summary version is provided here to maintain context. The detailed feasibility work is being undertaken by Sinclair Knight Merz in association with the Centre for Water Research at the University of WA. The modelling and assumptions used in the design are being tested by construction of a 1ha trial lagoon which will be monitored for a period of 6 - 12 months. In the event that monitoring indicates there are unforeseen problems with the lagoon proposal, this Development Plan will need to re-cast and re-presented for consultation and approval. It is not anticipated that final approval will be granted to the Development Plan until there is satisfaction with the monitoring outcomes.

The lagoon will be fed by bores drilled into the Tamala limestone layer underlying the area at a depth of 10 to 20 metres. The Department of Water has licensed this abstraction after various issues, including the possible presence of stygofauna were addressed. Outflow is to be injected back into the salt aquifer keeping the lagoon water separate from the upper aquifers.

Principles employed in the design of the lagoon include:

- Alignment relative to prevailing winds, reducing the fetch and wave generation.
- Embayments to concentrate water borne floating debris in particular areas for removal.
- A fully lined lagoon to separate the lagoon water from infiltration to upper groundwater.
- A 1mm welded PVC liner is proposed over the sand basin.
- This is to be followed by 200mm of compacted sand to protect the PVC liner.
- 100mm of compacted road base is then to be applied on top of the compacted sand.
- 20mm of Damseal is to be placed on top of the road base.
- The Damseal is then followed by a further 100mm of lightly compacted limestone road base.
- The bed of the lagoon will then comprise 300mm of compacted sand.
- A sand layer above the liner (and geofabric) to protect the liner and create a "natural" beach appeal.
- Shallow flat margins reducing the migration of sand down the slope and enhancing safety.
- Relatively shallow lagoon 1.2 to 2 metres deep.
- Areas exposed to potential erosion by wind and waves to be reinforced with low limestone revetments.

Figure 20 is a cross section of the lagoon illustrating many of these elements.

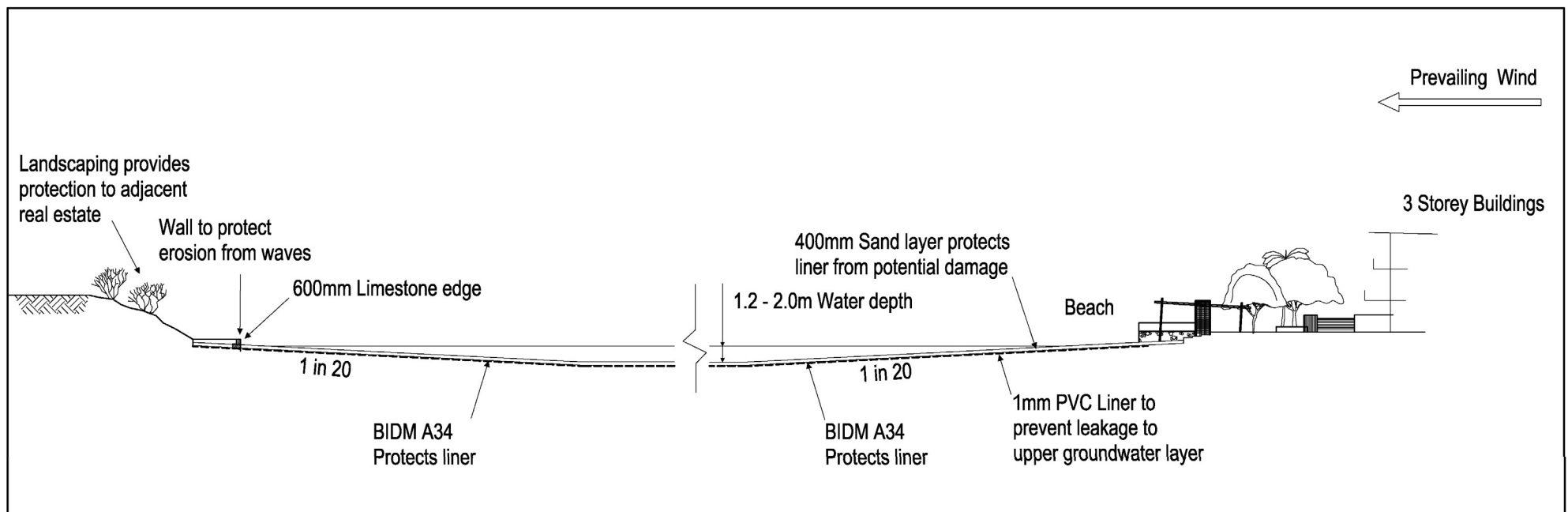


Figure 20

9.0 ZONING AND RESIDENTIAL DENSITY

The Shire of Dandaragan Town Planning Scheme requires that the Development Plan define zones and residential densities for the Development Plan area. **Figure 7** is therefore a zoning map for the area with R Code densities overlaid.

The zones include:

- Residential
- Tourist

Reserves include:

- Public Purposes
- Parks & Recreation

Residential density codings are proposed over the zones.

9.1 Residential Zone

Residential zoning covers most of the Development Plan providing for a variety of housing styles through the application of R Code densities. Provision is made for standard, single house development, grouped and multiple dwellings as well as aged or dependant persons dwellings.

Single housing is predominantly accommodated on land coded R15 and R20. Provision is made for small lot single housing or grouped dwellings on land coded R30. Between

11ha and 12ha of R30 land is identified as a retirement village site. An R100 code is also applied (land zoned “Tourist”), providing for the development of multiple dwellings.

An R12.5 Code is applicable to land possibly affected by height restrictions imposed by the air navigational aid on Reserve 41333 in the north-western corner. The larger lot sizes will provide adequate opportunity to construct a substantial dwelling within the height constraint.

9.2 Tourist Zone

The Tourist Zone is applicable to land identified for tourist accommodation such as the proposed caravan park, resort and motel as well as land to be used for purposes supporting tourist activity including entertainment functions and festival retailing. The zone therefore also covers the mixed use areas on the south-western side of the lagoon which will be predominantly permanent residential but will also accommodate commercial functions. An R100 Code is applied to the area of the zone south-west of the lagoon where permanent residential accommodation is anticipated.

9.3 Parks & Recreation Reserve

The Scheme Reserve – Parks & Recreation is shown over the

proposed open spaces including the lagoon and its surrounds.

9.4 Public Purpose Reserve

Enlargement of the existing school site to create a site large enough to accommodate a full sized high school is proposed. The primary school is shown to be separated from the high school and both sites are reserved for “Public Purposes”. The high school extension measures around 4ha to create a 10ha site. Approximately 2.63ha of land is shown for the future primary school with a balance 0.87ha to eventually come from portion of Vacant Crown Lot 1162. VCL 1162 is currently leased to the Chairman of Ardross Estates Pty Ltd.

A strategically located site is also identified for a visitor centre. It is close to the lagoon as well as being opposite a road link to Island Point where there is to be an interpretative park. It is therefore well positioned to intercept traffic approaching the town from the south and able to provide information on the town, the boat harbour, national parks and other attractions of the region.

A small reserve to expand Reserve 41333 is also proposed. This expansion will ensure all development, including roads, is outside the 300 metre radius exclusion zone of the air

navigational aid situated towards the centre of Reserve 41333.

10.0 HEIGHT CONTROL

As discussed, Airservices Australia operates an air navigational aid centrally within Reserve 41333 which adjoins the Development Plan area to the north. **Figure 7** shows the Reserve and the aid (VOR) in relation to the Development Plan, indicating that the nearest point of the Development Plan to the aid is a little under 300 metres distant.

Airservices Australia advice dated 23 August 2006 is included at **Appendix 1**. **Figure 21** shows how the maximum height of the structures is calculated for that area between 300m and 1000m from the VOR.

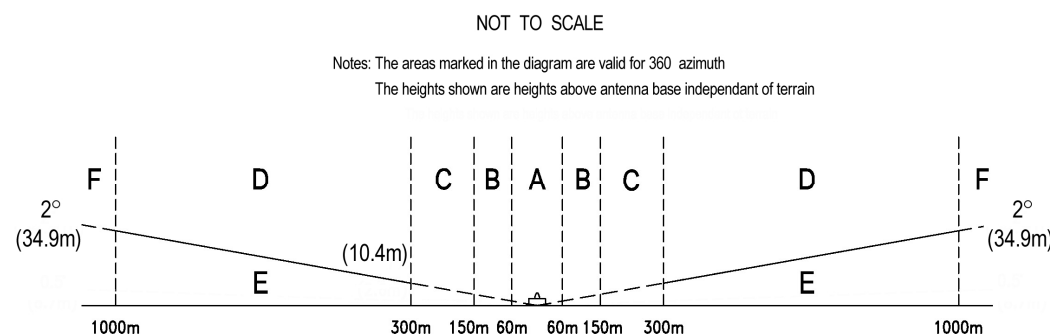


Figure 21

11.0 SERVICES

The Water Corporation has prepared a Water Management Plan for Jurien Bay, incorporating the complete water cycle. It addresses the supply of potable water, treatment and re-use of waste water as well as the management of stormwater, maintaining the natural groundwater regime and minimising nutrient export.

11.1 Water

Potable water is gravity fed from storage tanks located on high land to the north-east. The existing reticulation system can be extended to serve the Development Plan. The Water Management Plan makes provision for the expansion of the borefield supplying the area.

11.2 Sewerage

The existing waste water treatment plant is located to the east of the Development Plan area. A sewage pumping station is to be constructed near the entrance to the proposed lagoon precinct connected by a pressure main to the treatment plant.

Ultimately, a new treatment plant will be constructed on high

land to the east of Indian Ocean Drive. The overall plan is to recharge the shallow aquifer with treated waste water for re-use on parks and gardens.

11.3 Drainage

The Turquoise Coast development has employed landscaped swale drains to infiltrate run-off from roads to the groundwater as quickly and as close to source as possible, thereby maintaining the natural regime. It is intended to continue this technique.

The design of the system combined with guidelines for the development of housing lots ensures that lawns and exotic gardens requiring significant fertilizer applications are avoided, minimising nutrient exports.

12.0 TRAFFIC

12.1 INTRODUCTION/BACKGROUND

12.1.1 Purpose of this report

Sinclair Knight Merz (SKM) were retained by Ardross Estates Pty Ltd to report on traffic aspects of the Development Plan with a view to facilitating appropriate access and movements systems for all modes of transport, to integrate the development with the surroundings land uses and transport networks and to provide high quality pedestrian and cycle networks both within the development and connected to the surrounding area. The SKM report therefore backgrounds this section of the Development Plan.

12.1.2 Proposed Development

For the purposes of traffic assessment, the key components of the proposed Development Plan included the following;

- Approximately 1,140 residential lots,
- Approximately 130 residential units (multiple/grouped dwellings)
- A Primary School
- A Secondary School
- A 200 bed resort
- A motel
- 1,200 m2 of cafe and retail space

- One visitor centre
- 300 aged persons units
- A caravan park with 200 caravan bays.

12.2 EXISTING SITUATION

12.2.1 Jurien Bay

Jurien Bay is a small fishing/tourist town with approximately 2000 population and 700 visitors during holiday season. From 2006 census data, the population in Jurien Bay was 1,343. There was a total of 1,030 dwellings, of which 575 were occupied, a higher than usual absentee ownership rate of 44 percent. The major industries in Jurien Bay are cray fishing and tourism. The census was taken during the “off” season with the result that population was generally understated.

12.2.2 Existing road network

The existing road network is illustrated on **Figure 22**. The main street through the town is Bashford Street which has been adopted into the interim route of Indian Ocean Drive. Ultimately, Indian Ocean Drive is proposed to bypass the town centre with Bashford Street comprising a loop off the main north-south route. Both Indian Ocean Drive and Bashford Street are currently undivided rural 2-lane roads.

The Indian Ocean Drive has been completed with the exception of the final section of the road between Lancelin and Cervantes. This final section is planned to be constructed within the next few years. Once the construction is finished, it will allow traffic direct access to the entire stretch of coast between Joondalup and Dongara.

12.2.3 Existing traffic volumes

In January 2007, SKM commissioned Traffic Logistics to carry out traffic counts on Bashford Street (north of Dryandra Boulevard) and Jurien East Road (north of Coalseam Road). The locations are shown in **Figure 23**

The survey time period was during school holidays 5 - 16 January 2007. The traffic volumes are shown in **Table 3** and **Table 4**.

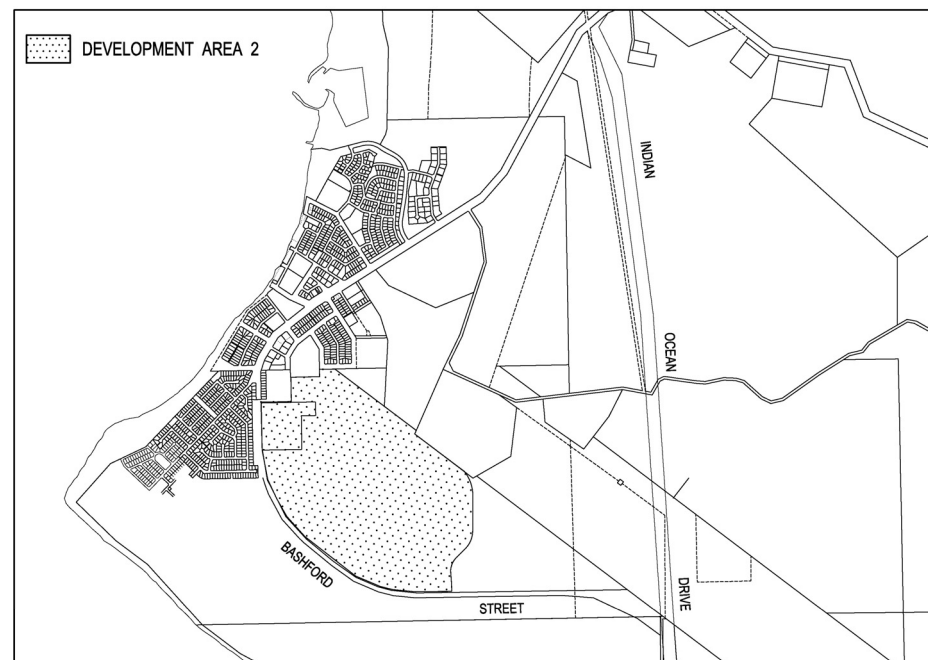


Figure 22

Table 3 Existing traffic volumes weekends (06 - 07 Jan 2007)

Location	Northbound	Southbound	Daily
Site 1 Bashford Street N of Dryandra Boulevard	290	370	660
Site 2 Jurien Road N of Coalseam Road	760	690	1450

Table 4 Existing traffic volumes weekdays (08 - 12 Jan 2007)

Location	Northbound	Southbound	Daily
Site 1 Bashford Street N of Dryandra Boulevard	350	380	730
Site 2 Jurien Road N of Coalseam Road	720	730	1450

The vehicle classification data revealed that heavy vehicles comprise approximately 10 percent of total traffic at both survey sites.

The average daily traffic volume appears to be similar during weekdays and weekends, with a slightly different time profile. On both weekdays and weekends, the peak traffic occurs during middle of the day between 11:00 am and 3:00 pm, instead of morning and afternoon peak. This suggests that the current commute community is relatively small in Jurien Bay.

The traffic profiles at these two survey sites are shown in **Figure 24** and **Figure 25**.

Historical traffic counts on external approach roads have been obtained from MRWA and are shown in **Table 5**. The external roads are Indian Ocean Drive (north of Jurien Bay) and Jurien East Road (the road connecting Brand Highway and Jurien Bay)

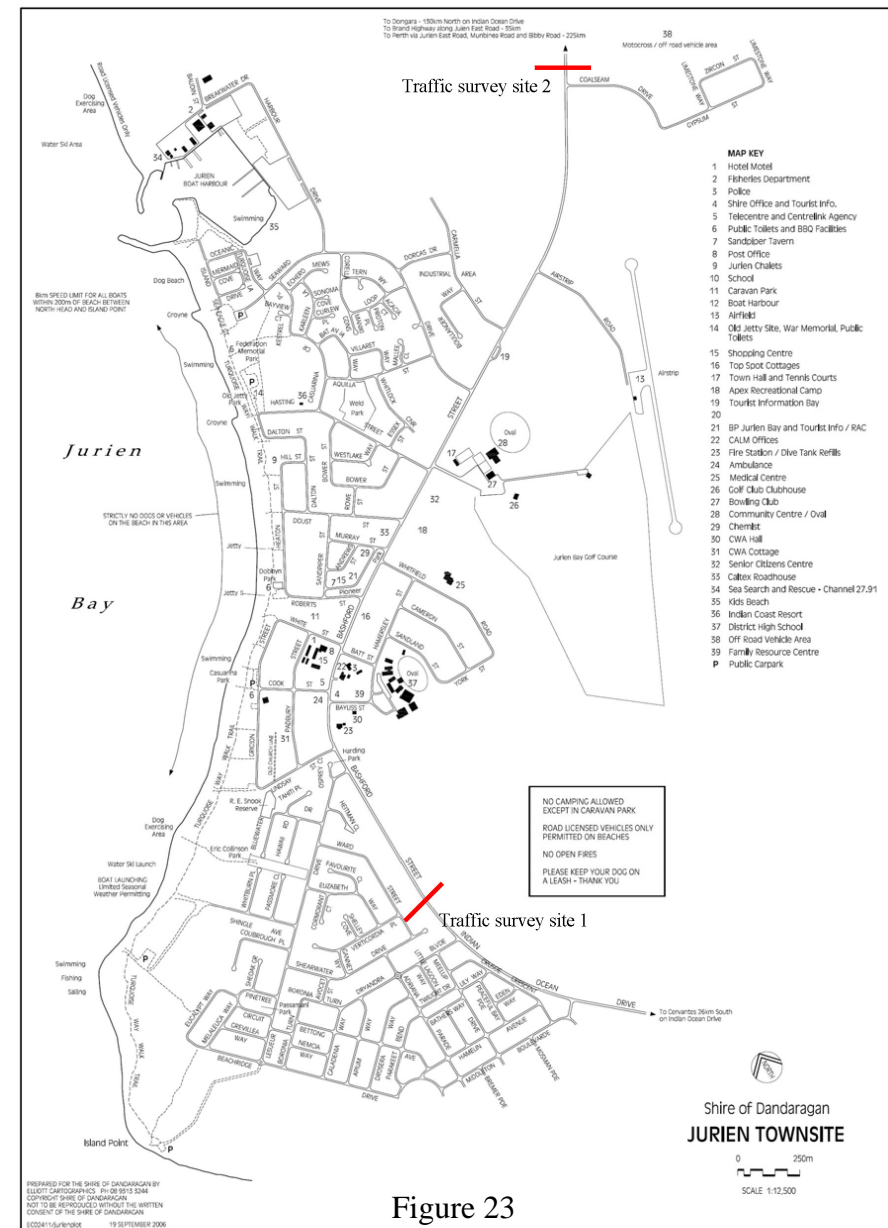


Table 5 Historical traffic volumes

Road	Date	Average weekday volumes	Average weekend volumes
Jurien East Road	23 Apr – 6 May 2005	810	620
Indian Ocean Drive (North of Jurien)	24 Apr – 5 May 2005	440	330

The traffic volumes in **Table 5** show that although Jurien Bay is a tourist destination, the average weekend traffic is approximately 25 percent less than average weekday traffic. It is also observed that traffic volumes on these two-lane roads are currently very low, suggesting that there is currently a great deal of spare capacity on these roads.

12.2.4 Public transport

Currently there are no public bus services in Jurien Bay. There is a licensed taxi servicing mainly the town and surrounding area.

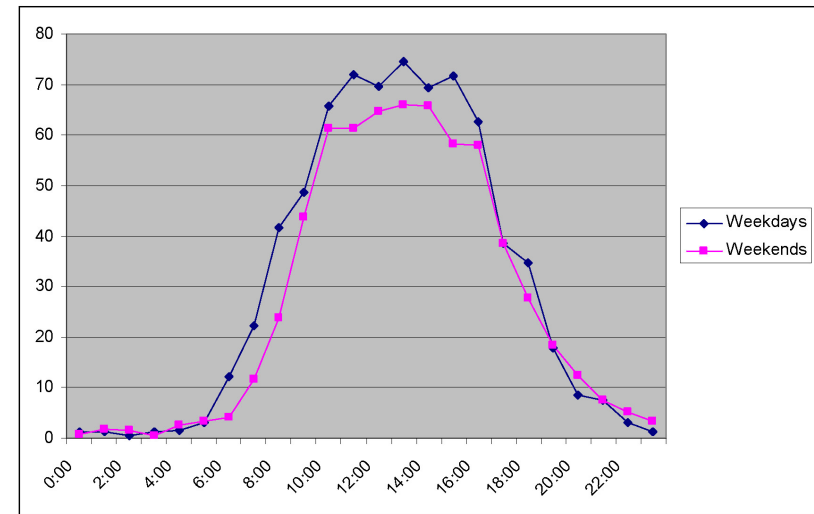


Figure 24 - Bashford Street north of Dryandra Boulevard

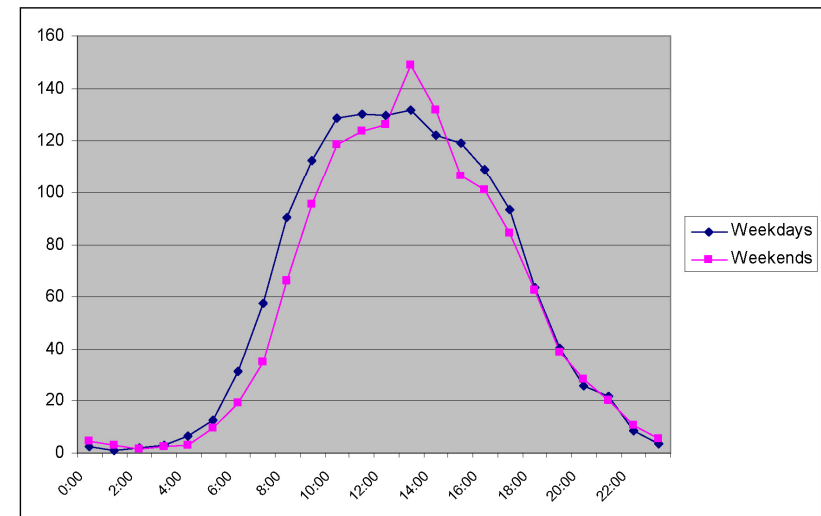


Figure 25 - Jurien East Road north of Coalseam Road

There are two school buses providing services for students in adjacent towns and surrounding rural areas; one school bus operates between Jurien Bay and Green Head/ Leeman, the other school bus operates between Cervantes and Jurien Bay.

12.3 TRAFFIC FORECAST

12.3.1 Traffic features

The traffic forecast has been based on the expected behaviour of target users for each activity associated with the proposed land uses.

12.3.1.1 Residential component

The 2006 census data showed a high proportion of dwellings are holiday homes. The holiday homes will generally generate less traffic during weekdays, and became more active during weekends and holidays.

It is expected that as the town grows, there will be more permanent residents and less holiday homes. This traffic assessment assumed that 30 percent of dwellings will be holiday homes.

12.3.1.2 Retail component

The 1200m² local retail centre will attract mainly local residents and tourists within ODP2.

12.3.1.3 Education component

The primary school will continue to serve the existing town area, surrounding rural areas, as well as ODP2. The high school will have similar catchment as it currently has i.e. Jurien Bay and surrounding towns and rural areas. It is expected that school buses will continue to provide services for surrounding towns and rural areas to the primary school and the high school.

12.3.1.4 Tourist component

The resort, motel and caravan park will attract tourist traffic from outside Jurien Bay, mainly during weekends and holidays.

12.3.1.5 Lagoon component

It is expected that the lagoon will attract local residents as well as tourists around the town during weekends and holidays.

12.3.1.6 External traffic

The analysis of existing traffic volumes on Indian Ocean Drive, Bashford Street and Jurien East Road indicated that currently a majority of the external traffic arrives/ departs via Jurien East Road - Brand Highway (east) and Indian Ocean Drive north (approximately 1450 vpd), with the balance (probably less than 500 vpd) arrives/ departs via the section of Indian Ocean Drive between Cervantes and Jurien Bay.

The Indian Ocean Drive is due to be completed with the final section of road between Lancelin and Cervantes being constructed by 2012. This will allow traffic direct access to the entire stretch of coast between Joondalup and Dongara. Non-heavy vehicle, currently travel via Brand Highway, will mostly likely to divert to Indian Ocean Drive. Therefore the proportion of traffic that access Jurien Bay via Indian Ocean Drive is likely to increase significantly.

in the traffic forecast are considered to be very conservative for a regional holiday/ tourist town like Jurien Bay, since it can be expected that the traffic generation rates would be generally lower than those in a metropolitan area.

Because the traffic generation rates may vary greatly depending on the residents/ population profile, a range of traffic generation rates have been assumed. The lower rates represent a smaller household size without school age children, while the higher rates represent families with employed adults and school children. The assumed rates are shown in **Table 6**.

12.3.2 TRAFFIC FORECAST VOLUMES

12.3.2.1 Traffic generation assumptions

The Turquoise Coast Development Structure Plan (Nov 2003) has provided traffic forecasts for the whole Turquoise Coast Development. The traffic assumptions used

Table 6 Traffic generation assumptions

Item	High rate	Low rate	Description
Trip rate per residential unit	7	5	trips per unit per average weekday
Trip rate per holiday unit	4	4	trips per unit per average weekday
Trip rate tourist bed	4	4	trips per tourist bed per average weekday
Trip rate caravan	2	2	trips per caravan per average weekday
Trip rate small retail	100	100	trips per 100 sq m – small sites
Trip rate large retail	60	60	trips per 100 sq m – large sites
Trip rate office	30	30	trips per 100 sq m – large sites
% of holiday homes	30%	30%	percentage of residential dwellings occupied as holiday home
% of residential units	70%	70%	percentage of residential dwellings occupied as residents
% holiday homes occupied on average weekday	60%	60%	
% tourist beds occupied on average weekday	60%	60%	
% caravans occupied on average week-day	60%	60%	

Based on the assumptions in **Table 6**, the traffic generated by the proposed Development Plan 2 would be between 8,840 vpd and 10,430 vpd. A breakdown of this is shown in **Table 7**.

Table 7 Traffic generation of Development Plan, average weekday

Land Use		High	Low
Residential	No. Dwellings	1,140	
	Rate	5.6	4.2
	Trips	6,380	4,790
Resort/Motel	No. Beds	300	
	Rate	2.5	2.5
	Trips	750	750
Caravan	No. Beds	200	
	Trips	400	400
Retail	Floor Area m²	1,200	
	Trips	1,200	1,200
School	Trips	800	800
Aged Care	No. Units	300	
	Rate	3	3
	Trips	900	900
Total Trips		10,430	8,840

12.3.3.2 Traffic volumes

Estimated future traffic volumes in the vicinity of development are shown in **Figure 26**. The traffic forecast volumes on surrounding distributor roads have been obtained from Turquoise Coast Development Structure Plan (Nov 2003).

Figure 26 shows that the ultimate forecast traffic volume on Bashford Street in the vicinity of the Beachridge development is expected to be in the range of 5,000 vpd to 8,000 vpd. The north-south distributor road between Cell 2 and Cell 3 is expected to carry up to 9,500 vpd (based on high generation rates). The neighbourhood connectors within the Development Plan are expected to carry up to 2,000 vpd (based on high generation rates).

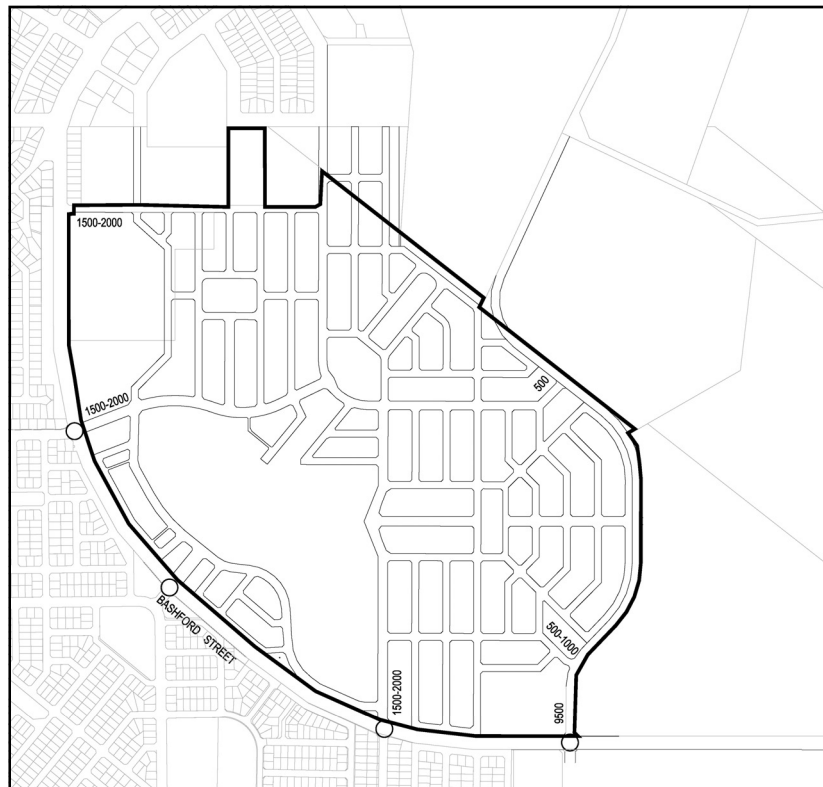


Figure 26

12.4 ROAD NETWORK ASSESSMENT

12.4.1 Road hierarchy

The recommended road hierarchy is shown in **Figure 27**.

The integrator roads in red colour will provide major inter-district connections. The neighbourhood connectors in blue colour will facilitate all transport modes travelling between adjacent neighbourhoods and provide connections onto integrator roads. Access streets will facilitate access to individual property for all travel modes and provide parking if required.

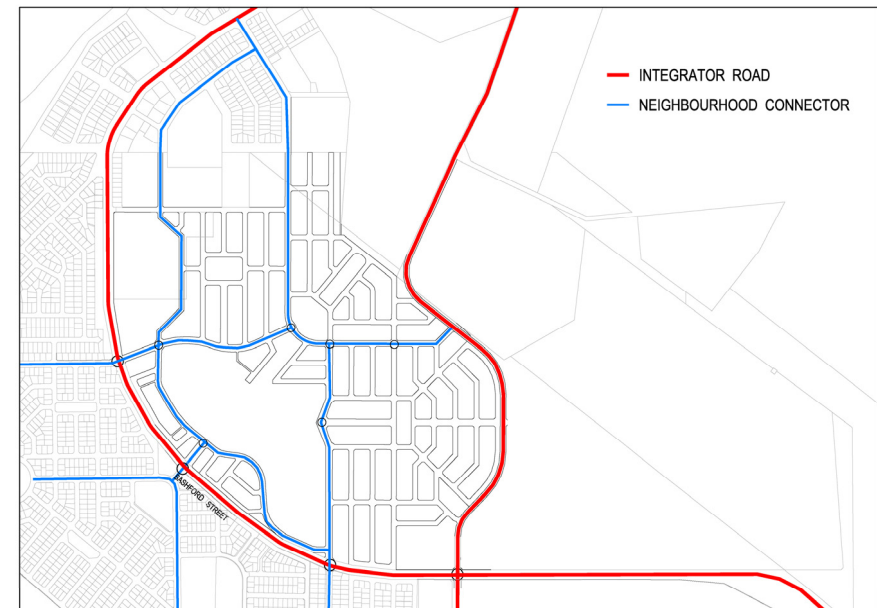


Figure 27

12.4.2 Indicative cross sections

Indicative cross sections for typical roads within Beachridge development are provided in **Appendix 2**. Median drainage swales will be provided on most roads and cross sections will be similar to those in previous development stages. Provisions have been made for shared paths on both sides along neighbourhood connector roads. In the vicinity of the local retail centre there will be high numbers of pedestrians as well as cars and cyclists. The road will be specially designed at this location to have particular regard to context, function and adjacent land uses.

Most access streets in ODP2 will provide mid-block median swales for storm water collection. At intersections, the streets are narrowed towards the centreline, providing visual and physical deflection to create a low speed environment on these streets.

12.4.3 Intersection control

The Development Plan proposes roundabouts where neighbourhood connectors intersect with Bashford Street as well as a number of internal four-way intersections on neighbourhood connector roads. The intersection controls are shown in **Figure 28**. Other intersections will operate under sign control.

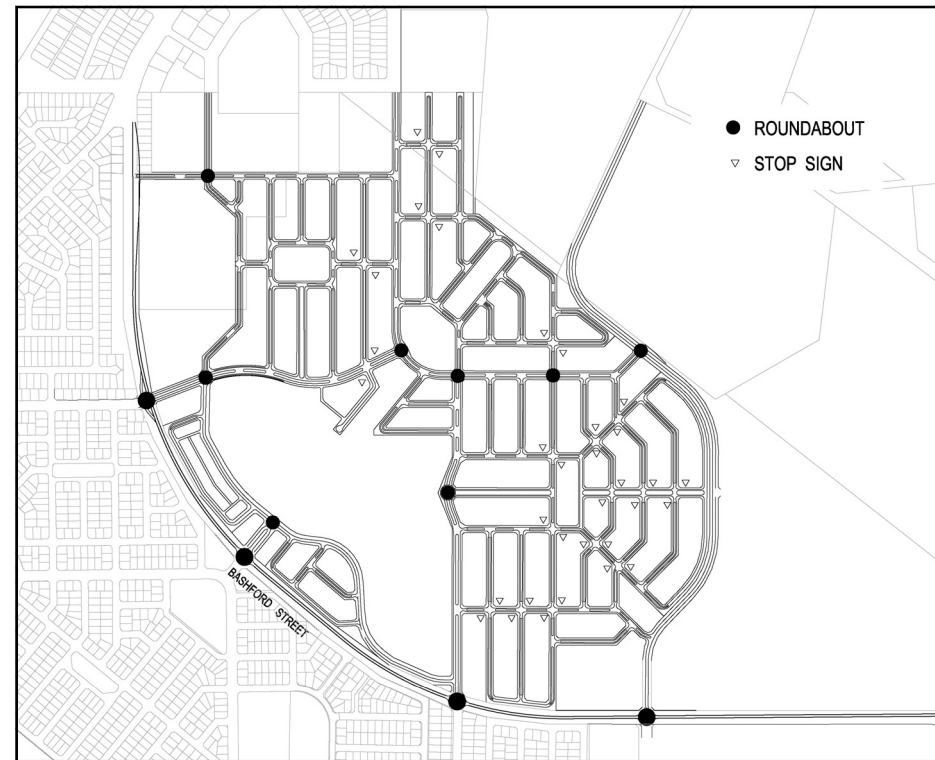


Figure 28

12.4.5 Parking

Parking will be mainly provided on site for all the residential units and tourist facilities. Most of the access roads also provide parking for visitors and overflow demands.

It is expected that there will be significant parking demand at the Lagoon during weekends and holidays. On Street parking will be provided on the surrounding neighbourhood

connector roads. Because of the nature of the leisure activities, it is recommended that on-street parking be augmented by off-street car parks provided at strategic locations (such as walk trail entrance to the Lagoon).

12.5. **Cyclists and pedestrians**

The general principles for pedestrians and cyclists are:

- Walking is the best mode of transport for short trips. The impact of using cars for these trips is such that walking should be encouraged.
- Pedestrian trips are the most common mode of transport, but also the most neglected.
- The bicycle is a convenient and viable transport mode, particularly for trips of between one and seven kilometres.
- Bicycle usage continues to increase and there is a responsibility for designers and engineers to provide for their use in the planning and design of urban areas.
- The bicycle is an economical mode of transport and the only reasonably available mode for certain sectors of the population. Where cycling is not possible these groups will be disadvantaged.
- Walking is the most common means of travel to and

from public transport and should be given priority to ensure safe and convenient access to public transport modes.

- The vast majority of pedestrian and bicycle trips are for transport purposes, i.e. to get from A to B, not for recreation. Consequently, in providing for these trips fast convenient travel should be the first priority, with equal importance being given to safety considerations.

The neighbourhood connectors within the development area will incorporate shared paths on both sides of the road. On local access streets it is envisaged that cyclists will share the roadway with motorists due to the low traffic volumes and small speed differential (assisted by the introduction of the 50 kph speed limit in built up areas). Footpaths will be provided on both sides of all local access streets.

Because of the central location and the proximity of the Lagoon, it is expected that some trips to / from the Lagoon will be made by foot or cycle. **Figure 29** shows the pedestrian and cyclist catchment areas of the Lagoon.

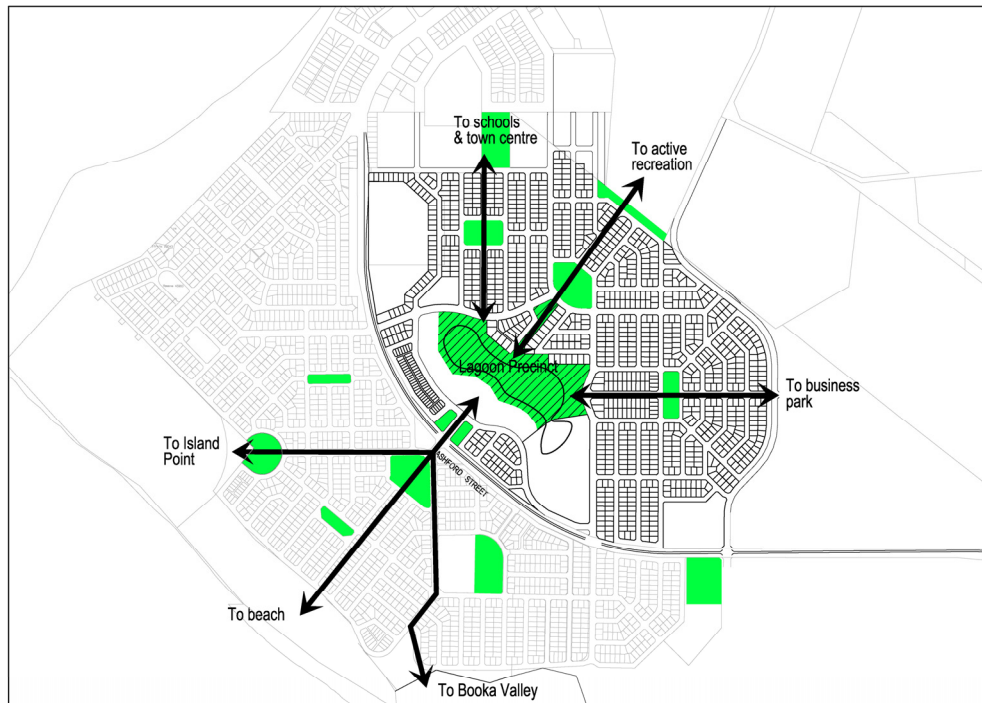


Figure 29

12.6 Public transport

A bus route along Bashford Street has been proposed in the Turquoise Coast Development Structure Plan as shown in **Figure 30**. A 400m catchment area is also shown, which covers most of the units, tourist resorts, retail and aged care facilities. The development will integrate shared path and footpaths with public transport services, providing connections through to the schools, aged units, café and retail, lagoon and resort facilities.

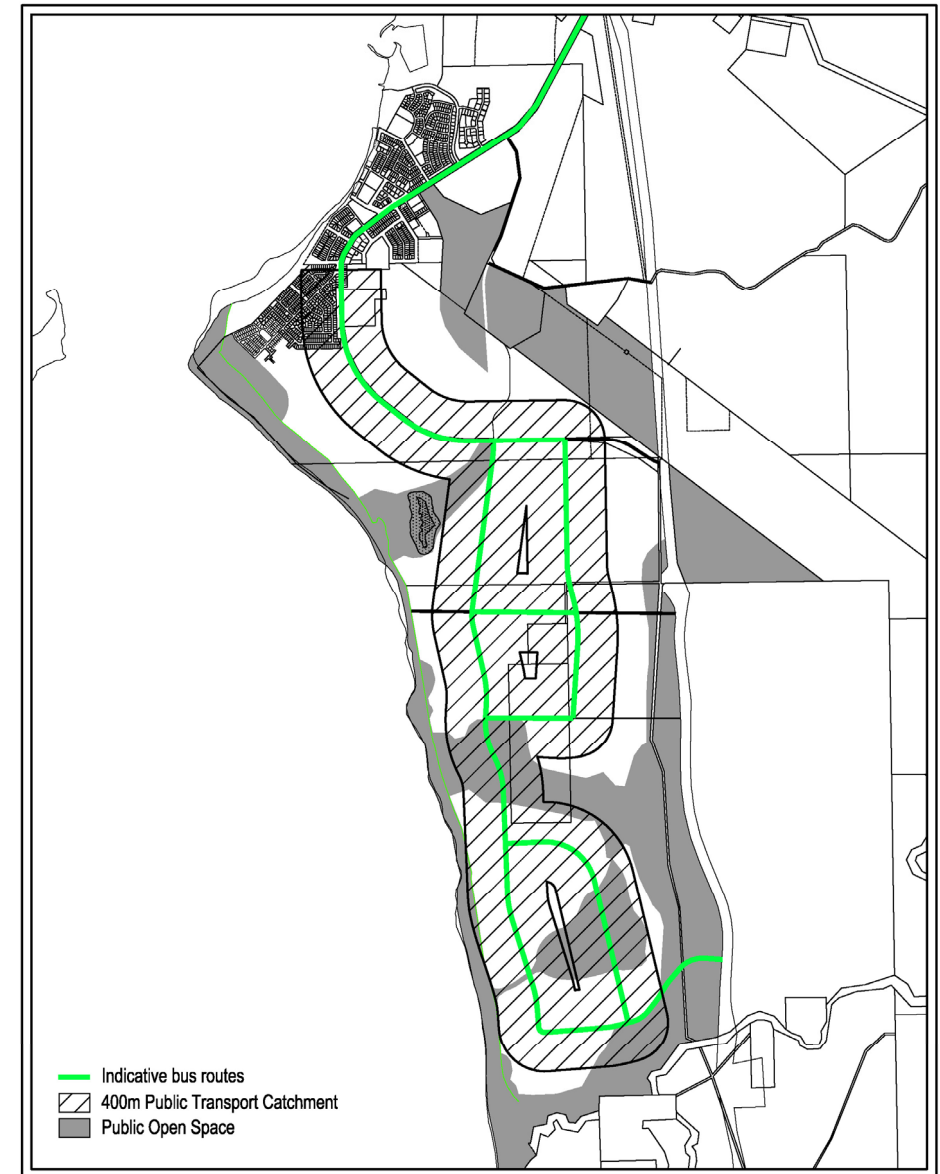


Figure 30

12.7 Summary

This report addresses Transport issues related to Development Plan 2 at Jurien Bay. The development plan proposes residential houses and units, tourist accommodation, schools, café and retail developments.

Existing and future road network

The main street through the town of Jurien Bay is Bashford Street which has been adopted into the interim route of Indian Ocean Drive. Ultimately Indian Ocean Drive is proposed to bypass the town centre with Bashford Street comprising a loop off the main north-south route. Both Indian Ocean Drive and Bashford Street are currently undivided rural 2-lane roads.

The Indian Ocean Drive from Cervantes to Jurien Bay has recently been completed. The final section between Lancelin and Cervantes is expected to be finished within 4-5 years. Once the construction is finished, it will allow traffic direct access to the entire stretch of coast between Joondalup and Dongara.

Existing traffic volumes

Traffic counts conducted in January 2007 showed existing

traffic volume on Bashford Street in the vicinity of Beachridge is approximately 700 vpd and on Jurien Road (northern entry of Jurien Bay) is approximately 1450 vpd.

Historical traffic data (May 2005) on Jurien East Road (the east-west road connecting Jurien Bay and Brand Highway) and Indian Ocean Drive (north of Jurien Bay) have been obtained from MRWA. The data suggested that traffic volumes on these roads were very low (up to 810 vpd on Jurien East Road and up to 450 vpd on Indian Ocean Drive), and that weekend traffic is approximately 25 percent less than weekday traffic.

Traffic forecast

The proposed development will generate between 8,840 vpd and 10,430 vpd on an average weekday, depending on the household sizes, residents profile and associated traffic generation rates. When fully developed, the neighbourhood connectors within Beachridge development are expected to carry between 1,500 vpd and 2,000 vpd.

The traffic forecast volumes on surrounding distributor roads have been obtained from Turquoise Coast Development Structure Plan (Nov 2003). Bashford Street is expected to carry between 5,000 vpd and 8,000 vpd and the north-south

distributor road between Cell 2 and Cell 3 is expected to carry up to 9,500 vpd

Road network assessment

Neighbourhood connectors have been identified based on their likely function and traffic volumes they are likely to carry.

Provision has been made for shared paths along neighbourhood connector roads. In the vicinity of the local retail centre there will be high numbers of pedestrians as well as cars and cyclists. The road will be specially designed at this location to have particular regard to context, function and adjacent land uses. Footpaths will be provided on both sides of all neighbourhood connector roads.

Most access streets in ODP2 will provide mid-block median swales. At intersections, the streets would be narrowed and traffic lanes tapered towards the centreline. The design provides visual and physical deflection, creating a low speed environment on these streets. Shared paths will be provided on both sides of all access streets.

Parking

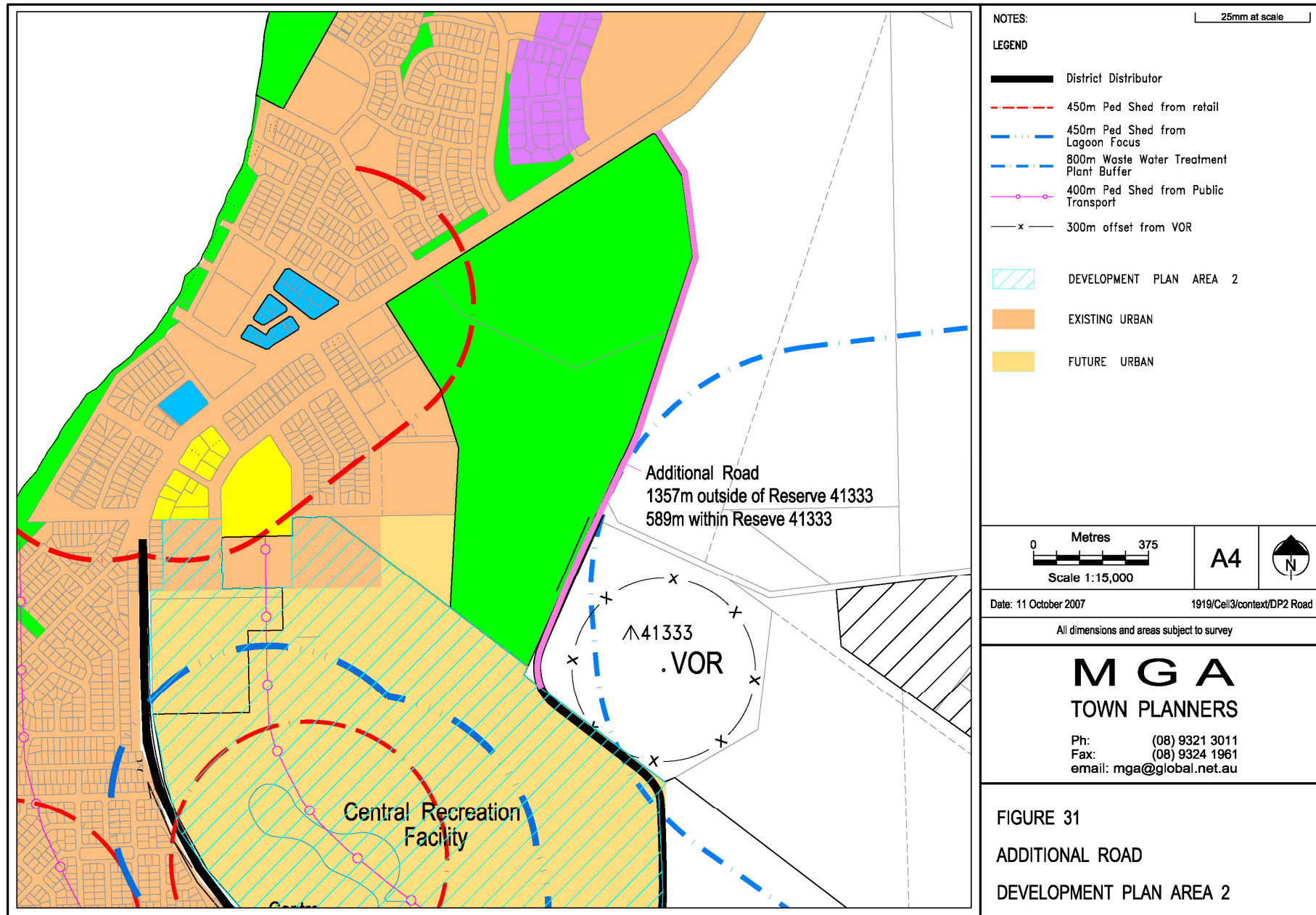
Parking will be mainly provided on site for all the residential units and tourist facilities. Most of the access roads also provide parking for visitors and overflow demands.

It is expected that there will be high parking demand at the Lagoon during weekends and holidays. On-street parking will be provided on the surrounding neighbourhood connector roads. Because of the nature of the leisure activities, it is recommended that suitable off-street car parks be provided at strategic locations (such as walk trail entrance to the Lagoon).

13.0 DEVELOPER/LANDOWNER CONTRIBUTIONS

13.1 District Distributor Construction

The Turquoise Coast Development, Jurien Bay Structure Plan indicates a District Distributor Road aligned generally between the Jurien Bay air strip and golf course. Approximately 1.946km of this road link is outside the Ardross Estates land holding. Of this length, approximately 1.357km is located within existing road reserve and approximately 0.589km is within Reserve 41333 as shown on **Figure 31**.



Reserve 41333 contains the Air Services Australia navigational aid and all roads must be outside a 300m radius of the aid. The proposed District Distributor is therefore aligned to respect this buffer.

At \$400 per linear metre, construction of the section of road outside Ardross Estates land holding is estimated to cost \$780,000. It is expected that Cell 3 will create approximately 140 lots and Cell 2, approximately 1,140 lots and it is proposed that the construction of the length of District Distributor road outside the Ardross Estate's land holding be funded by the subdivision of these two cells. A contribution of approximately \$610 per lot is therefore proposed.

This contribution is to be payable on each lot created on a Deposited Plan (DP) at the time of clearance of the DP. For the purposes of this exercise, a lot shall be any freehold lot created for private use and therefore excludes open spaces, school sites and sites for servicing agencies such as Western Power or the Water Corporation. There shall be no "weighting" based on the development potential of the lot created.

Ardross Estates shall supply the Council with an estimated cost of constructing the subject length of road along with

design drawings at the time of lodging the first DP for clearance and subsequently update the estimated cost annually. Council is to hold moneys collected in an interest bearing account and interest accruing is to be credited to the road construction project.

The contribution per lot shall be re-assessed each year that is, the sum payable per lot shall be the current estimated total cost of the road – (contributions already paid and interest) ÷ remaining lots to be created from Cells 2 and 3.

Should for some reason, such as an unexpected requirement for a large development site in either Cell, the lot yields be less than anticipated, the shortfall shall be funded by a contribution from the subdivision of Cell 4.

13.2 Lagoon

Ardross Estates will fund the development of the lagoon. It is proposed that the ongoing operation and repair/maintenance costs will be borne by the Local Authority via the imposition of a Specified Area Rate on all ratepayers within the area boundaries of Development Plan 1 and this Development Plan 2.

A detailed financial feasibility is to be conducted jointly by Ardross Estates and the Local Authority, which will be available and subject to detailed analysis, prior to final consideration of this Development Plan 2.

Appendix 1



Corporate Affairs

Manager Airport Relations
GPO Box 367, Canberra ACT 2601
25 Constitution Avenue, Canberra ACT 2601
Phone 02 6268 4060
Fax 02 6268 4233
ABN 59 698 720 886

23 August 2006

Mr Peter Goff
Town Planning Consultant
MGA Town Planners
PO Box 104
WEST PERTH WA 6872

Dear Mr Goff

Thank you for your letter of 26 June 2006 regarding the CVOR air navigational aid contained in Reserve 41333.

Following receipt of further information from your office including a contour site map, Airservices is able to provide the following advice.

The Jurien Bay VOR is a conventional VOR which cannot be elevated without significantly affecting its operation.

However, based on the information you have provided an elevation of the VOR will not be necessary.

Development near the Jurien Bay VOR will not adversely affect the performance of the VOR provided that the new buildings remain below an elevation angle of 2 degrees, measured from the base of the VOR.

This would allow buildings at 300m, to reach a height of 10.4m above the height of the VOR without penetrating the VOR's protection surface.

I understand the development is at a very early stage and that you were seeking a guide upon which you could make decisions regarding the planning of the development.

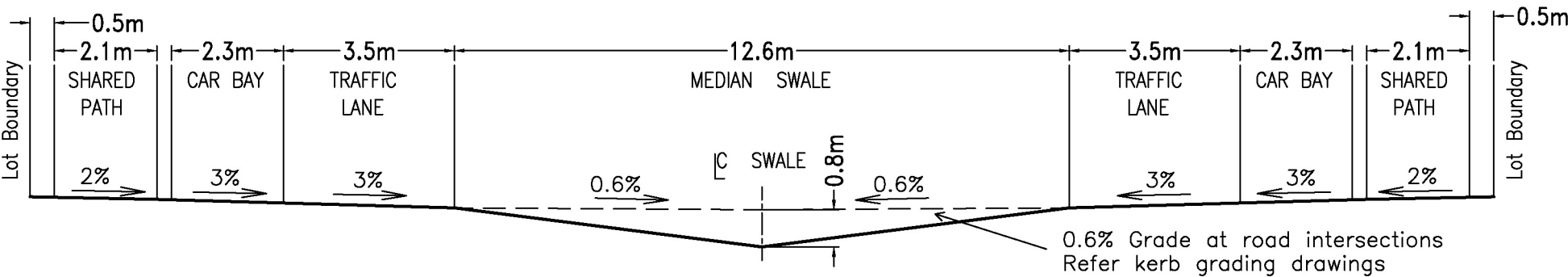
I trust this information is of some use and please don't hesitate to contact me if I can provide any further assistance

Yours sincerely

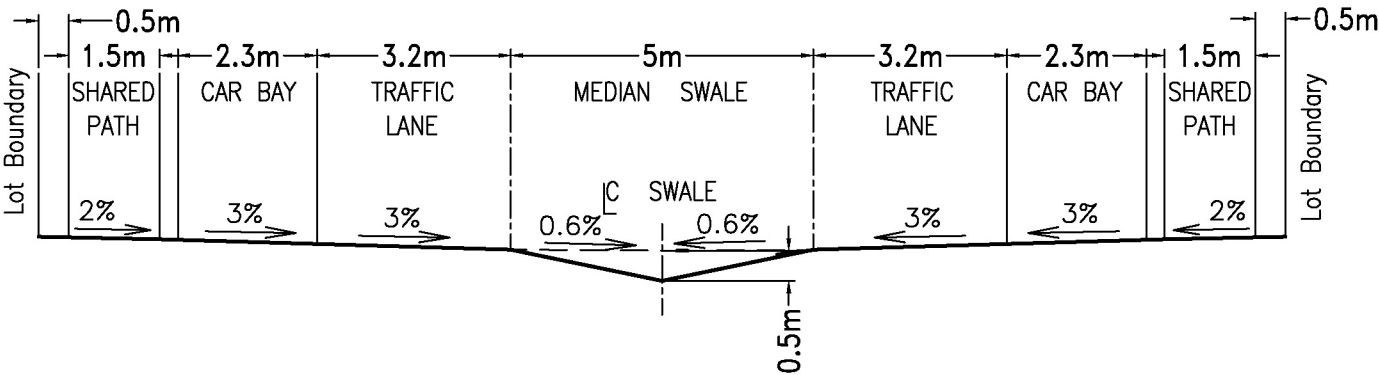
A handwritten signature in blue ink, appearing to read 'D Spinks', is written over a light blue horizontal line.

Denise Spinks
Manager, Airport Relations
Airservices Australia

APPENDIX 2



SECTION THROUGH 30m ROAD RESERVE - MIDDLETON BOULEVARD
2 x 3.5m PAVEMENT 12.6m MEDIAN SWALE



SECTION THROUGH 20.6m ROAD RESERVE
2 x 3.2m PAVEMENT 5.0m MEDIAN SWALE

INDICATIVE SECTIONS

Scale 1:125