

LOT 9 JINDALEE

FORESHORE MANAGEMENT PLAN

NOVEMBER 2013

REV M



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Rev M

November 2013

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1.0 INTRODUCTION

1.1 Background

This Foreshore Management Plan is prepared pursuant to the requirements of the Lot 9 Brighton Foreshore Management Strategy which was adopted by the City as part of Jindalee Local Structure Plan 88 documentation, and is also a requirement of Condition 18 of the WAPC Approval to Commence Subdivision for Lot (WAPC Ref 145521). This document also recognises the content and requirements of the Local Water Management Strategy as endorsed by the City of Wanneroo and the Department of Water.

Lot 9 Marmion Avenue is located between Marmion Avenue and the coastal reserve within the locality of Jindalee. Lot 9 is approximately 108ha in size, with the western coastal boundary extending over a length of 1.25km.

To the immediate west of the site lies the coastal reserve which is vested in the City of Wanneroo. The portion of the coastal reserve adjacent to Lot 9 extends over approximately 23.5ha, with an additional area of approximately 8.8ha to the water line (total management area is therefore 32.3ha). This area is also identified as part of Bush Forever Site No. 397 which is known as 'Coastal Strip from Wilbinga to Mindarie' (WAPC, 2000). Site 397 also extends into the north west corner of Lot 9.

The location of Lot 9 and the adjacent coastal reserve are shown on Figure 1.

Lot 9 is zoned Urban under the Metropolitan Region Scheme and Urban Development under the City of Wanneroo Town Planning Scheme No. 2. The site is proposed for urban development and will contain residential land, mixed use areas, a school site and public open space areas. The development concept plan is provided as Figure 2.

The future residents of Lot 9 will need to traverse the coastal reserve/Bush Forever site in order to access the beach. Public facilities will also need to be provided within this zone. As such planning is being undertaken to minimise potential impacts on the coastal environment. This Foreshore Management Plan (FMP) has therefore been prepared to guide development and use of the coastal zone. The management area boundary which is the subject of this FMP is outlined on Figure 1.

1.2 Scope of Report

This FMP has been prepared to guide the development and use of the coastal reserve adjacent to Lot 9. The management plan contains information addressing the following:

- Environmental characteristics of the management plan area
- Coastal management guidance relevant to the site
- Proposed foreshore development plans
- Management actions
- Implementation roles and responsibilities

1.3 Management Plan Objectives

The management objectives for the foreshore zone are summarised as follows:

- Promote conservation of the ecological features of the foreshore reserve.
- Improve the condition of the existing degraded areas within the foreshore reserve.
- Provide for community recreation opportunities in an environmental sustainable manner.
- Identify coastal access locations which minimise disturbance to the coastal environment and are at a frequency which discourages creation of informal public access ways.
- Provide for connectivity within the foreshore area to locations north and south of the project site.



1.4 The Foreshore Management Plan

1.4.1 Conditions of Management

The conditions of management for the foreshore zone are summarised as follows:

- This FMP indicates the preferred land use and development outcomes supported for the Foreshore Reserve and abutting public lands along the western edge of Lot 9.
- The proposals and level of detail indicated are derived and should be read in conjunction with the directions and requirements included within;
 - The Local Structure Plan 88;
 - The Foreshore Management Strategy;
 - The Local Water Management Strategy.
- Detailed proposals for all development within the foreshore will be subject to a Development Application.
- It is acknowledged that some of the final detail of those land use and development elements included in and on the Plan will be refined and possibly altered as part of subsequent subdivision, engineering and development approval processes, and that such interpretation and refinement remains at the final discretion of the City at the time any such application may be considered.
- In considering such refinements Council will continue to support the intent and directions included in the FMP and those other supporting documents mentioned above when making its decision and ensure any changes remain consistent with those documents and are contained to any development envelope which may defined within the FMP.



2.0 ENVIRONMENTAL SETTING

2.1 Topography, Landforms and Soils

The topography of the Foreshore Reserve varies in elevation from approximately 4 to 25m AHD. The landform generally consists of two rows of younger phase dunes which run parallel to the shoreline, separated by a lower lying swale. Topographic contours are provided on Figure 3.

The foreshore reserve lies within the Quindalup Soil and Landform Unit. This unit is described as 'Dunes and beach ridges composed of calcareous sand' (Churchward & McArthur, 1978).

The sub-units of the Quindalup system as mapped by the Department of Agriculture which are present within the site boundary include (Landgate, 2012; Wells & Clarke, 1986):

- Q4 - The youngest phase. Steep irregular dunes of loose pale, brown sand with no soil profile development.
- Q3 - The third phase. Steep irregular dunes with high relief; soils consist of loose sand with little surface organic staining and incipient cementation at depth.
- Q2 - The second phase. A complex pattern of dunes with moderate relief, soils have organic staining to about 20 cm, passing into pale brown sand; some cementation below one metre.
- Qs - Undulating landscape with shallow calcareous sand over limestone and much rock outcrop

The location of these units is shown on Figure 3.

2.2 Vegetation and Flora

Vegetation and flora surveys have been undertaken for the foreshore reserve and adjacent Lot 9 area by RPS Environment in 2004, 2005 and 2006. The vegetation units which have been mapped within the foreshore reserve include:

- AsLSg - *Acacia saligna*, *Spyridium globulosum*, *Olearia axillaris* Shrubland/Open Shrubland over *Pelargonium capitatum*, *Melaleuca systena*, *Acacia lasiocarpa* Open Low Heath over *Lomandra maritima*, *Desmocladius flexuosus* Sedgeland.
- Mixed - *Acacia truncata*, *Acacia cochlearis*, *Spyridium globulosum*, *Olearia axillaris* Closed Shrubland over *Lepidosperma gladiatum* Sedgeland/Open Sedgeland with *Hardenbergia comptoniana*.

- Sg – *Spyridium globulosum (Olearis axillaris) Closed/Open Heath* over
**Trachyandra divaricata, Trachymene pilosa, Conostylis pauciflora* subsp. ?
Herbland.

The vegetation condition within the foreshore reserve varied from Excellent to Very Good – Good (RPS, 2010). A number of tracks and associated areas of disturbance have been made within the foreshore reserve by unauthorised 4WD access. These are visible on aerial photography of the site. Vegetation condition is reduced in these areas and a number of dune blow-outs have occurred where the tracks intersect the beach zone.

Vegetation mapping, overlaid on the aerial photograph is provided on Figure 4.

2.3 Fauna and Habitat

A Level 1 fauna survey was conducted by Bamford Consulting Ecologists for Lot 9 and the adjacent foreshore reserve in 2010. Conservation significant species which were identified onsite and could also occur in the foreshore reserve include the Quenda, Bush Rat and Graceful Sun Moth. In addition other more common fauna which are likely to utilise the foreshore zone include local bush birds and reptiles.

A targeted Graceful Sun Moth (GSM) survey was undertaken for Lot 9 and the adjacent foreshore reserve in March 2010 (RPS, 2010). Based on the vegetation type mapping, potential areas of Graceful Sun Moth habitat (i.e. vegetation types containing *Lomandra maritima* or *Lomandra hermaphrodita*) are generally located within the eastern half of the foreshore reserve.

The results of the survey found five GSM individuals within the southern half of the foreshore reserve, associated with the AsLSg vegetation unit. The location of the recorded GSM population with the foreshore reserve is displayed on Figure 5.

2.4 Coastal Zone and Setback Requirements

A Physical Process Coastal Setback Assessment has been undertaken for Lot 9 by MP Rogers and Associates (MRA) (2011).

The coastal zone in this area is characterised by low energy, reflective and low tide terraced beaches (Short, 2006). At the time of the site inspection (November 2009), the beach was approximately 50m wide at low tide and was backed by an approximately 5m high dune system (MRA, 2011).

The coastal setback has been calculated taking into account the following criteria applicable to sandy shorelines as recommended by Statement of Planning Policy No. 2.6: The State Coastal Planning Policy (WAPC, 2013):

- Acute storm erosion allowance
- Historic shoreline movement allowance
- Sea level change allowance

Onsite observations suggested that the northern half of the shoreline has undergone recent accretion, while the southern half had an erosion scarp. These two shoreline

types are likely to have different responses to storm erosion, therefore the setback calculations have taken this into account.

In addition it is noted that the longer term shoreline movement is different in both zones, with the southern half receding up to 50m since 1954, and the northern half receding up to 36m over the same time period (MRA, 2011).

The allowances provided for in the setback assessment are summarised below:

Table 1 Physical Process Coastal Setback Assessment Allowances

Allowance	Northern Half of Coastline	Southern Half of Coastline
Acute Storm Erosion Allowance	14m	30m
Historic Shoreline Movement Allowance	67m	93m
Sea Level Change Allowance	90m	90m

As part of the setback assessment, MRA undertook a geotechnical survey of the southern foreshore reserve area. This survey found that out of 12 boreholes drilled, 9 encountered hard limestone caprock. The limestone areas were located approximately 120 to 150m landward (+3.5mAHD) of the coastal vegetation line. Limestone caprock is known to provide excellent coastal protection, as areas of competent limestone can withstand the erosive forces of the ocean beyond the coming century (MRA, 2011).

Based on the presence of the limestone caprock, should erosion of the beach occur in this area, the coastal conditions would change from being a 'sandy shoreline' to a 'rocky shoreline'. As such SPP 2.6 would treat this area differently, and the setback should not need to be further than 50m behind the +3.5mAHD rock (MRA, 2011).

Taking into account the conditions described above the recommended coastal setback for the coastline adjacent to Lot 9 is as follows:

- Coastline adjacent to the southern half of Lot 9 – 50m from the normalised alignment of Competent Rock @ +3.5mAHD.
- Coastline adjacent to the northern half of Lot 9 – 171m from the 2009 coastal vegetation line.

The position of the setback in relation to the coastal reserve and Lot 9 boundary is shown on Figure 6.

2.5 Climate

The Perth region experiences a Mediterranean climate pattern. The average summer maximum temperature is approximately 30°C, with the average winter maximum being approximately 19°C (BoM, 2012).

Perth has an annual rainfall of approximately 740mm, with the majority of the rain occurring between May and September. Average monthly rainfall from the Perth weather station is shown below.

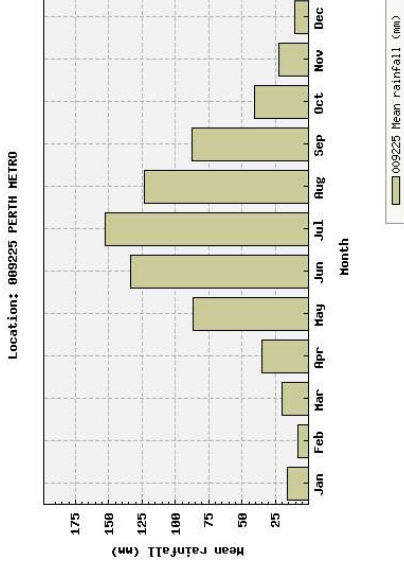


Figure A Average Monthly Rainfall Statistics - Perth

Coastal wind conditions also vary from easterly to north-easterly conditions in the morning, to west to south- westerly in the afternoon. Strongest wind conditions are typically experienced in summer. Wind roses for the Perth Airport weather station are shown below (BoM, 2012).

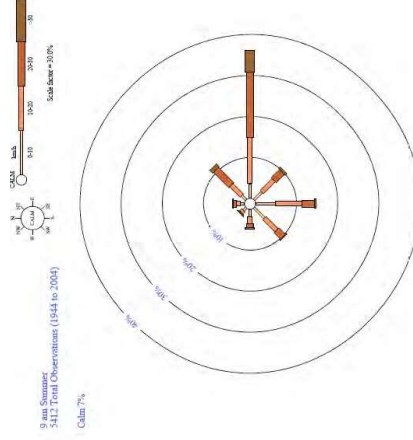


Figure B Wind Conditions - Summer 9am

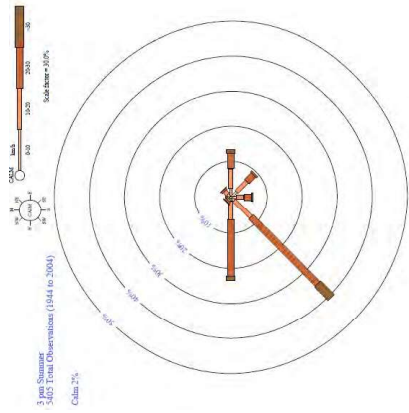


Figure C Wind Conditions – Summer 3pm

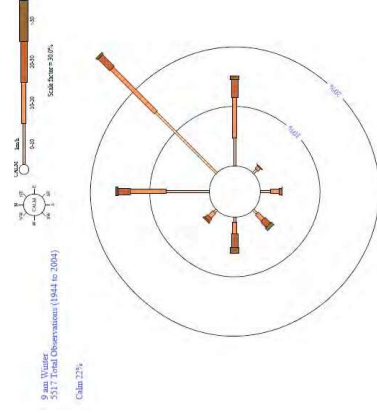


Figure D Wind Conditions – Winter 9am

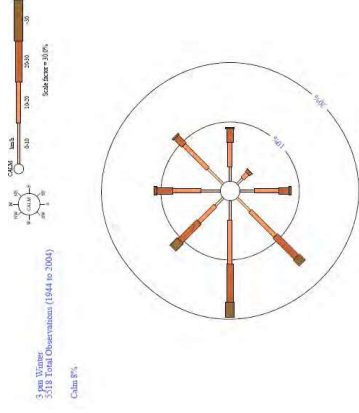


Figure E Wind Conditions – Winter 3pm

2.6 Aboriginal Heritage

An Archaeological and Ethnographic Site Identification Survey was undertaken for Lot 9 and the coastal reserve by Australian Interaction Consultants (AIC) in 2010.

One Aboriginal heritage site DIA 24404 is located within the foreshore reserve.

The site is described as a mythological site and natural feature (AIC, 2010). It was identified by Susan Parker in 2003 while undertaking a survey of the proposed residential development of Brighton Estate, Lot 8 Marmion Avenue in Butler, Western Australia. The report indicated:

The pools and swamps identified in the region are apparently associated with the drainage channels that extend across the lot 8 and lot 9 areas, resulting in the interpretation by the Elders that the spiritual water essence is a manifestation of the activities and presence of the Creation Waugyl.

This site status is listed by the Department of Indigenous Affairs (DIA) as 'Lodged' and as such a determination has not yet been made as to whether it will be identified as a Registered Site under the *Aboriginal Heritage Act 1972*.

Mythological site 20772 is located within the general Jindalee area. This site is described as a natural feature and water source. The DIA site file is closed, indicating sensitive information is contained therein. It is understood that this site is located on the coastal fringe, within crown land, with the location estimated to be 200 – 500m south of Lot 9 (AIC, 2010).

DIA have previously requested the City to not "sign" areas of Aboriginal significance, any signage and wording related to Aboriginal heritage should be approved by DIA and SWALSC prior to installation.

3.0 KEY MANAGEMENT GUIDANCE

3.1 Lot 9 Jindalee Foreshore Management Strategy

The Lot 9 Jindalee Foreshore Management Strategy was prepared in 2011 (RPS, 2011a) as a supporting technical document to the Lot 9 Jindalee Local Structure Plan. The strategy broadly addressed coastal management zones, potential impacts, management principles and objectives and proposed management measures.

The Strategy also identified the details which would be included in the future Foreshore Management Plan. These included:

- A comprehensive revegetation, rehabilitation and weed control program
- Detailed designs of proposed foreshore development
- Arrangements for pedestrian and vehicle access within the foreshore development area and conservation areas identified in Bush Forever Site No. 397
- Fencing and signage requirements
- Fire management
- Progress and compliance reporting
- A timing, responsibility and implementation schedule

3.2 State Planning Policy 2.6 – Coastal Planning

The objectives of the State Coastal Planning Policy (WAPC, 2013) are to:

- Ensure that development and the location of coastal facilities takes into account coastal processes, landform stability, coastal hazards, climate change and biophysical criteria;
- Ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities;
- Provide for public coastal foreshore reserves and access to them on the coast; and
- Protect, conserve and enhance coastal zone values, particularly in areas of landscape, biodiversity and ecosystem integrity, indigenous and cultural significance.

The policy provides guidance on matters of:

- Public interest
- Coastal Foreshore Reserve
- Coastal Strategies and Management Plans
- Environment
- Development and Settlement
- Physical Process Setback

Relevant details of the policy are further discussed in Section 5.0 as appropriate.

3.3 **Bush Forever & Bushland Policy for the Perth Metropolitan Region (SPP 2.8)**

Bush Forever (WAPC, 2000) was prepared by the Government of Western Australia to identify area of regionally significant bushland for future protection. Bush Forever mapping identifies 51,200ha of bushland, covering 26 vegetation complexes within Bush Forever sites. This amounts to approximately 18% of the original vegetation on the Swan Coastal Plain portion of the Perth Metropolitan Region, and excludes local conservation reserves.

The foreshore reserve and a portion of Lot 9 are identified within Bush Forever Site No. 397 which is known as 'Coastal Strip from Wilbinga to Mindarie'.

The implementation of Bush Forever with the planning system is achieved through State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region (WAPC, 2010).

3.4 **City of Wanneroo Coastal Management Plan**

The City of Wanneroo have prepared a Coastal Management Plan (Part 1) to identify relevant coastal issues and gauge community responses. The issues identified as relevant to the coastal zone include:

- Use of the beach for animal exercise, particularly dogs and horses;
- Tourism;
- Segregation of recreational activities;
- Beach names; and
- Surf Life Saving Clubs.

The coastline adjacent to Lot 9 is identified within the South Alkimos – Jindalee zone. The Coastal Management Plan has identified that the following land uses are proposed to be provided within this zone:

- Possible marina
- Possible horse beach
- Proposed surf lifesaving club

These land uses are not specifically proposed for the Lot 9 coastal reserve.

4.0 PROPOSED DEVELOPMENT

The Local Structure Plan (LSP) design emphasises the natural landform and proximity to the coast in terms of Public Open Space (POS) locations and the road network providing clear legibility and view corridors to the coast.

The foreshore zone is primarily proposed for landform and vegetation retention, with limited areas to provide passive recreation opportunities. A Foreshore Zone Concept Plan is provided in Figure 7, POS 1 and 2 Landscape Concept Plans in Figure 8, and Foreshore Cross Sections in Figure 9. Figure 10 shows Foreshore Access Examples, Figure 11 shows Staged Options for POS 2 and Figures 12 and 13 show perspective views of the preliminary design for POS 2.

The design shown in Figures 7, 8, 9, 11, 12 & 13 is very indicative at this very preliminary stage of the project. These figures show an area designated as 'Potential Development Area', identifying this area is subject to further design.

Detailed planning and design of the primary coastal node (POS2) within the foreshore will meet the following criteria:

- All earthworks required to accommodate vehicular and pedestrian routes will be fully reinstated as endemic dune vegetation;
- All earthworks west of the defined park area will be minimised;
- Gradients to any earthworks required to accommodate vehicular and pedestrian access will not exceed 1 in 6.

The footprint of the development area is intended to be minimised where possible, whilst celebrating the existing natural dune landform and plant species. Where disturbance within the 'Potential Development Area' has occurred, dunes will be restored through assisted regeneration as shown in Figures 7 and 8. The key elements of this design include:

- Provision of a primary coastal node (POS2) within the southern half of the foreshore reserve and adjacent development site which incorporates:
 - Community facility areas including toilets/showers/lockers and commercial development in the form of a kiosk, café or restaurant as outlined in Section 2.5.1 of the FMS
 - Playground
 - Open irrigated grassed area for active and passive recreation
 - Areas of local native plant species
 - Integrated drainage for 1 in 1, 1 in 5, 1 in 100 yr in landscape areas
 - Car parking and bike racks
 - Showers, feet washers and drink fountains
 - Vehicle access to the beach, including emergency, maintenance and disabled access and pickup/set-down bays
 - Shelters, electric barbecues, benches and rubbish bins
 - Lookout/viewing deck
 - Pedestrian and cyclist pathways
 - Directional and Interpretative Signage
 - Lighting

- Carparking provision within this preliminary design of POS 2, consists of between 90–100 carbays, including 4 pickup/drop of bays located close to beach. The Department of Planning has provided a guide for carparking in a similar Coastal POS node, of 1 carbay per 100m² of turf. With preliminary design for POS 2, carpark figures would equate to 60 carbays, of which this design has exceeded.
- Secondary coastal node (POS1) provides a secondary foreshore entrance within the northern half of the site including an open shelter structure, BBQ, beach showers and parking bays.
- It is envisioned that a public promenade, including footpath, dual use path, and carparking provides the interface between the development area and the foreshore reserve.
- A central coastal access path which is located on existing tracks within the foreshore reserve, and connects the coastal node to the central and northern foreshore entry points.
- Four beach access paths linking the beach to the central and northern foreshore entry points.

The primary coastal node (POS 2) has been located in an area that contains limestone outcropping and is therefore geotechnically stable and as such considered appropriate for passive recreation uses. The secondary coastal node (POS1) has been located in an area of existing disturbance, adjacent to existing tracks (RPS, 2011a).

The eastern boundary of the foreshore reserve is generally comprised of road or POS areas (Figure 2). There is only one location where the residential area is immediately adjacent to the foreshore reserve. The boundary of the single lot which adjoins the foreshore reserve will be fenced with conservation-style fencing, as per the City of Warreroo Standards and will have an elevation difference to the foreshore reserve (approximate height difference from the coastal reserve is at this preliminary stage of design in excess of +3 to 7m). Figure 9.0 displays Cross Sections illustrating this elevation difference. The dual use path provided between the lot and the retained vegetation of the reserve will further delineate the public and private realm.



5.0 MANAGEMENT

5.1 Public Use and Access

5.1.1 Access Paths

The State Coastal Planning Policy (WAPC, 2003) requires the provision of public access to the coast that is consistent with the values and management objectives of the area including, the interests of security, safety and protection of coastal resources, as well as the recreational opportunities, both on and off-shore, of that section of the coast.

As such, earthworks proposed within the foreshore area will be undertaken to facilitate the installation of a dual use path, north-south orientated coastal access path and beach access paths. The dual use path will be designed with grades not exceeding 1:10 and be located along the interface of the development zone and the foreshore reserve. The coastal access path will be located along the alignment of existing tracks to minimise disturbance to vegetation. Beach access paths will also utilise existing tracks where possible to minimise vegetation disturbance. The proposed path locations are shown on Figure 7, 8 and 9. Figure 10 shows examples of foreshore access to the beach.

The final location of the northern extent of the coastal access path will be determined on site and be subject to detailed design with regards to the environmental features relating to the adjacent foreshore management area.

Fencing will be installed along the path boundaries in accordance with prevailing City of Wanneroo standards, to restrict access of these designated routes to prevent disturbance of the adjacent dunes. Fencing will be as per the City of Wanneroo standards. The location of fences is proposed as follows:

- Dual Use Path – fence provided along the western side only
- Coastal Access Path – fence provided along both sides
- Beach Access Path – fence provided along both sides

Fencing will also be provided on the beach along the coastal side of the dune vegetation to prevent unauthorised access into the foreshore reserve and encourage the use of the beach access paths.

The orientation of the beach access paths has been designed to take into consideration the prevailing wind direction (see Section 2.5) and potential for dune erosion. The beach access paths are orientated in along a north-easterly or easterly axis where possible to prevent the south-westerly sea breeze airflow creating a wind tunnel along the path causing sand movement and dune erosion.

In addition to the three path types described above, universal access to the beach will also be provided from the primary node. This will include both vehicle access and disabled access. The disabled access path will primarily have a grade of 1:21, with a maximum grade of 1:14. The maximum grade of the vehicle access to the route will be 1:10, where not adjacent to universal access paths.

Specifications for the paths have been designed to meet the City of Wanneroo requirements. Details are summarised below.

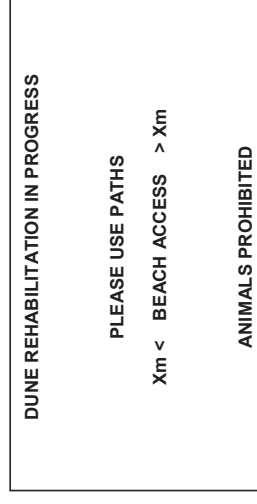
Table 2 Path Specifications

Path Type	Width	Surface Material	Intended Use
Dual Use Path	3.0m	Red asphalt	Cycle and pedestrian
Coastal Access Path	2.5m	Stabilised limestone	Pedestrian and emergency vehicle access (4WD vehicle)
Beach Access Path	0.5m	Clearance either side	Pedestrian access
Universal Access Paths	1.2m	Stabilised limestone with timber stairs as required	Pedestrian access
- Emergency Access to Beach	6m	Sealed asphalt	Vehicle access
- Pedestrian Access to Beach	2.5m	Concrete footpath	Pedestrian and disabled access

Lockable bollards and/or locked access gates will be provided at locations where the Emergency Vehicle Access Path and Coastal Access Path intersect with roads, POS areas, car parks and other locations where vehicle access is possible. Keys will be provided to the City of Wanneroo, Fire and Emergency Services and the Satterley Property Group. In the future a set of keys will also be kept at the community facility building (once operational) for use in emergencies only.

5.1.2 Signage

All signage will comply with City of Wanneroo standards. Signs will be placed at strategic locations along access paths for public information and environmental interpretation. An example of public information signage is given below:



Specific fire management signs are proposed to be installed at the stie. These are discussed in Section 5.5. Temporary construction warning signs are also proposed to be used as discussed in Section 5.1.3.

5.1.3 Active Recreation Areas and Public Facilities

As discussed in Section 4.0, recreation areas and public facilities are proposed to be located within the coastal node. These facilities and the majority of the recreation areas will be located within the eastern portion of the node which lies within the development site, rather than the foreshore reserve (Figures 7, 8, 9).

Prior to earthworks/construction commencing for the recreation areas or public facility sites within the foreshore node, temporary fencing will be installed to prevent inadvertent access into surrounding areas of retained vegetation. The fencing will also be provided for safety reason to prevent public access to construction zones. Signs will be installed along the surrounding fencing advising the public of potential dangers and stating "Access Restricted to Authorised Personnel Only".

Public facilities including any public buildings, playground and BBQ areas will all be located inland of the recommended coastal setback line derived from the MP Rogers & Associates (2011) Setback Assessment. The only infrastructure which will be provided within the setback zone will include access paths and limited open lawn areas (Figures 7 and 8).

Future ongoing management requirements for the recreation areas and public facilities will include:

- Irrigation and maintenance of turf and planted landscape areas
- Emptying rubbish bins
- Lighting maintenance
- General maintenance of fencing and footpaths
- Maintenance of play equipment and softfall surface
- Maintenance of beach showers/drink fountains
- Maintenance and cleaning of barbeques
- Maintenance of urban furniture such as shelters, bike racks, bins, benches etc
- Maintenance of drainage infrastructure

5.2 Vegetation

5.2.1 Vegetation Protection

The majority of the vegetation within the foreshore reserve is in Excellent or Very Good – Good condition. As such management of this vegetation is proposed to primarily focus on preventing future disturbance which could lead to degradation.

Primary management will take the form of fencing to restrict access. As discussed above, all coastal access paths, beach access paths and the beach vegetation will be fenced to direct pedestrian movement. Fencing will also be installed adjacent to the dual use path along the perimeters of the coastal reserve to further prevent uncontrolled access (vehicle and pedestrian) to the coastal dunes.

The location of the proposed fences is shown on Figure 7, 8 & 9.

5.2.2 Assisted Regeneration

Limited sections of the foreshore reserve currently show signs of disturbance and degradation. These areas are typically associated with uncontrolled 4WD access and associated areas of dune erosion / blowouts.

As discussed in Section 5.1.1, these tracks have been utilised for proposed access paths where possible. Tracks not required for future access paths will be closed and assisted to regenerate. This will comprise of a combination of spreading of seed and planting of tubestock. Species selected for use in these works will comprise locally

native flora. A list of coastal flora species common within the coastal zone which were identified as part of the vegetation survey work is provided in Table 3. The use of these species will form the basis of the assisted regeneration program.

Table 3 Coastal Flora Species

Species	Form
<i>Acacia cochlearis</i>	Medium – Low Shrub
<i>Acacia cyclops</i>	Tall Shrub
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>	Medium – Tall Shrub
<i>Acacia rostellifera</i>	Small – Medium Shrub
<i>Acacia truncata</i>	Low Shrub
<i>Acanthocarpus preissii</i>	Low Shrub
<i>Carpobrotus virescens</i>	Succulent
<i>Cassytha racemosa</i>	Climber
<i>Conostylis candidans</i>	Herb
<i>Conostylis pauciflora</i>	Herb
<i>Crassula colorata</i> var. <i>colorata</i>	Herb
<i>Dianella revoluta</i>	Herb
<i>Eremophila glabra</i>	Low Shrub
<i>Gompholobium tomentosum</i>	Low Shrub
<i>Hardenbergia comptoniana</i>	Climber
<i>Kenedia prostrata</i>	Low Shrub
<i>Lepidosperma glabratum</i>	Herb
<i>Leucopogon parviflorus</i>	Medium – Tall Shrub
<i>Lomandra maritima</i>	Herb
<i>Olearia axillaris</i>	Medium – Tall Shrub
<i>Opercularia vaginata</i>	Low Shrub
<i>Ozothamnus cordatus</i>	Medium Shrub
<i>Phyllanthus calycinus</i>	Low Shrub
<i>Poa drummondiana</i>	Herb
<i>Schoenus grandiflorus</i>	Herb
<i>Spyridium globulosum</i>	Tall Shrub
<i>Spinifex hirsutus</i>	Herb
<i>Spinifex longifolius</i>	Herb
<i>Trachymene pilosa</i>	Herb

Where tubestock is used, these plants will be watered for the first summer after planting to assist with successful establishment.

Dune blowouts, and areas adjacent to tracks which are void of vegetation, will have brushing applied to assist with sand stabilisation prior to seeding/planting. The bush will be gathered from clearing material onsite. The bush has the additional benefit of potentially being a source of seed matter to further assist with the native vegetation regeneration.

Locations of areas proposed for regeneration assistance are shown on Figure 7.

Regeneration works area proposed to commence following the first round of weed control (see Section 5.2.3). Seeding and tubestock planting will be undertaken in the first year. If required, additional works would be undertaken in year 2 to supplement these areas. The criteria for measuring success will mean 2 healthy plants per 1m² growing in October, following the year the planting occurred.

It is noted that depending on the staging program derived, assisted regeneration works may be undertaken progressively along the foreshore to allow for a manageable size area to be dealt with at one time. The staging would reflect the extent of the access path network constructed in that year.

In the event that vegetation coverage is deemed to have failed, replanting will be undertaken at original specification reviewing species suitability for the location.

Prior to the completion of the program a site visit will be undertaken with the City of Wanneroo to view the progress of the works and discuss any final requirements prior to handover of the site.

5.2.3 Weed Control

Disturbed areas within the foreshore reserve are likely to be prone to weed invasion. The main weeds noted within the foreshore reserve during the botanical assessment included:

- *Euphorbia terracina*
- *Trachyandra divaricata*
- *Pelargonium capitatum*
- *Romulea rosea*

Weed control methods recommended for these species include:

Table 4 Weed Control Methods

Species	Common Name	Control Method	Control Program Timing
<i>Euphorbia terracina</i>	Geraldton Carnation Weed	Apply metsulfuron methyl solution prior to flowering. Flowering period August – November	Late Autumn – Early Winter
<i>Trachyandra divaricata</i>	Dune Onion Weed	Apply glyphosate solution prior to flowering. Flowering period August – November	Late Autumn – Early Winter
<i>Pelargonium capitatum</i>	Rose Pelargonium	Hand pull isolated plants taking care to remove entire stem. Spot spray with metsulfuron methyl. Easy target after fire.	Flexible
<i>Romulea rosea</i>	Guldford Grass	Spot spray with metsulfuron methyl. Spray application to be timed just on flowering. Flowering period August – October.	Winter

Source: Brown & Brooks, 2002

Given the predominant condition of the foreshore reserve is Excellent and Very Good – Good limited weed control only is likely to be required. The areas where weed control will be focused on will include edges of tracks to be retained and closed tracks. Weed control will be undertaken by the developer for 5 years (for each rehabilitation stage, if applicable) in accordance with the control methods outlined above.

Weed control will initially be undertaken prior to regeneration activities, with supplementary work continued throughout the developer maintenance period if required.

5.3 Fauna

The key fauna management objective for the foreshore reserve is to retain and improve the existing vegetation condition so it will continue to provide habitat opportunities.

Graceful Sun Moths were observed within the foreshore reserve adjacent to the existing tracks (Figure 5). Specific care will be taken to ensure that the track is not widened in this location to avoid any habitat disturbance. Further management measures proposed in relation to this species include:

- Chemical weed control within the foreshore reserve is to be avoided between 15 February and 15 April, which coincides with the GSM flight season.
- Track and general foreshore maintenance activities are also to be planned outside of the GSM flight season so as to avoid vehicle access along the central access track during this period.

5.4 Stormwater Drainage

The general drainage strategy for the site is for storm events from 1 year ARI (Average Recurrence Interval) to be retained and infiltrated as close to source as possible. Larger storm events (5 year ARI to 100 year ARI) will be conveyed and retained through a network of road, drainage reserve and POS.

Both POS 1 and POS 2 contain drainage retention areas for the larger storm events. These swales have been designed to detain the 1 in 100 ARI event and will be subject to design and management to address potential scouring, erosion and damage to existing vegetation (RPS, 2011b). The drainage retention area within POS 1 & 2 maximises the use of the development site, with a small area only extending into the foreshore reserve. The indicative location of the proposed drainage areas is shown on Figure 7, 8 and 9.

Prior to release of stormwater into these swales pre-treatment in the form of Gross Pollutant Trap (GPT) filtering will be undertaken. This strategy is in accordance with advice contained in the State Coastal Planning Policy (WAPC, 2006) which states that the discharge of some storm water into the foreshore may be acceptable if there is no alternative disposal method and provision is made for pre-treatment to remove solids, reduce nutrients and other contaminants.

The inclusion of partial drainage areas within the foreshore reserve has been discussed within the Lot 9 Marmion Avenue Local Water Management Strategy (RPS, 2011b). This document has received approval from the Department of Water and City of Wanneroo. Further information regarding the detailed design of the drainage areas will be submitted to the City of Wanneroo and Department of Water for approval as part of the Urban Water Management Plan(s) for the development.

5.5 Fire Management

Background

Fire management is a significant design consideration for the foreshore area and the adjacent residential zone. Fire management advice was sought from specialist bushfire consultant Roger Underwood of York Gum Services. Roger is Chairman of the Bushfire Front, former General Manager of the WA Department of Conservation and Land Management, and a bushfire specialist.

Two fire management objectives are identified for the site:

1. Minimise the potential impact of bushfires leaving the foreshore reserve and entering adjacent housing; and
2. Minimise ecological impact of frequent fires in the reserves.

Bushfire risk

The foreshore vegetation consists of heathland, shrubland and sedgeland which is generally less than 1.5m tall. There are no trees in the area. According to *The Planning for Bushfire Protection Guidelines* (WAPC & FESA, 2010) the bushfire risk is classified as “moderate”.

Bushfire threat

It is inevitable that a fire will start in the foreshore reserve at some time, started by lightning, accident or an arsonist.

Actions to minimise bushfire impacts

The following measures are incorporated into the design for the site:

- Provision of a minimum 25m road reserve, separating the foreshore reserve from residential areas, plus an additional 5m building setback for all residential lots located to the east of this coastal road (Figure 2).
- Provision of an irrigated turf POS area (as shown in Figure 8: Concept Plan), plus a 3.0m wide dual use path running parallel to the coastal road on the western side, providing a further separation between residential lots and the foreshore reserve.
- Electric powered BBQ's only to be provided within the POS areas; all open fires banned.
- Fast attack vehicle (4WD short wheel based vehicle with tank and pump) access along the dual use path (3.0m wide), central access path (2.5m wide with 0.5m clearance) and emergency vehicle beach access path (6.0m wide). The dual use path and emergency vehicle beach access path will be an asphalt surface, with the central access path to comprise compacted crushed limestone.
- Locked gates/bollards to be installed at path entrances to prevent unauthorised vehicle access (see Section 5.1.1). Emergency service personnel will have master key access.

- Installation of FESA approved signage at the controlled vehicle access points indicating access is restricted to emergency vehicles only.
- Installation of standard FESA approved '000' signage within the Foreshore Reserve.
- Fire hydrants to be provided in both POS 1 and POS 2.
- Reticulated water supply to be provided to every house in the residential zone, with fire hydrants connected to reticulated high pressure water supply placed at a maximum interval of 200 metres between hydrants; all hydrants to satisfy Fire and Emergency Services Australia (FESA) requirements.
- Irrigated turf to be provided within POS 1 and POS 2 to provide further fire protection for the facilities constructed in these areas.
- Vehicle turn-around area to be provided at the foot of the emergency vehicle beach access path

Regular management will be applied to the vegetation adjacent to the paths to ensure vegetation does not overgrow the path and restrict vehicle access.

Closure of non-essential internal tracks

Non-essential tracks within the foreshore reserve will be closed to prevent unauthorised vehicle access within the reserve. Closure and rehabilitation of the tracks is discussed further in Section 5.2.2.

Fuel management

No direct fuel management is proposed in the bulk of the bushland of the foreshore reserve, at least during an initial 10-year period during which restoration of degraded vegetation will occur.

Revegetation of disturbed areas along road sides will be undertaken with ground cover species including "succulents" such as *Pigface* *Carpobrotus virescens* which has a low flammability.

Fire Attack

Should a fire occur within the foreshore reserve, it is expected that fire detection will be rapid due to the proximity of the residential area. All initial lot buyers will be supplied with information on how to report a fire.

In the event of a fire, FESA will be immediately notified. The site is serviced by the Quinns Rocks volunteer Bush Fire Brigade (which is owned and operated by the City of Wanneroo) with additional support from FESA if required. The nearest fire station is located in Clarkson. When manned, this fire station will be within approximately 10–15 minutes travelling time of the site. As discussed in Section 5.1.1, keys to the access gates will be provided to FESA for use as required.

FESA and DEC water bombers are located at Jandakot, which is less than 20 minutes flight from the site and could also assist with fire control if needed.

Community Relations

Satterley Property Group will prepare a package of material, including a summary of this plan, for issue to every initial lot buyer. Satterley will also work with FESA and the City of Wanneroo to ensure all fire management requirements are addressed.

Responsibility for bushfire management

Satterley Property Group will be responsible for setting up the bushfire management measures in this plan. At a time to be agreed between Satterley and the City of Wanneroo, the latter will assume responsibility for fire management (specifically management of the internal access) on the foreshore reserve.

5.6 Aboriginal Heritage Conservation

The State Coastal Planning Policy recommends protection of significant natural, indigenous and cultural features of the coast. These include sites and features significant as coastal habitats and for their biodiversity, cultural, built, archaeological, ethnographic, geomorphological, visual or wilderness values (WAPC, 2013).

The foreshore reserve contains one Aboriginal heritage area (as discussed in Section 2.6). The specific site coordinates are provided in the AIC (2010) report. These coordinates indicate that the site is located to the west of the existing track. As such the proposed access path has been re-aligned to the east to avoid intersecting the area. Fencing of the path (as discussed in Section 5.1.1) will prevent access and damage to this area.

Interpretative signage is proposed to be provided at the foreshore node which will identify that this area has sites of Aboriginal heritage significance and provide selected information as appropriate. The location of the site will not be specifically referred to in order to avoid targeted vandalism.

5.7 Residential Zone Interface

The Foreshore Reserve is separated from the adjacent residential development by a road interface in most areas. One lot located adjacent to POS 1 will have a dual use path interface separation rather than a road. The location of these features is shown on Figure 2.

This interface has been designed in accordance with the recommendations of SPP 2.6 which notes the foreshore reserve should be separated from adjacent development in a way that provides a clear demarcation between public and private land.

In order to construct the road alignment, earthworks will be required adjacent to this area to achieve the road levels in the undulating coastal terrain. The extent of intrusion of the earthworks into the coastal reserve based on the worst case scenario is shown on Figure 7. The extent of this area will be refined following detailed engineering design. The area of disturbance associated with the earthworks will be included within the revegetation program which is discussed in Section 5.2.2.



Within the residential zone interface there is open space forming adjacent parks, and within one of these areas it is proposed to locate a sewer pump station. The Water Corporation waste water strategy for Jindalee includes a pump station to be located in the vicinity of the Foreshore Reserve, which will pump waste water from the local low adjacent to the reserve back to the Quinns Main Sewer. Typically, when waste water pump stations are located adjacent to any area of environmental significance, the overflow storage capacity is doubled from 3 hours to 6 hours. This increased capacity then provides adequate response time for the Water Corporation, in instances of pump failure, to rectify any issues and get the pump station successfully operating.

The Water Corporation will need to obtain a section 38 EPA approval for the waste water pump station, due to the sensitive environment of the foreshore, with the final location of this pump station to be confirmed at this time subject to detailed design. There are other examples of waste water pump stations being located adjacent to coastal foreshore reserve in other developments, including Lot 10 Jindalee and Secret Harbour.

6.0 IMPLEMENTATION

The following table presents a provisional schedule of all programmed activities for the Construction and Post-construction phases of the foreshore landscaping and protection program.

At the completion of implementation of Satterley Property Group's requirements in relation to the Foreshore Management Plan a closure report will be prepared and issued to the City of Wanneroo. This report will detail the implementation action and describe the current status of the foreshore reserve.

The works proposed under the FMP may ultimately exist on Crown land under the management of the City of Wanneroo. As such, those works will constitute 'assets' which the City may ultimately be responsible for maintaining for perpetuity, for the benefit of the community at large. At the development application stage, detailed life-cycle/asset management costings for any works proposed that will ultimately be the responsibility of the City to manage will be provided. On the basis of those costings, some of the works proposed may or may not be approved. Alternatively, subject to agreement between parties, prior to the City accepting handover of any reserved land upon which works are proposed, then approved and constructed, the City may (having regard to the life-cycle/asset management costings of those works) require such works to be removed or modified to its satisfaction.

Table 5 Implementation Plan

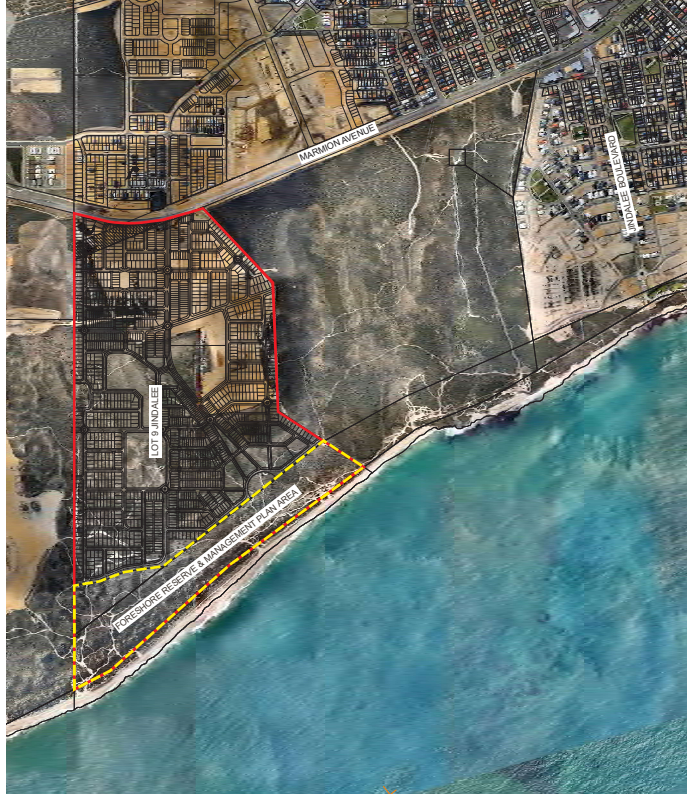
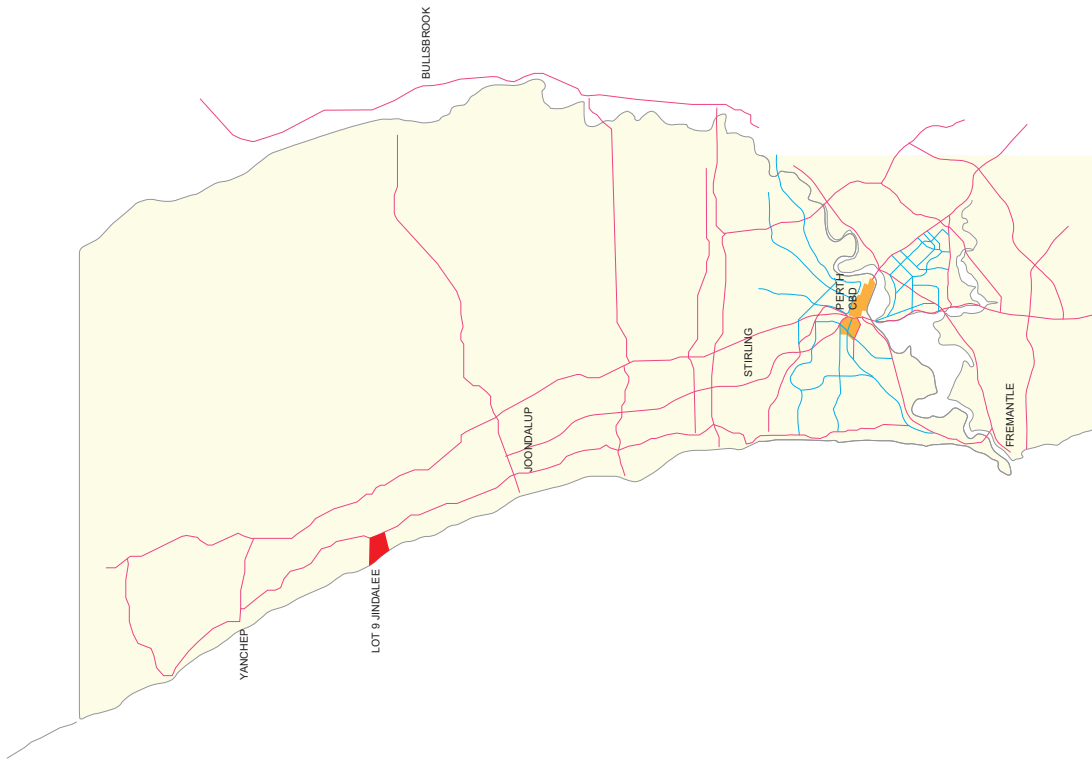
Issue	Action	Frequency	Responsibility
Construction Phase Access Control and Foreshore Protection	Construct paths (Dual Path, Coastal Access Paths, Universal/Emergency Access Path) Install lockable bollards/gates on paths as required to prevent unauthorised vehicle access Install fencing along paths and along the back of the beach. Install public information and interpretative signage Install temporary fencing and safety signage around the construction area within POS 1 & 2.	Once Once Once Once Once	Construction Contractor (Developer) Construction Contractor (Developer) Construction Contractor (Developer) Landscape Contractor (Developer) Construction Contractor (Developer)
Vegetation Management	Initial weed control works to be undertaken prior to planting occurring but after path and fence construction. Assisted regeneration planting and direct seeding	Once (late Autumn – winter) First 2 years (winter – spring)	Construction Contractor (Developer) Construction Contractor (Developer)
Fire Management	Install fire hydrants within POS 1 and POS 2.	Once	Developer
Ongoing Management Phase			

Issue	Action	Frequency	Responsibility
Vegetation Management	Weed maintenance	Annually (late Autumn – Winter)	Landscape Contractor (Developer) for minimum of 5 Years for each rehabilitation stage then City of Wanneroo
	Prune vegetation adjacent to tracks	Annually	Landscape Contractor (Developer) for minimum of 5 Years for each rehabilitation stage then City of Wanneroo
Drainage Management	Clean Gross Pollutant Traps within drainage areas	Annually	Landscape Contractor (Developer) for minimum of 2 Years then City of Wanneroo
Fire Management	Provide future residents with information relating to fire management	With information supplied at the purchase of the lot	Developer
General maintenance	Inspect path and fence condition and repair as required.	Annually	Landscape Contractor (Developer) for minimum of 5 Years then City of Wanneroo
	General POS maintenance (empty rubbish bins, mow lawns, reticulation maintenance etc)	As required	Landscape Contractor (Developer) for minimum of 5 Years then City of Wanneroo
Completion Reporting	Prepare a completion report at the end of the 5 year maintenance period identifying works undertaken in accordance with this plan.	Once	Developer



7.0 REFERENCES

- Australian Interaction Consultants. 2010. Archaeological and Ethnographic Site Identification Survey Report of the Proposed Brighton Beachside Development at Jindalee, Western Australian. Report prepared for Satterley Property Group.
- Bamford Consulting Ecologists. 2010. Terrestrial Vertebrate Fauna Assessment of the Lot 9 Brighton Project Area. Report prepared for RPS.
- Bureau of Meteorology. 2012. Climate Average Statistics online. http://www.bom.gov.au/climate/averages/tables/ca_wa_names.shtml
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- RPS Bowman Bishaw Gorham. 2006. Lot 9 Marmion Avenue, Jindalee – Vegetation and Flora Survey. Report No. L04053, Revision 2. Report prepared for Satterley Property Group.
- RPS. 2010. Lot 9 Brighton Environmental Assessment Report. Report No. L09488, Rev 1. Report prepared for Satterley Property Group Pty Ltd.
- RPS. 2011a. Lot 9 Brighton Foreshore Management Strategy. Report No. L10488, Revision 0. Report prepared for Satterley Property Group Pty Ltd.
- RPS. 2011b. Lot 9 Marmion Avenue, Jindalee – Local Water Management Strategy. Report No. D10245, Revision 0. Report prepared for Satterley Property Group Pty Ltd.
- Brown, K and Brooks, K. 2002. Bushland Weeds: A Practical Guide for the Management. Environmental Weeds Action Network, Greenwood WA.
- Wells M.R. and Clarke, A.J. 1986. Shire of Wanneroo – A Study of Land Resources and Planning Considerations. Resource Management Technical Report No. 74. Department of Agriculture, WA.
- Western Australian Planning Commission. 2000. Bush Forever. WAPC, Perth
- Western Australian Planning Commission. 2003. Statement of Planning Policy No. 2.6 – State Coastal Planning Strategy. Published in the Government Gazette 10 June 2003. WAPC, Perth.
- Western Australian Planning Commission. 2010. State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region. Published in the Government Gazette 22 June 2010. WAPC, Perth.



All road contingents detail depicted on this plan including footpaths, road reserves, medians and parking are for illustrative purposes only and are not intended to be used for any other purpose. The plan does not reflect the intent of the road reserve standards preferred by the jurisdiction.

All dimensions and areas depicted on this plan are subject to further site plan survey and may vary from the figures shown.



LEGEND

- MRS Reserve - 3.6743ha
-MRS reserve (foreshore) to be set aside for public ownership and management, public access, recreation and conservation.
- Public Open Space - 12.2491 (Credit)
- Public Open Space - 0.5212ha (No Credit)
- FORESHORE RESERVE
- PRIMARY SCHOOL
- RESIDENTIAL



PROPOSED SUBDIVISION
 Lot 9 Marmion Avenue, Jindalee
 City of Wanneroo



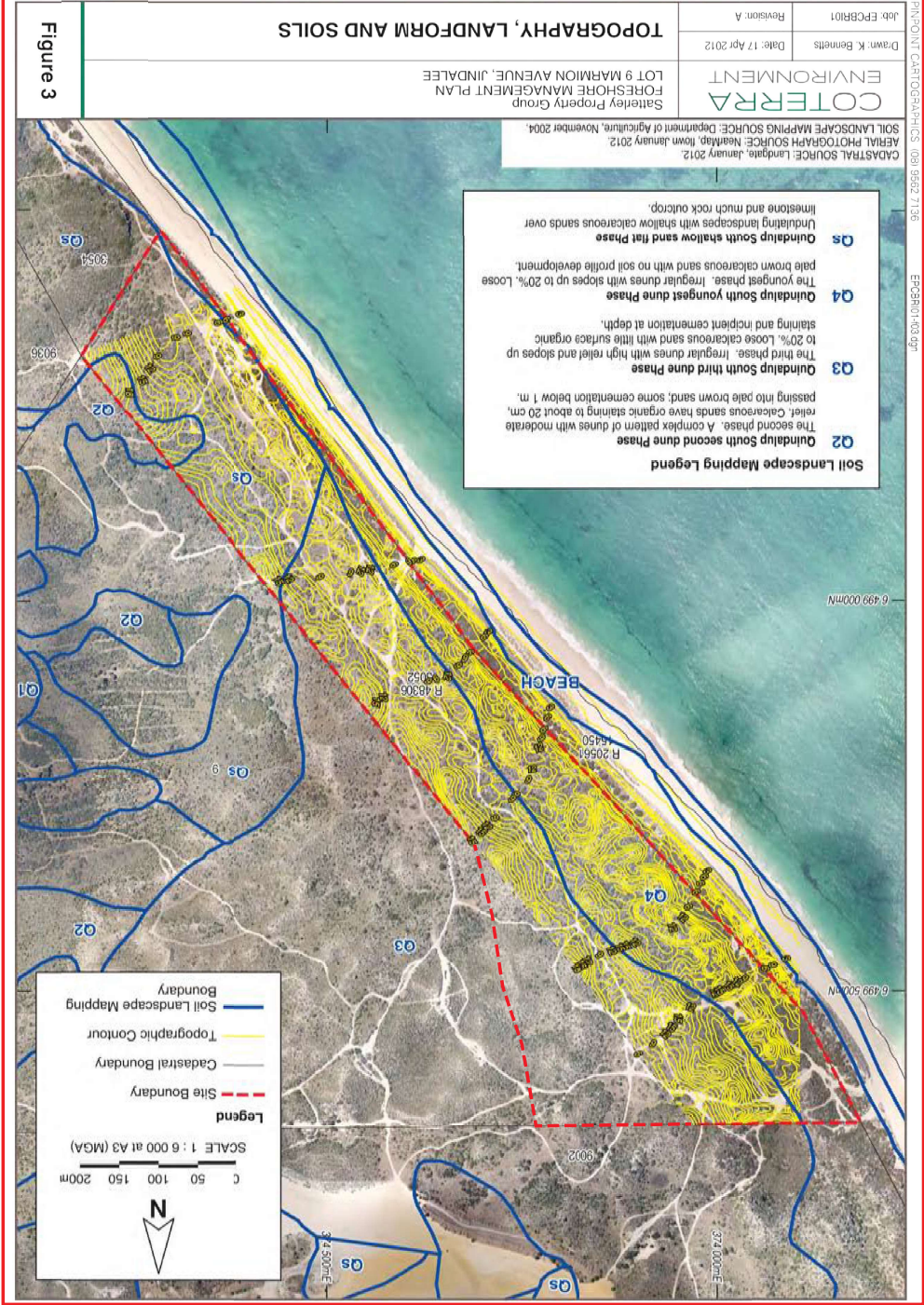
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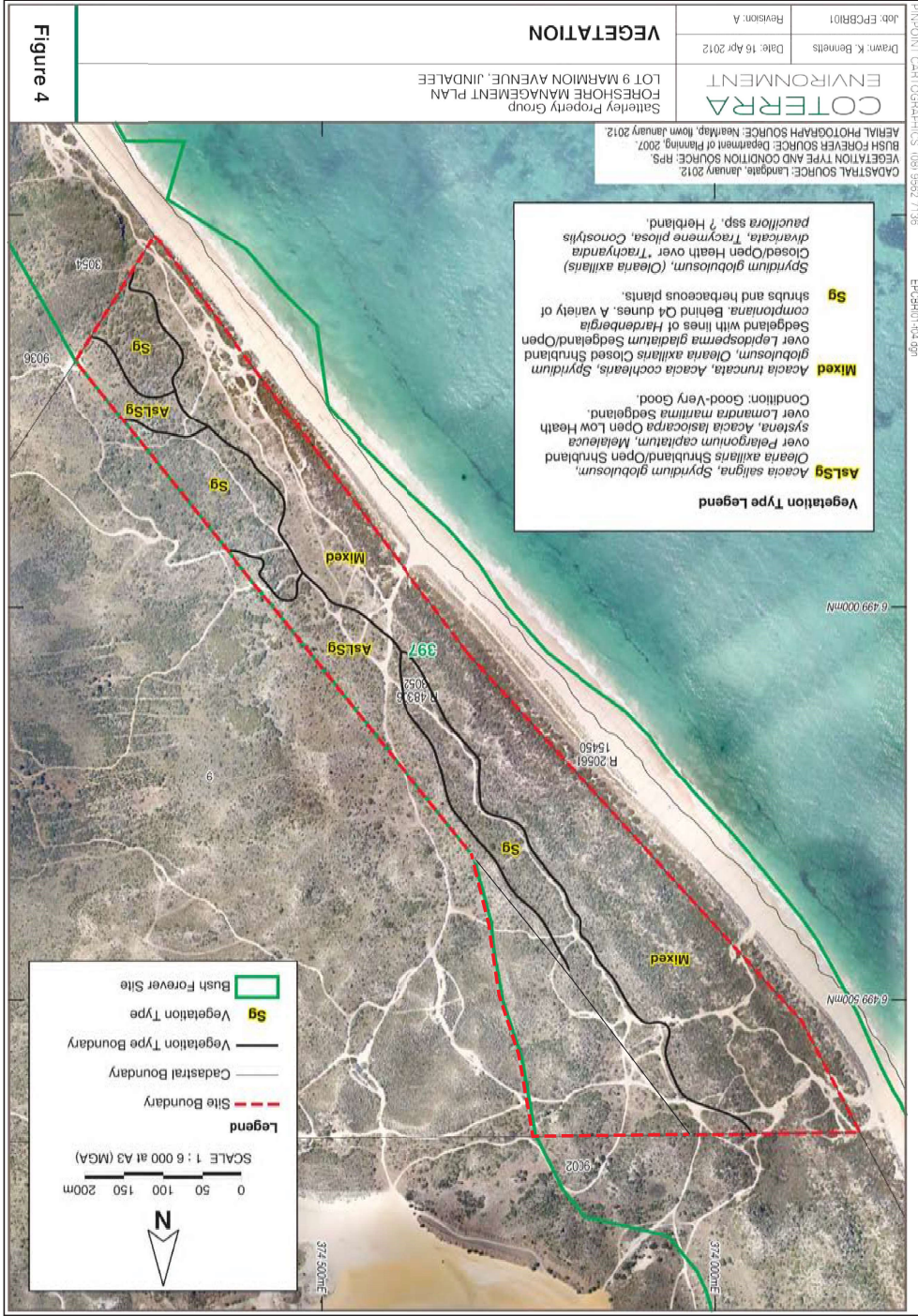
date: 16.01.2012

11/1511 0312 1231 - P-11511 0312 1127
 G. JENNINGS/PLANNING
 12, 30 KAWAIAO STREET, SUDBURY WA, 6008
 PO BOX 795, SUDBURY WA, 6008

This plan is issued at the request of the applicant and is subject to approval, review & engineering advice. The plan remains the property of CLE.







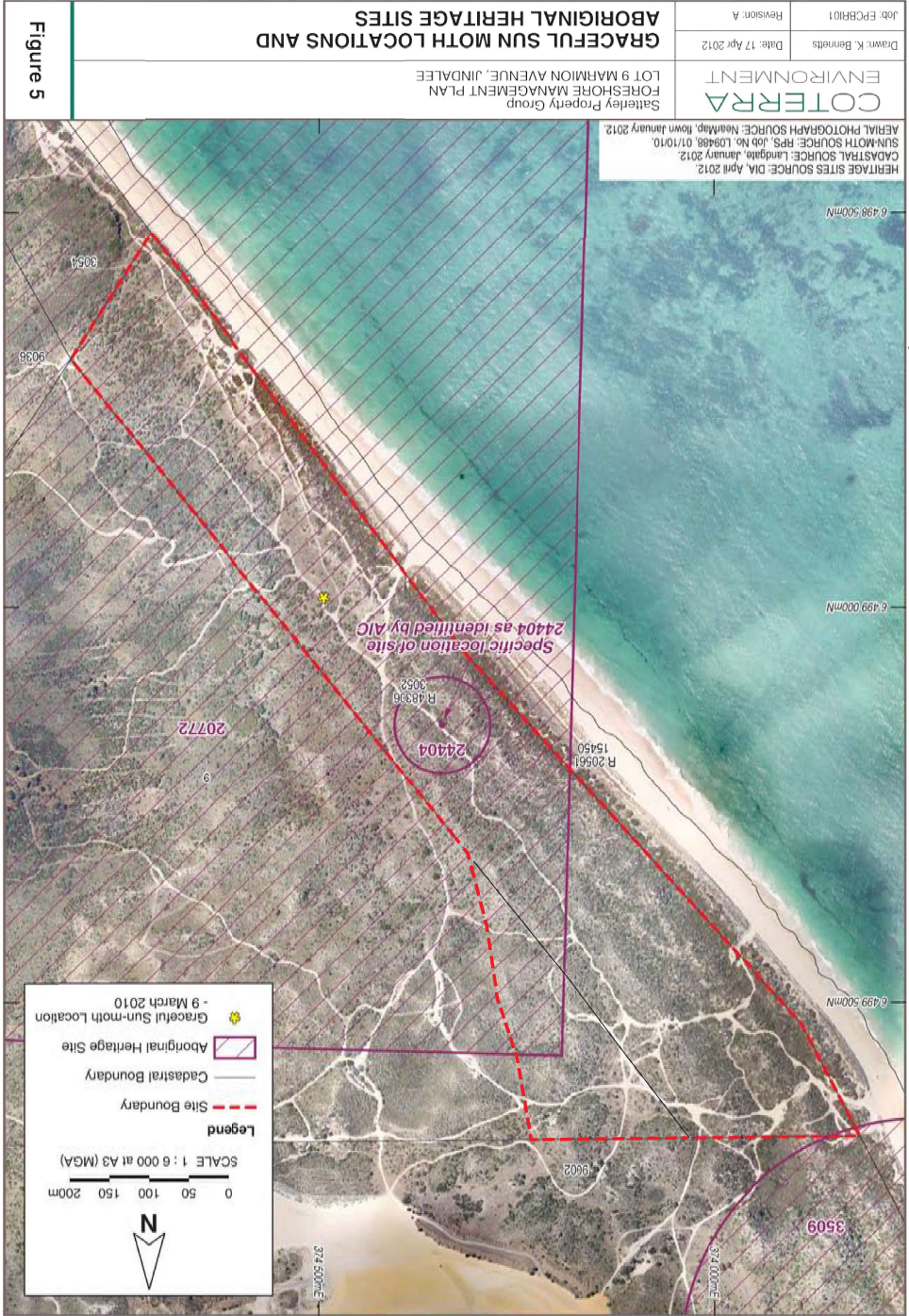


Figure 5

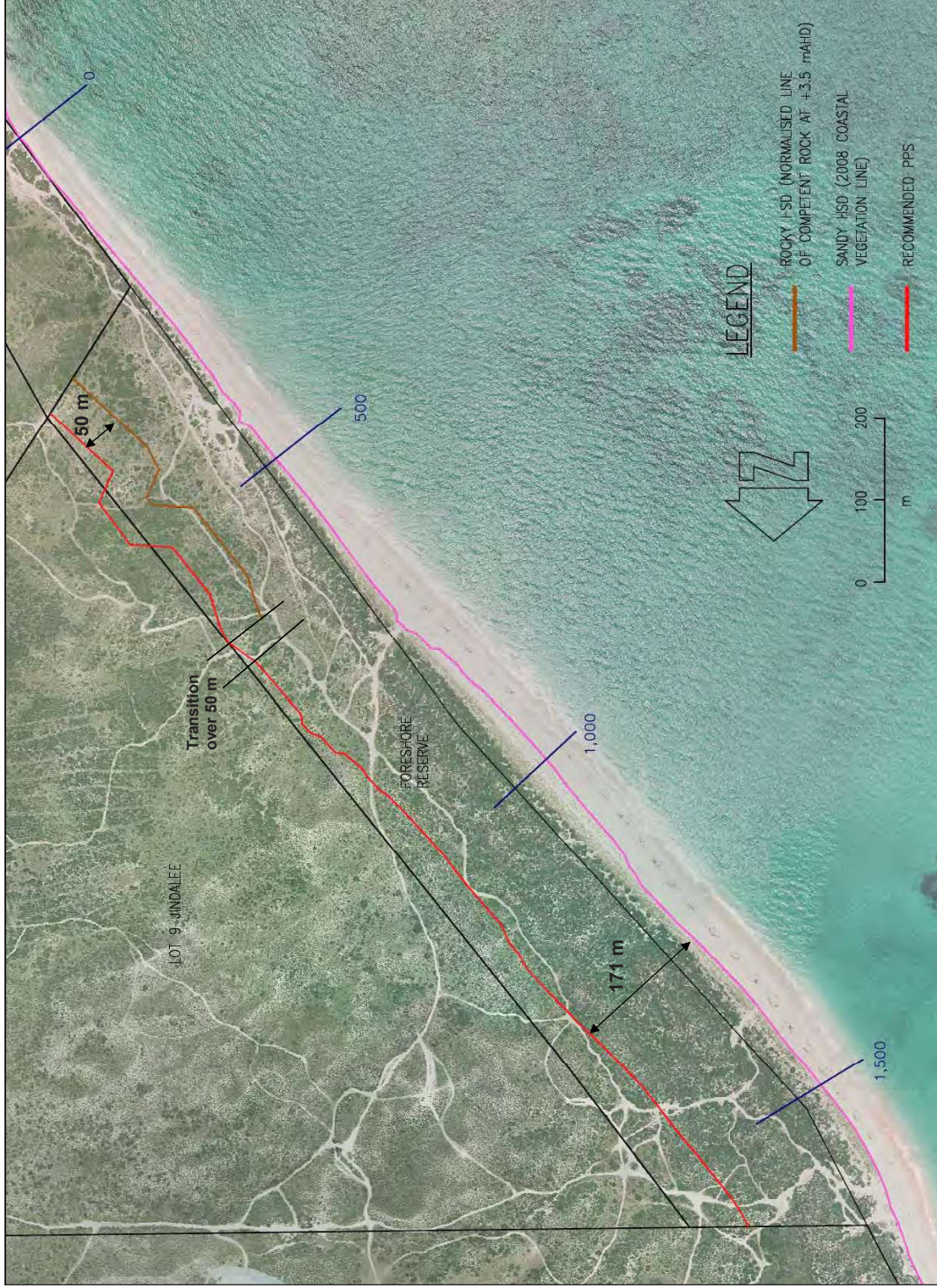


Figure 8.2 – Recommended Setback Distance to Freehold Development (Aerial Dec 2008)
m p rogers & associates pl

Lot 9 Jindalee Setback Assessment
Job J805, Report R258 Rev 1, Page 34



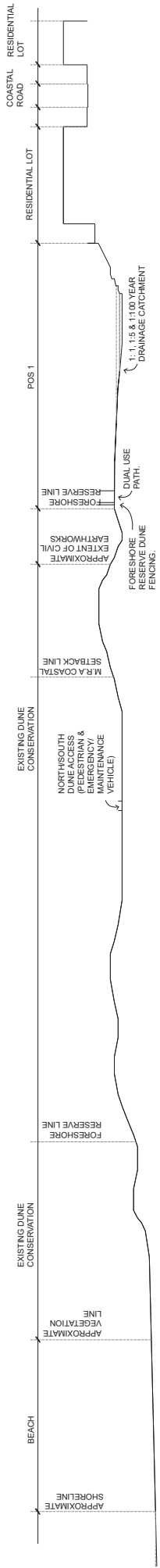
CIRCULATION		FORESHORE		SIGNAGE	
	PEDESTRIAN ACCESS THROUGH DUNES, FENCED. (STABILISED LIMESTONE TRACK WITH TIMBER STAIRS AS REQUIRED, 1.2m WIDTH).		ASSISTED REGENERATION AREAS.		DIRECTIONAL SIGNAGE.
	DUAL USE PATH. (RED ASPHALT, 3m WIDTH).		DUNE CONSERVATION/ REVEGETATION FENCING.		INTERPRETATIVE SIGNAGE.
	UNIVERSAL ACCESS WITHIN POS & VERGES, TO BEACH. (CONCRETE FOOTPATHS, 2.5m WIDTH).		COASTAL SETBACK LINE.		
	MAINTENANCE (EMERGENCY VEHICULAR ACCESS THROUGH DUNES (NORTH/SOUTH), FENCED. (STABILISED LIMESTONE TRACK, 2.5m WIDTH WITH 0.5m CLEARANCE EITHER SIDE).		FORESHORE RESERVE.		
	PUBLIC VEHICLE ACCESS WITH TURN AROUND, TO BEACH, FENCED. (SEALED ASPHALT, 6m WIDTH).		POTENTIAL DEVELOPMENT AREA SUBJECT TO DETAIL DESIGN.		
	EMERGENCY VEHICLE ACCESS WITH TURN AROUND, TO BEACH, FENCED. (SEALED ASPHALT, 6m WIDTH).		EXTENT OF BATTER.		
	SERVICE VEHICLE ACCESS TO KIOSK/COMMUNITY FACILITY.		GRACEFUL SUN MOTH LOCATION (SURVEY 9th MARCH 2010).		
	PARALLEL VERGE PARKING.		LOOKOUT/VIEWING DECK.		



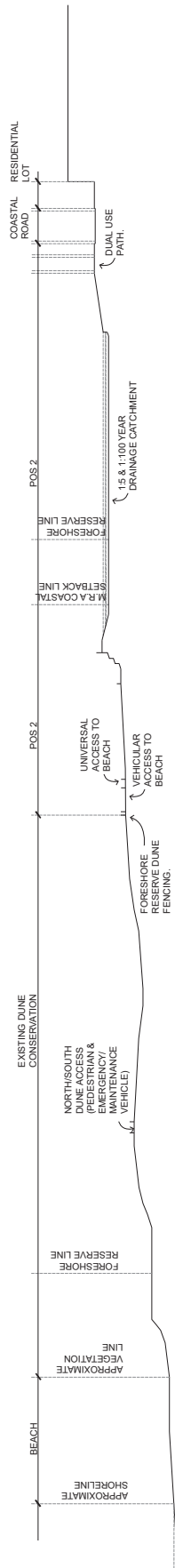
- CIRCULATION**
- ① DISABLED ACCESS PARKING.
 - ② PICKUP/DROP OFF BAYS TO BEACH.
 - ③ W/UD CARPARK TO POS 1.
 - ④ W/UD CARPARK TO POS 2.
 - ⑤ PARALLEL CARBAYS TO VERGES.
 - ⑥ SERVICE ACCESS TO CAFÉ/KIOSK.
 - ⑦ KEY LOCKABLE GATES/BOLLARDS TO PREVENT VEHICULAR ACCESS.
- SIGNAGE**
- ⑧ PARK NAME SIGNAGE.
 - ⑨ DIRECTIONAL SIGNAGE.
 - ⑩ INTERPRETATIVE SIGNAGE.
 - ⑪ FES SIGNAGE.
 - ⑫ FIRE HYDRANTS.
- POS**
- ⑬ COMMUNITY FACILITY: TOILETS/CHANGEROOMS.
 - ⑭ PLAY EQUIPMENT & SOFTFALL.
 - ⑮ SHELTER.
 - ⑯ ELECTRIC BBQ.
 - ⑰ BEACH SHOWERS & FEET WASHER.
 - ⑱ DRINK FOUNTAIN.
 - ⑲ BIN ENCLOSURES.
 - ⑳ BIKE RACKS.
 - ㉑ BENCHES.
 - ㉒ PROPOSED INDICATIVE LOCATION OF SEWER PUMP STATION.



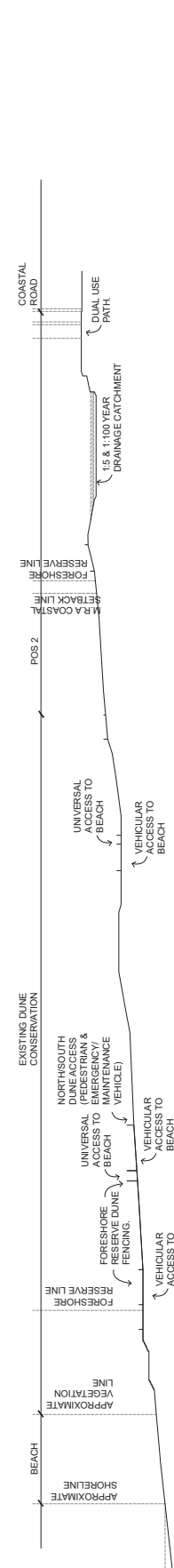
- CIRCULATION**
- ① PEDESTRIAN ACCESS THROUGH DUNES: FENCED. (CONCRETE FOOTPATHS: 2.5m WIDTH). TIMBER STAIRS AS REQUIRED (1.2m WIDTH).
 - ② DUAL USE PATH. (RED ASPHALT: 3m WIDTH).
 - ③ UNIVERSAL ACCESS WITHIN POS & VERGES: TO BEACH. (CONCRETE FOOTPATHS: 2.5m WIDTH).
 - ④ MAINTENANCE / EMERGENCY VEHICULAR ACCESS THROUGH DUNES (NORTH/SOUTH). FENCED. (STABILISED LIMESTONE TRACK: 2.5m WIDTH WITH 0.5M CLEARANCE EITHER SIDE).
 - ⑤ PUBLIC VEHICLE ACCESS WITH TURN AROUND TO BEACH. FENCED. (SEALED ASPHALT: 6m WIDTH).
 - ⑥ EMERGENCY VEHICLE ACCESS WITH TURN AROUND TO BEACH. FENCED. (SEALED ASPHALT: 6m WIDTH).
 - ⑦ SERVICE VEHICLE ACCESS TO KIOSK/COMMUNITY FACILITY.
 - ⑧ PARALLEL VERGE PARKING.
- FORESHORE**
- ⑨ ASSISTED REGENERATION AREAS.
 - ⑩ DUNE CONSERVATION/ REVEGETATION FENCING.
 - ⑪ COASTAL SETBACK LINE.
 - ⑫ FORESHORE RESERVE.
 - ⑬ POTENTIAL DEVELOPMENT AREA SUBJECT TO DETAIL DESIGN.
 - ⑭ EXTENT OF BATTER.
 - ⑮ GRACEFUL SUN NORTH LOCATION (SURVEY 8th MARCH 2010).
- POS**
- ⑯ OPEN IRRIGATED GRASSED AREA FOR ACTIVE RECREATION.
 - ⑰ 1 in 100.1 in 5 and 1 in 1 year DRAINAGE CATCHMENT AREA.
 - ⑱ LOCAL NATIVE PLANTED AREAS, IRRIGATED.
 - ⑲ TERRACED RETAINING WALLS <900mm WITH PLANTING.
 - ⑳ FEATURE PAVING.
 - ㉑ SHADE TREES.



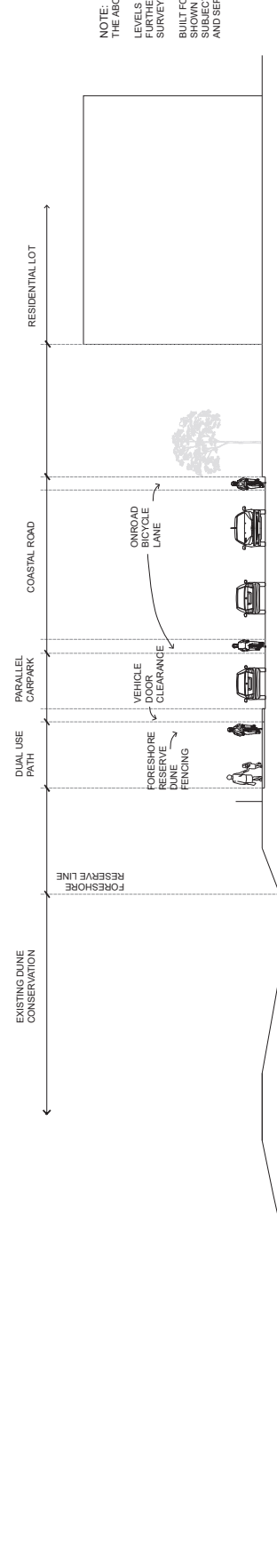
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SECTION B-B
1:500@ A1



SECTION C-C
1:500@ A1

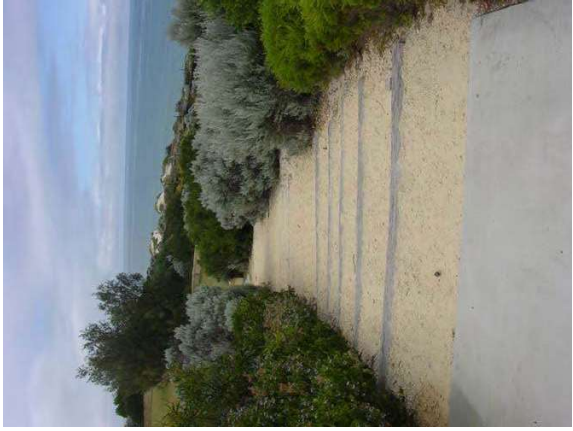


SECTION D-D
1:100@ A1

NOTE:
THE ABOVE SECTIONS ARE INDICATIVE ONLY.
LEVELS & SLOPES SHOWN ARE SUBJECT TO FURTHER REVIEW, CIVIL DESIGN & FEATURE SURVEY.
BUILT FORM AND LANDSCAPE STRUCTURES SHOWN ARE INDICATIVE ONLY AND ARE SUBJECT TO FURTHER DETAILED DESIGN AND SEPARATE APPROVALS PROCESS.



LOOKOUT/VIEWING DECK WITH FEATURE BALUSTRADE



TIMBER BEACH ACCESS STEPS



DUNE & BEACH ACCESS FENCING



CONCRETE UNIVERSAL ACCESS FOOTPATH



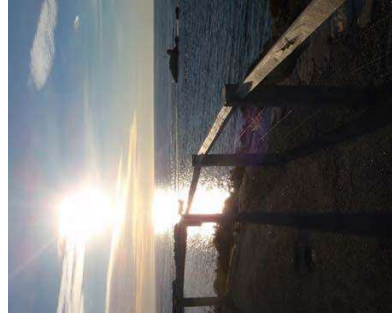
CITY OF WANNEROO APPROVED DUNE & BEACH ACCESS FENCING



FLEXIBLE DECKING ON CHAIN



DUAL USE PATH (RED ASPHALT 3m WIDTH)



VIEWING/LOOKOUT WITH TIMBER TOPRAIL

SOURCE: KRISTEN DAWSON (EPCAD)



**POS 2
INTERIM
SHORT TERM
BEACH
ACCESS**

- CIRCULATION**
- PEDESTRIAN ACCESS THROUGH DUNES: FENCED. (STABILISED LIMESTONE TRACK WITH TIMBER STAIRS AS REQUIRED, 1.2m WIDTH).
 - DUAL USE PATH. (RED ASPHALT, 3m WIDTH).
 - UNIVERSAL ACCESS WITHIN POS & VERGES: TO BEACH. (CONCRETE FOOTPATHS, 2.2m WIDTH).
 - MAINTENANCE / EMERGENCY / BIKEWAY ACCESS THROUGH DUNES: (WOODEN SOUTH FENCE, STABILISED LIMESTONE TRACK, 2.5m WIDTH WITH 0.5M CLEARANCE EITHER SIDE).
 - PUBLIC VEHICLE ACCESS WITH TURNAROUND, TO BEACH FENCED. (SEALED ASPHALT, 6m WIDTH).
 - EMERGENCY VEHICLE ACCESS WITH TURNAROUND, TO BEACH FENCED. (SEALED ASPHALT, 6m WIDTH).
 - SERVICE VEHICLE ACCESS TO RISK/COMMUNITY FACILITY.
 - PARALLEL VERGE PARKING.

- FORESHORE**
- ASSISTED REGENERATION AREAS.
 - DUNE CONSERVATION/REVEGETATION FENCING.
 - COASTAL SETBACK LINE.
 - FORESHORE RESERVE.
 - POTENTIAL DEVELOPMENT AREA SUBJECT TO DETAIL DESIGN.
 - EXTENT OF BATTER.
 - GRACEFUL SUN MOTH LOCATION (SURVEY, 8th MARCH 2010).

- POS**
- OPEN IRRIGATED GRASSED AREA FOR ACTIVE RECREATION.
 - 1 in 100 and 1 in 5 year DRAINAGE CATCHMENT AREA.
 - LOCAL NATIVE PLANTED AREAS, IRRIGATED.
 - TERRACED RETAINING WALLS ~900mm WITH PLANTING.
 - FEATURE PAVING.
 - SHADE TREES.

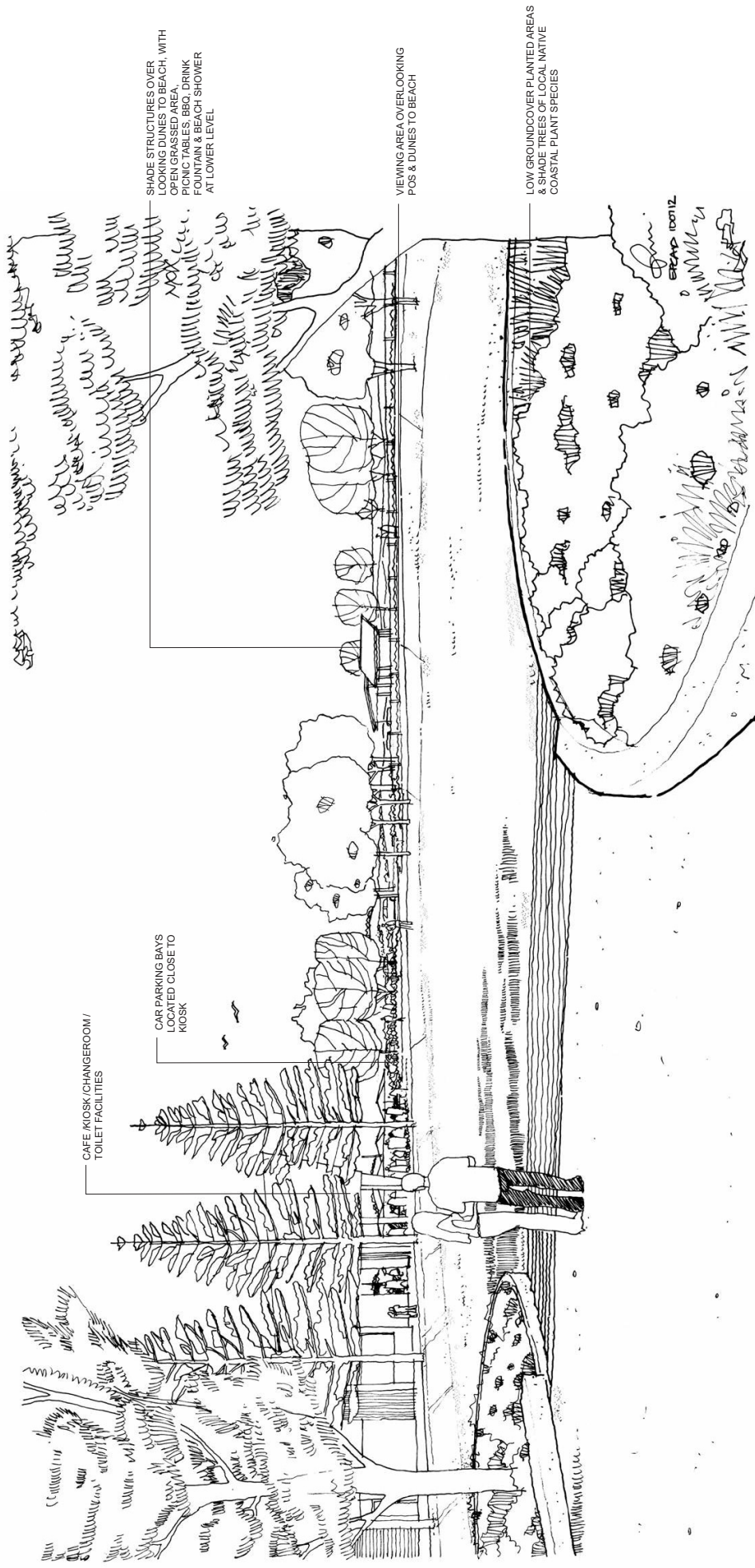


**POS 2
MAIN POS
& BEACH
ACCESS**

- CIRCULATION**
- DISABLED ACCESS PARKING.
 - PICKUP/DROP OFF BAYS TO BEACH.
 - WSUD CARPARK TO POS 1.
 - WSUD CARPARK TO POS 2.
 - PARALLEL CARBAYS TO VERGES.
 - SERVICE ACCESS TO CAFETERIA/KIOSK.
 - KEY LOCKABLE GATES/BOLLARDS TO PREVENT VEHICULAR ACCESS.

- SIGNAGE**
- PARK NAME SIGNAGE.
 - DIRECTIONAL SIGNAGE.
 - INTERPRETATIVE SIGNAGE.
 - FESA SIGNAGE.
 - FIRE HYDRANTS.

- POS**
- COMMUNITY FACILITY/ TOILETS/ CHANGEROOMS.
 - PLAY EQUIPMENT & SOFTFALL.
 - SHELTER.
 - ELECTRIC BBO.
 - BEACH SHOWERS & FEET WASHER.
 - DRINK FOUNTAIN.
 - BIN ENCLOSURES.
 - BIKERACKS.
 - BENCHES.



SHADE STRUCTURES OVER
LOOKING DUNES TO BEACH, WITH
OPEN GRASSED AREA,
PICNIC TABLES, BBQ, DRINK
FOUNTAIN & BEACH SHOWER
AT LOWER LEVEL

VIEWING AREA OVERLOOKING
POS & DUNES TO BEACH

LOW GROUND COVER PLANTED AREAS
& SHADE TREES OF LOCAL NATIVE
COASTAL PLANT SPECIES

CAFE/KIOSK/CHANGEROOM/
TOILET FACILITIES

CAR PARKING BAYS
LOCATED CLOSE TO
KIOSK

