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Integrated Science & Design

FORESHORE MANAGEMENT PLAN

AMBERTON ESTATE

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Executive Summary

Stockland and Eglinton Estates are joint venture partners in developing the Amberton Estate, a residential development in Eglinton, which includes approximately 700 metres (m) of coastal frontage within the City of Wanneroo. Stockland engaged Emerge Associates to prepare a foreshore management plan to guide the planning, development, rehabilitation and long term management of the Amberton coastal foreshore area.

This Amberton Foreshore Management Plan (FMP) specifically deals with an area referred to within this document as the Amberton "foreshore reserve". The foreshore reserve incorporates a "Parks and Recreation" reserve and areas of Public Open Space (POS) (zoned "urban" under the Metropolitan Region Scheme (MRS)), the latter which were located under the Eglinton Local Structure Plan (LSP), to ensure that an adequate foreshore reserve was provided in accordance with *State Coastal Planning Policy 2.6* (SCPP).

Amberton and the Eglinton area have had an extensive planning history, including two historic Ministerial Statements, MRS amendments, the Alkimos Eglinton District Structure Plan (DSP) and most recently the Eglinton Local Structure Plan (LSP). The endorsed LSP formally established the spatial extent of the foreshore reserve, to ensure that any proposed residential development, including a foreshore road, were located landward of the determined coastal processes setback. Both the DSP and LSP identify two local coastal nodes within the Amberton estate. The preparation and implementation of this FMP addresses a number of planning and existing approval requirements.

The overarching vision for the foreshore reserve is to establish an area that retains and protects coastal landforms and vegetation, and provides an amenable and useable system of open space which encourages outdoor activity and interaction with nature, the outdoors and most importantly the coast. The foreshore management principles focus on maintaining the condition of the foreshore while providing for increased usage, coastal access and amenities to compliment residential development of the adjacent Amberton site. The overall design approach aims to balance the needs for coastline stabilisation, coastal processes and weather conditions, foreshore restoration and controlled human activity, including informal active and passive recreation linked to community benefit, education and appreciation, and acknowledges Amberton's status as a 'local beach'.

As part of the preparation for this management plan a review of the historic planning and environmental investigations that have been completed for the site and surrounding areas, coupled with detailed site specific inspections and investigations, were undertaken to determine the opportunities and constraints presented by the site. Parts of the Amberton foreshore reserve have historically been significantly disturbed through dune blowouts, the results of which provide an opportunity to locate future passive recreation and amenity areas without requiring the clearing of native vegetation or disturbance of the natural foreshore dunal landform. These blowout areas are positioned in the northern and southern regions of the foreshore reserve, while the central portion contains relatively intact remnant vegetation which is proposed to be protected through generally avoiding any construction and clearing in these areas, restricting access, and the proposed provision of boardwalks and paths located on existing tracks to access the foreshore reserve.

This FMP has considered these opportunities and constraints to present a foreshore master plan that provides controlled access to the coast, with recreation opportunities and strategic lookouts to incorporate coastal views. The southern coastal node (café node) has been located within a highly degraded area and will provide recreational amenity for the local community. The development of this Amberton FMP has been supported by a Surf Life Saving Western Australia (SLSWA) Coastal Aquatic

Risk Assessment (CARA) which has provided recommendations on the most appropriate location for a swimming beach.

Management of the foreshore and the proposed development of the Amberton foreshore reserve are discussed in **Section 7**, which provides information on:

- Construction management
- Interface management
- Rehabilitation/ecological restoration of historic disturbance
- Fauna management
- Water management and Water Sensitive Urban Design (WSUD)
- Access
- Beaches
- Foreshore reserve amenities and structures
- Bushfire management
- Staging.

In accordance with the SCPP, this FMP is also supported by a Coastal Hazard Risk Management Adaptation Plan (CHRMAP) to consider the potential impacts to assets and infrastructure within the foreshore reserve over the SCPP planning timeframe. To progress the CHRMAP, assets and infrastructure have been considered against three planning timescales (30, 50 and 75 years) and management strategies have been considered in accordance with the coastal adaptation hierarchy (SCPP 2013).

In accordance with the SCPP, the majority of coastal assets have been located behind (landward of) the 30 year coastal processes setback and as such generally meet the requirements as a “variation” to the SCPP. Beyond this timeframe, the general approach has been to allow for planned or managed retreat of assets and infrastructure which will allow these structures to be removed at the end of their life span, with options for relocation where relevant. In addition to this detailed discussion have been undertaken with the City of Wanneroo as to their level of comfort in terms of assets within foreshore reserve areas.

This FMP is for the endorsement of the proposed assets and infrastructure within the Amberton foreshore area as delineated in the foreshore master plan. The subdivision east of the foreshore area is subject to a separate planning approval. Endorsement of this FMP does not include the areas outside of the Amberton foreshore area. Following endorsement and approval of this FMP by the City of Wanneroo and the Western Australian Planning Commission (WAPC), Stockland will submit detailed development applications and/or landscape approvals as required to the relevant authorities. The relevant applications and subsequent assessment will be guided by the FMP which sets the framework and expectations for how the foreshore reserve will be treated through the subdivision and development process.

Stockland and the City of Wanneroo acknowledges that this FMP is conceptual and that the detailed design of all prescribed assets and infrastructure will occur during the development application stage. Stockland recognises that should the City of Wanneroo determine that they do not have the capacity to maintain and manage a proposed asset then the City reserves the right to require the application to show this accordingly.

The proposed playground and all other public amenities including but not limited to applications for play equipment, exercise equipment, outdoor furniture, shelters, structures, BBQ's, drinking fountains and public art will satisfy the following criteria:

- Maintenance thereof is to be within the City's operating budget;
- Replacement thereof is to be within the City's capital works budget;
- Compliance thereof with the Australian Standards and City's safety standards;
- The scale of the playground is to be appropriate to the size of park it is proposed in; and
- The playground provides opportunity for physical and creative play and accommodates for different age groups.

Notwithstanding the above, this FMP is based on extensive discussions over almost two years between Stockland and the City and any decision to deviate from the FMP framework should not be made lightly and without reasonable justification by either party.

The developer will implement this FMP as specified and monitor and maintain the foreshore for a minimum period of five years in accordance with the SCPP. Following this, the foreshore reserve will be handed over to the City of Wanneroo for ongoing maintenance and management.

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1 Introduction

1.1 Project background

Amberton Estate (Amberton) is situated along the north Alkimos coastline, 46 km north of Perth Central Business District (CBD). The entire Amberton site is approximately 198 hectares (ha) with a coastal frontage of approximately 700 metres (m). Shorehaven, which is currently being developed by Peet Limited is situated immediately to the south, with Eglinton Estates land to the north.

A marina and coastal village is proposed north of the site, which will be subject to additional detailed planning and a separate approvals process. As the marina development is not expected to commence for a number of years, temporary foreshore works may also be required within the marina site in order to provide safe access to the coast for future residents.

This Foreshore Management Plan (FMP) has been prepared to guide the planning, development, rehabilitation and long term management of an area referred to as the Amberton 'foreshore reserve', as established under Eglinton Local Structure Plan No. 82 (LSP) (see **Figure 1**). The foreshore reserve includes areas both reserved for "Parks and Recreation" and zoned "Urban" as shown in **Figure 2**.

1.2 Purpose of this document

Stockland engaged Emerge Associates (Emerge) to support the preparation of the foreshore master plan and relevant supporting documentation comprising this plan.

This FMP document:

- Provides guidance for the future development and management of the Amberton foreshore reserve.
- Establishes a management framework that will enable the foreshore reserve to be managed in a sustainable manner providing access and amenity to local residents and the wider local community.
- Outlines the management of the interface between the foreshore and the development area.
- Defines acceptable uses, facilities and structures within the foreshore reserve.
- Makes commitments regarding future revegetation and the extent of conservation activities.

The focus of this FMP is primarily the Amberton foreshore reserve, however it has considered a broader area including the area of foreshore immediately north of Amberton associated with the future development of land owned by Eglinton Estates.

1.3 Objectives

The FMP for Amberton has been guided by a number of design principles. These design principles follow four key themes for the development of the estate;

- Being site responsive
- Providing strong community building
- Being connected and accessible
- Providing leading built environment.

The relevant design principles associated with the key themes are detailed below:

- Site Responsive
  - Respect the complex coastal ecologies the site represents.
  - Consider natural attributes of the existing topography when determining urban structure and place making.
  - Consider location of recreational facilities to take advantage of sheltered low lying areas on the leeward side of existing dunes.
  - Panoramic views to be a design consideration.
  - Design to accommodate areas of vegetation and dunal landform identified for retention.
  - Where possible retained areas should be available for multiple use (public access, public use, conservation, flood storage).
  - Foreshore reserves to include recreational uses, public access, parking and food storage.
  - Where possible, environmental and landform elements selected for retention to form part of credited public open space.
- Strong Community Building
  - Where appropriate, celebrate high points with built form and select vantage points.
  - Co-locate facilities to maximize place making, economic benefits and design efficiencies.
  - Integrate public open space with the coastal foreshore reserve to facilitate and enhance public use.
- Connected and Accessible
  - Pedestrian and cycle network to offer a variety of choices linking the community to local landmarks, public art, landscape elements, community infrastructure and neighbouring communities.
  - Links to facilitate important east-west non-vehicular connectivity/routes from the coast to freeway as well as due consideration to north-south connectivity axis. Due consideration to be given in promoting these routes in providing the required linkages with the rest of Amberton and into neighbouring landholdings.
- Leading Built Environment
  - Locate and design for built environment to support unique place creation and identity.

In addition, a specific vision has been identified for the Amberton FMP being:

- Identify the natural resources and processes as well as the necessary management measures for preserving and enhancing the environmental values of the foreshore reserve.
- Identify and provide for sustainable levels of leisure, recreation, commercial and general public infrastructure necessary for the planned population growth in the surrounding area.
- Identify and provide opportunities for interpretive facilities consistent with the environmental and cultural values of the area.
- Develop an implementation plan for future development works and management within the foreshore reserve, which outlines priorities, responsibilities and an indication of the likely costs for each action.

1.4 Assessment and implementation of this FMP

This FMP will require endorsement by both the City of Wanneroo and the Western Australian Planning Commission (WAPC). While it provides a clear framework and guidance for the future development and management of the foreshore reserve, separate development approval will be required prior to the implementation of various aspects of the foreshore works. This FMP is for the endorsement of the

proposed assets and infrastructure within the Amberton foreshore area as delineated in the foreshore master plan. The subdivision east of the foreshore area is subject to a separate planning approval. Endorsement of this FMP does not include the areas outside of the Amberton foreshore area.

For the implementation of any works within the MRS Parks and Recreation reserve, development approval will be required from both the WAPC and the City of Wanneroo, while the land is under the ownership of the developer. This would involve a development application for the implementation of foreshore works. When the foreshore reserve is transferred to the Crown and a management order exists with the City of Wanneroo, planning (development application) approval is only required from the City of Wanneroo.

For any implementation of works within the Amberton foreshore reserve outside of the Parks and Recreation reserve, approval will be the same process as for standard areas of Public Open Space (POS) within residential development within the City of Wanneroo. Landscape detailed design will be submitted directly to the City of Wanneroo for approval prior to any implementation of works.

1.5 Land details

The Amberton foreshore reserve is located within Lot 9005 Pipidinny Road, Reserve 20561 and Unallocated Crown Land within Eglinton (see **Figure 1**).

The land reserved for Parks and Recreation includes freehold land (Lot 9005 Pipidinny Road), Reserve 20561 and Unallocated Crown Land. The Department of Planning (DoP) is currently the responsible authority for Reserve 20651, however there is a management order with the City of Wanneroo.

The areas reserved for Parks and Recreation under the MRS are also recognised as Parks and Recreation reserves under the City of Wanneroo Town Planning Scheme No. 2 (TPS No. 2), with a portion of the foreshore reserve within Lot 9005 Pipidinny Road zoned for “Urban Development” which corresponds with the area zoned Urban under the MRS.

Areas reserved for Parks and Recreation are also part of Bush Forever Site 397 – *Coastal strip from Wilbinga to Mindarie* (Government of WA 2000).

2 Statutory Framework and Policy Requirements

Any future management framework proposed for the foreshore reserve will need to be cognisant of the relevant prevailing legislation and policy requirements. The key legislation, policy and guidelines that are relevant to the design approach and management of the Amberton foreshore reserve are outlined in the following section.

2.1.1 State Planning Policies

2.1.1.1 SPP 2.6 State Coastal Planning Policy

The most relevant State Planning Policy associated with the Amberton foreshore reserve is the *State Coastal Planning Policy 2.6* (SCPP). The (SCPP) was introduced in 2003 and provides guidance for the siting of new development including subdivision and strata subdivision along the coast. The objectives of the policy are to:

- *ensure that 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.*

A revised version of the SCPP and new accompanying guidelines were finalised and released in July 2013 following a review of the original policy to take into account the latest coastal planning information locally, nationally and internationally in addition to learnings from over 10 years of policy application. This FMP has taken this policy into consideration and is based on the current version of the policy.

The SCPP provides guidance on calculating the component of the coastal foreshore reserve required to accommodate for coastal processes. The relevant coastal processes include erosion, accretion, storm surges, winds, sea level change and biophysical criteria (SCPP 2.6, 2003). A coastal processes assessment was completed for the Eglinton Estates land (including the Amberton foreshore reserve) by M.P. Rogers and Associates in 2011 based upon the 2003 SCPP. This was a key consideration reflected in the extent of the foreshore reserve for the ultimately endorsed Eglinton LSP (**Appendix A**). Other considerations for a coastal foreshore reserve (in accordance with SCPP) include "*the consideration of, and protection for significant natural features such as coastal habitats and, for their biodiversity, archaeological, ethnographic, geological, geo-morphological, visual or wilderness, biodiversity and ecosystem integrity, heritage, landscape, seascape, and visual landscape values…and opportunities for public access, public recreation needs and safety to lives and property.*"

The M.P. Rogers (2011) coastal processes assessment is discussed further in **Section 3.8.**

The 2013 SCPP requires foreshore management plans to consider coastal hazard risk management and adaptation planning. To this end, this FMP includes a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) to address proposed development within the Amberton foreshore (**Section 10**). The CHRMAP has been incorporated into this FMP as discussed further in **Section 10**.

2.1.1.2 SPP 2.9 Water Resources

SPP 2.9 aims to ensure the protection and appropriate management of water resources in line with state guidelines is included within the planning framework. The broad aims of this policy are to:

- Protect, conserve and enhance water resources.
- Assist in ensuring the availability of suitable water resources to maintain essential requirements for human and other biological life and to maintain or improve the quality and quantity of water resources.
- Promote and assist in the management and sustainable use of water resources.

The FMP has considered SPP 2.6 in relation to the protection of water resources through revegetation, the proposed stormwater management approach within the foreshore and public open space network and the selection of water efficient species for landscaping.

2.1.1.3 Draft SPP 3.7 Planning for Bushfire Risk Management

The draft State Planning Policy 3.7 Planning for Bushfire Risk Management (2014) is intended to inform and guide decision makers, referral authorities and proponents to achieve acceptable bushfire protection outcomes, including expectations at the different stages of planning.

In consideration of this, a Bushfire Management Plan has been developed for the Amberton Estate (including the foreshore reserve) and will be used to support future residential development. This application of bushfire management is discussed further in **Section 7.8.**

2.1.2 Other state policy and guidelines

2.1.2.1 Bush Forever

Bush Forever provides a policy and implementation framework to ensure bushland protection and management within the Perth Metropolitan Region (Government of WA 2000). It integrates the environmental values and the protection of specific bushland areas with the economic and social considerations for future development. The policy does not restrict development where it is consistent with the measures in the Bush Forever policy.

The Bush Forever policy is applied through *State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region*.

A large portion of the Amberton foreshore reserve is part of a Bush Forever site, which is consistent with the extent of the Parks and Recreation reservation (see **Figure 2**). This area is identified as Bush Forever Site No. 397 (Coastal Strip from Wilbingia to Mindarie) with remnant vegetation representative of the Quindalup Vegetation Complex.

Given that the Bush Forever site is reserved for Parks and Recreation, the planning and implementation of the FMP needs to be consistent with the Bush Forever Practice Note 14 (Government of Western Australia 2000b). In selecting sites for protection, Bush Forever's starting position was that vegetation in Parks and Recreation reserves was to be regarded as regionally significant and included as protected sites. However, a number of Parks and Recreation reserves may include degraded areas. The Bush Forever Practice Note 14 notes that future recreation, servicing or community objectives may therefore be appropriate in cleared or degraded portions of existing reserved lands forming part of a Bush Forever site.

2.1.3 City of Wanneroo policy

2.1.3.1 City of Wanneroo Draft Coastal Management Plan Part 1

The City of Wanneroo Coastal Management Plan (CMP) is being developed in two parts. Part 1 was completed in May 2011. The purpose of the CMP was to research the pressures the expanding population is having on the Wanneroo coastline, as beaches are being more intensively used. The overview of current changes will allow the City of Wanneroo to implement and manage conservation and recreational coastal areas to meet the needs of the expanding population.

The objectives of this document are to:

- Document existing uses of and facilities included on City of Wanneroo coastal reserves.
- Investigate key community issues and concerns regarding coastal access and use.
- Obtain community feedback on the issues surrounding coastal access and use.

The majority of the Coastal Management Plan is targeted on “Parks and Recreation” reserved land under the MRS.

The Amberton foreshore reserve is identified as being part of the “Eglinton, North Alkimos, South Alkimos-North Jindalee” area. The CMP states there will be a marina and approximately three recreation nodes within Eglinton. Fishing and four wheel driving are identified as presenting management issues within the Eglinton area.

Within this document, a dog beach is acknowledged as occurring to the south of Amberton within North Alkimos (within Shorehaven).

2.1.3.2 City of Wanneroo Local Biodiversity Strategy

The Local Biodiversity Strategy consists of key strategies and actions which are to be implemented by the City of Wanneroo in order to reduce the loss of natural habitat and maintain or improve biodiversity protection within the Wanneroo local government area. The key strategies identified within the Local Biodiversity Strategy (2011- 2016) to achieve this are:

- Strategy 1: Utilise the WA Planning System to maintain and protect the City’s key biodiversity assets.
- Strategy 2: Maintain and enhance biodiversity assets through reserve management.
- Strategy 3: Develop new projects to improve the protection of biodiversity assets.

The City of Wanneroo Alkimos Eglinton Precinct supports of three vegetation complexes, which will be maintained and improved with the implementation of the Biodiversity Strategy by:

- Increasing the protection of natural areas within existing public open space.
- Effectively managing existing public open space for conservation of biodiversity value.
- Where possible, reducing threats to biodiversity.
- Increasing reservation of natural areas in new urban developments to protect up to or a minimum of three percent of the sub divisible area in the overall precinct to protect local natural areas in public open space vested for a purpose that includes conservation.
- Successful application of the District Structure Plan to later planning stages.
- Formalising the requirements of biodiversity protection by updating the City’s public open space policy.

The vegetation complex within the foreshore reserve (Quindalup) is identified as a medium priority within the Local Biodiversity Strategy, as current protection of this vegetation complex within the City of Wanneroo is over 10%, but under 30%.

Specifically the Local Biodiversity Strategy recognises the requirement for the City to undertake a strategic assessment of existing coastal reserves and foreshore management plans to ensure a holistic approach to coastal reserve management. This is achieved through a recommendation in the Local Biodiversity Strategy that the City develop a Management Plan for the Coastal Foreshore and/or review the existing management plan, to encourage biodiversity retention and protection whilst also planning for the impact of recreation and a larger number of visitors to the coast, to guide local management plans and future land use. The City's Coastal Management Plan (**Section 2.1.3.1**) has been developed to address this recommendation.

This FMP addresses the key strategies of the Local Biodiversity Strategy by developing a management framework to maintain and enhance the coastal biodiversity assets, including the protection and management of a large area of Quindalup vegetation complex in "Very Good" condition, and revegetation and rehabilitation of "Degraded" and "Completely Degraded" areas.

2.2 Historic planning and approvals context

The site and wider Alkimos Eglinton area have been subject to a detailed and extensive planning and environmental approval process over a number of years. The relevant planning and environmental process and approvals for the site are discussed further below.

PGV Environmental provided some of the historic planning information for this section of the FMP and this contribution is acknowledged.

2.2.1 Eglinton Beach Proposal Ministerial Statement 150

In 1990, Ocean Dunes Pty Ltd submitted a Public Environmental Review (Assessment 229) for the Eglinton Beach Resort (EBR) proposal to the Environmental Protection Authority (EPA). The proposal was for a recreational resort complex incorporating an eighteen hole links golf course, marina and beach resort and associated residential components that covered an area of 325.28 ha (note the approximate area under the proposal without any reclaimed land is 298.37 ha). The proposal is located west of the original Marmion Avenue alignment.

In February 1991, the EPA published its report and recommendations (Bulletin 500) for the proposal. The Minister's associated statement of approval and environmental conditions (Ministerial Statement 150) was issued on 8 July 1991.

During the assessment period for the EBR PER a number of proposal details were modified as a result of the public submissions received, the EPA's assessment and feasibility studies undertaken by the proponent, however the central components of the project (golf course, marina, resort and residential estate) remained the same.

With respect to the Foreshore reserve Ministerial Statement 150 requires:

> *3. Foreshore Reserve*
>
> *The Public is to have ownership of and thereby adequate access to all foreshore of the developed site.*

> *Prior to the commencement of any site works, the proponent shall prepare a plan indicating that all foreshores be included in a Crown Reserve and showing the location and dimensions of the Reserve. The plan is to be acceptable to the Minister for the Environment, the Minister for Planning, the Minister for Lands and the Minister for Transport.*

Ocean Dunes Pty Ltd submitted a revised concept design plan for the EBR proposal as requested under Ministerial Statement 150. This concept design plan identified the foreshore reserve, environmentally significant areas to be transferred from private lands to the Crown, access ways to the foreshore reserve and a plan to protect the dune system during development. As such Condition 3 of Ministerial Statement No. 150 has been historically satisfied.

2.2.2 MRS Amendment 932/33

The first District Structure Plan (DSP) for the Alkimos–Eglinton area was prepared in 1993 by the landowners within the DSP area. A study defining the boundary of the foreshore reserve, the alignment of Marmion Avenue and the Mitchell Freeway was completed by Alan Tingay and Associates in 1993 as part of the preparation of the DSP (Alan Tingay & Associates and Feilman Planning Consultants, 1993). An alternative foreshore reserve boundary was determined in 1993 on behalf of the Department of Planning and Urban Development, (now the Department of Planning), in the event that the resort/golf course did not proceed and the land was developed for residential purposes instead.

Amendment 932/33 was part of a program of major amendments to the MRS undertaken through the 1990s to implement *Metroplan* (Department for Planning and Infrastructure (DPI), 1990) and the *Urban Expansion Policy* (DPI 1990). MRS amendment (932/33) enabled the re-zoning of the Eglinton Estates landholding from “Rural”, “Waterways Reservation” and Parks and Recreation” to “Urban”, and “Parks and Recreation”, allowing implementation of the golf course, marina, resort and urban development consistent with that approved under Ministerial Statement 150.

The EPA provided informal advice to the then State Planning Commission on Amendment 932/33 in August 1993 (Bulletin 729). Amendment 932/33 was gazetted in 1995.

2.2.3 Alkimos Eglinton MRS Amendment 1029/33- Ministerial Statement 722

MRS Amendment 1029/33 for the Alkimos Eglinton area was initiated by the WAPC to implement the changes proposed in a revised DSP (1997). MRS Amendment 1029/33 covers the entire Alkimos Eglinton region including the area approved for development under Ministerial Statement 150. The areas subject to rezoning under MRS Amendment 1029/33 did not impact on the Eglinton Beach Resort project area, as this area was previously zoned “Urban” under the previous MRS Amendment 932/33. During 2000-2003 the DSP (1997) was superseded by the Alkimos–Eglinton Concept Structure Plan.

In November 2005, the EPA provided their report (Bulletin 1207) on MRS Amendment 1029/33. In April 2006, The Minister for the Environment recommended that the scheme amendment could be environmentally acceptable if a set of conditions were addressed as outlined in Ministerial Statement 722.

The Minister for the Environment’s Statement 722 (published on 24 April 2006) states that (with the exception of an area near the Groundwater Treatment Plant) “*all land reserved for Parks and Recreation shall be managed to protect the integrity, function and environmental values of the*

bushland and landforms to the requirement of the Western Australian Planning Commission on the advice of the Environmental Protection Authority and shall only be used for conservation, landscape and complimentary purposes".

Ministerial Statement No. 722, also includes the following condition:

> *2-1 Prior to approving subdivision or development applications (whichever is sooner) for infrastructure proposals, the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed subdivision, development of infrastructure on the following:*
>
> 1. *land which is reserved as Regional Open Space in the Scheme; and*
> 2. *bushland or land that may be part of an ecological linkage.*
>
> *The Environmental Management Plan shall include:*
>
> 1. *a description of existing environmental values, and the identification of the environmental outcome to be achieved through the implementation of this plan;*
> 2. *clear delineation of boundaries of significant areas to be protected;*
> 3. *management of construction, access and rehabilitation;*
> 4. *vegetation mitigation strategies;*
> 5. *allocation of responsibilities and identification of timing and duration of implementation;*
> 6. *provision for routine monitoring and environmental values; and*
> 7. *provision of details of contingency plans in the event that the monitoring surveys indicate that the development is having of has had an adverse impact upon the environmental values.*
>
> *2-2 An Environmental Management Plan prepared pursuant to the condition 2-1 shall be prepared to the satisfaction of the WAPC or the local authority as required, having due regard for advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.*

This condition applies to all proposals that will have an impact on Parks and Recreation areas, which includes the Amberton foreshore. This Foreshore Management Plan effectively provides the Environmental Management Plan required under Ministerial Statement No. 722 for the Amberton foreshore MRS reservation.

2.2.4 Alkimos Eglinton DSP

In 2007, two main landowners prepared and submitted the Alkimos Eglinton District Structure Plan (DSP) to the WAPC and the City of Wanneroo on behalf of all owners within the DSP area. The relevant components of the DSP for the Amberton foreshore reserve are discussed below.

2.2.4.1 Alkimos Eglinton Coastal Strategy

A coastal strategy for the Alkimos and Eglinton DSP area was prepared to facilitate the DSP and to amalgamate and update previous coastal planning studies.

This Alkimos Eglinton Coastal Strategy provided indicative and potential uses for the foreshore reserve that had been supported by previous coastal planning strategies for the area and that were considered as “complimentary purposes” to the main objectives of conservation and landscape protection in the Minister for the Environment’s Statement 722.

The coastal strategy states that the management principles and objectives for the broader Alkimos-Eglinton foreshore reserve were as follows:

- Foreshore reserve to be developed in accordance with the Minister for the Environment’s Statement 722 and State Coastal Planning Policy (Statement of Planning Policy No. 2.6).
- Places of unique landscape, scientific and cultural significance to be managed appropriately.
- Natural habitats, particularly areas of high ecological value, to be protected.
- Public places and facilities and public access to the beach in the foreshore reserve to be developed in a manner that does not compromise the ecological values of the area.
- Development in the foreshore reserve to be concentrated in nodes.

Furthermore, it divided the Alkimos Eglinton foreshore into a number of coastal management zones. The Amberton foreshore reserve was included within the Eglinton Marina and Coastal Village Precinct, with the zone classification for this area described as:

- High Use Zone
- Marina
- Active Recreation
- Passive Recreation
- Conservation.

The key objectives of this zone were as follows:

- Conserve the key ecological features of this area of the foreshore reserve in a natural state.
- Control access through the provision of appropriate beach access paths and conservation fencing.
- Any car parking, drainage and public facilities should be located with due consideration of the key ecological values of this area of the foreshore reserve.
- Active recreation such as grassed areas, BBQ and picnic facilities and other public facilities should be permitted in appropriate areas where the integrity of the reserve will not be adversely impacted upon.

Furthermore, the DSP identified that the Amberton area should be a “local beach” and that particular areas of the Amberton foreshore reserve within Parks and Recreation Reserve areas could be used for “possible car park/drainage/picnic facility use”. These areas appear to be consistent with large dune blowouts, where there was (and currently is) minimal native vegetation present. The Amberton Coastal Management Zones as depicted in the Alkimos Eglinton Coastal Management Strategy are shown below in **Plate 1**.

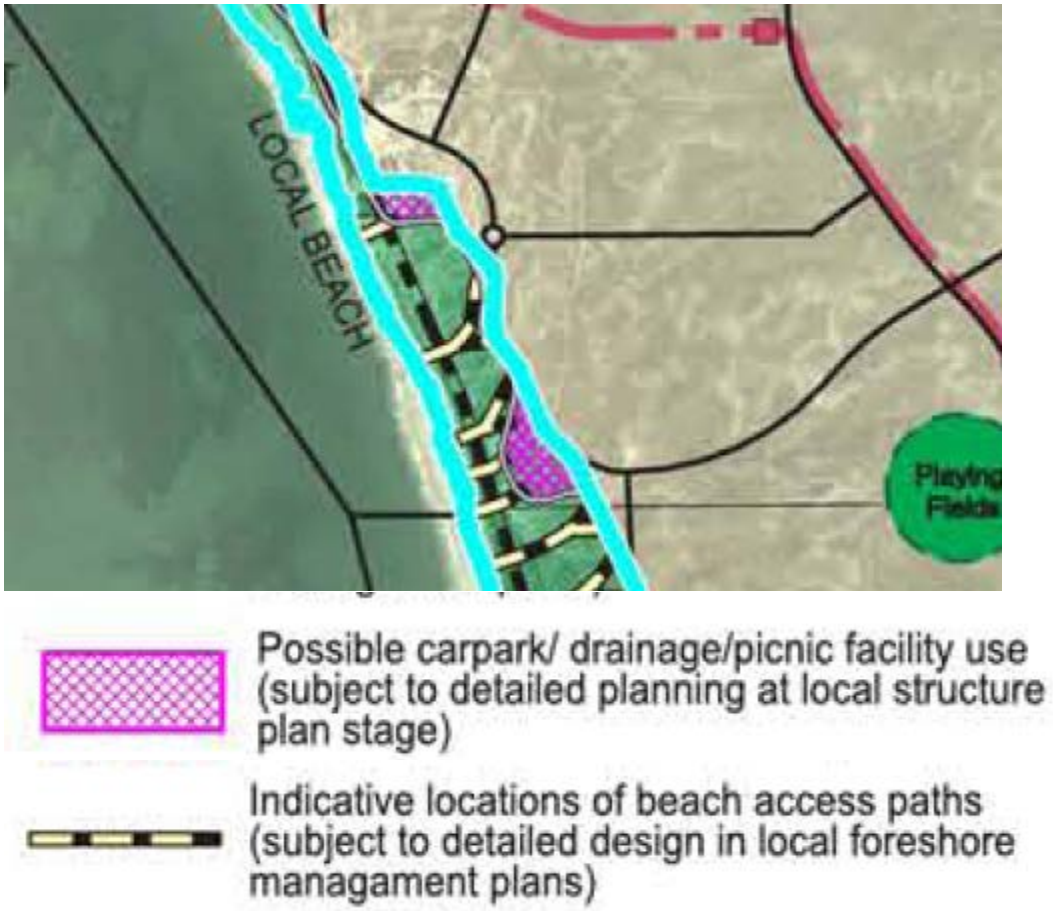


Plate 1 Excerpt from Alkimos Eglinton District Structure Plan, (Figure 3 Coastal Management Zones).

2.2.5 Eglinton LSP No. 82

In 2010, the Eglinton LSP No. 82 was prepared and submitted to the WAPC and City of Wanneroo (**Appendix A**). The LSP has been planned around the previously proposed conservation areas that provide an ecological link between the Bush Forever sites to the north and south.

As part of the LSP preparation process a coastal processes assessment was undertaken by M.P. Rogers and Associates in 2011 in accordance *State Planning Policy 2.6: State Coastal Planning* Policy (SCPP) and Schedule 1 of SCPP which provided guidelines on coastal setbacks based on current climate change information at that time (WAPC Position Statement). The assessment resulted in a recommended coastal processes setback that extended eastward from the currently zoned foreshore reserve (as defined by the MRS Parks and Recreation reserve). The LSP established a foreshore reserve to respond to the recommended coastal processes setback through the provision of Public Open Space (POS) on Urban zoned land in addition to the MRS reservation to make up the Amberton foreshore reserve.

The LSP states that within the Amberton foreshore reserve "*large areas of totally degraded dune and dunal vegetation are proposed to be utilised as a recreation development node. This will incorporate beachside facilities such as car parking, barbeques, shelter facilities, foot paths and a grassed drainage swale*".

This is reflected in the LSP plan which shows two possible foreshore recreation development nodes plus a possible beachside restaurant/café/corner store within the Amberton foreshore reserve (**Appendix A**). The LSP also shows a coastal road adjacent to the foreshore reserve, plus a regional foreshore shared path.

The LSP was adopted by the City of Wanneroo in December 2012 and endorsed by the WAPC in February 2013.

2.3 Statutory requirements

The Amberton FMP will facilitate the resolution of a number of statutory and policy requirements as outlined below in **Table 1**.

Table 1 Statutory requirements satisfied by this FMP.

LEGISLATION/POLICY	REQUIREMENT	ACTION TO ADDRESS REQUIREMENT
Environment Protection and Biodiversity Conservation Act 1999.	A referral has been submitted by the developer including the foreshore reserve within the site. This referral was deemed by the Department of Environment to be "not a controlled action".	No action required.
State Coastal Planning Policy 2.6 (see **Section 2.1.1**)	Accommodate a coastal processes setback and reflect this in the allocated foreshore reserve. Prepare a CHRMAP to assess and provide a framework to manage risks associated with any development within the foreshore reserve.	Foreshore reserve defined in adopted LSP No. 82. Implementation of the FMP and CHRMAP to allow consideration of future coastal hazards.
Bush Forever and Bushland Policy for the Perth Metropolitan Region (see **Section 2.1.2.1**)	Proposals should support a general presumption against the clearing of regionally significant bushland. The preparation and implementation of a bushland management plan to managed the Bush Forever reserve for conservation purposes.	Preparation of this FMP as a bushland management plan. Implementation of the FMP to protect and manage the Bush Forever site.
Ministerial Statement No. 722 (see **Section 2.2.3**)	*2-1 Prior to approving subdivision or development applications (whichever is sooner) for infrastructure proposals, the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed subdivision, development of infrastructure on the following:* • *land which is reserved as Regional Open Space in the Scheme; and* • *bushland of land that may be part of an ecological linkage.* *The Environmental Management Plan shall include:* • *a description of existing environmental values, and the identification of the environmental outcome to be achieved through the implementation of this plan;* • *clear delineation of boundaries of significant areas to be protected;* • *management of construction, access and rehabilitation;*	Preparation of this FMP as an environmental management plan. Specifically this FMP includes: • a description of existing environmental values, and identification of the environmental outcome to be achieved through the implementation of this plan (**Section 3**, **Section 6** and **Section 7**). • clear delineation of boundaries of significant areas to be protected (**Figure 11**). • management of construction, access and rehabilitation (**Section 7.1**). • vegetation mitigation strategies (**Section 7.3**). • allocation of responsibilities and identification of timing and duration of implementation (**Section 7.10** and **Section 9**).

LEGISLATION/POLICY	REQUIREMENT	ACTION TO ADDRESS REQUIREMENT
	• *vegetation mitigation strategies;* • *allocation of responsibilities and identification of timing and duration of implementation;* • *provision for routine monitoring and environmental values; and* • *provision of details of contingency plans in the event that the monitoring surveys indicate that the development is having of has had an adverse impact upon the environmental values.* *2-2 An Environmental Management Plan prepared pursuant to the condition 2-1 shall be prepared to the satisfaction of the WAPC or the local authority as required, having due regard to advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.*	• provision for routine monitoring and environmental values (**Section 7.3**, **Section 9** and **Section 10.6**). • provision of details of contingency plans in the event that the monitoring surveys indicate that the development is having of has had an adverse impact upon the environmental values (**Section 10** and **Section 9**). Implementation of the FMP to manage the natural environment, including revegetation outlining responsibilities monitoring and ongoing management.
Alkimos Eglinton District Structure Plan (see **Section 2.2.4**)	The Alkimos Eglinton Coastal Strategy produced as part of the DSP provides indicative and potential uses within the foreshore. The objectives for the foreshore include: • Conserve the key ecological features of this area of the foreshore reserve in a natural state • Control access through the provision of appropriate beach access paths and fencing • Any car parking, drainage and public facilities should be located with due consideration of the key ecological values of this area of the foreshore reserve • Active recreation such as grassed areas, BBQ and picnic facilities and other public facilities should be permitted in appropriate areas where the integrity of the reserve will not be adversely impacted upon. The foreshore is identified as a local beach and two specific areas are identified for “possible car park/drainage/picnic facility use”.	Foreshore objectives are addressed through this FMP. FMP to outline implementation of relevant objectives of Alkimos Eglinton Coastal Strategy.
Eglinton Local Structure Plan (see **Section 2.2.5**)	The Local Structure Plan notes the following: “*large areas of totally degraded dune and dunal vegetation are proposed to be utilised as a recreation development node. This will incorporate beachside facilities such as car parking, barbeques, shelter facilities, foot paths and a grassed drainage swale”.*	Foreshore design and management has considered LSP recommendations.

2.4 Aboriginal heritage sites

The Department of Aboriginal Affairs (DAA) maintains an Aboriginal Inquiry System for both the heritage site register and the heritage survey database. The Aboriginal Heritage Site Register is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* (AHA) (DAA 2011) and contains information on over 22,000 listed Aboriginal sites throughout Western Australia. Based on an online search of the inquiry system, the site was not registered as containing Aboriginal Heritage sites (DAA 2011).

A *Report of the Ethnographic Consultation and Archaeological Inspection Eglinton Local Structure Plan Area* was produced for Woodsome Management in July 2010 (McDonald and Coldrick 2010). This plan did not identify any archaeological or ethnographic sites within the Amberton foreshore reserve.

3 Foreshore Reserve Existing Environmental Conditions

The Amberton foreshore reserve extends over 700 m in length (along the coast) ranging in width from 150 m to 200 m with a total area of approximately 11 ha. Currently the site is covered partly with intact remnant coastal vegetation primarily in the central portion, with various blowouts, informal paths and tracks used for beach access and by recreational vehicles. The northern and southern most sections have been significantly impacted through historic uncontrolled access and consequential wind erosion causing large blow out areas. These areas now retain limited natural values (biodiversity or natural landforms) and will require significant future investment and attention (as described in this FMP) to stablise these areas and restore natural values.

The below sections describe the environmental attributes and features of the foreshore reserve in accordance with the City of Wanneroo's *Environmental Management Plan Guidelines* (2013). Additional information on the existing environment is provided as **Appendix B**.

3.1 Climate, landforms and topography

The coastal frontage of the Amberton foreshore reserve is comprised of discontinuous dunes approximately 1 km wide. These dunes have elevations up to 30 m AHD as shown in **Figure 4**. The site is characterised by the Quindalup dunes system, with the visible presence of limestone outcrops due to surface soil removal from wind action.

The beach edge is defined by small emergent foredunes which have been degraded by wind and wave action and further eroded by uncontrolled 4WD beach access. The beach is relatively wide (40 – 50 m) and for most of its length is backed by a 10 – 20 m high primary dune, with transgressive dunes extending two to three kilometres inland. Swales between the dunes have been degraded by 4WD access. Secondary dunes reach to 30 m with views to the north and south and these dunes form the landward extent of the foreshore reserve. There are two predominate blowout areas within the foreshore reserve – one to the north and one to the south. Both of these occur behind the primary dune and have been extensively degraded by uncontrolled access.

The landforms and topography of the site have been considered in this FMP with regards to the location of public access, the provision of lookouts and passive surveillance. The stability of degraded landforms (i.e. dune blow outs) within the foreshore and techniques to improve stability have also been considered in this FMP.

The predominant winds are from the south-west and are a very important feature of coastal environments as they are a major determinant of landward sand migration, influencing landforms and landscape. During summer, winds blow from the east to south east in the morning (4am to midday) and from the south-west in the afternoon (1pm to 6pm, the local sea breeze). Winter is characterised by north-westerly storm winds that back around to the west and south-west, interspersed with calmer periods. These climatic conditions have been considered in this FMP when allocating areas of amenity and public recreation to provide shelter from coastal winds. In addition, this FMP has considered the orientation of access locations to reduce sand drift across this infrastructure.

Further information on the prevailing climatic conditions is available in **Appendix B**.

3.2 Geology and karstic features

The foreshore reserve is located within the Quindalup dunes geomorphic entity, within the parabolic dune complex. The Quindalup dunes are described as “coastal dunes with dominant calcareous deep sand, with shallow calcareous sand and yellow or brown sand”.

The Perth Metropolitan Region 1: 50,000 Environmental Geology Series, Yanchep (Sheet 2034 IV) (Gozzard 1982) indicates that the subject site is largely comprised of calcareous sand (S2) with the presence of a finer calcareous sand (S1) located along the south of the Amberton foreshore reserve. The general description of the soil units are provided below in **Table 2.**

Table 2 Soil Mapping Description

MAP UNIT	DESCRIPTION
S1	Calcareous Sand - white fine to medium grained sub-rounded quartz and shell debris, of eolian origin. It is safety Bay sand (mobile dunes). Active blowouts and san sheets, unvegetated.
S2	Calcareous Sand - same as S1. Safety Bay Sand. Moderate to steep slopes, and susceptible to remobilization where the sparse vegetation is removed.

Karst features are known to generally occur within Tamala limestone, which is not mapped as occurring within the foreshore reserve. City of Wanneroo released Draft LPP4.13 *Caves and Karstic Features* (July 2012) (City of Wanneroo 2012b), which has been prepared under the provisions of Section 8.11 of the *City of Wanneroo District Planning Scheme No.2.* (City of Wanneroo 2012a). The purpose of the policy is to outline the information requirements required for investigation and management of caves and karstic features to assist in design, assessment and determination of structure plans, subdivision applications and development applications.

The karst assessment and risk map associated with this policy identifies the foreshore reserve as being an area of “low” karst risk.

A desktop geotechnical assessment was undertaken by Coffey Geosciences (2006) as part of the DSP preparation process and did not identify any karstic features within the foreshore reserve.

The geology of the foreshore reserve is shown in **Figure 5.** Further information on the geology of the foreshore reserve is available in **Appendix B**.

3.3 Soils and hydrology

The Alkimos - Eglinton area consists of Holocene Safety Bay sand and Tamala limestone. The yellowish brown fine to course grained aeolian calcarenite occurs as limestone overlain by the white, fine to medium grained Safety Bay Sands forming coastal dunes. The soils of the foreshore reserve are shown in **Figure 6**. The foreshore reserve within the Quindalup dunes contains Safety Bay sand and contains weakly cemented limestone cap rock.

Erosion and depositional processes occur along the Eglinton coastline. Wave and wind activity create mobile or stabilized dunes which are covered in vegetation. Removal of vegetation can create unstable dune systems which can lead to further erosion and the creation of blow outs. As outlined above, soils and topography require consideration in this FMP in order to stabilize degraded dune blowouts.

Depth to groundwater over the Amberton site is highly variable due to the variable topography associated with dune formations. The Perth Groundwater Atlas indicates depth to groundwater along the coast is approximately 0 m AHD, and rises with distance from the coast. The foreshore reserve ranges in elevation from 0 m to 30 m so therefore depth to groundwater will vary throughout the foreshore reserve. The sandy nature of the foreshore reserve and the visible landforms indicate direct infiltration of rainfall with very little to no surface water runoff. In accordance with this, there are no surface water features (waterways or wetlands) associated with the site.

Emerge Associates conducted site specific infiltration testing at two locations within the foreshore reserve in 2013, and then additional infiltration testing in 2015 within POS areas adjacent to the foreshore reserve. Initial testing in 2013 utilised two different infiltration measurement techniques, and infiltration was found to range from 19.3 m/day to 22.2 m/day in the southern portion of the Amberton foreshore reserve. Infiltration in the northern portion of foreshore reserve was higher ranging from 37.4 m/day to 37.5 m/day. During the 2015 infiltration testing, measured rates ranged between 38.27 m/day to 62.15 m/day). Further information on infiltration is available in **Appendix B.**

The Perth Groundwater Atlas indicates groundwater salinity within the foreshore reserve is very saline (approximately 7000 mg/l total dissolved salinity) that decreases with distance from the coast.

3.4 Flora and vegetation

3.4.1 Vegetation condition

The vegetation condition within the foreshore reserve has been determined in accordance with the Keighery (1994) scale (see **Table 3** and **Figure 7**). Examples of the vegetation condition across the foreshore reserve are shown in **Plate 2.** Further information on vegetation, including information on historic flora and vegetation surveys is contained in **Appendix B**. Vegetation condition will influence revegetation works and conservation areas within this FMP.

Plate 2 Examples of vegetation condition over the Amberton foreshore reserve.

Table 3 Vegetation condition scale (Keighery 1994)

CONDITION	DESCRIPTION
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the areas are completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

3.4.2 Vegetation communities

Based on a historic Flora and Vegetation Survey (published within ATA Environmental 2005), four vegetation units were mapped within the foreshore reserve. The vegetation communities were inspected by Emerge Associates in 2012 and the vegetation community mapping was updated. The updated vegetation communities are outlined in below **Table 4** and shown in **Figure 8**. Vegetation communities provide an indication of the flora species that should be included within revegetation works.

Table 4 Amberton foreshore reserve vegetation communities

VEGETATION COMMUNITY	DESCRIPTION
OaASc	Shrubland of *Olearia axillaris, Acacia spp. Scaevlola crassifolia* and *Spyridium globulosum* over forbland of *Lomandra maritima.*
ArMs	Low open heath of *Acacia rostellifera* and *Melaleuca systena.*
OaSl	Open shrubland of *Olearia axillaris* over grassland of *Spinifex longifolius* and open sedgeland of *Lepiodsperma galdiatum.*
MsLm	Low open shrubland of *Melaleuca systena* over forbland to closed forbland of *Lomandra maritima.*
Ac	Shrubland *of Acacia cyclops*.

3.4.3 Weed species

A number of weed species have also been historically recorded within the Amberton foreshore reserve. These are listed in **Table 5**. Identification of the key weed species will inform revegetation and restoration works.

Table 5 Weed species within the Amberton foreshore reserve.

WEED SPECIES	COMMON NAME
Avena barbata	Bearded oat
Cakile maritima	Sea rocket
Carpobrotus edulis	Pig face
Ehrharta calycina	Perennial veldt grass
Euphorbia terracina	Geraldton carnation weed
Euphorbia paralias	Sea spurge
Hypochaeris glabra	Daisy
Lagurus ovatus	Hare's tail grass
Pelargonium capitatum	Rose pelargonium
Sonchus oleraceus	Sowthistle
Tetragonia decumbens	Sea spinach
Trachyandra divaricata	Dune onion weed

None of these weed species are declared under the *Agriculture and Related Resources Protection Act 1976*.

3.5 Fauna

A vertebrate fauna survey was conducted for the Alkimos - Eglinton area by Alan Tingay & Associates in October 1996 and ATA Environmental in 2005. Based upon these surveys and DPaW's NatureMap Database and the Department of Environment (DoE) Protected Matters database a number of species of conservation significance may occur within or potentially use the site. These significant species are listed below in **Table 6**.

Table 6 Conservation significant species which may potentially use the site (based on DoE Protected Matters search tool, DEC Naturemap database, Alan Tingay and Associates 1996 and Bamford and Davies 2005)

SPECIES		CONSERVATION SIGNIFICANCE		
COMMON NAME	**SCIENTIFIC NAME**	**DEC**	**WAWC**	**EPBC**
MAMMALS				
Chuditch	*Dasyurus geoffroii*		S1	VU
Quenda	*Isoodon obesulus fusiventer*	P5		
Western Brush Wallaby	*Macropus irma*	P4		
BIRDS				
Carnaby's black cockatoo	*Calyptorhynchus latirostris*		S1	EN
Gibson's Albatross	*Diomedea exulans gibsoni*		S1	VU
Malleefowl	*Leipoa ocellata*		S1	VU
Southern Giant-Petrel	*Macronectes giganteus*	P4		EN
Northern Giant-Petrel	*Macronectes halli*			VU
Australian Painted Snipe	*Rostratula australis*		S1	VU
Fairy Tern (Australian)	*Sternula nereis nereis*		S1	VU
Peregrine Falcon	*Falco peregrinus*		S4	
Rainbow Bee Eater	*Merops ornatus*		S3	MIG
Shy Albatross, Tasmanian Shy Albatross	*Thalassacrche cauta cauta*		S1	VU
INVERTEBRATES				
Graceful Sun Moth	*Synemon gratiosa*	P4		EN
REPTILES				
Carpet Python (south-western spp.)	*Moreila spilota imbricata*		S4	
Black striped-snake	*Neelaps calontus*	P3		

Subsequent to this, a graceful sun moth survey was conducted by Coffey Environmental (2010) in order to determine the presence and density of the graceful sun moth within the Eglinton Estate. This survey did not reveal any graceful sun moth along any transects located within the Amberton foreshore reserve. This is likely due to the higher velocity winds experienced in the primary dunes. It is also relevant to note that the graceful sun moth is no longer a listed species under the *Environment Protection and Biodiversity Conservation Act 1999* or the *Wildlife Conservation Act 1952*.

Overall, the Amberton foreshore reserve would provide fauna habitat for small birds, mammals and reptiles, who could seek shelter within the remaining areas of native vegetation. Maintaining connectivity and improving fauna habitat values (through revegetation) is an important consideration for this FMP.

3.6 Coastal nearshore environment.

The Alkimos - Eglinton area is generally protected from the effects of long period oceanic swell and short period local wave activity by a series offshore reefs (RPS Bowman Bishaw Gorham 2006), including the well-known Alkimos reef south west of the site. These reefs help dissipate wave energy in the area.

The shoreline portion of the foreshore (beach) varies from 30 to 80 m and is predominately sandy, however there are small sections of partly exposed beach rock. Beaches are backed by a 10 to 20 m high primary dune with a number of blow outs. The presence of beach rock and offshore reefs will influence the usage and water based activities of the Amberton foreshore reserve and consequently the future access, useage and amenity provided in this FMP reflects these coastal nearshore conditions.

3.7 Past and present land uses

3.7.1 Historical and current landuse

Currently the Amberton foreshore reserve is undeveloped and is characterised by remnant bush land and evidence of extensive vehicle tracks and blowouts. The property was once used for light cattle grazing although there is no evidence or records of any intensive agriculture within the last 50 years.

The site is identified by the Department of Defence (DoD) mapping ("Where is UXO" map, available on the DoD website) as having "Other" Unexploded Ordnance (UXO) potential. The definition of "Other" potential is: "*Defence records do not confirm that the site was used for live firing. UXO or explosive ordnance fragments have not been recovered from that site. Defence opinion is that it would be inappropriate to assess as either slight or substantial*". "Other" UXO potential is recorded through the Butler-Jindalee and Alkimos-Eglinton area (DoD 2012).

The remains of the Alkimos Shipwreck (wrecked in 1963) saw increased visitation to the area, which resulted in the creation of numerous foreshore tracks since this time. The heavy usage of these tracks for beach access has increased the degradation of the foreshore vegetation and has contributed to significant dune blowouts.

Currently areas of the Amberton foreshore are accessed illegally by recreational vehicles for off-road use, including four wheel drives, quad bikes and trail bikes. This has created a number of tracks throughout the Amberton foreshore reserve (see **Plate 3**). In addition, accessible parts of the foreshore reserve have been subject to fishing, rubbish dumping and other undesirable activities (see **Plate 4**). Addressing these historic and ongoing land uses is an important consideration for this FMP.

3.7.2 Future adjacent land use

As outlined in **Section 2.2**, the site and wider Alkimos Eglinton area have been subject to an extensive historic planning process. The Alkimos Eglinton area will be subject to extensive urban development, incorporating a number of primary and high schools, a train station, town centre, commercial development and a marina precinct.

With regards to the foreshore, the site is immediately north of the Shorehaven development within Alkimos, also referred to as "North Alkimos". The FMP for this area was approved in 2012 and the foreshore will be developed as a recreational node, incorporating a foreshore park and beach club.

North of Amberton is a small local beach and the Eglinton marina. Both of these areas are currently owned by Eglinton Estates and are expected to be developed over the next 20 years. Connectivity between Amberton and areas to the north and south is an important consideration within this FMP and is discussed further in **Section 7.6.2**.

Plate 3 Informal access tracks through the Amberton foreshore reserve.

Plate 4 Evidence of unauthorised access and undesirable activity within the Amberton foreshore reserve.

3.8 Coastal processes setback requirements

In order to determine an appropriate coastal setback, the SCPP outlines the recommended criteria for determining the Physical Processes Setback (PPS). This setback provides protection from physical coastal processes over a 100 year planning horizon (SCPP). The 2003 SCPP was used to determine the coastal setback requirement for the Eglinton LSP in 2011, which now forms the Amberton foreshore reserve (and the subject of this FMP).

The coastal processes setback is based on criteria to calculate and determine the PPS. The three allowance criteria include acute storm erosion, historic shoreline movement and sea level change.

Acute Storm Erosion (S1) incorporates increased erosion of the shoreline with changing wind speeds and increased water levels that come with storm surges and storm events. S1 was calculated using the SBEACH model developed by the Coastal Engineering Research Centre to simulate beach profile evolution in regards to storm events. The S1 is calculated using the SBEACH profile change model to simulate three repeats of a severe storm experienced in the south west of WA in July 1996.

Historical Shoreline Movement (S2) captures the longer term processes that are likely to affect the shoreline in the future. Aerial photography and vegetation mapping is used to observe changes in the shoreline through history, and therefore determine shoreline movement rates and allowances required for the next 100 years.

Impact of Climate Change (S3) includes an allowance for possible climate change condition and sea level rise to occur over the coming century. Due to uncertainties, predictions have to be made in regards to the changes that will take place in the future. A suggestion to use 0.9m allowance for sea level rise to 2110 was decided by the WAPC in 2010. This allowance was based on the Intergovernmental Panel on Climate Change (IPCC) AR4 model scenario.

The results of the 2011 Eglinton Coastal Setback Assessment are outlined in the **Table 7**.

Table 7 Total Recommended PPS (M.P Rogers & Associates, 2011)

FACTOR	ALLOWANCE (M)	
	CHAINAGE 0-600M	CHAINAGE 600-800M
S1- Acute Storm Erosion	25	25
S2- Historical Shoreline Movement	30	25-30
S3- Climate Change	90	90
Total Recommended PPS	145	145-135

The table indicates that a minimum foreshore reserve width of 135 -145m would be required contain the planning timeframe PPS. This PPS is shown below in **Plate 5** and has been reflected in the foreshore reserve, incorporating areas of existing Parks and Recreation Reservation and additional areas of “Urban” zoning (see **Figure 2**), which are allocated for public open space within the endorsed Eglinton LSP (**Appendix A**).

The development of the Eglinton marina to the north of the Amberton foreshore reserve would be exempt from the SCPP. The development of the marina will be guided by the potential structures to be

put in place, and their impact on wave action overtopping parts of the marina. These factors will be taken into account during design and construction of the marina works.

The Eglinton coastline formation is influenced by a series of offshore Tamala limestone ridges located between 1300 m - 5000 m from the coast. These reefs run parallel to the coast protecting it from offshore wave action and influencing sediment transport patterns. These factors influence the Amberton foreshore reserve which was modified to incorporate all these natural setbacks.

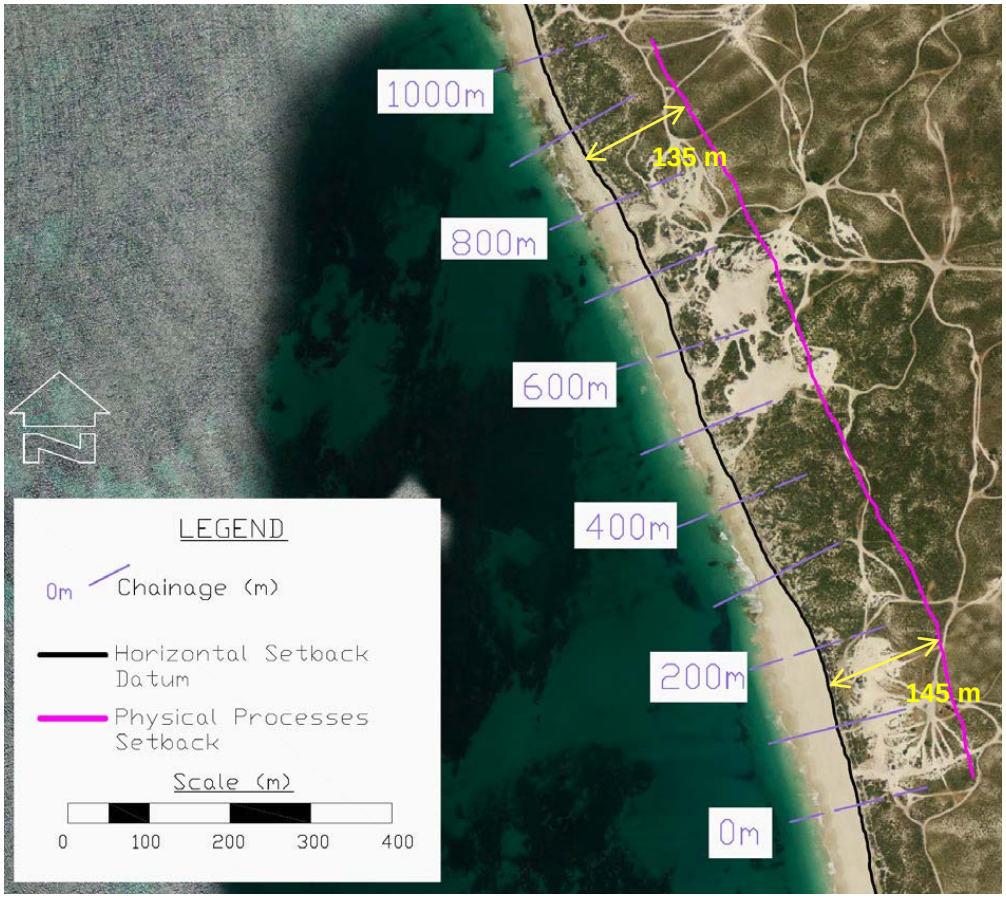


Plate 5 Recommended Physical Processes Setback. Note Amberton Foreshore reserve extends to 700m chainage. (M.P. Rogers and Associates 2011).

The coastal processes setback is shown in **Figure 2.**

4 Stakeholder Consultation

As outlined in **Section 3**, the Amberton foreshore reserve has been considered historically as part of various environmental and planning approval processes and these processes have involved consultation with various stakeholders. While this has not focused on the foreshore in particular, the approvals have defined a number of parameters for the Amberton foreshore reserve including:

- The extent and boundaries of the "Parks and Recreation" reservation within the Amberton foreshore reserve (see **Figure 2**).
- The required coastal setback for the Amberton foreshore reserve, as defined by M.P. Rogers and Associates in 2011 and confirmed through the endorsement of the Eglinton LSP in 2013. For the Amberton foreshore reserve this includes areas beyond the "Parks and Recreation" Reserve, addressed through the provision of additional areas of POS.
- Two coastal management zones within the Amberton foreshore reserve incorporating "possible car park/drainage/picnic facility use" defined through the Alkimos-Eglinton DSP.
- The requirement for an Environmental Management Plan for "Parks and Recreation" zoned areas associated with Ministerial Statement No. 722.

Further to these parameters, a specific consultation session and workshop was undertaken with staff from the City of Wanneroo and the DoP Coastal Planning Branch at the site (5th February 2013). This workshop involved a review of the information to date and a presentation of the preliminary foreshore concepts for the site. Following this, the workshop attendees conducted a site visit over the entire foreshore to view the site on the ground.

The key stakeholders who attend this workshop included:

- Melinda Goode (Environmental Planner, City of Wanneroo)
- Helen Gray (Landscape Architect, City of Wanneroo)
- Tristan Bruyn (Environmental Planner, City of Wanneroo)
- Jeremy Thompson (Planner, City of Wanneroo)
- Sujit Shrestha (Engineer, City of Wanneroo)
- Ben Bassett (Senior Planning Officer, Coastal Planning, Department of Planning)
- Jas Lapinski (Planner, Department of Planning).

This FMP has considered the comments made at these consultation sessions (and subsequent meetings) and has been amended through the process.

Further to this, an additional stakeholder meeting was held at the City of Wanneroo in May 2014 to present a revised FMP and discuss comments raised by the City of Wanneroo on the previous workshop. The external stakeholders who attended this meeting included:

- Jeremy Thompson (Planner, City of Wanneroo)
- Ben Bassett (Senior Planning Officer, Coastal Planning, Department of Planning)
- Alex Gavranich (Environmental Planner, City of Wanneroo)
- Peter Erskine (Engineer, City of Wanneroo)
- Michelle Meuwese (Landscape Officer, City of Wanneroo)
- Edward O'Connell (Planner, City of Wanneroo).

A copy of the Amberton FMP was provided to the City of Wanneroo and DoP in July 2014. Comments on the Amberton FMP were provided by both stakeholders in September 2014. Subsequent to this, additional meetings were held with the City of Wanneroo and the DoP to clarify these comments including:

- Meeting with Ben Bassett (Senior Planning Officer, Coastal Planning, Department of Planning) on 30th October 2015 to discuss the foreshore reserve interface.
- Meeting with Mark Dickson (Director – City Growth, City of Wanneroo) and Alex Gavranich (Environmental Planner, City of Wanneroo) on 3rd November 2014 to discuss the City of Wanneroo's comments**.**
- Workshop with Mark Dickson (Director – City Growth, City of Wanneroo) and Alex Gavranich (Environmental Planner, City of Wanneroo) on the 9th April 2015 to specifically discuss coastal assets within the foreshore.

A revised version (Revision C) was provided to both the City of Wanneroo and the DoP in May 2015. At this point DoP indicated that in principle they were happy with the document, and a number of additional meetings and discussions were held with the City of Wanneroo following additional comments provided by the City of Wanneroo on 22 June 2015. These comments were accommodated (Revision D) and submitted back to the City of Wanneroo. As part of preparing the Council Agenda papers, additional amendments were requested by the City of Wanneroo, and these were accommodated Revision E to be presented to Council in September 2015.

Revision E of the FMP was considered by the WAPC Statutory Planning Committee on 10 May 2016, who resolved to endorse the FMP subject to a number of minor modifications. These modifications have now been made and are provided as Revision F of this document.

Consultation has also been conducted with Surf Life Saving Western Australia (SLSWA) on the most appropriate location for a swimming beach and the requirements for any surf lifesaving infrastructure. SLSWA have prepared a Coastal Aquatic Risk Assessment (CARA, **Appendix C**) to outline costal risks and management and this has been a key input into this FMP. The results of the CARA and its influence on the FMP is discussed further in **Section 7.7.**

In addition, the existing Amberton community has been kept informed with the general content of the Amberton FMP and importantly the approval process required prior to any foreshore works commencing. Stockland are committed to continuing consultation and open engagement with all stakeholders, including approval authorities and residents through the approval and implementation of the FMP.

5 Foreshore Constraints, Issues and Opportunities

Based on historic surveys, technical assessments and detailed site inspections undertaken by Emerge and the broader Amberton project team, the following constraints, issues and opportunities were identified as being relevant for the Amberton FMP.

In this section, constraints are defined as those factors where there is government policy or guidance for a particular environmental feature which dictates a specific management response or approach. Issues reflect environmental features which may influence development including the management, siting and design of particular infrastructure and facilities. In contrast, opportunities represent areas where environmental features are particularly advantageous for future use and management within the foreshore reserve.

5.1 Constraints

A key constraint for the future use and management of the Amberton foreshore reserve is the coastal processes setback which was discussed in **Section 3.8.** An assessment undertaken by M.P Rogers recommended a coastal processes setback of between 135 -145 metres. As shown in **Figure 2** the coastal processes setback generally extends beyond the foreshore Parks and Recreation reserve under the MRS which was previously considered by the Department of Planning and the EPA through MRS Amendment 1029/33.

On this basis, the Eglinton LSP allocated additional POS adjacent to the MRS Parks and Recreation reserve to account for this setback and to create the Amberton foreshore reserve.

With regards to public foreshore access and the potential location of facilities, another constraint is the “Excellent” condition native vegetation which exists in the centre of the foreshore reserve (see **Plate 6** and **Figure 7**). In accordance with the Alkimos – Eglinton Coastal Strategy, there is a need to conserve the key ecological features of the foreshore reserve in a natural state, so it is important that this area is treated appropriately to retain vegetation, while still providing some amenity and passive recreation/visual amenity opportunities. Native vegetation can also provide an opportunity through the stabilisation of dunes and providing biodiversity values.

5.2 Issues

The key issues associated with the design and development of the FMP generally relate to the current and historic land uses of the site, which have shaped the condition of the foreshore reserve. Specifically, addressing ongoing erosion within the foreshore (see **Plate 7**) will require significant investment and innovative rehabilitation techniques. Likewise addressing and controlling uncontrolled access as the foreshore is developed over time is a significant issue which will require consideration through the implementation of the FMP.

Balanced with these issues, is the requirement to provide safe and controlled access for beach users to the beach for swimming and recreation.

While large areas of the Amberton foreshore reserve are degraded, there are also large areas of native vegetation and the damage and degradation of the existing foreshore vegetation, including the spread of weed species is another issue which requires consideration in the FMP.

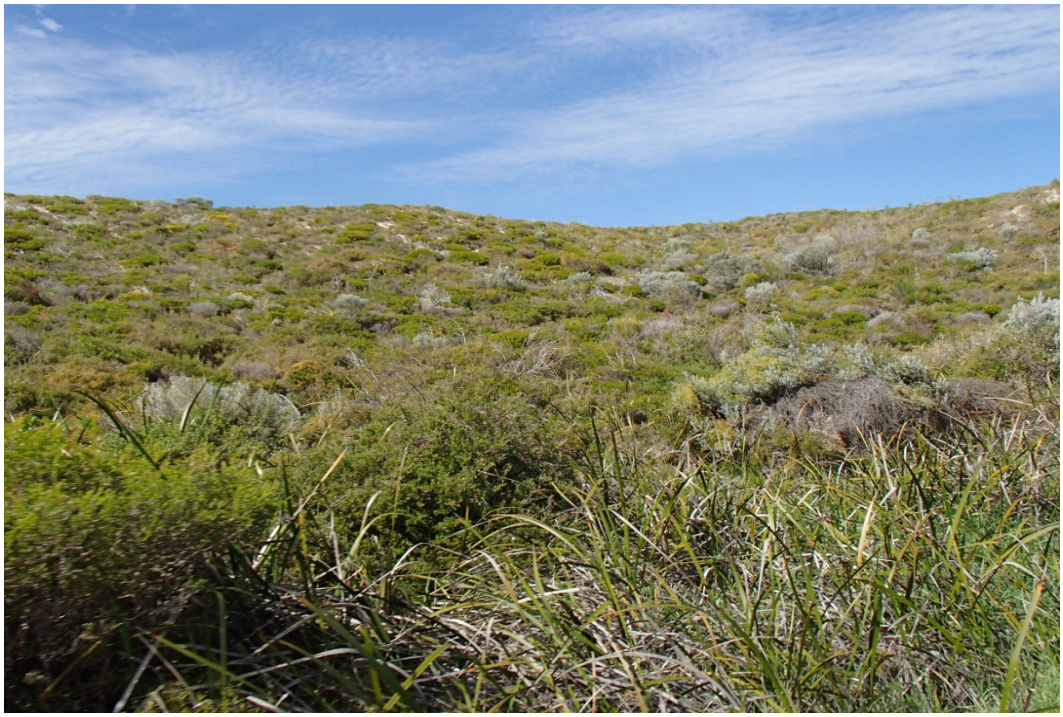


Plate 6 Example of vegetation within foreshore in "Excellent" condition.

5.3 Opportunities

While there are issues and constraints associated with the Amberton foreshore reserve, the existing environment and physical conditions within the foreshore reserve also provides a range of opportunities.

Historic land uses over the site have caused the formation of several degraded foreshore areas. The FMP provides an opportunity to stabilise and restore these areas of the foreshore, and to also locate public infrastructure and amenity in the foreshore reserve without the need for clearing native vegetation (see **Plate 7**). These areas provide opportunity for flood storage areas, small landscaped and turfed areas and nodal points.

Similarly, existing informal off-road vehicle tracks created associated with uncontrolled access to the site provide an opportunity to create pathways through the foreshore reserve, providing to the beach (see **Plate 8**). This will minimise the impact of access on existing native vegetation and will allow a high degree of public access and use.

The undulating topography also provides an opportunity to use the foreshore management plan to maximise views and panoramas, to celebrate the coastal environment and to maximize the connection to the coast (see **Plate 9**).

As outlined in **Section 5.1**, the Amberton foreshore reserve includes areas of vegetation in "Excellent" condition. While these can also be viewed as constraints as outlined above, these (and other) areas of native vegetation provide an opportunity to retain and protect biodiversity values within the foreshore reserve, including fauna habitat. Importantly, areas of native vegetation also provide a significant

opportunity to address dune stabilisation and provide protection from minor coastal erosion and storm events.

Overall, the opportunities allow a high degree of public access and use within the foreshore reserve without impacting on environmental values, such as native vegetation. The implementation of the FMP will provide a significant investment into coastal facilities and management, including revegetation works. The implementation of the FMP provides the opportunity to reduce the undesirable activities which are currently undertaken in the foreshore reserve and are continuing to degrade the foreshore.

Plate 7 Existing blowout creating an opportunity for public infrastructure

Plate 8 Existing tracks to beach creating opportunities for future public access.

Plate 9 High points within the Amberton foreshore reserve for vantage viewing opportunities.

6 The Amberton Foreshore Management Plan

The proposed Amberton FMP has been articulated in a concept foreshore master plan shown **Figure 10.** The concept foreshore master plan incorporates a number of components of the foreshore management approach, including:

- Node incorporating café
- Boardwalks and pathways
- Amenities and structures including beach showers, shelters and lookouts
- Carparking
- Passive recreation areas
- Stormwater management.

Stockland and the City of Wanneroo acknowledges that this FMP is conceptual and that the detailed design of all prescribed assets and infrastructure will occur during the development application stage. Stockland recognises that should the City of Wanneroo determine that they do not have the capacity to maintain and manage a proposed asset then the City reserves the right to require the application to show this accordingly.

The proposed playground and all other public amenities including but not limited to applications for play equipment, exercise equipment, outdoor furniture, shelters, structures, BBQ's, drinking fountains and public art will satisfy the following criteria:

- Maintenance thereof is to be within the City's operating budget;
- Replacement thereof is to be within the City's capital works budget;
- Compliance thereof with the Australian Standards and City's safety standards;
- The scale of the playground is to be appropriate to the size of park it is proposed in; and
- The playground provides opportunity for physical and creative play and accommodates for different age groups.

This FMP is based on extensive discussions over almost two years between Stockland and the City and any decision to deviate from the FMP framework should not be made lightly and without reasonable justification by either party.

6.1 Key themes and principles

The Amberton FMP establishes the vision for the Amberton foreshore, and addresses the foreshore reserve inclusive of the MRS Parks and Recreation reserve and areas of POS. The FMP has been developed through a collaborative design process incorporating comments from the Amberton project team and various key stakeholders. Like the Eglinton LSP, the FMP and foreshore master plan have been guided by the key themes and principles as outlined in **Section 1.3.**

6.2 Design process

As part of the design process, a detailed site analysis was undertaken to identify and understand the environmental, amenity and access factors pertaining to the foreshore reserve. The constraints, issues and opportunities presented by these factors (as outlined in **Section 5**) were then overlain on a base plan and the foreshore master plan developed based on this detailed understanding of the setting.

The Amberton foreshore is proposed to accommodate a local beach and therefore the structures and facilities located within the foreshore reserve are consistent with this level of usage. Nevertheless, access would be provided to the beach at numerous points along the foreshore, in order to provide a coastal connection along the length of the foreshore reserve and in accordance with the Alkimos - Eglinton DSP. Beach access pathways have been largely located on existing tracks with consideration also given to the existing topography, slope and stability.

Future public access, usage and amenity has been concentrated around the southern node (café node), with a number of proposed lookouts at local highpoints. Large event stormwater flood storage areas and passive recreation areas have been strategically located within cleared areas, generally consistent with the Alkimos – Eglinton District Structure Plan (see **Plate 1**).

6.3 Foreshore management zones

Foreshore management zones have been created to define revegetation and stabilisation requirements based upon existing site conditions. Within the Amberton foreshore reserve, foreshore management zones have been defined based upon the vegetation condition and vegetation communities of the foreshore reserve, in addition to the results of numerous detailed site inspections. Five management zones were defined for the Amberton foreshore being:

- **Management Zone 1:** “Very Good” condition vegetation. This area requires little revegetation and/or weed control works.
- **Management Zone 2:** Primary dune (OaSl community) in “Degraded” vegetation condition. This primary dune community requires revegetation, minor weed control and some minor stabilisation of the fore dune.
- **Management Zone 3:** “Good” to “Degraded” vegetation condition. These areas require revegetation and weed control.
- **Management Zone 4:** Current access tracks which do not require stabilisation due to the existing topography. These areas require revegetation only.
- **Management Zone 5:** “Completely Degraded” bare areas requiring stabilisation. These areas require revegetation and stabilisation and are generally associated with the steep slopes of dune blow outs.

These management zones are shown in **Figure 9**. The rehabilitation approach for these foreshore management zones is discussed further in **Section 7.3**.

While the Amberton foreshore master plan (as shown in **Figure 10**) sets the general form and layout of the foreshore management approach, a detailed design and documentation process will be undertaken as part of development applications and landscape approval prior to any works being undertaken within the foreshore reserve. Generally, the management of the foreshore is focused on rehabilitation and retention of native vegetation within the foreshore, however accessibility and passive recreation for local residents and visitors is also a key focus of the Amberton FMP and foreshore master plan.

7 Foreshore Management and Proposed Facilities

7.1 Construction management

The Amberton FMP will be implemented in stages, tied in with adjacent residential development within the Amberton Estate and will occur over a number of years. Staging is discussed specifically in **Section 7.9.**

The Amberton FMP has considered and intends to reduce impacts to native vegetation within the foreshore reserve. To ensure that construction activities do not disturb the existing intact vegetation within the foreshore reserve, limits to construction works will be clearly marked out prior to and during any adjacent civil works being undertaken. Temporary fencing will be used during construction to clearly delineate areas of vegetation to be retained and to prevent earthworks machinery and personnel access into intact native vegetation.

Within the foreshore reserve, UXO searches are proposed to be undertaken only in areas where coastal assets and infrastructure are proposed to be located and these UXO searches will be undertaken prior to construction. UXO searches require the clearing of vegetation and therefore these will be limited to avoid disturbance to native vegetation. Fencing (**Section 7.6.7**) will be used to restrict public access to vegetated areas of the foreshore and to reduce exposure of potential UXO.

Erosion control wind break fencing will be installed along the foreshore interface adjacent to the development site during construction to reduce smothering of vegetation within the foreshore reserve via sand drift from strong easterly winds. This wind break fencing will be consistent with the City of Wanneroo standards (Drawing TS01-11-0).

In addition to temporary construction fencing, environmental management requirements and measures to protect vegetation within the Amberton foreshore reserve will form part of inductions for all construction contractors. A dust and noise management plan will be a requirement of the civil construction contract for any works within or adjacent to the foreshore reserve.

7.2 Interface management

Across the foreshore reserve there are several interfaces that need to be managed including the interface between the development and the foreshore reserve as well as interfaces within the foreshore reserve between areas of restoration and/or intact remnant vegetation and passive and active recreation areas that will be formally landscaped.

The Amberton foreshore reserve is delineated by either public open space areas or a local coastal road along the majority of its length. To the southern foreshore reserve, the coastal road is diverted around an elongated public open space which connects the coastal environment into the development. It is important to note that while the Eglinton LSP shows the foreshore road diverting into the foreshore reserve in its northern extent, the actual road alignment has been revised to remain outside the foreshore reserve and also divert around a conservation area adjacent to and contiguous with the foreshore reserve in the northern extent of the foreshore reserve. The final location of the boundary foreshore road in the northern extent of the site is yet to be formally finalised and this will be done separate to this FMP. An indicative road alignment has been shown as part of this FMP.

Changes in levels and grades are anticipated within the foreshore reserve and between the foreshore reserve and the development to varying degrees. Changes in level and grades are required due to the location of the western boundary road and road reserve width as specified within the endorsed Eglinton LSP (**Appendix A**). This is primarily driven by the undulating dunal nature of the landforms in this area.

Some areas within the foreshore reserve will require treatments in order to provide an interface between the road and the undulating foreshore landforms. Given the dynamic nature of the coastal dune landforms and the need to maintain regular and constant grades along the foreshore road, it is not possible to design the foreshore road to entirely tie in with the adjacent foreshore reserve levels/landform and therefore interface treatments are required.

A number of treatments and approaches have been explored in this regard, particularly involving grading (i.e. from the edge of the road reserve level to the adjacent foreshore level) and the use of retaining walls. Neither provide an absolute solution to the foreshore interface, particularly since:

- Grading if used as the sole approach has the potential to impact intact foreshore reserve vegetation and natural landforms.
- Retaining walls if used as the sole approach can create passive surveillance concerns, abrupt boundaries, safety issues, and have higher ongoing maintenance requirements.

It is acknowledged that regrading of the foreshore reserve to address the interface should be avoided in areas with intact foreshore vegetation and landforms.

Generally the final design of the interface treatment proposed will be based upon:

- The extent and quality of native vegetation and the requirement to avoid clearing in areas of “Very Good” condition vegetation.
- The placement of additional areas of POS at various locations along the interface of the foreshore reserve (as opposed to a public road) as the POS can be used to accommodate the change in levels on the development side of the interface.
- The extent of earthworks and dune re-contouring required to stabilise areas of the foreshore reserve in any case without interface works being considered.

The design principles to guide the final detailed design for the foreshore interface (which is likely to be progressed in stages) are:

- Regrading into the foreshore reserve should be considered acceptable where the adjacent foreshore is already significantly disturbed (i.e. in the northern and southern most sections) and there is already a need for significant investment in re-contouring, stabilisation and revegetation of the foreshore reserve area, even without the interface regrading occurring.
- Regrading should not be considered acceptable when this would impact on intact foreshore vegetation in “Very Good” or “Excellent” condition.
- No retaining walls are to be higher than 3 m.
- It will be acceptable to allow for a working area of up to 5 m at the base of retaining walls in order to allow for construction and ensure that the toe of the retaining wall is appropriately integrated into the surrounding landform.
- Any areas disturbed through foreshore reserve interface works (involving either regrading or retaining walls) will be subject to the highest specification for stabilisation (jute matting and intensive revegetation).

Discussions with the City of Wanneroo during the course of finalising this FMP indicate that the City will consider battering into the foreshore in areas of 'Degraded' or 'Completely Degraded' vegetation on the basis that the completed batters and surrounding areas are subject to re-contouring, stabilisation, and revegetation by Stockland. Any imported fill is to be certified fill that is disease and weed-free. Prior to any works commencing, a vegetation survey is to be undertaken by Stockland to determine the degraded areas, to be agreed by the City and the proposed extent of grading and contouring into the degraded area is to be justified by Stockland to the City's approval and satisfaction. In areas where 'Very Good' vegetation occurs at the foreshore interface, the City will not permit any battering into the foreshore. These considerations do not apply to open space areas within the foreshore surrounding the southern node that will be re-contoured to establish landscaped open space and other facilities.

The City has also advised that retaining walls located alongside road reserves, pedestrian access ways and public open spaces shall be minimised wherever possible. If retaining is absolutely necessary, the height shall be limited to 1.5 metres. As per the City of Wanneroo's Local Planning Policy 4.5, the City will consider limited retaining walls up to 3m high subject to variation criteria and subject to Stockland justifying there is no alterative possible. Structural vehicle-impact safety rails or balustrades may be required for safety reasons at the discretion of the City of Wanneroo.

The specific interface treatment for the foreshore reserve, will be finalised through a detailed design process undertaken as part of development and landscape approvals. This process will be staged over the course of the Amberton Estate development project.

Plate 10 Example of 1:4 grade native vegetated slope at Amberton public open space 1.

Minor localised regrading to the edge of dual use paths or pedestrian pathways may be required to achieve universal access grades along the paths. These batters will be installed to City of Wanneroo standards and will be managed and rehabilitated with jute matting (where required), mulching, brushing and re-vegetation (see **Plate 10**).

Where necessary, grading will occur in accordance with accepted City of Wanneroo standards for maintenance of slopes (typically 1:6 for grass and 1:4 for shrub planting), disability and access standards and safety standards (including wall fall heights).

Generally, interfaces will be addressed with mortared rock pitching and/or low walling with native rehabilitation planting where possible. However, there may also be opportunities to use grassed interfaces in strategic locations to provide useable play areas and passive recreation areas. This will also assist with safety and passive surveillance.

Separation of the different uses within the foreshore with an appropriate interface or edge treatment will be important to delineate the different uses and functions within the foreshore reserve. Edge treatments will be compatible with the physical conditions and uses of each management zone.

Generally edge treatments will be “hard” and provide a distinct management edge for maintenance and to reduce the spread of turf and weeds into intact vegetation and revegetation areas. Within the Amberton foreshore reserve these interfaces will be formed by pedestrian pathways and in the absence of a pathway, kerbing or other formalised landscape barriers/edges.

7.3 Rehabilitation/ecological restoration of historic disturbance

7.3.1 Long-term conservation areas

The majority of the foreshore vegetation will be retained, rehabilitated and managed in the long term for conservation purposes. Proposed infrastructure, facilities and passive recreation usage has been deliberately located in historically degraded areas, such as dune blow outs and existing access tracks in order to maximize the retention of existing intact remnant vegetation.

Areas of revegetation and retention are shown in the master plan (**Figure 10**), which will represent conservation areas within the Amberton foreshore reserve. **Figure 11** shows areas of native vegetation which will be retained without any disturbance (and not require significant restoration works) through implementation of the FMP.

7.3.2 Invasive environmental weed control

A number of invasive weed species occur within the Amberton foreshore reserve. Weeds often establish in disturbed and degraded areas and invade the adjacent native vegetation and subsequently can impact on the local biodiversity and visual amenity, as well as leading to increased fire risk, erosion, and future management costs.

Weed treatment is not proposed across the entire Amberton foreshore reserve as there are a number of areas with minimal weed invasion where vegetation is in “Very Good” condition. In particular, weed control will be focused on areas targeted for revegetation in order to ensure the highest likelihood of revegetation success or where Declared Weed species are observed. Weeds will largely be controlled chemically with either a selective herbicide (such as glyphosate) or a generic broad spectrum herbicide for significant infestations.

The *Coastal Planning and Management Manual* (WAPC 2003) provides specific management and control methods for common coastal weed species. Given the extensive area of foreshore, weed species are expected to be best controlled using chemical methods.

As outlined in the *Coastal Planning and Management Manual* (WAPC 2003) a three-pronged attack to control and eradicate weeds from the will be necessary to:

- Kill/remove the adults
- Kill newly emerged seedlings
- Block the opportunities for further introduction.

Weed control will take place over a number of years, associated with revegetation works and therefore weeds are expected to be largely controlled before conservation areas are handed over to the City of Wanneroo for management, reducing ongoing maintenance costs. With regards to the foreshore management zones, weed control will be targeted within foreshore management zones 2 and 3. Weeds will be sprayed twice a year (in spring and autumn), with any further localised weed eradication to be carried out as required. The most degraded/disturbed areas of the Amberton foreshore reserve are bare and therefore do not require any weed control.

7.3.3 Stabilisation

A large component of the revegetation works will also involve the stabilisation of existing blow outs and dunes. A number of stabilisation techniques will be implemented dependent on the extent of

stabilisation required and the future foreshore land use of the area (i.e. either a conservation or recreation orientation).

Where extensive stabilisation is required, this will be undertaken over a number of stages. Stabilisation will mostly involve soft engineering techniques, such as the use of mulch, brushing, sand trap fencing and jute matting. Brushing sourced from vegetation cleared from within the adjacent development areas will be used, considering the slopes and exposure to winds. However, in some areas, regrading and the contouring of blow out areas will be required in order to create a stable dune form and allow for the establishment of vegetation. An example of stabilisation techniques is shown in **Plate 11**.

Plate 11 Examples of coastal stabilisation techniques, including brushing, sand trap fencing and jute matting.

Where grades of slopes are proposed to be greater than 1:4, the City will need to approve the type of stabilisation required and this will be achieved through standard landscape approvals as discussed in **Section 9.1.**

7.3.4 Revegetation

Revegetation will be undertaken in disturbed areas that are degraded or bare and will aim to re-establish the native vegetation communities present within the foreshore reserve as outlined in **Table 8**. Revegetation will assist in stabilising exposed dune areas as well as improving biodiversity and native fauna habitat.

Revegetation will use endemic native plants and will incorporate species that have been observed over the foreshore reserve or are known to occur in similar nearby areas. In addition to the species listed in **Table 8**, a number of common native coastal species will be used including *Eremophila glabra, Hemiandra pungens, Jacksonia furcellata, Melaleuca huegelii, Melaleuca cardiophylla, Pithocarpa cordara* and *Templetonia retusa.* Native seed collection has commenced from the Amberton foreshore reserve and will be utilised in areas requiring rehabilitation.

Table 8 Native species list for revegetation by plant community.

SPECIES	PLANT COMMUNITY				
	OASL	OAASC	ARMS	AC	MSLM
Acacia cochlearis					X
Acacia cyclops				X	
Acacia lasiocarpa					X
Acacia rostellifera		X	X		
Acacia truncata		X			
Acanthocarpus preissii		X	X		
Atriplex cinerea		X	X		
Atriplex isatidea		X			X
Carpobrotus virescens		X			
Cassytha racemosa	X	X			
Conostylis candicans		X			X
Conostylis pauciflora subsp. pauciflora		X	X		X
Desmocladus asper					X
Exocarpus sparteus		X	X	X	
Hardenbergia comptoniana			X		X
Kennedia prostrata					X
Leucophyta brownii		X			
Lepidosperma gladiatum	X	X			
Lepidosperma pubisquameum					X
Lomandra maritima		X	X		X
Melaleuca systena			X		X
Myoporum insulare		X	X		
Olearia axillaris	X	X	X		X
Phyllanthus calycinus		X	X		
Rhagodia baccata		X	X		X
Santalum acuminatum		X			X
Scaevola crassifolia		X			X
Scaevola nitida		X			X
Spinifex hirsutis	X				
Spinifex longifolius	X	X			

SPECIES	PLANT COMMUNITY				
	OASL	OAASC	ARMS	AC	MSLM
Spyridium globulosum		X	X		
Threlkeldia diffusa			X		

7.3.5 Revegetation of earth worked areas

Re-vegetation of earth worked areas will be carried out to ensure that any batters are fully stabilised through both mulching and planting works. For these areas, it is generally recommended that re-vegetation shall be undertaken at a minimum of 4 plants per square metre to provide rapid stabilisation, in addition to either mulching or brushing, seeding works and possible further supplementary planting.

Where slopes cannot be maintained at or below 1:4 grades, jute matting or geotextile may need to be installed to minimize further erosion of slopes. This will ultimately depend on the slope in question and its level of exposure to prevailing winds or uncontrolled access.

7.3.6 Summary of revegetation and restoration works

Foreshore management zones (**Figure 9**) have been used to establish the revegetation and restoration requirements based upon the site specific conditions of these areas, including existing vegetation and vegetation condition. A summary of the revegetation and restoration works for the foreshore management zones is shown in **Table 9**.

Table 9 Summary of revegetation and restoration works

FORESHORE MANAGEMENT ZONE		AREA	STABILISATION	WEED CONTROL	VEGETATION COMMUNITIES	REVEGETATION
1	"Very Good" condition vegetation.	3.4 Ha	Not required	Not required	MsLm	Infill planting as required approximately 2,000 plants/ha
2	Primary dune (OaSl community) in "Degraded" vegetation condition.	0.5 Ha	Brushing recommended over approximately 50% of area	Over entire area	OaSl	10,000 plants/ha
3	"Good" to "Degraded" vegetation condition.	3.0 Ha	Not required	Over entire area	Ac OaASc MsLm ArMs	2,500 plants/ha
4	Current uncontrolled access tracks which do not require stabilisation due to existing topography.	0.1 Ha	Not required	Bare area – not required	OaASc MsLm	10,000 plants/ha
5	"Completely Degraded" bare areas requiring stabilisation	3.0 Ha	Entire area requires stabilisation. Mulch recommended over approximately 50% of area. Brushing recommended over approximately 50% of area. Localised regrading to restore landform may be required.	Bare area – not required	OaASc MsLm Ac	10,000 plants/ha

Revegetation, like other foreshore works will be subject to a period of maintenance by the developer for five years. Maintenance of the revegetation works will include:

- Ongoing weed control
- Infill planting to replace dead plants.
- Maintenance of revegetation and conservation fencing.

It is acknowledged that this FMP is not a detailed and specific bushland management plan. Prior to each stage of revegetation and restoration progressing, Stockland will submit a specific foreshore restoration works plan to the City of Wanneroo, which will outline/provide:

- The specific area of the foreshore being targeted.
- The key issues currently experienced in the area (i.e. weeds, dune erosion, absence of native vegetation, evidence of pests etc.).
- Detailed foreshore condition mapping.
- Key objectives and specific completion criteria for works (acknowledging that these will differ for different landforms and vegetation communities across the foreshore reserve).
- A species list and planting plan.
- A monitoring and reporting framework.

7.4 Fauna management

The Amberton foreshore reserve provides an important north-south fauna linkage through the local area. The retention of intact coastal vegetation plus the revegetation of areas will enable this linkage to be retained and strengthened in the long term. The Amberton FMP includes small areas of landscaping and hard stand, which will be navigable by the majority of fauna species expected to use the foreshore reserve.

Fencing types (as discussed further in **Section 7.6.7**) will generally allow fauna movement through areas of native vegetation and importantly discourage access into areas of native vegetation by dogs. There are a number of native bird, reptile and small mammal species which use the foreshore reserve and restricting access to these areas through fencing, will allow the fauna habitat values to be retained. The use of native species within soft landscaping will also provide fauna habitat value and allow some native species to move between areas of remnant vegetation and through landscaped areas.

Limited lighting is proposed for the Amberton foreshore reserve (only proposed in activity nodes) which will ensure minimal disturbance and allow the natural movement of fauna at night.

7.5 Water management and Water Sensitive Urban Design (WSUD)

7.5.1 Stormwater management

Stormwater shall be managed in accordance with the following principles:

- Frequent storm events (the 1:1 year Average Recurrence Interval (ARI)) and including 1:10 year ARI) will be directed to vegetated bio-retention swales located entirely outside of the Amberton foreshore reserve.
- In-frequent storm events (for the 1:100 year ARI) will be directed to larger flood storage areas located within POS adjacent to the Amberton foreshore reserve, with some flood storage to be provided within the foreshore reserve.
- Soak wells or open bottom pits will be used to infiltrate stormwater generated from car parking within the foreshore reserve.

Residential areas adjacent to the Amberton foreshore reserve are divided into three separate catchments, and stormwater generated from these areas will firstly be directed to POS areas outside of the foreshore reserve.

Bio-retention swales will be created outside of the Amberton foreshore reserve to treat the 1:1 year ARI, and detention will be provided for up to the 1:10 year ARI event. The bio-retention swales will be vegetated with native sedges to assist with nutrient stripping of stormwater.

1:100 year ARI event flood storage areas are located in “useable” open space adjacent to and also within the Amberton foreshore reserve where a variety of surface treatments such as open turf, low groundcovers and paving will provide amenity. The 1:100 flood storage areas have been located in existing low points, which are historically degraded and have minimal native vegetation.

In accordance with the *State Coastal Planning Policy Guidelines* (WAPC 2013) stormwater retention and/or infiltration areas for major events and overland flow paths onto the beach are permitted, subject to there being minimal adverse impact on the environment, including landform modifications within dune systems. This principle has been accommodated in the Amberton FMP although the majority of

stormwater infiltration areas (and all stormwater treatment areas) are located outside of the foreshore. Where stormwater is proposed to be directed to within the foreshore reserve, this is only for stormwater associated accommodating the 1: 100 year ARI event, which will serve as flood storage areas for water that has already been treated through bio-retention areas outside of the Amberton foreshore reserve.

7.5.2 Irrigation management

Irrigation will be required for any newly planted trees, shrub planting and turf in landscaped areas to ensure sufficient establishment at installation and provide a secure ongoing water source for long term maintenance. Rehabilitation planting will not require any form of irrigation if it is planted at the appropriate time of year and irrigation should not be considered for these areas.

It is proposed that the soft landscaped areas within the Amberton foreshore reserve will have a maximum of 33% of the area irrigated permanently, to provide the minimum open space amenity while providing water efficient outcomes. Irrigation application rates and volumes will be calculated and applied in accordance with the Department of Water's *Method to develop the North West Growth Corridor licensing schedule* and local authority standards. The use of irrigation will be minimised and native species will be used within landscaping. An irrigation allocation has been put aside for the foreshore reserve, which will enable the irrigation of turf in the long term to provide passive recreation areas.

Irrigation bores will not be installed within the Amberton foreshore reserve and will be located in adjacent POS areas.

7.6 Access

7.6.1 Public road interface (foreshore reserve road)

A public road is provided along the majority of the boundary of the Amberton foreshore reserve and the adjacent residential area. This road will provide a clear delineation between the foreshore reserve and land to be privately owned in the future. Additionally this foreshore road will have parking opportunities along its length for adequate parking provision for future foreshore and beach users and visitors. The foreshore road will also provide emergency vehicle access to the southern foreshore node and the beach via a car park and turn around area.

7.6.2 Paths and networks

A linear Dual-Use Path (DUP) will be provided along the length of the Amberton foreshore reserve, as shown on the foreshore master plan (**Figure 10**). This DUP will be constructed of red asphalt/poured concrete or a similar product as shown in **Plate 12**. The DUP will also be constructed with an appropriate sub-base to allow for occasional light maintenance vehicle use. The DUP will be 3 m wide, and an additional 0.5 m crushed limestone shoulder will be provided either side to assist with surface drainage and to allow maintenance vehicle access and rest point opportunities for pedestrians. Where the DUP interfaces with the adjacent public road there will be controlled access points with removable bollards inhibiting uncontrolled vehicular access onto the DUP.

The current specified City of Wanneroo requirements for a DUP are as follows:

All concrete footpaths to be 32MPa concrete with expansion joints every 5m and contraction joints every 1.25m. Concrete dual-use paths are to have expansion joints every 5 m and contraction joints

every 2.5m Refer to the City of Wanneroo's Development Design Specification: Cycleway and Pathway Design (City of Wanneroo 1998).

The DUP will connect with a proposed DUP within Shorehaven immediately south of the Amberton foreshore and will extend through the Amberton foreshore reserve to the Eglinton Estates land immediately north. This will facilitate a continuous DUP being provided through the foreshore reserve through the Alkimos – Eglinton area.

Additional to the DUP, smaller pedestrian pathways will be provided through the Amberton foreshore reserve, providing beach access. The Amberton FMP proposes four access points to the beach, including one emergency access as discussed in **Section 7.6.5** and indicated in the Amberton foreshore master plan (**Figure 10**).

The proposed access network has been located and designed in the first instance with regard for the existing environment/physical setting and regional planning needs. The pathway system will include:

- Elevated boardwalks made from composite timber/plastic decking and substructure.
- 2 m wide sealed pedestrian footpaths with crushed limestone shoulders.
- Composite timber decking or boardwalks at beach landings and viewing points.
- 3 m sealed DUP – to accommodate light maintenance vehicles.
- Pathways may be line marked to assist with pedestrian and cyclist circulation.

Pathway and DUP construction will be consistent with Australian Standard *AS2156.2 Walking Tracks – Infrastructure Design* (Standards Australia 2001a) and Australian Standard *AS1428 Design for Access and Mobility (*Standards Australia 2001b*).*

An elevated boardwalk structure is proposed within areas of high quality native vegetation (vegetation in "Very Good" condition) as shown in **Figure 7**. Compared with pedestrian paths, boardwalks have a reduced clearing footprint, reduce disturbance to native vegetation and reduce impacts from uncontrolled access due to their elevated nature and controlled edge. It is therefore proposed to use these in areas of intact vegetation. Boardwalk structures will also be used in certain circumstances to accommodate changes in elevation, such as steps up to lookouts (see **Plate 13**).

Plate 12 Example of coastal dual-use path.

The materials used to construct boardwalk structures will be selected to limit the visual impact of these structures and be constructed from sustainably sourced materials and shall be in accordance with City of Wanneroo's requirements. Boardwalks will ideally be constructed from Wood Plastic Composite (WPC) material. This will aid durability of the boardwalk in this coastal environment. The WPC material shall have the following qualities.

- Contain an anti-slip or textured surface treatment (to be a minimum of R11 anti slip rating).
- Be Ultra Violet (UV) weather stable in preventing/slowing pigment fading or changes.
- Be resistant to food and drink stains (and can be high pressure hosed for cleaning).
- Will not rot, splinter or warp.
- Be of low maintenance/not have continuing upkeep requirements.
- Decking boards and substructure components to have a fibre reinforced resin core for added strength.

An example of a coastal boardwalk is shown in **Plate 13**. An indicative sketch of the boardwalk through the Amberton foreshore reserve is shown in **Plate 14.**

Plate 13 Example of boardwalk steps for one of the proposed beach access points.

7.6.3 Limiting uncontrolled access

At present, uncontrolled access through the Amberton foreshore reserve is exacerbating dune erosion through the damage and ultimate removal of native vegetation. The management of uncontrolled access will be critical to the successful implementation of the FMP, particularly to any proposed rehabilitation and stabilisation works.

The implementation of the Amberton FMP will facilitate a number of the existing access tracks being closed and rehabilitated. A key component of this rehabilitation will be the initial restriction of access via use of fencing, bollards or limestone boulders. Brushing can also be used as an informal treatment to areas that require restricted access.

Stockland will continue to work with the City of Wanneroo and the local police to reduce uncontrolled access within the foreshore reserve and it is anticipated that with the creation of a larger local community and improved pedestrian access to the Amberton foreshore reserve will inherently assist in reducing the incidences of uncontrolled vehicle access. Signage can also be used to inform users about uncontrolled access.

Plate 14 Indicative concept sketch of the boardwalk through high quality native vegetation.

7.6.4 Security and lighting

Crime Prevention Through Environmental Design (CPTED) principles have been considered in the foreshore master plan (**Figure 10**) and will be further applied at the detailed design stage to promote community safety. There are three CPTED basic strategies adopted for the foreshore reserve:

- Ensure natural access control to direct access and provide safety measures in activity spaces.
- Ensure passive surveillance created by default as part of the design allowing for improved surveillance opportunities across the scheme.
- Provide territorial reinforcement to create ownership over different spaces.

The use of suitable and site appropriate localised lighting, clear and open sightlines in high use areas, selective planting and thoughtful design will encourage both daytime and evening uses. In addition, suitably graded, selected and designed materials, surfaces and elements will be used throughout public areas to promote personal safety and security.

Currently no lighting is proposed within the Amberton foreshore reserve except for the area immediately around the proposed café node and car park. Designated smaller rest points or areas of boardwalks/decking may be provided with lighting if deemed to be required through detailed design. Galvanised pole top lighting (4.5 m in height) will be provided along segments of DUP directly to the north and south of the café node where the DUP links back to the public road. Standard street lighting will also be present along the public road abutting the Amberton foreshore reserve. The exclusion of lighting to the majority of the Amberton foreshore reserve will discourage access and unsociable behaviour, plus minimise impacts on fauna from light over spill.

The activation of the foreshore reserve through the southern café node, incorporating a small café (as outlined in **Section 7.7.4**) will also provide passive surveillance opportunities, an increased community presence and increased public ownership over areas of the foreshore reserve. The design of this café node will accommodate CPTED principles to reduce crime and antisocial behaviour.

7.6.5 Emergency vehicle beach access

Emergency vehicle beach access will be provided at the southern end of the Amberton foreshore reserve (see **Plate 15**). This will involve a wide trafficable pathway down to the beach, with a turn-around area at the beach end for emergency vehicles such as ambulances and/or light fire-fighting appliances. This is the most accessible part of the foreshore for emergency vehicle access based on the current topography of the foreshore as the natural elevations of the fore dunes are lower in this location. Furthermore there is an existing informal four wheel drive beach access in this location and thus will not require major earth working and excessive disturbance to existing foreshore vegetation to facilitate the necessary access design requirements. The emergency vehicle beach access will include revegetation along the edge of the access to stabilise these areas and control windblown sand.

Plate 15 Concept sketch illustrating the emergency vehicle beach access point.

7.6.6 Universal access

The provision of universal access standards across the Amberton foreshore reserve and into the neighboring communities will encourage and foster an inclusive community ethos. Creation of the pathway network promoting universal access will be factored into the detailed design and implementation of the Amberton FMP. This network will provide clear linkages between the foreshore pathway system, adjoining POS areas and the wider residential development.

The vision of the Walk WA: *A Walking Strategy for Western Australia (2007-2020)* (Government of WA 2007) is that by 2020 Western Australia will be *"a vibrant, safe, accessible place with a supportive walking environment".* In realising this objective the strategy has four main walkability targets and goals that will be facilitated wherever possible as part of the detailed design across the Amberton foreshore, these targets are as follows:

- Access – easy to reach walks and attractive open spaces for people of all physical activity levels and abilities.

- Aesthetics – an environment offering pleasant, clean surroundings in which to walk. The location has a natural or developed attractiveness that encourages people to use it.
- Safety and Security – walkers feeling that they and their belongings are safe. People need to feel that they are well maintained.
- Comfort – walkers can be confident of shelter, conveniences and rest stops. Amenities such as drinking water, seating, shade or shelter must be available.

The proposed emergency beach access will serve a dual purpose in providing an opportunity for wheelchair, disabled and stroller access to the foreshore and beach areas. The provision of a café node in this location (incorporating a small kiosk/café) will enable all users to access these facilities. An example of a universal pathway system is shown in **Plate 16.**

Plate 16 Example of a universal pathway system with shallow gradients over existing landform

7.6.7 Fencing

Fencing will be used within the Amberton foreshore reserve to restrict access to intended areas. All pathways will be fenced to restrict access in order to reduce impacts on native vegetation and revegetation. In addition, fencing will restrict access by dogs, which can be a significant threat in the urban environment to ground-dwelling birds and mammals.

All fencing will be generally in accordance with the City of Wanneroo's fencing requirements (Drawing, TS01-4-01 and TS01-7-1), or other City of Wanneroo standards. Base design criteria for fencing shall be as follows:

- Total fence height to be 1225 mm, with 900 mm being ring locked fence and 335 mm being galvanized PVC coated plain wires.
- Upright supports shall consist of timber posts and no pickets.
- Maintenance access gate provision shall be provided at the required intervals to the various maintenance zones within the Amberton foreshore reserve. These shall be incorporated into the fencing design to the City of Wanneroo standards and be wide enough to allow maintenance vehicle access as required.

- Timber bollards or removable bollards in certain locations will be centrally located to pathways to restrict vehicle access.

Alternative fencing types may be required in areas in beach access areas, high traffic areas or adjacent to a public road or car park. The specific fencing type will be discussed with the City of Wanneroo as part of the detailed approval process and will be consistent with the fencing that the City of Wanneroo has installed in other coastal areas.

7.6.8 Connectivity to adjoining areas

The Amberton foreshore reserve node and connecting pathways will form part of the greater Alkimos Eglinton foreshore access and amenity. The DUP will connect to a similar DUP within the Shorehaven development to the south and the proposed Eglinton development and marina to the north. The DUP will provide an important north – south connection through the foreshore reserve. This connection is shown on the Amberton foreshore master plan (**Figure 10**).

DUPs will also connect to the greater east west greenlink through the northern portion of the Amberton development, where areas of conservation public open space occur.

7.7 Beaches access and use

Amberton is 8 km from Yanchep Surf Life Saving Club (SLSC) to the north and 7.5 km from Quinns Mindarie SLSC to the south, which are the closest existing SLSC facilities.

Stockland engaged Surf Life Saving Western Australia (SLSWA) to undertake a Coastal Aquatic Risk Assessment (CARA) (**Appendix C**) with the primary aim of determining if swimming/wading activities were suitable at beaches within the Amberton foreshore reserve and secondly the most suitable location designated as a recreational and leisure beach. The CARA also provides an assessment of the coastal risks present at Amberton Beach and provides a risk management plan and recommends treatments including beach accessibility, access signage, lifesaving services and awareness and education.

The CARA report notes the following features of the beach:

- Beaches are backed by 10 m to 20 m high primary dunes along its length with a number of blowouts in degraded areas.
- Beach widths along the length range from 30 m to 80 m although some sections are narrower than this.
- The beach is relatively sandy with some exposed beach rock/platforms along the northern section toward and beyond Pipidinny beach.
- Some rock is present in the intertidal or on the shore, particularly in the central section.
- Sea grass meadows and outer reefs sit adjacent to the intertidal areas.
- The outer reefs reduce the onshore influence of swell but create a moderately steep beach face and under certain low tide conditions the onshore beach areas are prone to rips.

The CARA assessed the Amberton beach as a “moderately hazardous” beach, with an average hazard rating of four out of a maximum of 10. Moderately hazardous beaches are where “the level of hazard depends on the wave and weather conditions, with the possibility of strong rips and currents proposing a moderate risk”.

The CARA provided a number of recommendations for the Amberton foreshore and beach (and wider area) including:

- Providing beach access and public amenity. SLSWA recommended that the southern area of the Amberton foreshore is the most "friendly" to a range of beach users based upon user competency and user experience.
- Provision of safety signage. SLSWA recommend that suitable signage needs to be put in place including information on beach and aquatic safety signage and general locational and information signage.
- Education and awareness program. SLSWA suggest that an education and awareness program is developed with Stockland and the City of Wanneroo in order to mitigate risks at aquatic coastal locations.
- As beach visitation rates increase, a lifesaving and surveillance outpost could be accommodated at Amberton beach co-located with the proposed café and connected to the proposed Shorehaven Surf Lifesaving Club.

7.7.1 Proposed Amberton swimming beach

As outlined in the CARA (see **Appendix C**) SLSWA noted that the southernmost boundary of the Amberton foreshore reserve is likely to present the best area in which to guide beach users for entry to the beach and participation in aquatic activity. This section of beach has more of a gradual gradient from the swash zone into the surf line. These features provide a more favourable depth for a greater distance before dropping away into deeper water.

Furthermore, the CARA noted that the best location for a beach emergency access track was located to the south near the allocated swimming area, where reduced dune heights permit construction of a vehicle access track. This is reflected in the Amberton foreshore reserve master plan (**Figure 10**) and has been a key consideration in the design and siting of facilities (including the café node) within the Amberton foreshore reserve master plan.

7.7.2 Dog beach

A dog beach was proposed in the Alkimos – Eglinton District Structure Plan for the southern portion of the foreshore reserve. Within the City of Wanneroo's *Draft Coastal Management Plan* (2012), a dog beach is proposed for 100 m south of the Amberton foreshore reserve, within the Shorehaven development. We understand that planning for this dog beach has recently commenced with the City of Wanneroo and Peet (the developer of Shorehaven). It is expected that specific facilities associated with the dog beach will be provided within Shorehaven, consistent with the City of Wanneroo's *Draft Coastal Management Plan* (2012).

Amberton is not expected to provide the primary access to the dog beach, which will be accessed through Shorehaven. However, dog beach users may access the dog beach from Amberton and as such appropriate signage will be provided to direct dog beach users to the Shorehaven dog beach. Dog specific infrastructure (dog bin bags located with bins) may also be provided at the direction of the City of Wanneroo.

7.7.3 Foreshore reserve amenities and structures

To provide adequate foreshore facilities for the community, selected areas of the foreshore have been allocated for public amenity and passive recreation. Generally speaking, these structures have been

included within existing degraded areas of the foreshore reserve. Such amenity and facilities are provided to ensure the minimum standards for the following are provided:

- Universal access to the Amberton foreshore reserve, beach front and adjacent open space.
- Resting points and areas of respite.
- General shelter with low level solar lighting.
- Visual surveillance.

These areas will incorporate a combination of hard and soft landscape treatments such as:

- Hard landscape treatments:
  - Hard pavements such as concrete, asphalt or unit paving to provide safe pathways
  - Asphalt car parking and road infrastructure (for public access and emergency access)
  - Retaining walls, dividing walls or concrete edging to define designated public access
  - Fencing to prevent undesired access to dunes and direct pedestrian movement
  - Boardwalks, decking or light weight structures to viewing areas that will have a minimal impact on the landform and vegetation
  - Shade structures, play equipment and general foreshore facilities to encourage community use and gatherings.
- Soft landscape treatments:
  - Native and water wise tree and shrub planting to provide shade and wind protection
  - Low native groundcovers to assist with passive surveillance of key areas
  - Rehabilitation native planting to degraded areas
  - Roll on turf (kikuyu) to designated active recreation areas (for people and pets).

Specific structures proposed such as shade shelters, boardwalks and seating are generally considered to be “coastally dependent and easily relocatable development” in accordance with the definition of the 2013 SCPP. In this sense, it is appropriate and reasonable for these structures to be located within the foreshore reserve. The acceptability of locating assets and infrastructure within the Amberton foreshore reserve (and the coastal processes setback) is discussed as part of the Coastal Hazard Risk Management Adaptation Plan in **Section 10.**

Information on specific facilities and structure is detailed in the sections below.

7.7.4 Café node

7.7.4.1 Café node intent

Consistent with the Alkimos Eglinton DSP and the LSP, a central community node (café node) is planned within the Amberton foreshore reserve (see **Figure 10**) and shall provide the primary focus for community activities and access within the wider foreshore reserve. The café node will provide an important public benefit within coastal areas, as these are frequently associated in proximity to the ocean, generally with ocean views.

A small relocatable café facility is proposed for the café node. It is the intention that this café takes advantage of ocean views from its nestled position in the dunes towards the north and west.

Adjacent to the café shall be an informal open recreational landscaped area as well as access to a boardwalk beach access route.

7.7.4.2 Café node location

The Café node has been strategically placed:

- To be adjacent the swimming beach identified by SLSWA.
- To occur in a heavily disturbed area of foreshore with little intact vegetation, which would require a high degree of modification and stabilisation if the café was not proposed.
- To allow an area of passive recreation to be created with a microclimate that is protected from prevailing summer winds during periods of peak patronage.
- In close proximity to the existing uncontrolled beach vehicle access point which will form the proposed emergency vehicle beach access.
- At the confluence of a large park and a broader east-west green link leading into the adjacent residential precinct. It is therefore a natural meeting point of several pathway networks in particular the north - south DUP axis and the east - west pathways from the development to the beach.
- To enable the café building to take advantage of existing cleared and level natural high points within the dune system with sweeping beach views for surveillance.

Examples of coastal nodes are shown in **Plate 17** and **Plate 18**.

The exact location of the proposed café facility will be subject to a detailed site survey and will depend on the footprint and design of the final structure. The café facility will be subject to a specific Development Approval and will be discussed further in detail leading up to that time with the City of Wanneroo.

The café location and design is conceptual and subject to further detailed design and planning to the satisfaction of the City of Wanneroo. The following conditions of any future approval are to be established in conjunction with the City of Wanneroo:

- Approval is time limited.
- All temporary assets must be removed upon expiry of the approval unless agreed with the City otherwise.
- Any associated infrastructure directly associated with the café, such as lighting and pathways are also temporary in nature.
- Stockland will ensure that the community is aware of the asset's temporary nature.

Plate 17 Busselton Foreshore (left) and Jindalee Foreshore (right), both nodes with passive recreation and supporting small business opportunities.

Plate 18 Burns Beach node with passive recreation space, lookouts and shelters.

7.7.4.3 Café node patronage

Intended future users of the Café node will be the general public. Community groups and residents alike will be able to use the informal landscape areas and the café building for their passive recreational needs and take advantage of the afforded sea views. DUP users from the neighboring communities shall be encouraged to use the facilities provided within the Café node in promoting inclusive community awareness and initiatives. Local residents and other foreshore users will also be able to access the swimming beach directly via a boardwalk and proposed emergency vehicle beach access from the café node.

7.7.4.4 Café node design

The café building location has been selected specifically because of its elevation to capture views over the dunes to the ocean and in an area that minimises modification to the landscape/landform which has been subject to historic modification and degradation.

The café building design will incorporate passive solar principles to reduce the energy requirements of the café. This is expected to include:

- Open plan internal layout and glazing to ensure maximum passive lighting and ventilation.
- Bi-fold doors to maximise external amenity of location.
- A lightweight structure to be insulated to mitigate internal heating in summer.
- Glazing to be appropriately rated for insulation.
- Contemporary flat (skillion) roof to maximise internal roof space for ventilation and opportunities for glazing facing the ocean, and to minimise visual impact/blocking of views from adjacent areas.

The café building design may also incorporate rainwater tanks for toilet flushing and solar panels (or wind generators) for energy generation.

It is anticipated that the café building will be on the DUP route and have ancillary public toilet facilities which will also service the public.

The café node may also include the following facilities:

- Car park.
- Playground.
- BBQs.
- Directional, safety and interpretative signage.
- Exposed aggregate, asphalt or poured concrete paving.
- Shelters/shade structures.
- Beach shower and foot tap, with drink fountain, or dog tap.
- WPC decking or boardwalks with viewing areas.
- Bicycle racks.
- Litter bins/dog bins/refuse collectors.
- Standard fencing to restrict access, with possible feature balustrade at viewing areas.
- Feature picket style fencing or artwork.
- Masonry retaining or freestanding walls.
- Rest point/seating opportunities.

The specific facilities located within the café node would be subject to detailed design and approval by the City of Wanneroo. The proposed playground and all other public amenities including but not limited to play equipment, exercise equipment, outdoor furniture, shelters, structures, BBQ's, drinking fountains and public art will satisfy the following criteria:

- Maintenance is to be within the City's operating budget.
- Replacement is to be within the City's capital works budget.
- Compliance with the Australian Standards and City of Wanneroo's safety standards.
- The scale of the playground is to be appropriate to the size of park it is proposed in.
- The playground provides opportunity for physical and creative play and accommodates for different age groups.

7.7.4.5 Café building

The construction of the café building will use a modular and prefabricated approach in order to minimise the extent of earthworks and also the construction footprint. The café building and associated public toilet facilities will be constructed from robust outdoor materials suitable for coastal conditions. This may include galvanised steel structural elements, rust free aluminium or timber framing, HDPE plastic battens, hot dipped galvanized fixings and stirrups, double glazed glass and aluminium framed windows and galvanized reinforced concrete stump footings rather than slab construction. The colour scheme will be consistent with the natural colours of the coastal landscape. All materials and design will be subject to further consultation with the City of Wanneroo at the detailed design stage.

Installation works will be controlled by future construction drawings and specification clauses as part of future detailed design with the intention of limiting clearing, limiting and control working access, outlining possible penalties and ensuring stabilisation to locally disturbed areas post installation.

Due to the light framed construction method, a probable lifespan for the building would be between 30 and 40 years. Some aspects of building maintenance are expected to rest with the café operator and it would not be unusual for the building owner to meet some of the insurance obligations. Examples of similar light framed construction buildings are shown in **Plate 19**.

7.7.4.6 Café facility tenure/lease arrangement

Based on discussions with the City of Wanneroo there are two tenure arrangements that could be pursued to facilitate the café within the foreshore reserve, which are:

- A crown reserve that is leased for the creation and operation of a cafe.
- A residual portion of freehold land that is only retained by Stockland for the period of time the cafe is operational under the relevant approval.

The first option involves creating a small separate reserve within the Amberton foreshore reserve to allow for the servicing, construction and contract leasing arrangement for the café building. This lot will need to be vested to the Crown and as for the current Jindalee café the reserve would be Crown land managed by the City for Recreation and Cafe purposes with the power to lease and license as a minimum requirement. A strategy for the café site to be relocated due to shoreline recession (inclusive of sea level rise) is discussed in **Section 10.**

The lease would be held by a private third party and initially this is expected to be Stockland. Stockland would construct and establish the café but then may seek an operator to manage the facility in the longer term. The lease duration would reflect the relocatable nature of the café (i.e. initially a 10 year lease with 10 year extension options), and specifically be in place at least until the nearby Eglinton marina is constructed.

The lease would carry a condition to fully decommission the site at the termination. A bond would be put in the place to enable the structure to be relocated or decommissioned if these works were unable to be undertaken by the leaseholder.

The second option would involve leaving the relevant portion of land as freehold land in Stockland ownership, along with the cafe facility and associated infrastructure, and is also the head lessor for the lease to a third party. The City of Wanneroo has indicated it may be interested in entering into a deed of agreement to take on the land at the end of the cafe term to utilise the land for recreation.

The preferable servicing strategy would be to have the café serviced through the creation of this lot (either as a reserve or residual freehold land) and services (communications, water and power) to be metered separately for each structure. Gas could be provided through replaceable bottles where necessary and wastewater could be managed via a standalone self-contained pump out waste management facility or onsite effluent disposal system (such as an Aerobic Treatment Unit).

Café car parking can be accommodated by the proposed public car park, however there would be a strong emphasis for residents to walk or cycle to the café.

As outlined in **Section 7.7.4.2,** the café will be subject to a Development Approval and the design, location, lease and tenure arrangements are expected to be discussed and agreed with the City of Wanneroo prior to this time.

7.7.4.7 Café node operators expectations

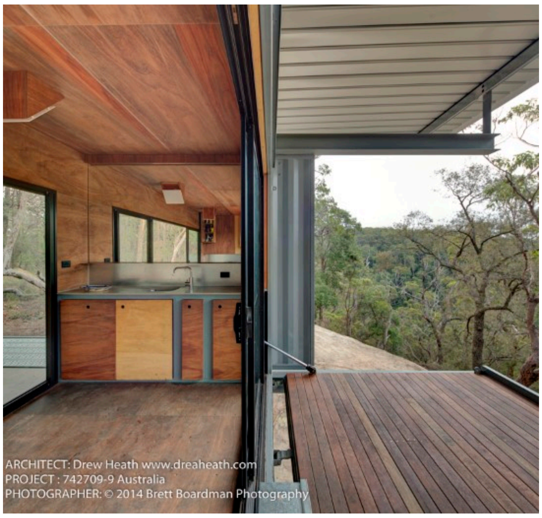
There may be a commercial arrangement between the existing landowner (Stockland), Council and the first operator of the café. Any leasing agreement will need to contain lease terms and timing to provide regular review and assessment should there be major adverse coastal shoreline recession. It would require that responses and management must be in place for the following:

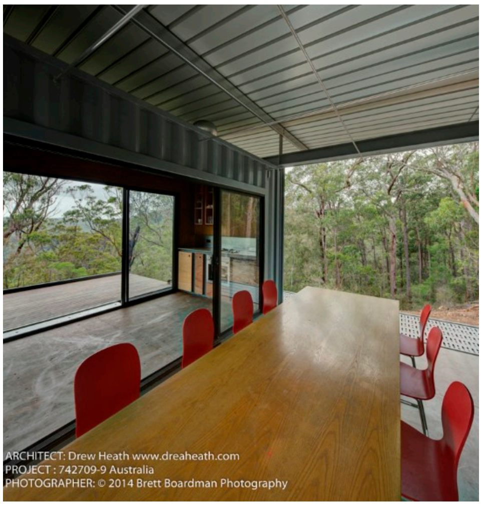
- Major storm events.
- Major adverse changes to the coastline, seas level rise etc.
- Major erosion of existing dune systems.
- Business viability due to future competition.

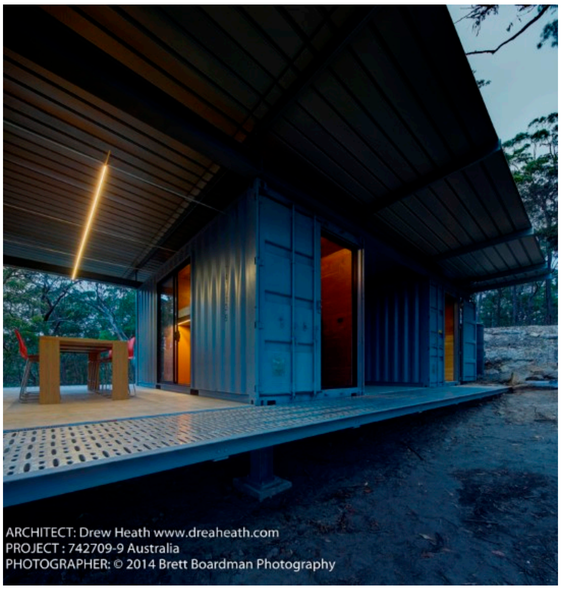
The lease arrangement will include a clause to remove the café structure and restore the site following termination of the lease. As outlined above, a bond is expected to be provided as a condition of the lease arrangement which can be accessed by the City of Wanneroo to facilitate café removal/relocation as a last resort.

As discussed above, a strategy to address changes to the foreshore over time and potential impacts on the coastal node is discussed in **Section 10**.

Plate 19 Examples of potential built form method and character to minimise construction impacts within foreshore reserve and enable ease of relocation (continued below).







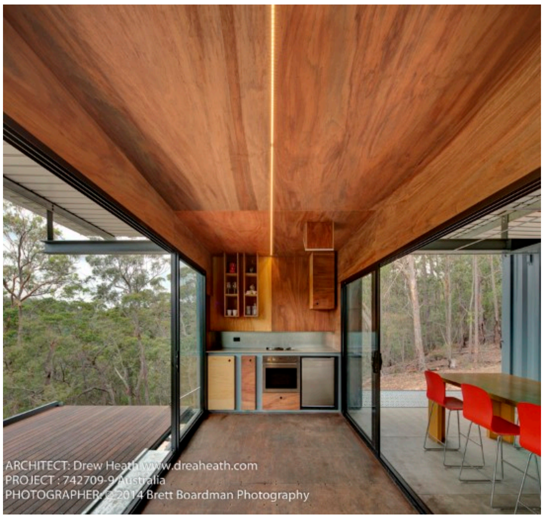


Plate 19 Examples of potential built form method and character to minimise construction impacts within foreshore reserve and enable ease of relocation (continued from above).

7.7.5 Northern passive recreation area

7.7.5.1 Northern passive recreation area intent

A small passive recreation area is proposed for the northern section of the Amberton foreshore reserve. An open turf area is proposed to be located within a historically degraded part of the foreshore reserve and will provide a small kick-about area. This area may also incorporate flood storage (greater than 1:10 year event) and could include some minor facilities such as:

- Directional, safety and interpretative signage.
- Exposed aggregate, asphalt or poured concrete paving.
- Shelters/shade structures.
- Beach shower and foot tap, with drink fountain, or dog tap.
- WPC decking or boardwalks with viewing areas.
- Bicycle racks.
- Litter bins/dog bins/refuse collectors.
- Standard fencing to restrict access, with possible feature balustrade at viewing areas.
- Feature picket style fencing or artwork.
- Masonry retaining or freestanding walls.
- Rest point/seating opportunities.

The specific facilities located within the northern passive recreation area would be subject to detailed design and approval by the City of Wanneroo. This area will provide a smaller space for recreation surrounded by areas of native vegetation and proposed revegetation areas.

An example of a similar area within Burns Beach is provided in **Plate 20**.

Plate 20 Burns Beach Design efficiencies in coastal nodes providing seating opportunities/rest points and minimising impact on vegetated areas.

7.7.5.2 Northern passive recreation location

The northern passive recreation area has been located within a natural basin and hollow within the dunal system. The native coastal vegetation in this location is severely degraded and therefore it is located within a dune blow out requiring stabilisation and revegetation.

7.7.5.3 Northern passive recreation area patronage

It is the intention that the northern passive recreation area functions as a minor node for the local community. Facilities will be minimal and the focus of the area will be to provide a small passive recreation area within the dune hollow. The node is likely to be used by local residents who can walk from the adjacent Amberton development.

7.7.5.4 Northern passive recreation area design

The northern passive recreation area is adjacent to an area of POS within the Amberton development and therefore the area will be designed to be similar in appearance to this POS area, effectively representing an extension of the POS. Pathways and fencing are proposed to be used as a defining edge between areas of the Amberton foreshore reserve that are in good condition, in which pedestrian access will be prevented.

7.7.5.5 Northern passive recreation area construction

As outlined above, the northern passive recreation area will be designed and constructed to be similar to that of the adjacent POS area, incorporating consistent materials and feature elements. The materials used will be suitable for coastal conditions and installation works will be controlled by future construction drawings and specifications as part of the detailed design and approval process.

7.7.6 Pathway intersection and rest points

Small intersection and rest points are located within the Amberton foreshore reserve. These points may include the following:

- Directional, safety and interpretative signage.
- Exposed aggregate, asphalt or poured concrete paving.
- Standard fencing to restrict access.
- Masonry retaining or freestanding walls with seating.

An indicative concept for these intersection points is shown as **Plate 21**.

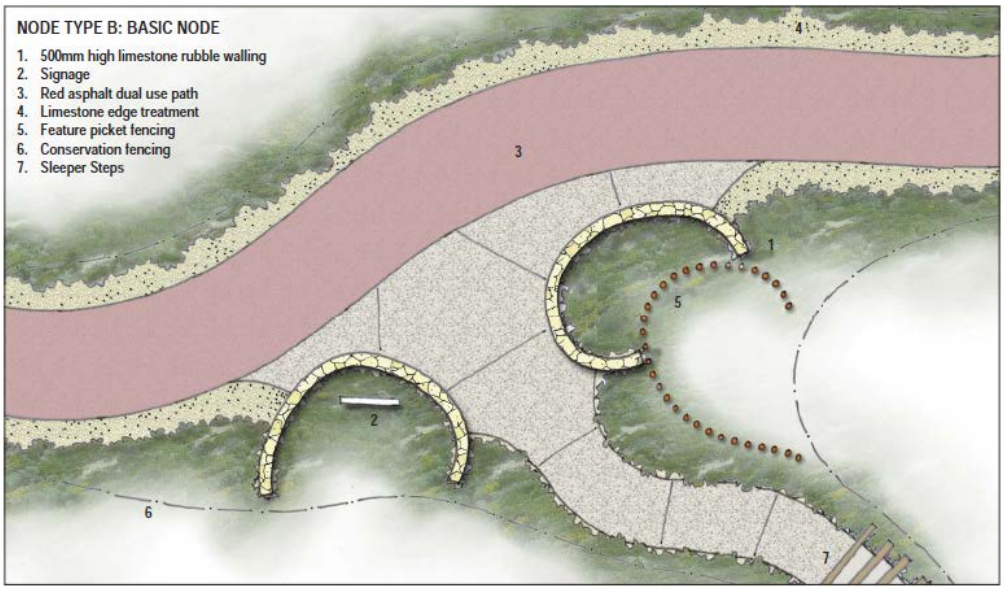


Plate 21 Intersection Point (plan view)

The Amberton foreshore master plan (see **Figure 10**) shows the proposed location for intersection points between areas of dual use path and pedestrian pathways to slow cyclist traffic and enable safe movement through these intersections.

The specific facilities of these intersection points within the Amberton foreshore reserve will be subject to a detailed landscape approval process to be negotiated with the City of Wanneroo.

7.7.7 Car park

Car parking bays have been included within the foreshore reserve in a currently degraded natural depression. A carpark has been provided given the significant width of the foreshore reserve (greater than 175 m) and is not required to meet the car parking requirements of the LSP or any broader car parking strategy.

Engineering design shall be focused on reducing impact to this area, with the car park being designed mainly for emergency vehicle access (with the car park connected to the emergency access), universal community access, maintenance vehicle access and minor café associated deliveries.

The carpark is proposed to be constructed of sealed asphalt and on-street parallel parking is also proposed for the length of the public road adjacent to the foreshore reserve.

7.7.8 Lookouts

7.7.8.1 Lookout intent

The foreshore is proposed to contain two lookouts to promote public viewing across the beach and surrounding foreshore reserve. The lookouts are a key facility for the Amberton foreshore reserve as they provide the following benefits:

- Provide important orientation and reference points when viewed from the path system and surrounds.
- Encourage and allow passive surveillance across the foreshore and beach.
- Provide regular periodic rest stops for pedestrian and cyclists.

Examples of coastal lookouts that could guide those proposed for the Amberton foreshore reserve are shown in **Plate 22**.

Plate 22 Injidup Beach Lookout (left) and Capricorn Village Lookout (right)

7.7.8.2 Lookout location

The lookouts are proposed to be located on dune peaks and ridges to maximise views. Ideally the lookouts will be located on areas that have been historically disturbed or degraded and are targeted already with a range of stabilisation and revegetation initiatives. This approach provides controlled stable access to high points where otherwise uncontrolled pedestrian access has historically occurred and may be most likely in the future. The Amberton foreshore master plan (see **Figure 10**) shows the currently proposed locations for these lookouts.

7.7.8.3 Lookout patronage

The lookouts are proposed be for general public use. As a result of their high point locations it is anticipated that stair access will be necessary in many instances to avoid extensive clearing and regrading for ramps. Lookouts are also proposed to occur at suitable areas where views may exist adjacent to proposed sealed paths. These lookouts will cater for disability access and cyclists.

7.7.8.4 Lookout design

The lookouts are proposed to be designed as a series of level platforms which are orientated to maximise key views. The lookouts will typically be inclusive of balustrades if required adjacent to significant fall heights. Lookouts may include shade structures and possible interpretive and directional signage. Subject to further design refinement the lookouts may be designed as a hierarchy in response to anticipated use patterns. For example:

- A more prominent type may occur in a high use zone on a dune peak and could include stair access, a level viewing platform, seating, shade, signage and full balustrades.
- A less prominent type may occur in a lower use zones adjacent paths and may simply include a level platform, seating and partial balustrade.

7.7.8.5 Lookout construction

The lookout elements are anticipated to be constructed of a range of materials suitable for coastal conditions. This may include rust free aluminium framing, HDPE plastic battens, hot dipped galvanised fixings and stirrups and galvanised reinforced concrete footings. Installation works will be controlled by future construction drawings and specification clauses as part of future detailed works approval applications with the intention of limiting clearing, limiting and control working access, outlining penalties and ensuring stabilisation to locally disturbed areas post installation.

7.7.9 Public art

Public art in the form of sculptures, decorative way finding and directional signage will be accommodated within the Amberton foreshore reserve. These items are important as they assist with way finding, provide areas of activity and can help educate the local community about heritage or environmental values.

All public art will require separate development approval which will detail the intent, maintenance regime and engineering requirements for any structures that need to be suited to this coastal environment.

7.7.10 Landmark and safety signage

Landmark and safety signage will be provided to the main pedestrian pathways and beach access points within the Amberton foreshore reserve and will include information on illegal access. All landmark and safety signage will comply with the City of Wanneroo's requirements and specifications. It should be noted that after 24 months of community use, signage should be reviewed to determine if additional signage is required to highlight to the community any evident coastal or other hazards. SLSWA have also provided recommendations on appropriate beach/swimming safety signage as part of the CARA.

7.8 Bushfire management

Planning for Bush Fire Protection (WAPC 2010) and the recently released draft *Planning for Bushfire Risk Management Guidelines* (WAPC 2014) is a guideline for various stages of the planning process to avoid inappropriately located or designed land uses, subdivision and development on land where a bushfire risk is identified so that an appropriate level of protection to life and property from bushfires is provided.

Fire management is expected to be managed as part of the subdivision approval process which will need to consider the hazards posed by vegetation within the foreshore to adjacent residential dwellings. Bushfire Management Plans will be required to be prepared as conditions associated with adjacent subdivision. A Fire Management Plan has been prepared by Strategen (2014) and demonstrates that a suitable, compliant and effective bushfire management outcome can be achieved for the site.

The provision of the public road separating the Amberton foreshore reserve and future residential dwelling adjacent to the foreshore reserve will provide a Building Protection Zone in these areas to reduce radiant heat and provide a line of defense. The DUP will also provide fire control access for small firefighting appliances within the foreshore reserve, although would not provide a formal fire service access route in accordance with the guidelines.

Separate technical assessments will be required to outline hazard ratings, delineate bushfire prone areas and Bushfire Attack Levels for dwellings within 100 m of classified vegetation (as defined in Australian Standards 36959 *Construction of building in bush-fire pone areas* (AS3959)). This will be completed for subdivision adjacent to the foreshore reserve in line with standard subdivision conditions.

7.9 Staging

The implementation of the Amberton FMP will be conducted in a staged manner to coincide with adjacent residential subdivision and development. An indicative staging plan has been provided as **Figure 12**, which has the implementation of the Amberton FMP proceeding from south to north. The subdivision process that actually creates the separate foreshore reserve will result in a subdivision condition that requires the foreshore reserve be ceded free of cost to the Crown (with a management order with the City of Wanneroo). These foreshore reserves will be created adjacent to the proposed subdivision area as shown in **Figure 12**.

The FMP will be implemented and the foreshore reserve maintained by Stockland for a period of five years (in accordance with SCPP) and sequentially handed over to Council for long term management and maintenance. This effectively means that Stockland will be implementing works in Crown land (with a management order with the City of Wanneroo) as the land is likely to have been ceded prior to foreshore works. However, should works be completed prior to subdivision, subdivision of the foreshore reserve will be undertaken prior to handover to enable the creation of a foreshore reserve which can be handed over to the City of Wanneroo for maintenance.

With regards to the staged handover of maintenance responsibilities, this will occur five years from practical completion of a particular stage. Given that only minor infrastructure and assets are proposed in the foreshore reserve, it is expected that all works within a stage will be completed at the same time. For example, if we assume that works associated with Stage 1 commence in January 2016 and are completed in April 2016 the process for handover will be as follows:

- The City of Wanneroo inspects and grants practical completion of works at Stage 1 in April 2016.
- Following this, the five year maintenance period begins for Stockland.
- In April 2021, following inspection of the foreshore reserve by the City of Wanneroo, the ongoing maintenance of Stage 1 is transferred to the City of Wanneroo.

While the implementation of the FMP will be on a staged basis, there are a number of work areas that may be completed in a particular area prior to adjacent residential development. These tasks include:

- Placement of brushing material or barriers (boulders) to reduce unauthorised access to the foreshore reserve.
- Provision of early beach access for residents. This has involved the creation of an access track and temporary car park (outside the Amberton foreshore reserve) and signage directing uses to the swimming beach in the southern portion of the Amberton foreshore reserve.
- Stabilisation works, including revegetation. Revegetation may be undertaken in strategic locations prior to development to ensure vegetation is well-established prior to residential development.

8 Summary of Compliance with SPP 2.6 State Coastal Planning Policy

The Amberton FMP has been prepared in accordance with the *State Planning Policy 2.6 State Coastal Planning Policy* (SCPP). The SCPP includes a number of policy measures which planning decisions and instruments, including foreshore management plans are required to comply with. These policy measures and how the Amberton FMP is consistent with them are discussed in further detail below.

8.1 Development and settlement

The SCPP measures for development and settlement generally applies to new coastal developments and recommends that these are strategically located and that use of the coast for recreation, conservation, tourism, commerce, industry, housing ocean access and other activities is sustainable and located in suitable areas.

While Amberton is a new development, there has been an extensive historic planning process (as discussed in **Section 2.2)** to inform the pattern of coastal development. Likewise, historic planning has informed the nature and scale of the Amberton foreshore master plan, which provides for a local beach with local facilities.

In accordance with the SCPP measures, the Amberton FMP and adjacent residential development has been planned to complement and enhance the natural environment including:

- Making use of coastal views through the use of lookouts and coastal café.
- Revegetation and dune stabilisation to improve environmental values within the Amberton foreshore reserve.
- Locating structures, facilities and pathways within historically degraded (cleared) areas within the Amberton foreshore reserve, with consideration of coastal hazards.

8.2 Water resources and management

The SCPP measures for water resources and management specify that coastal development should manage water resources in accordance with water sensitive urban design and integrated water cycle management. Specifically the Amberton FMP has responded to the SCPP measures through:

- Locating all stormwater treatment areas outside of the Amberton foreshore reserve.
- Having major events (greater than 1:10 year events) progress through overland flow paths into the Amberton foreshore reserve without requiring substantial modification of the natural dune system.
- Locating the sewer pump station and emergency overflow outside of the Amberton foreshore reserve.

8.3 Building height limits

There are no specific SCPP measures for building height limits that apply to the Amberton FMP given that an endorsed LSP exists and green title residential development is proposed.

8.4 Coastal hazard risk management and adaptation planning

A coastal hazard risk management and adaptation plan (CHRMAP) has been accommodated into the Amberton FMP and is dealt with in detail in **Section 10.**

8.5 Infill development

The site is not subject to infill development and therefore the infill development policy measures do not apply. Nevertheless, the Amberton FMP has responded to policy measures associated with the development which may be subject to coastal hazard over the planning timeframe, as discussed in **Section 10**.

8.6 Coastal protection works

No coastal protection works are proposed as part of the Amberton FMP.

8.7 Public interest

The local Amberton community has been informed of the development of the Amberton FMP through community consultation and meetings. In accordance with this SCPP measure, public access will be provided to the coast at regular intervals along the length.

Through subdivision and subsequent development of the Amberton Estate, the Amberton foreshore reserve will be sequentially ceded to the Crown (to be managed by the City of Wanneroo) as a public asset. The implementation of development will facilitate the creation of the foreshore reserve, facilitating legal public access and use of the foreshore and beach.

8.8 Coastal foreshore reserve

A coastal foreshore reserve has been historically determined based upon a coastal processes setback as determined by a technical assessment undertaken by M.P. Rogers in 2011, as discussed in **Section 3.8.** In accordance with this SCPP measure the coastal foreshore is proposed to be vested with the relevant local government for the purpose of coastal foreshore management, public access, recreation and conservation. The extent of the coastal foreshore reserve was formalised through the endorsement of the Eglinton LSP in February 2013.

In addition, the Amberton FMP coastal foreshore reserve provides for a clear demarcation between public and private land.

8.9 Coastal strategies and management plans

This FMP has been prepared to address this SCPP measure and will be reviewed and ultimately accepted by the City of Wanneroo and the WAPC. In accordance with this policy, Stockland will be responsible for the implementation of the Amberton FMP as well and the funding, maintenance, monitoring and management of foreshore works for a period of not less than five years.

8.11 Precautionary principle

In accordance with this policy measure, the Amberton foreshore management plan has aimed to avoid any significant environmental impacts and to reduce any other environmental impacts. The proposed development will not pose any significant threat to the environment and overall, through revegetation and stabilisation there will be significant improvements to the environmental and biodiversity values of the foreshore reserve. Development within the foreshore that is consistent with this FMP will not cause significant harm to the environment.

9 Implementation, Developer Maintenance and Handover

9.1 Implementation

An implementation schedule for the implementation of the foreshore management plan has been provided below (**Table 10**). It should be noted that development applications and/or landscape approval will be required for works within the Amberton foreshore reserve, which will provide a greater level of detail than provided within this FMP. Furthermore, it should be acknowledged that there may be some minor changes to the development elements incorporated into this FMP due to detailed engineering, drainage or subdivision design and approval process.

The preparation of development applications for foreshore works provides an approval process to consider these detailed designs and changes; however Council and WAPC will have regard to the concepts and general intent of this FMP when considering development applications and/or landscape approvals.

In terms of staging, it is acknowledged that staging and handover of areas will need to take into consideration the location of groundwater bores (for irrigation) and the distribution of use of groundwater from these. To facilitate multiple stages of handover there will need to be multiple bores.

9.2 Developer maintenance and practical completion

Developer maintenance refers to the period in which the developer, Stockland will maintain the foreshore reserve following practical completion of works (on a staged basis).

Practical completion relates to when landscaping construction and revegetation works have been completed in accordance with the Amberton FMP and in accordance with the detailed landscape plans. Prior to the City of Wanneroo undertaking inspection of the foreshore reserve works, the following information will be provided:

- As constructed landscape plans in PDF format, in DWG format and A3 hard copy.
- Bore installation details, controller manuals and software.
- As constructed electrical plans in PDF format, in DWG format and A3 hard copy of all.
- Electrical certification for lights, BBQ, bore cabinet etc.
- Copy of current bore licenses (license to take water).
- Certification for playground and playground audit (required upon installation prior to practical completion and on an annual basis thereafter).
- Building permits where required for structures.
- As-constructed irrigation plans in PDF format, in DWG format and A3 hard copy of all.

Following a final inspection by the City of Wanneroo additional detail will be provided on:

- Capital costs of all physical assets for inclusion in City of Wanneroo's asset register.
- 12-month maintenance schedule and estimate of annual maintenance costs.

The maintenance expectations for areas of public open space are clearly outlined in the City of Wanneroo *Local Planning Policy 4.3 Public Open Space* (2010). The requirements for maintenance of foreshore reserve are expected to be similar; however foreshore reserves are expected to be maintained by the developer for five years in accordance with SCPP.

The City of Wanneroo *Local Planning Policy 4.3 Public Open Space* (2010) notes the following are required for maintenance of public open space:

- *the City being satisfied that the maturity of vegetation, density of planting, species selection and standard of infrastructure are consistent with that specified in the landscaping plan approved by the City, as being acceptable for handover to the City;*
- *for at least 12 consecutive months prior to handover, the developer maintaining the POS to the same standard as it would otherwise be maintained by the City post-handover;*
- *the developer providing the City with annual metered bore water usage data for any irrigated public open space during the term of their maintenance period, to demonstrate compliance with the water licence allocation for that area; and*
- *the developer providing the City with as-constructed drawings and asset management data for the public open space and any facilities/infrastructure contained therein.*

During the developer maintenance period, infill planting, weed control and fencing repair will be undertaken over revegetation areas based upon monitoring undertaken by the revegetation contractor. The five year maintenance period for the foreshore reserve will allow significant establishment of native species, plus ongoing weed control.

9.3 Handover

Following the five year maintenance period, as outlined in **Section 7.9** above, areas of the foreshore will be handed over for ongoing management and maintenance by the City of Wanneroo. As a part of the formal handover process and to assist with the on-going maintenance, Stockland will provide the following:

- All bore licences applications to be lodged and transferred to the City of Wanneroo prior to handover, with appropriate electrical certification being provided on installation completion. Stockland to complete a *4t – Transfer a Bore Licence* and submit a cheque to City of Wanneroo to cover the costs of bore licence transfer. Stockland to provide City of Wanneroo with a copy of existing bore licence/s.
- Electricity transfer process (if applicable), with Stockland to pay the final electricity account and forward invoice copy to the City of Wanneroo's who will arrange for account details to be transferred to City of Wanneroo account name.
- Playground audits (required annually) and rectifications for the maintenance period are to be handed to City of Wanneroo (five years of playground maintenance will incur five playground audits).
- Details of the areas maintained.
- Revised 12-month maintenance schedule and estimate of annual maintenance costs.
- Maintenance specifications.
- OSPEC (survey).

The long term management and maintenance of the foreshore reserve is discussed further in **Section 11.**

Table 10 Amberton FMP Implementation schedule for developer

ACTION	LOCATION (AS SHOWN ON FIGURE 10)	TIMING/ TIMEFRAME	DESCRIPTION OF WORKS:		
			PRE-CONSTRUCTION IMPLEMENTATION	CONSTRUCTION IMPLEMENTATION	POST-CONSTRUCTION IMPLEMENTATION AND MONITORING
Construction management					
Temporary fencing of conservation and rehabilitation areas to prevent unauthorised access.		To be installed pre construction and removed post construction on a staged basis.	Install fencing around areas of native vegetation proposed to be retained. Where necessary this should be wind-break fencing standard to prevent sand drift.	Regularly inspect fencing and provide maintenance where required.	Remove fencing around site and dispose of appropriately Replace fencing around conservation areas with adequate long-term fencing.
Rehabilitation/ecological restoration					
Control and reduce the presence of weeds within conservation areas within the foreshore.	As shown on the Foreshore Management Plan (**Figure 10**). Foreshore management zones 2 and 3.	To be undertaken concurrent with revegetation works on a staged basis.	Weed control requirements will be assessed by a revegetation contactor and targeted in areas proposed for revegetation.	Weed control works will be undertaken seasonally in spring and autumn.	Ongoing weed control and infill revegetation should be undertaken during the maintenance period.
Stabilise degraded areas of foreshore (blow outs) to reduce ongoing erosion.	As shown on the Foreshore Management Plan (**Figure 10**).	To be undertaken concurrent with foreshore works on a staged basis.	Review degraded areas and determine appropriate stabilisation techniques.	Implement stabilisation techniques using soft engineering techniques (mulch, brushing, sand trap fencing and matting). Undertake re-contouring and earthworks if required.	Monitor stabilisation techniques and re-adjust if required until handover.
Undertake revegetation with native coastal species.	As shown on the Foreshore Management Plan (**Figure 10**).	To be undertaken as part of foreshore works on a staged basis.	Review revegetation requirements (direct seeding or tubestock planting) and determine seedling orders.	Undertake soil preparation and planting/seeing.	Monitor revegetation works and undertake maintenance works as required until handover.
Landscape treatments					
Undertake installation and construction of soft landscape treatments including tree, shrub, ground cover and turf planting.	Shown indicatively in the foreshore management plan in publicly accessible areas.	To be undertaken as part of foreshore works on a staged basis.	Undertake design of landscape treatments.	Implement soft landscape treatments.	Monitor landscape treatments and provide maintenance as required until handover.
Foreshore access					
Install dual use paths and boardwalks.	As shown on the Foreshore Management Plan (**Figure 10**).	To be undertaken as part of foreshore works on a staged basis.	Undertake design of pathways and networks.	Implement construction of dual use paths and boardwalks.	Monitor pathways and boardwalks and provide maintenance as required until handover.
Restrict and reduce uncontrolled access.	As shown on the Foreshore Management Plan **(Figure 10**).	To be undertaken prior to foreshore works as required.	Install barriers to uncontrolled access.	Review barriers throughout construction and repair/upgrade as required.	Continue to monitor uncontrolled access throughout maintenance period.
Install car park and emergency beach access.	As shown on the Foreshore Management Plan (**Figure 10**).	To be undertaken as part of foreshore works on a staged basis.	Undertake detailed design of car park and emergency beach access.	Construct car park and emergency beach access.	Monitor car park and emergency beach access.
Install permanent fencing to restrict access and protect native vegetation.	As shown on the Foreshore Management Plan (**Figure 10**).	To be undertaken as part of foreshore works on a staged basis.	Undertake detailed design of fencing to City of Wanneroo standards.	Construct fencing.	Monitor effectiveness of fencing and make repairs as necessary.

Amenities and structures					
Install amenities and structures for users of the Amberton foreshore reserve including: • Signage, • Shelters/shade structures • Beach showers and foot tap • Drink taps • Bicycle racks • Bins; • Feature fencing or artwork • Feature walling • Seating and rest points	As indicated in the Foreshore Management Plan (**Figure 10**).	To be undertaken as part of foreshore works on a staged basis.	Undertake detailed design of amenities and structures and submit for approval.	Implement structures and facilities	13 week consolidation period for all soft works. 12 month consolidation period for all hard works. 5 year developer maintenance period from date of practical completion
Control the spread of weeds within the area of native vegetation to be retained in conservation/passive public open space.	As shown on attachment **Figure 10**.	Pre, during and post construction, with continued ongoing maintenance.	Areas of vegetation to be retained in conservation/passive public open space should be assessed for weed abundance, and where possible treated and rehabilitated with local native species.	Ongoing monitoring and maintenance of conservation /passive public open space areas should be undertaken to prevent the spread of weeds, particularly during phases when construction will occur close to conservation areas.	Monitoring of rehabilitated areas should be undertaken in accordance with the Rehabilitation Plan Undertake ongoing weed management of the conservation/passive public open space areas.

10 Coastal Hazard Risk Management and Adaptation Plan

State Planning Policy 2.6: State Coastal Planning Policy (2013) specifies that a Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) should be undertaken to support proposed development in coastal areas.

In accordance with SCPP, the CHRMAP process should include:

- Context for the CHRMAP.
- Identification of risks and vulnerability.
- Analysis and evaluation of risks.
- Risk management and adaptation options.
- Monitoring and review process.
- Communication and consultation process.

The CHRMAP process should adopt risk management framework to identify, evaluate and manage appropriate responses to coastal hazards, including inundation, storm surge and sea level rise. The sections below outline the CHRMAP that has been undertaken to support the Amberton FMP and specifically the provision of new assets or infrastructure within the Amberton foreshore reserve, within the nominated coastal processes setback.

The City of Wanneroo are planning to undertake a CHRMAP over the entire coastline within their local government area in the near future and as such, this CHRMAP has been developed so as to provide suitable input into this broader, regional scale hazard risk management and adaptation planning process.

10.1 Context

The approach adopted for the Amberton CHRMAP has been to assess the proposed assets in the foreshore reserve, in the context of a dynamic coastal environment around defined coastal process considerations. The Amberton CHRMAP considers the assets and infrastructure which are proposed to be located within the Amberton foreshore reserve and provides the City of Wanneroo with a framework to respond to the influence of coastal processes (including erosion and storm surge inundation) over a 100 year planning timeframe.

Local governments with existing coastal foreshore reserves and existing assets adopt a simplified coastal hazard adaptation process, whether this process is formalised or not, which involves responding and adapting to changes in the coastal zone, particularly those which occur following significant winter storms.

Existing CHRMAPs within Western Australia and Australia have generally been undertaken for existing coastal assets and infrastructure where the management imperative relates to the vulnerability and exposure of private assets (coastal homes) and infrastructure that may be affected by coastal processes. In this context, the CHRMAP process also deals with community expectations around existing assets and infrastructure and the persistence of these structures and facilities over time.

The proposed implementation of the Amberton FMP provides a different context where proposed new coastal assets can be located, developed or constructed in a way to account for future coastal processes and therefore respond to likely hazards.

Section 7 in Schedule 1 of the SCPP states that it "*is recognised that in circumstances…development may need to occur within an area identified to be potentially impacted by physical coastal processes within the planning timeframe".* Specifically the SCPP identifies that public recreation facilities with finite lifespan (less than 30 years) are appropriate to be located in areas of foreshore which may be affected by physical coastal processes in the long term (i.e. the planning timeframe of 100 years). This is on the proviso that any assets can be removed or modified should they be threatened by coastal hazards.

In addition, the SCPP states that coastally dependent or easily relocatable development is also acceptable within an area likely to be affected by coastal processes.

Generally the overarching objectives within the Amberton FMP have been to:

- Provide access to the beach at suitable intervals.
- Provide emergency beach access at the designated swimming beach.
- Provide facilities and amenity in line with community's expectation for a local beach.
- Conserve, stabilise and enhance coastal dune habitat.

These objectives have been central when progressing the CHRMAP process for assets and infrastructure within the foreshore reserve at Amberton, particularly adaptation responses which can be adopted to meet these objectives in the longer term.

10.2 Coastal hazard risk identification and vulnerability assessment

10.2.1 Coastal hazards

The coastal hazards which are relevant for the Amberton foreshore reserve include inundation and erosion from various coastal processes including sea level rise, tides, storm surges, waves and wind. These hazards apply at differing time scales with differing severity. Shoreline movement analysis shows that shoreline movement at the site has been characterised by recession over the longer term (M.P. Rogers 2011) and minor localised erosion of the primary dune was observed a during detailed site inspection in 2012.

Currently a 10 to 20 m high primary dune provides some protection from coastal hazards particularly winter storm events and offshore reefs also reduce the influence of storm surge, wind and waves on the foreshore.

10.2.2 Exposure to coastal processes over time

As outlined in **Section 3.8**, a coastal processes setback was determined based upon the 2003 SCPP, which was then used to delineate the foreshore reserve for the Eglinton LSP.

Further to this, and in accordance with the 2013 SCPP, a technical assessment was undertaken to determine the coastal processes setback at three different timeframes; 30, 50 and 75 years. This assessment included the S1, S2 and S3 components as well as a 0.2 m / year allowance for uncertainty (M.P. Rogers and Associates 2013). This provides an assessment of the likely shoreline vulnerability at several timescales over the 100 year planning window and the coastal process setbacks (i.e. indication of vulnerability) for these timeframes are provided in **Figure 13**. This assessment also included a calculation of the S4 storm surge inundation allowance and recommended minimum development levels. Accordingly the recommended minimum development level was 3.4 m AHD.

By breaking down the coastal processes assessment into separate temporal sequences, the potential vulnerability of different assets can be evaluated over time. These impacts can then be considered in conjunction with the value and lifespan of the asset to ascertain whether an asset's position within the foreshore reserve is appropriate. Furthermore through monitoring and measurement (see **Section 10.6**) the actual impact over time can be evaluated and compared to the predicted scenarios.

There is a degree of uncertainty when estimating the future vulnerability based upon the frequency of storms and future climate change scenarios. For context an "almost certain" scenario, which provides an indication of the likely minimum shoreline recession over time, has been determined. This "almost certain" scenario is based upon historical shoreline movement plus an estimate of potential shoreline recession due to sea level rise based upon a site specific application of the Bruun rule (using the Amberton foreshore beach slope profile). This "almost certain" coastal vulnerability assessment has been determined for the Amberton foreshore reserve for the 30 year period (see **Figure 13**). This has been included to provide a range to the 30 year coastal vulnerability assessment and demonstrate the level of uncertainty associated with estimating coastal vulnerability and likely future shoreline recession.

10.2.3 Structures and exposure

This CHRMAP specifically considers the proposed assets and infrastructure within the foreshore reserve.

As a local beach, the assets and infrastructure subjected to future physical coastal processes will be limited to assets that are defined as coastally dependent or easily relocatable under the SCPP. Specifically the functions, assets and infrastructure that have been considered as part of this CHRMAP include:

- Car park within the Amberton foreshore reserve
- Southern node, specifically a relocatable café facility
- DUP, pedestrian paths and boardwalks
- Emergency vehicle beach access
- Flood storage areas
- Foreshore reserve structures (such as seating, playgrounds, drinking fountains, bins, shelters, bicycle racks)
- Beach showers
- Lookouts.

The location of these assets within the Amberton foreshore reserve, with the 30, 50 and 75 year coastal processes/vulnerability extent is provided as **Figure 13**. Exposure of these assets to future vulnerability from coastal processes has been limited by locating the majority of these assets behind the fore dune, which will provide some protection from storm surge (and sea level rise), at least in the short term. The DUP system and pedestrian paths are also generally located by the secondary dune providing additional protection for this infrastructure over time. In addition, a series of offshore reefs west of the site also provide protection from storm surge and wave action. Furthermore the majority of development (other than beach access) has been allocated above the 3.4 m AHD storm surge inundation level and therefore is unlikely to be affected by storm surge for the duration of the planning period.

The coastal café facility is located seaward of the 30 year coastal vulnerability extent, but will be specifically equipped to be easily relocated and/or removed and the construction, servicing, siting,

tenure and leasing arrangements will be cognizant of this (as outlined in **Section 7.7.4**). The café will be subject to a specific Development Approval and conditions to be agreed with the City of Wanneroo to accommodate these considerations.

10.2.4 Sensitivity and adaptive capacity

The assets and infrastructure proposed for the Amberton foreshore reserve are generally low to medium cost assets which will be ultimately owned and maintained by the local government. While the assets may be sensitive to coastal hazards, they have a high adaptive capacity as they are easily removed or relocated and have relatively short lifespans from an asset management point of view. The location of these assets, their materials and construction will be cognizant of the coastal environment to minimise ongoing maintenance requirements.

10.3 Coastal hazard risk analysis and evaluation

The analysis of coastal hazard risk needs to consider the likelihood and consequence of the coastal hazard risks for the Amberton foreshore reserve. The likelihood represents the chance of erosion and or storm surge inundation affecting the future assets and infrastructure, while the consequence represents the impact that erosion or storm surge inundation will have on the social, economic and environmental benefits of a particular asset or feature. An example consequence table is provided in **Table 11**.

Table 11 Example consequence scale for coastal hazards (adapted from Ministry for the Environment and Wollongong Coastal Zone Management Plan).

RATING	SOCIAL	ECONOMIC	ENVIRONMENT
Catastrophic	Loss of life and serious injury. Large long-term or permanent loss of services, employment wellbeing, finances or culture (e.g. > 75% of community affected), international loss, no suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances >$5 million	Permanent loss of flora and fauna (no chance of recovery) with national impact.
Major	Serious injury. Medium term disruption to services, employment wellbeing, finances or culture (e.g. < 50% of community affected), national loss, very limited suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances > $2 - $5 million	Long-term loss of flora and fauna (limited chance of recovery) with regional impact.
Moderate	Minor injury. Major short term of minor long-term disruption to services, employment wellbeing, finances or culture (e.g. < 25% of community affected), regional loss, limited suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances > $100,000 - $2 million	Medium-term loss of flora and fauna (recovery likely) with regional impact.
Minor	Small to medium disruption to services, employment wellbeing, finances or culture (e.g. < 10% of community affected), local loss, many suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances > $10,000 - $100,000	Short-term loss of flora and fauna (strong recovery) with local impact.
Insignificant	Minimal short term inconveniences to services, employment, wellbeing, finances or culture (e.g. < 5% of community affected), neighbourhood loss, many alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances < $10,000	Negligible to no loss of flora and fauna (strong recovery) with local impact.

The likelihood and consequence can then be used to evaluate risk in accordance with a risk management matrix as shown below in **Table 12**.

Table 12 Risk matrix (adapted from Coffs Harbour Coastal Zone Management Study)

LIKELIHOOD	CONSEQUENCE				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Low	Low	Low	Medium	High

A specific risk evaluation for the CHRMAP has not been completed because:

- In accordance with SCPP, the coastal assets and infrastructure proposed are "coastally dependent", "easily relocatable" or "public recreation facilities with a finite life span". There is recognition within the SCPP that these assets could be impacted by coastal processes and the consequences of coastal hazard impacts on this infrastructure is minor.
- These assets are mostly low cost assets (less than $50,000 replacement value[1]) and therefore the consequence of erosion and storm surge inundation on these assets is generally "minor" or "insignificant" in accordance with **Table 11**.
- These assets generally have a design life of 30 years or less which allows the assets to be relocated or removed prior to coastal hazard impacts.
- There is no essential infrastructure or assets proposed within the Amberton foreshore reserve (e.g. transport infrastructure, water or sewerage infrastructure, residential development or other essential infrastructure (hospitals and schools)).
- Impacts on the community are considered to be relatively minor given the assets and infrastructure are associated with a local beach and "Minor" in accordance with **Table 11.** Amenity is provided within nearby public open space associated with the development and will be provided in future regional beaches to the north (Shorehaven coastal node) and south (Eglinton marina node).
- Adaptation measures are provided as part of this CHRMAP and can be accommodated into the planning, monitoring and maintenance of the foreshore reserve (i.e. retrofitting is not required). This provides clear expectations around the lifespan and temporary nature of assets and infrastructure which can also be included into any community consultation process.

It is therefore considered that overall the risk evaluation for the proposed coastal assets and infrastructure would generally be medium to low and as such the risk is acceptable.

Furthermore as part of developing a CHRMAP for the City of Wanneroo, officers within the City have developed a draft "asset value matrix" which assigns asset value based upon estimated monetary

[1] **The proposed café within the Amberton foreshore reserve is expected to cost in excess of $50,000 replacement value. This structure will be subject to a separate approvals process and will be specifically designed to be relocated. Further information on the café design, construction and tenure arrangements is found in Section 7.7.4.**

value, where low assets are <$50,000, medium value assets are $50,000 - $300,000 and high value assets are greater than $300,000.

Further to this, the value and lifespan of coastal assets has been used to develop a “minimum” setback value for a number of specific coastal assets within a local beach as shown in **Table 13** below.

Table 13 City of Wanneroo local beach assets and minimum setbacks.

ASSET	ASSET VALUE ($)	STRUCTURAL LIFESPAN (YEARS)	MINIMUM SETBACK (YEARS)
Public Ablutions	Medium	50	50
Car parking (20 bays)	Medium	Resurfacing required every 25-50 years. Indefinite lifespan if resurfaced.	50 (allows for resurfacing in 25)
Small park	Medium	Indefinite	75
Small playground	Medium	20	40
Lookout shelter	Medium	40	40
Picnic table	Low	20	20
Drinking fountain	Low	20	20
Seat	Low	20	20

The majority of coastal assets within the Amberton FMP are compliant with these setbacks (as discussed in **Section 10.4**) and therefore it is considered that the risk to the assets is acceptable.

10.4 Coastal hazard risk adaptation

In accordance with the *State Coastal Planning Policy Guidelines* (WAPC 2013), a CHRMAP typically involves an adaptation hierarchy, which includes four main categories. These four adaptation categories and relevant considerations for the foreshore reserve are detailed in **Table 14** below.

Table 14 CHRMAP adaptation hierarchy and measures relevant for the foreshore reserve (adapted from WAPC 2013).

ADAPTATION HEIRARCHY	MEASURES RELEVANT FOR THE FORESHORE RESERVE
Avoid	• Avoiding development within primary and fore dunes and low lying coastal areas.
Planned or managed retreat	• Removal of infrastructure as they become at risk by coastal hazards. • Prohibiting high value developments and infrastructure in at risk areas in favour of low cost activities (such as recreation, etc). • Retaining public coastal land in public ownership.
Accommodate	• Locating development on least hazardous portion of the site. • Reducing the footprint of the proposed building, and shifting the footprint away from the hazard. • Be designed to be durable and effective for the estimated time period and/or have reasonably well known maintenance and operating costs for the design period. • Indicate the anticipated response at the end of the estimated extended period when risks again approach intolerable levels. • The design of temporary or relocatable structures, or structures that could be readily repaired or reinstated following the impacts of the likely coastal hazards.
Protect	• Dune management. • Emergency management • Construction methods or materials that reduce the consequences of inundation and/or reduce the costs of relocation.

The CHRMAP process for the Amberton FMP has been based on a list of assets, the risk management and adaption options, monitoring and triggers. Given a coastal hazard risk evaluation has not been completed, an alternative (or worst case) adaptation mechanism is also provided. A summary of the CHRMAP for the foreshore reserve is provided as **Table 15** and the potential impacts on coastal assets and infrastructure over three separate timescales (30, 50 and 75 years) is provided on **Figure 13**. Assessment at three separate timescales, allows progressive assessment of the assets, which is appropriate to their cost and lifespan, rather than requiring all assets to be located beyond the coastal processes setback, at which point their value as a “coastal” asset is reduced.

The design and layout of the Amberton FMP has been primarily based on an approach whereby all assets and infrastructure have been located outside of the 30 year coastal processes setback (except beach access, beach showers and the proposed café). Therefore the Amberton FMP has primarily used the adaptation measure of “avoid” to setback assets and infrastructure to ensure that this infrastructure is present for at least 30 years in accordance with the SCPP. This also provides a 30 year window to consider the level and extent of shoreline recession and modify adaptation measures as required.

Following this 30 year timeframe, the majority of these assets would then adopt the “planned/managed retreat” adaptation mechanism, due to the fact that they are low-value coastal assets located in an area subject to coastal processes, where retreat is the most sensible option. These assets also have a limited asset life span (generally less than 30 years) which allows planned/managed retreat to occur naturally over time, where assets are simply not replaced at the end of their life span in conjunction with shoreline recession. This progressive assessment is appropriate for coastal assets, as their value is inextricably linked to their proximity to the beach. Facilities will also be provided in other areas of POS within the Amberton Estate.

The “accommodate” option would also be adopted as an adaptation mechanism through the detailed design and construction of assets and the materials used. Similarly, ongoing maintenance and inspection of coastal assets will allow accommodation of coastal processes, where by temporary and minor impacts (sand drift, inundation) can be managed.

Furthermore the extensive revegetation and stabilisation works provided within the foreshore reserve (particularly within the primary dune) will also “protect” coastal assets and infrastructure at least in the short to medium term. Likewise the presence of Tamala limestone below the Safety Bay sand may also serve to reduce the extent of coastal shoreline recession and provide some protection to coastal assets and infrastructure. This is not specifically referred to in the CHRMAP summary (see **Table 14**), however would be applicable to all assets and infrastructure located within the foreshore reserve, and may mean that the costal processes setbacks are conservative given the shoreline is inherently more stable than adopted in the costal processes setback scenarios.

None of the proposed assets within the Amberton foreshore reserve are proposed to be protected through beach nourishment or replenishment or through the construction of seawalls or groynes, however revegetation and stabilisation of the fore dune as part of the implementation of the Amberton FMP will provide some protection to coastal assets and may reduce the severity of coastal hazards, at least in the short to medium term as outlined above.

Some assets, such as the café node and/or car parking can be relocated (also a “planned/managed retreat” adaptation option) to provide these facilities over the longer term. These facilities are discussed in more detail in the sections below.

The approach for triggers and monitoring has been to incorporate coastal hazard monitoring into the current maintenance program of assets and infrastructure. Coastal shoreline recession and storm surge inundation are gradual processes which can be routinely monitored over time. Initially, winter storms may lead to increased sand drift or dune movement, followed by gradual de-stabilisation of the fore dune. Following this, strong south westerly winds (particularly in summer) may result in large sand drift events following the removal of vegetation from the fore dune, which may then lead to increased sand accumulation in areas behind the fore dune.

Inspection of coastal assets and the shoreline following severe winter storms will provide an indication of the progressive impacts and threats from coastal hazards and severity of these hazards on areas of the foreshore. In this way, the triggers provided in **Table 15** do not mean that adaptation responses have to be undertaken immediately but rather they provide feedback that more regular and focused inspection, maintenance and monitoring may be required. In particular, the monitoring and triggers for the 50 and 75 year scenarios are expected to be revised over time based upon coastal hazard impacts observed (particularly during the first 30 years) and the broader regional CHRMAP process being undertaken by the City of Wanneroo.

The interface between the foreshore reserve and the development (such as any regrading within the foreshore reserve) is not considered to be coastal infrastructure as it is only required to integrate the levels from the public road appropriately back to the foreshore landform and is not essential to the operation of the development (i.e. the structural integrity of the road). The development boundary road, parallel carparking and areas of POS immediately adjacent to the foreshore reserve are required to be integrated into the existing coastal landform within the foreshore reserve. A mixture of soft and hard engineering techniques are proposed to manage this interface, and these will be specific to the coastal landform and landform stability within the foreshore reserve. In this way, it is the coastal

landform and stability which will drive the interface treatments. Given this, the interface between the foreshore reserve and the development has not been included within this CHRMAP.

10.4.1 Proposed car park

The proposed car park in the foreshore reserve provides improved beach accessibility for people with disabilities, young children and the elderly. The proposed car park has been located behind the extent of 50 year coastal processes vulnerability and in accordance with the current SCPP can be described as a public recreation facility with a finite lifespan. Typically a car park requires resealing every 25 – 30 years and following discussions with the City of Wanneroo, it was considered that a minimum 50 year lifespan was appropriate for a coastal car park (as outlined in **Table 13**).

As such, after 50 years, the proposed car park is likely to be affected by physical coastal processes, although the frequency and speed at which these influence the structure of the car park is not currently clear or easily predictable. Should the fore dune erode, sand drift will first become visible in the car park, particularly after severe winter storm events. Initially, general maintenance and repair will allow the car park to continue to be used, although being affected by coastal processes.

Should the coastline recede, the beach and swimming areas will be closer to the development and it is expected that the requirement for car parking will decrease as the distance to the beach becomes more easily walkable. Furthermore the staging of development will mean that over time, there are more beach users within walking and cycling distance to the foreshore.

In order to accommodate the car parking spaces provided by the coastal car park outside of the foreshore reserve, one adaptation measure is to provide a portion of road reserve (located adjacent to the southern POS area within the Amberton development) for car parking at the appropriate time (**Figure 13**). The requirement for additional car parking is expected to be determined by the City of Wanneroo and may be influenced by the location (and presence) of the coastal café (see **Section 10.4.2**).

As the beach interface moves closer to the car park, the car park will continue to provide an option for emergency access to the beach (following potential erosion of the proposed emergency access which extends from the end of the car park road), assuming that this area is still suitable for swimming (and therefore requires emergency beach access).

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Table 15 CHRMAP summary

ASSETS	PLANNING TIMEFRAME 30 YEARS				PLANNING TIMEFRAME 50 YEARS				PLANNING TIMEFRAME 75 YEARS			
	RISK MANAGEMENT AND ADAPTATION OPTIONS	**MONITORING**	**TRIGGERS**	**ALTERNATIVE RESPONSE (WORST CASE)**	**RISK MANAGEMENT AND ADAPTATION OPTIONS**	**MONITORING**	**TRIGGERS**	**ALTERNATIVE RESPONSE (WORST CASE)**	**RISK MANAGEMENT AND ADAPTATION OPTIONS**	**MONITORING**	**TRIGGERS**	**ALTERNATIVE RESPONSE (WORST CASE)**
Car park within foreshore reserve	**Avoid.** Asset has been located outside of the 50 year coastal processes setback. This is in accordance with the CoW requirements (**Table 13**). **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required. Removal of sand through street sweeping or mechanical removal.	Car park to be inspected following severe winter storms as part of general car park maintenance.	Sand drift into car park. Erosion/inundation visible at western portion of car park	Restrict access to car park at affected locations.	**Avoid.** Asset has been located outside of the 50 year coastal processes setback. This is in accordance with the CoW requirements (**Table 13**). **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required. Removal of sand through street sweeping or mechanical removal	Car park to be inspected following severe winter storms as part of general car park maintenance.	Sand drift into car park. Erosion/inundation visible at western portion of car park	Restrict access to car park at affected locations.	**Planned/Managed retreat.** Asset has been designed to allow retreat through materials and siting. **Accommodate.** Ongoing maintenance will enable repair of asset as required. Removal of sand through street sweeping or mechanical removal.	Car park to be inspected following severe winter storms as part of general car park maintenance and retreat signage/access updated accordingly	Sand drift into car park. Erosion/inundation on visible in car park. Public reporting.	Close off entire car park.
Café Node	**Planned/Managed retreat.** Cafe to be designed to allow for removal and located near 20 year coastal processes setback. Lightweight frame to enable easy dismantling (and reuse) of structure. Other structures within node will be removed and replaced (landward of 75 year coastal processes line) as required. **Accommodate.** Café asset designed for coastal conditions	Café owner to observe coastal changes and report to council. Review location of shoreline periodically and determine if lease extension can be granted. Other Public Open Space structures (shelters, bbqs) to be monitored as part of standard City of Wanneroo maintenance.	Sand drift. Visible erosion of fore dune in front of café. Assets in poor physical state with rust, corrosion, damage etc.	Relocate café landward within designated lot. Remove café. Relocate public open space structures landward within designated lot. Remove public open space structures.	**Planned/Managed retreat.** Café asset to be designed to allow for removal. Lightweight frame to enable easy dismantling (and reuse) of structure. Assets can be relocated as appropriate. **Accommodate.** Café asset designed for coastal conditions. Public open space assets installed will most likely have a maximum lifespan of 30 years in this location.	Café owner to observe changes and report to council. Other Public Open Space structures (bbq, shelters) to be monitored as part of standard City of Wanneroo maintenance.	Sand drift. Visible erosion of fore dune in front of café. Assets in poor physical state with rust, corrosion, damage etc.	Relocate café landward within designated lot. Remove café. Relocate public open space structures landward within designated lot. Remove public open space structures.	**Planned/Managed retreat.** Café likely to be relocated by this timeframe. Relevant Public Open Space structures to be relocated or removed.			
Boardwalks	**Planned/Managed retreat.** Boardwalks designed & constructed to have components removed if dunes are eroded. Lightweight materials can be used to enable easy removal. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required.	Monitoring undertaken as part of standard boardwalk maintenance. Boardwalks to be inspected following severe winter storms as part of general maintenance.	Sand drift, fore dune movement, erosion beneath boardwalks due to water encroachment, access not available due to level changes	Removal of boardwalks with the replacement of pathways at grade (possibly not providing universal access).	**Planned/Managed retreat.** Boardwalks designed & constructed to have components removed if dunes are eroded. Lightweight materials can be used to enable easy removal. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required.	Monitoring undertaken as part of standard boardwalk maintenance. Boardwalks to be inspected following severe winter storms as part of general maintenance.	Sand drift, fore dune movement, erosion beneath boardwalks due to water encroachment, access not available due to level changes	Removal of boardwalks with the replacement of pathways at grade (possibly not providing universal access).	**Planned/Managed retreat.** Boardwalks designed & constructed to have components removed if dunes are eroded. Lightweight materials can be used to enable easy removal. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required	Monitoring undertaken as part of standard boardwalk maintenance. Boardwalks to be inspected following severe winter storms as part of general maintenance.	Sand drift, fore dune movement, erosion beneath boardwalks due to water encroachment, access not available due to level changes	Removal of boardwalks with the replacement of pathways at grade (possibly not providing universal access).

ASSET	PLANNING TIMEFRAME 30 YEARS				PLANNING TIMEFRAME 50 YEARS				PLANNING TIMEFRAME 75 YEARS			
	RISK MANAGEMENT AND ADAPTATION OPTIONS	MONITORING	TRIGGERS	ALTERNATIVE RESPONSE (WORST CASE)	RISK MANAGEMENT AND ADAPTATION OPTIONS	MONITORING	TRIGGERS	ALTERNATIVE RESPONSE (WORST CASE)	RISK MANAGEMENT AND ADAPTATION OPTIONS	MONITORING	TRIGGERS	ALTERNATIVE RESPONSE (WORST CASE)
Coastal paths	**Planned/Managed retreat.** Coastal paths constructed of long lasting materials (concrete and asphalt). **Accommodate** Multiple pathways provide north south connection through foreshore. Ongoing maintenance will enable repair/realignment of asset as required.	Monitoring undertaken as part of standard pathway maintenance. Pathways to be inspected following severe winter storms as part of general maintenance.	Sand drift, dune movement, inundated pathways	Relocation of pathways outside of the influence zone. Pathway outside of foreshore reserve (associated with foreshore road) can provide north south connection.	**Planned/Managed retreat.** The asset can be designed to be removed or not replaced in stages over time. **Accommodate.** Lifespan of coastal paths is less than 50 years, so upgrades will allow for staged removal and realignment. Ongoing maintenance will enable repair of asset as required.	Monitoring undertaken as part of standard pathway maintenance. Pathways to be inspected following severe winter storms as part of general maintenance..	Sand drift, foredune movement, inundated pathways	Relocation of pathways outside of the influence zone. Pathway outside of foreshore reserve (associated with foreshore road) can provide north south connection.	**Planned/Managed retreat.** The asset can be designed to be removed or not replaced in stages over time. **Accommodate.** Lifespan of coastal paths is less than 50 years, so upgrades will allow for staged removal and realignment.	Monitoring undertaken as part of standard pathway maintenance. Pathways to be inspected following severe winter storms as part of general maintenance.	Sand drift, foredune movement, inundated pathways	Relocation of pathways outside of the influence zone. Pathway outside of foreshore reserve can provide north south connection.
Emergency access	**Planned/Managed retreat.** Emergency access has been allowed to retreat over time while still providing access. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required.	Monitoring undertaken as part of standard maintenance. Access points inspected following severe winter storms as part of general maintenance.	Sand drift, dune movement, inundation.	Provide alternative emergency access. If required. Close off emergency access if unsafe.	**Planned/Managed retreat.** Future emergency access maybe provided by car park and coastal paths at southern coastal node. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required.	Monitoring undertaken as part of standard maintenance. Access points inspected following severe winter storms as part of general maintenance.	Sand drift, dune movement, inundation.	Evaluate requirement for emergency access. Close off emergency access if unsafe	**Planned/Managed retreat.** Future emergency access maybe provided by car park and coastal paths at southern coastal node. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required.	Monitoring undertaken as part of standard maintenance. Access points inspected following severe winter storms as part of general maintenance.	Sand drift, dune movement, inundation.	Evaluate requirement for emergency access. Close off emergency access if unsafe
Flood storage areas	**Avoid.** All treatment areas have been located outside of the foreshore only flows greater than 1:100 will enter into the Amberton foreshore reserve. Asset has been located outside of the 30 year coastal processes setback.	Flood storage areas to be inspected in accordance with City of Wanneroo standard maintenance.	Sand drift around flood storage area. Scouring of flood storage areas.	Repairs to flood storage areas as required.	**Avoid.** All treatment areas have been located outside of the foreshore, only flows greater than 1:100 will enter into the Amberton foreshore reserve. Asset has been located outside of the 50 year coastal processes setback.	Flood storage areas to be inspected in accordance with City of Wanneroo standard maintenance	Sand drift around flood storage area, inundation of flood storage areas, Scouring of flood storage areas.	Flood storage areas to be repaired/ stabilised as required.	**Planned/Managed retreat.** Only flow greater then a 1:100 has been contained within Amberton foreshore reserve. Large events to discharge via overland flow into dunes and eventually into ocean as per natural drainage system.	Flood storage areas to be inspected in accordance with City of Wanneroo standard maintenance.	Sand drift around flood storage area, inundation of flood storage areas, Scouring of flood storage areas.	Flood storage areas to be repaired/ stabilised as required.

ASSET	PLANNING TIMEFRAME 30 YEARS				PLANNING TIMEFRAME 50 YEARS				PLANNING TIMEFRAME 75 YEARS			
	RISK MANAGEMENT AND ADAPTATION OPTIONS	MONITORING	TRIGGERS	ALTERNATIVE RESPONSE (WORST CASE)	RISK MANAGEMENT AND ADAPTATION OPTIONS	MONITORING	TRIGGERS	ALTERNATIVE RESPONSE (WORST CASE)	RISK MANAGEMENT AND ADAPTATION OPTIONS	MONITORING	TRIGGERS	ALTERNATIVE RESPONSE (WORST CASE)
Public open space structures	**Avoid.** All public open space structures are located outside of the 30 year coastal processes setback. The City of Wanneroo recommends a minimum setback of 20 years for these structures(Table 14)	Monitored as part of standard City of Wanneroo maintenance.	Assets in poor physical state with rust, corrosion, damage etc.	Full removal of assets.	**Accommodate.** Public open space assets installed will most likely have a maximum lifespan of 30 years in this location. **Planned/Managed retreat.** Assets can be removed and not replaced or relocated as appropriate.	Monitored as part of standard City of Wanneroo maintenance.	Assets in poor physical state with rust, corrosion, damage etc.	Full removal of assets.	**Accommodate.** Public open space assets installed will most likely have a maximum lifespan of 30 years. **Planned/Managed retreat.** Assets can be removed and not replaced or relocated as appropriate.	Monitored as part of standard City of Wanneroo maintenance.	Assets in poor physical state with rust, corrosion, damage etc.	Full removal of assets
Lookouts	**Planned/Managed retreat.** Asset will be removed and not replaced over time. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required. The City of Wanneroo recommends a minimum setback of 40 years for lookouts, however proposed lookout structures are to be a flat platform extension of proposed boardwalks and are not considered to be “medium” value assets as assumed by the City of Wanneroo.	Monitoring undertaken as part of standard maintenance.	Sand drift, dune movement, inundation.	Full removal of assets.	**Planned/Managed retreat.** Asset will be removed and not replaced over time. **Accommodate.** Asset designed for coastal conditions. Ongoing maintenance will enable repair of asset as required.	Monitoring undertaken as part of standard maintenance.	Sand drift, dune movement, inundation.	Full removal of assets.	**Planned/Managed retreat.** Asset will be removed and not replaced over time. **Accommodate.** Asset designed to be durable for the time period.	Monitoring undertaken as part of standard maintenance.	Sand drift, dune movement, inundation.	Full removal of assets.
Beach showers	**Planned/Managed retreat.** Beach showers installed will most likely have a maximum lifespan of 20 years in this location. Assets can be relocated as appropriate. While the City of Wanneroo requires a 50 year coastal processes setback for public ablutions, this is not considered to include separate beach showers but rather a public toilet block (which is not proposed).	Monitored as part of standard City of Wanneroo maintenance.	Beach showers in poor physical state with rust, corrosion, damage etc.	Early relocation of assets.	**Planned/Managed retreat.** Beach showers installed will most likely have a maximum lifespan of 20 years. Assets are small and can be relocated as appropriate.	Monitored as part of standard City of Wanneroo maintenance.	Beach showers in poor physical state with rust, corrosion, damage etc.	Early relocation of assets.	**Planned/Managed retreat.** Beach showers installed will most likely have a maximum lifespan of 20 years. Assets are small and can be relocated as appropriate.	Monitored as part of standard City of Wanneroo maintenance.	Beach showers in poor physical state with rust, corrosion, damage etc.	Early relocation of assets.

10.4.2 Proposed café node

The café will provide a community node for Amberton and is co-located with the swimming beach, coastal carpark and emergency beach access.

The café facility is located on the leeward side of the primary dune and as such can be expected to be vulnerable to coastal processes within the 30 year planning timeframe. It is expected that the initial lease for this facility will be 10 years with a potential 10 year extension.

The café will be constructed of lightweight material that is practical and cost-effective to relocate (see **Plate 19**). The café will be specifically designed for relocation and subject to a separate Development Approval by the City of Wanneroo.

Furthermore, a separate elongated title will be created for this structure, which extends landward to proposed POS. This will enable the movement of this structure over time.

Any initial lease arrangements for the café (in the initial proposed location) should be established for a maximum of 20 years on a staged lease arrangement, however this can be reviewed and if shoreline movement or coastal erosion is not progressing consistent with predictions, there is an opportunity to renew and/or extend lease arrangements.

Further information on the café design, location, construction and tenure/lease arrangement is provided in **Section 7.7.4.**

Other public open space structures associated with the café node (beach showers, shelters, bike racks, bbqs and playground, as outlined in **Figure 10**) are also expected to be relocated over time as required, such that all relevant facilities of the café node are relocated.

10.5 Funding arrangements

Stockland will be responsible for the initial installation of structures, infrastructure and revegetation within the foreshore reserve. In accordance with the SCPP, areas of the foreshore will be managed by Stockland for a period of no less than 5 years. Further information on the implementation of the FMP is provided in **Section 9**.

The installation of commercial facilities (café) into the foreshore provides an opportunity for the City of Wanneroo to receive a profit from these facilities over time. The remaining facilities have been designed or located such that there are no excessive costs or resources outside of a normal monitoring and maintenance framework. Asset maintenance and replacement at the end of the asset life span will allow for planned/managed retreat as required. The long term monitoring and maintenance of the Amberton foreshore reserve is discussed further in **Section 11.**

10.6 Monitoring and review

The City of Wanneroo is currently proposing to undertake a CHRMAP that will cover the entire City of Wanneroo coastline. It is anticipated that this document will cover monitoring and review of the entire CHRMAP process on a regular basis. It will also be important to evaluate the change to coastal foreshore and compare this with predictions made in accordance with SCPP. Throughout the maintenance period, Stockland will make note of any observed changes to the shoreline, and monitor and record triggers in accordance with **Table 15**. This information will be provided to the City of Wanneroo at handover to provide information on the current impact of coastal hazards.

CHRMAP is a cyclical process, where ongoing monitoring and review allow the management and adaptation measures to be reviewed to ensure the management plan remains relevant. In this way adaptation measures can be altered over time and this will form part of the City of Wanneroo's long term CHRMAP process, which will extend well beyond the relevant timeframe for the implementation of this FMP.

10.7 Communicate and consult

Stockland will continue to update the local community on the foreshore, the coastal processes assessment and asset maintenance. Stockland currently undertakes monthly meetings with residents and provide weekly construction/approval updates. In the future, the foreshore works, plus the CHRMAP process will form part of this regular communication process.

Beyond the implementation timeframe for this FMP, it is expected that the City of Wanneroo will include a comprehensive communication and consultation strategy with all residents within the City of Wanneroo as part of their CHRMAP process.

11 Long term monitoring and maintenance

The maintenance requirements for the Amberton foreshore reserve will generally be consistent with current City of Wanneroo landscape maintenance requirements for coastal areas. An indicative landscape maintenance schedule outlined in **Table 16** for the foreshore reserve provides a general indication of maintenance tasks to be undertaken by Stockland during the maintenance period. A review of this schedule will be undertaken prior to the areas of foreshore reserve being handed over to the City of Wanneroo. This table provides a schedule of expected maintenance, including frequency of the action and yearly number of visits.

Table 16 Ongoing maintenance schedule for the Amberton foreshore reserve.

FORESHORE RESERVE ELEMENT AND/OR TASK	ACTIONS	FREQUENCY	NUMBER OF TIMES PER YEAR
Hard landscape including DUP, beach access, fencing, gates, pedestrian paths and boardwalks	Inspection	Monthly	12
	Repair	As required	As required
Furniture	Inspection	Monthly	12
	High pressure hosing	Annually	1
	Sealing of timber	Annually	1
	Repair	As required	As required
Irrigated turf areas (within passive recreation areas)	Mowing	Fortnightly (September – April) Monthly (May – August)	21
	Fertiliser	Annually (September)	1
	Top dressing	As required	As required
Weed removal (within passive recreation areas)	By hand	Monthly	12
	Chemical treatment	Annually	1
Flood storage areas	Inspection	Annually	1
	Plant removal and trimming	Annually	1
Garden beds within passive recreation areas	Inspection	Monthly	12
	Fertiliser	Biannually (February and September)	2
	Mulch replenishment	Annual	1
	Pruning and trimming	Every 6 months	2
	Weeding	Monthly	12
	Plant replacement	As required	As required
Trees within passive recreation areas	Inspection	Annually	1
	Pruning	As required	As required

FORESHORE RESERVE ELEMENT AND/OR TASK	ACTIONS	FREQUENCY	NUMBER OF TIMES PER YEAR
	Fertiliser	Biannually (February and September)	2
	Mulch replenishment	Annually	1
Irrigation	Inspection	3 times per week (September – April) Weekly (May to August)	123
	Flushing	Monthly (May – August)	4
	Repair	As required	As required
Playground	Inspection	Fortnightly	26
Soft fall	Clean (by hand)	Fortnightly	26
	Clean (mechanical)	Annually	1
Rubbish removal		As required	Every visit
Graffiti removal		As required	Every visit
Lighting	Maintenance, including bulb replacement.	As required	As required
Revegetation	Infill planting	As required. Planting to be undertaken in spring.	As required
	Weed removal	As required.	As required.

This routine maintenance schedule also provides an opportunity to review the potential impacts of coastal processes, such as sand drift, inundation and erosion (as outlined in **Table 15**). This is particularly important during the winter storm season when large changes to the shoreline may occur.

This routine maintenance schedule provides an opportunity to observe changes to the coastline and implement the adaptation measures outlined in the CHRMAP, such as the relocation and/or removal of coastal assets and infrastructure in accordance with **Table 15.** Relocation and/or removal of coastal assets and infrastructure as identified in the CHRMAP will also occur in accordance with the expected life span of coastal assets. Therefore no additional monitoring or maintenance is required beyond the City of Wanneroo's usual maintenance schedule for areas of foreshore reserve and public open space.

The development of a regional CHRMAP by the City of Wanneroo also provides an opportunity to undertake regular monitoring and review of a) ongoing coastal processes such as shoreline recession and b) the efficacy of adaptation measures across the entire local government area. It is anticipated that the regional CHRMAP will be reviewed on regular basis to ensure that the management and adaptation measures established remain relevant. The Amberton FMP CHRMAP is intended to be incorporated into the wider CHRMAP produced by the City of Wanneroo.

12 Conclusions

The Amberton FMP provides a framework to guide the planning, development, revegetation and management of the Amberton foreshore reserve. As part of preparing the FMP, a review of the historic planning and environmental investigations was undertaken to determine the opportunities and constraints presented by the foreshore reserve. SLSWA undertook a CARA which provided recommendations on the most appropriate location for a swimming beach.

This FMP has considered these opportunities and constraints to develop a foreshore management plan that provides controlled access to the coast, with activation and passive recreation opportunities and strategic lookouts to incorporate coastal views. Amenity is focussed on the southern coastal node (café node) with the provision of car parking, passive recreation areas and a café with public toilet facilities. The general location and layout of these works are provided within the Amberton master plan (**Figure 10**).

Management of the foreshore and the proposed development of the Amberton foreshore reserve are discussed in **Section 7**, which provides information on:

- Construction management
- Interface management
- Rehabilitation/ecological restoration of historic disturbance
- Fauna management
- Water management and Water Sensitive Urban Design (WSUD)
- Access
- Beaches
- Foreshore reserve amenities and structures
- Bushfire management
- Staging.

In accordance with the SCPP, Stockland will fund, monitor and maintain the foreshore works for a period of five years, and it is expected that portions of the foreshore will be handed over to the City of Wanneroo for ongoing maintenance on a staged basis. This will be subject to ongoing discussion and agreement between Stockland and the City of Wanneroo as the subdivision of the adjacent areas progresses.

The FMP has considered a CHRMAP for coastal assets and infrastructure in the foreshore reserve to respond to coastal processes over time. In accordance with the SCPP, the majority of coastal assets are coastally dependant and easily relocatable and as such meet the requirements as a “variation” to the SCPP. Beyond this timeframe, the general approach has been to allow for planned or managed retreat of assets and infrastructure which will allow these structures to be removed at the end of life span, with options for relocation where relevant. In this way, no excessive costs or resources outside of a normal monitoring and maintenance framework are required to implement the proposed adaptation measures.

Following approval of the FMP, detailed development approval and/or landscape approval will be required from the City of Wanneroo and/or the Western Australian Planning Commission prior to implementation. This FMP provides the key framework to guide the preparation of such applications by Stockland and the assessment and approval of such applications by the City of Wanneroo.

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FIGURES

Figure 1: Locality Plan

Figure 2: Metropolitan Region Scheme Zoning

Figure 3: Cadastral Information

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Figure 7: Vegetation Condition

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Figure 10: Amberton Foreshore Master Plan

Figure 11: Areas of Vegetation to be Retained and Revegetated

Figure 12: Staging of Foreshore Implementation

Figure 13: CHRMAP Summary

Figure 1: Locality Plan

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F38

Drawn:	GRO	Date:	17/12/12
Approved:	CKK	Date:	19/06/14
Checked:	JDH	Scale:	1:17,000@A4

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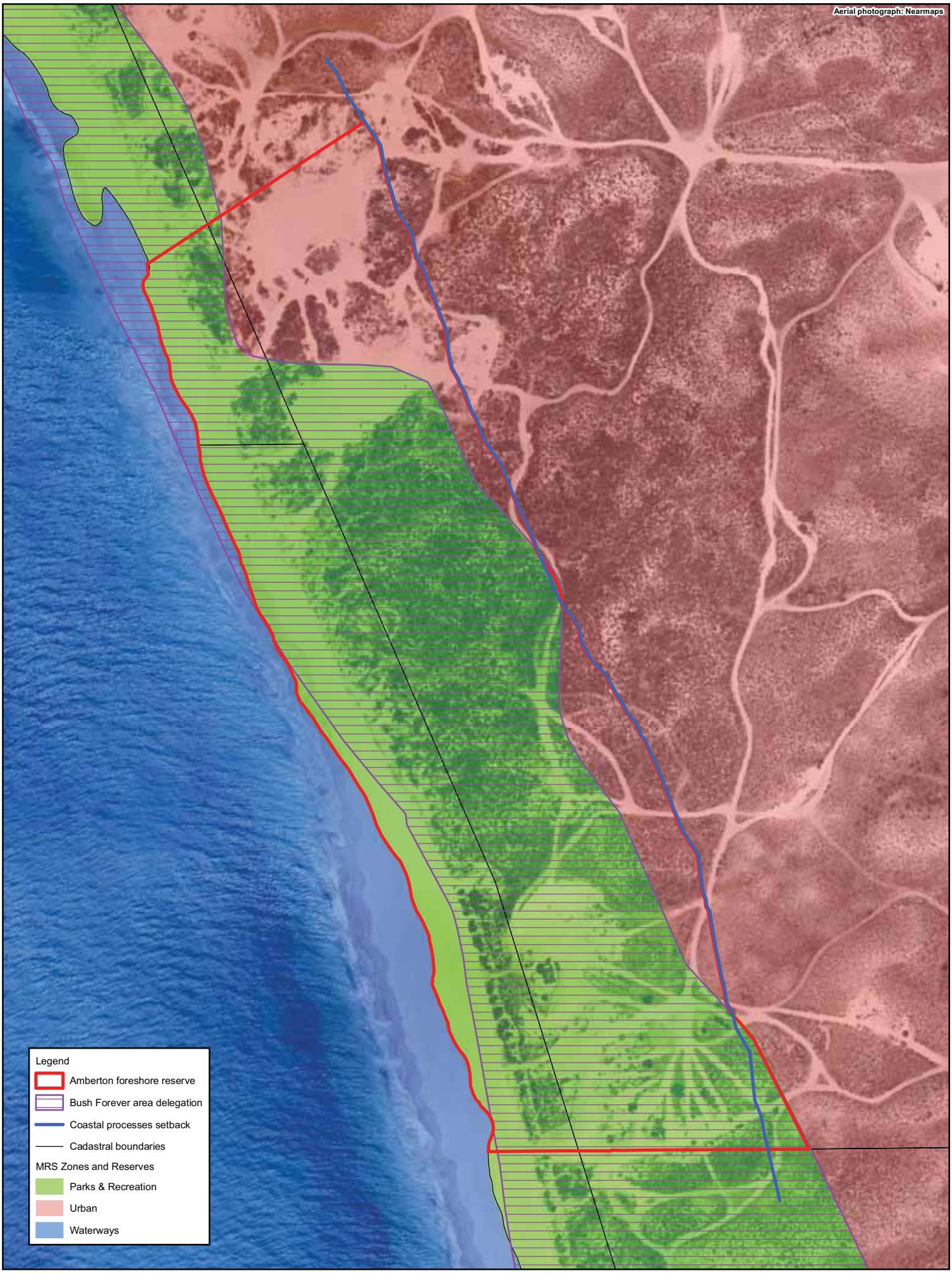

Figure 2: Metropolitan Region Scheme Zoning

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F11

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Approved:	JDH	Date:	19/06/14
Checked:	CKK	Scale:	1:3,000@A4

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emerge ASSOCIATES Integrated Science & Design

Sources: The following datasets were used in the production of this map: MRS Zones and Reserves - DOP (2011), Bush Forever Sites - DoP (2007), Coastal processes setback - M.P. Rogers (2011)

Figure 3: Cadastral Information

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F41

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Approved:	JDH	Date:	19/06/14
Checked:	CKK	Scale:	1:3,000@A4

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Figure 4:	**Site Topography**	**Plan Number: EP12-032(01)--F12**	
Project:	Amberton Foreshore Management Plan	Drawn: GRO	Date: 10/08/12
		Approved: JDH	Date: 19/06/14
Client:	Stockland Pty Ltd	Checked: CKK	Scale: 1:3,000@A4

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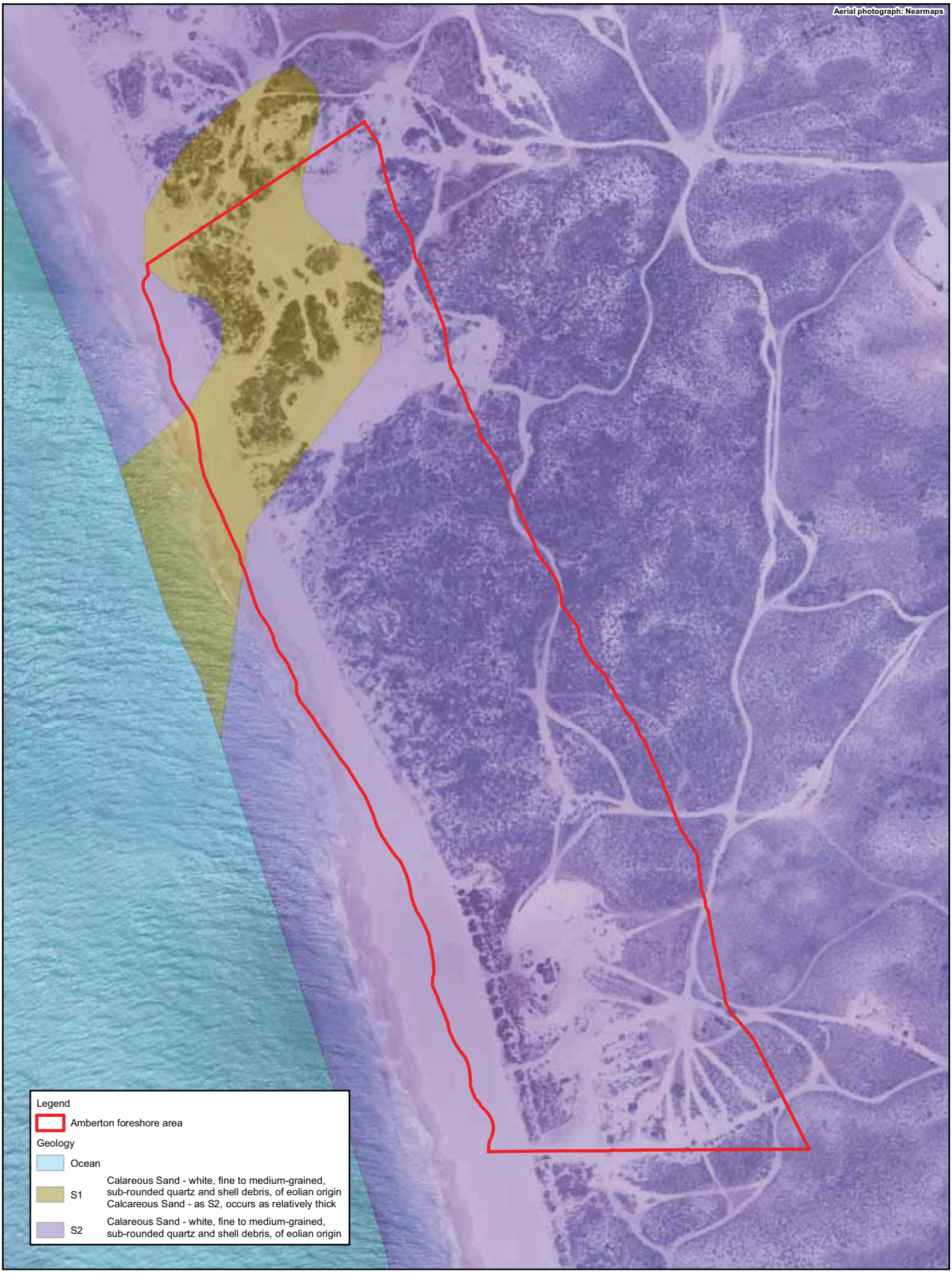

Figure 5: Geology

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F44			
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Approved:	JDH	Date:	19/06/14
Checked:	CKK	Scale:	1:3,000@A4

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emerge ASSOCIATES Integrated Science & Design

Sources: The following datasets were used in the production of this map: Geology - Gozzard (1982)

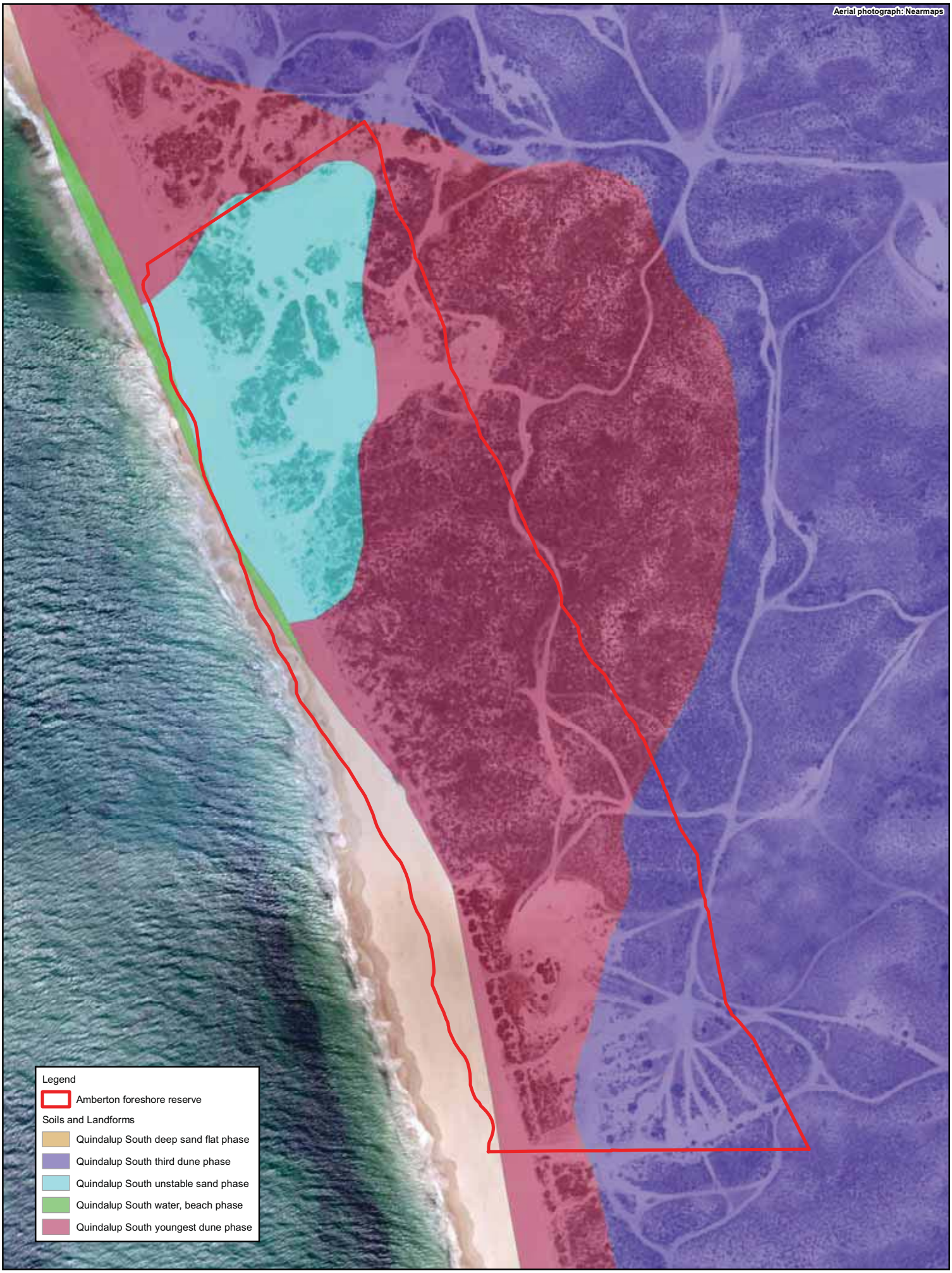

Figure 6: Soils and Landforms

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F45

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Approved:	JDH	Date:	19/06/14
Checked:	CKK	Scale:	1:3,000@A4

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emerge ASSOCIATES Integrated Science & Design

Sources: The following datasets were used in the production of this map: Landforms and Soils - DoA (2007)

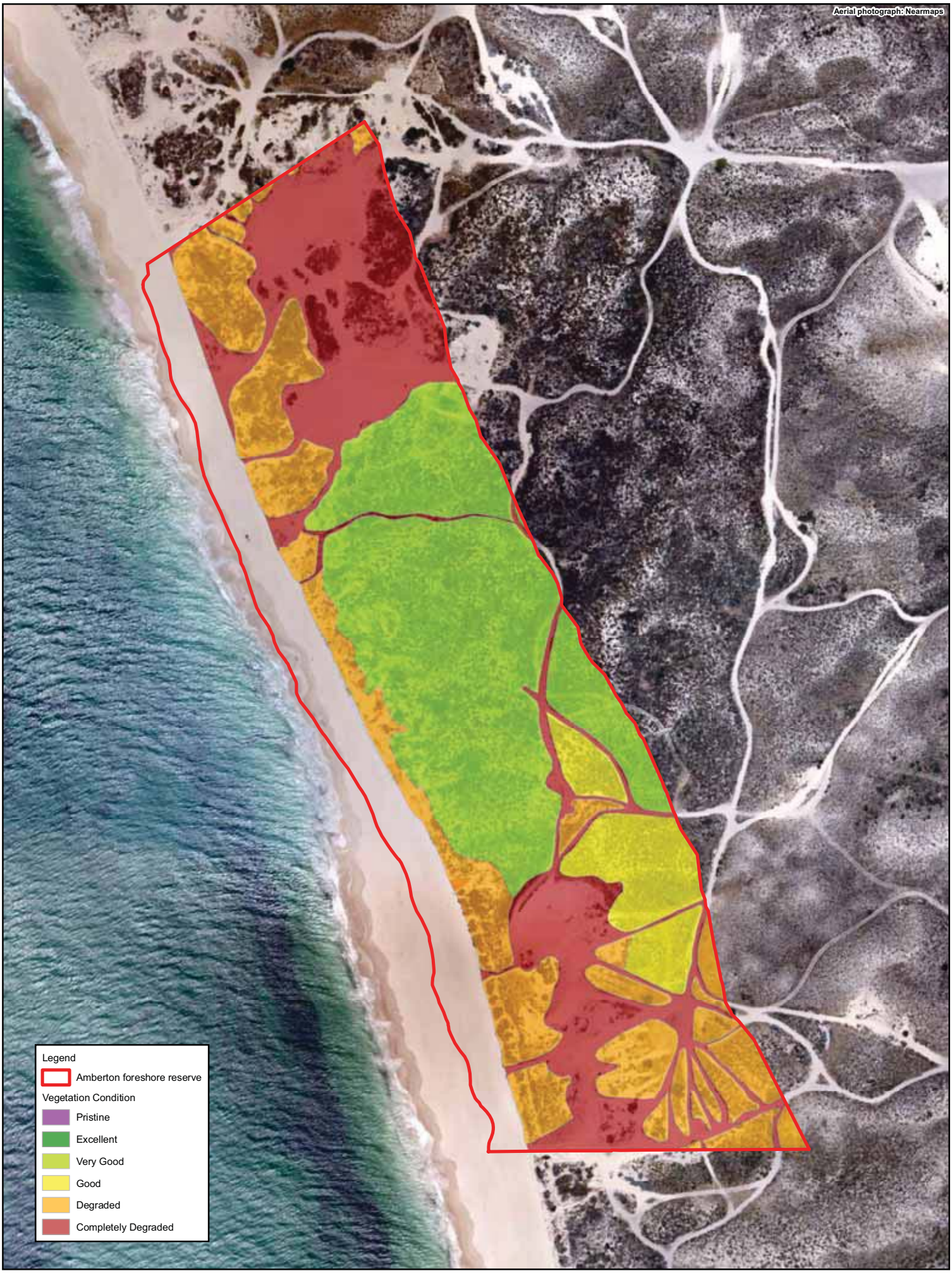

Figure 7: Vegetation Condition

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F46			
Drawn:	GRO	Date:	29/04/13
Approved:	JDH	Date:	19/06/14
Checked:	CKK	Scale:	1:3,000@A4

0 30 60 120 Metres

emerge ASSOCIATES Integrated Science & Design

Sources: The following datasets were used in the production of this map: Landforms and Soils - DoA (2007)

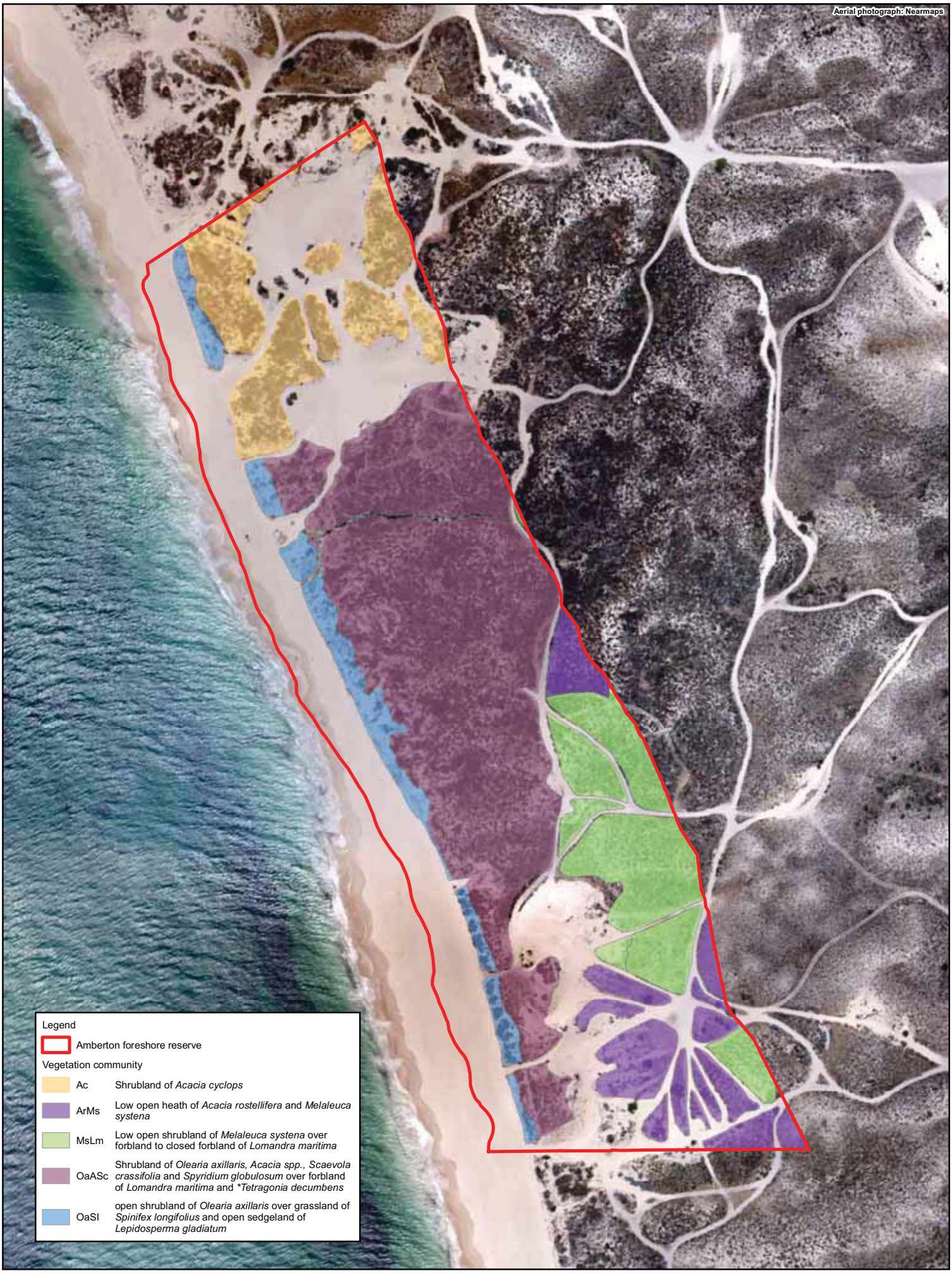

Figure 8: **Vegetation Communities**

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F47

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Approved:	JDH	Date:	19/06/14
Checked:	CKK	Scale:	1:3,000@A4

0 30 60 120 Metres

emerge ASSOCIATES Integrated Science & Design

Sources: The following datasets were used in the production of this map: Vegetation communities - Emerge Associates (2012)

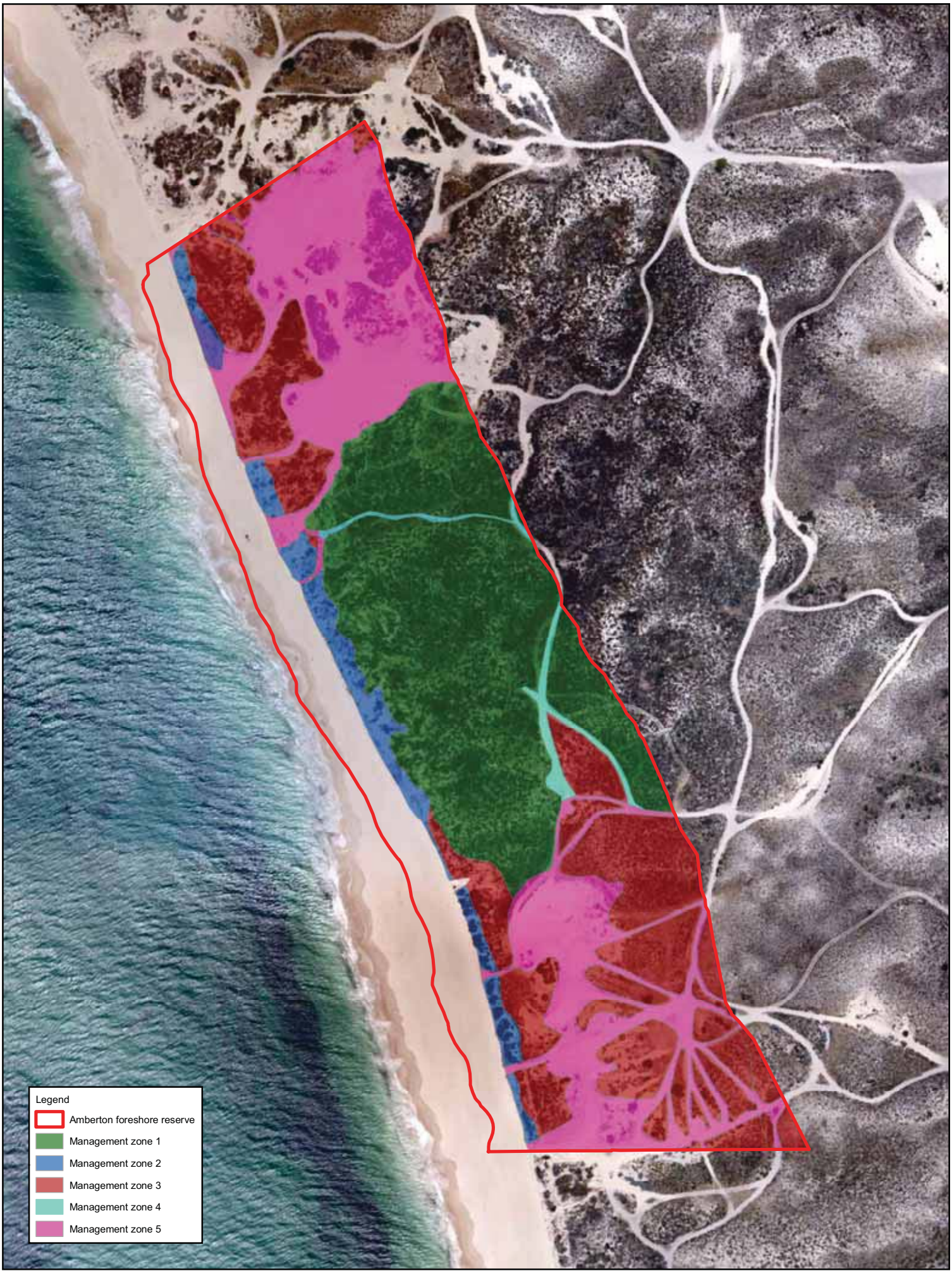

Figure 9: **Foreshore Management Zones**

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F48

Drawn:	GRO	Date:	29/04/13
Approved:	JDH	Date:	19/06/14
Checked:	CKK	Scale:	1:3,000@A4

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NOTE:
This master plan is indicative only. Further design development is required to determine the exact locations of pathways, infrastructure and drainage. This drawing should be read as concept only but will inform and guide future detailed design for development approval.

SUBDIVISION ROAD ALIGNMENT
Ultimate road layout to the north is subject to a separate approval process.

LOOKOUT

REST POINT
including low wall seating, beach views.

BEACH ACCESS
1.5m wide concrete beach access is located on existing tracks. Sleeper steps as well as chain and logs will be used at steeper sections of the tracks.

NORTHERN PASSIVE RECREATION AREA
Existing degraded blowout area will provide open space and cater for 1:100yr flood storage areas.

RESTORATION OF DEGRADED AREAS
Works to involve re-contouring where required, stabilisation and revegation.

AREA OF 'VERY GOOD' VEGETATION
Areas of 'Very Good' vegetation to be retained, protected and shall be fenced with conservation style fencing to restrict access.

DUAL USE PATH
This section of DUP may require minor clearing of vegetation.

BOARDWALK ACCESS
Boardwalk access allows direct access to the beach with the least amount of disturbance to existing vegetation.

SAND PATH TO ACCESS BEACH

CLOSURE AND REVEGETATION OF TRACKS TO RESTRICT ACCESS

DUAL USE PATH
A 3m wide DUP traverses the site, following the existing contours to meet with the proposed road levels.

EXISTING REHABILITATION AREA IDENTIFIED FOR FUTURE CAFE NODE RELOCATION

DUNE BLOWOUT TREATMENT
A range of facilities are proposed within existing degraded blowout area including sheltered active open space which accommodates 1:100 flood storage areas, play and art elements, low walls and slope to create an amphitheatre within the lower sheltered area. Passive surveillance occurs from adjacent lots, road and car park.

PLAYGROUND
Playground (including safety surface), seating, shade structures, BBQs and drink fountains located in close proximity to car parking, open space and beach access.

CAFÉ NODE
The café will be located to provide passive surveillance to the west, north and east from a strategically located highpoint. The structure will allow for future relocation if needed. The node caters for landscaped areas, beach showers, shelters, bike racks, BBQ area, low walls and playground elements. The adjacent path system allows vehicle and pedestrian access to the beach. Bollard control will restrict vehicle access to the beach and POS areas. The ultimate café structure and location will be finalised through future development approval application.

EMERGENCY VEHICLE BEACH ACCESS

LINK TO FUTURE DEVELOPMENT
SITE BOUNDARY
REGIONAL OPEN SPACE
1:100 FLOOD STORAGE
FUTURE REPLACEMENT ON-ROAD CARBAYS (15)
TWL 11.00
TWL 13.00
LINK TO SHOREHAVEN
LINK TO SHOREHAVEN

LEGEND

- Usable open space.
- Irrigated native planting to earthworked slopes (max 1:6).
- Re-contouring, stabilisation and revegetation of dune areas (no irrigation)
- Dual use path located along existing tracks.
- Dual use path to be created.
- Pedestrian paths located along existing tracks.
- Composite timber decking or lookouts to minimise further damage to existing dunes.
- Conservation fence.
- 30 year coastal processes setback
- 50 year coastal processes setback
- P & R / POS — Parks and Recreation Reserve boundary.
- Existing property boundary
- Amberton Foreshore area
- Bollards
- Speed hump

dwg • AA-16
date • MAY 2016
rev • s
scale • 1:1000 @ A1

0 10 20 30 m

AMBERTON FORESHORE MASTER PLAN REV S
FIGURE 10 -
PRELIMINARY LANDSCAPE CONCEPT WITH CAFE STAGING PLAN

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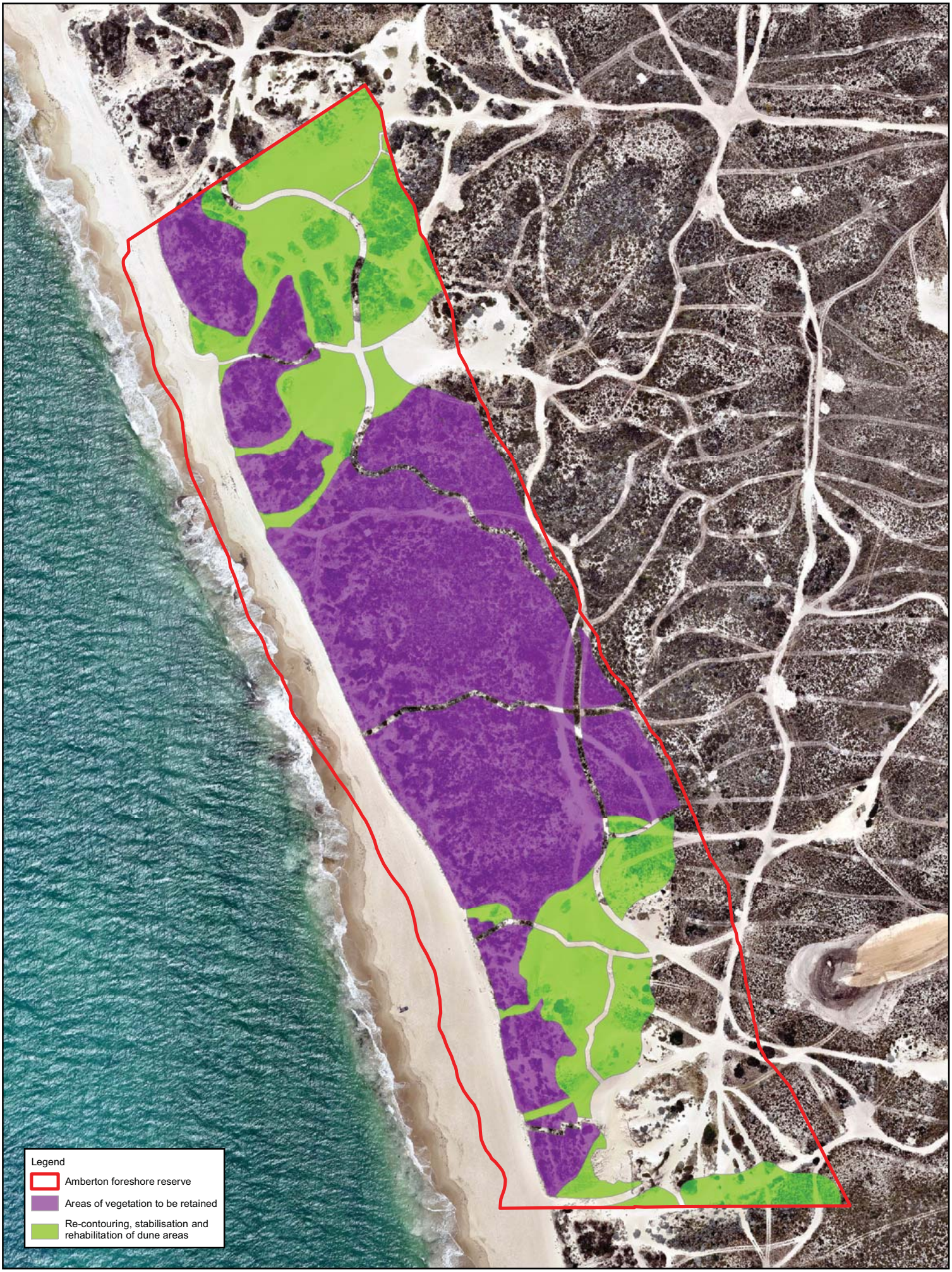

Figure 11: Areas of Vegetation to be Retained and Revegetated

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F53

Drawn:	GRO	Date:	21/04/15
Approved:	JDH	Date:	01/05/15
Checked:	ADB	Scale:	1:2,750@A4

0 25 50 100 Metres

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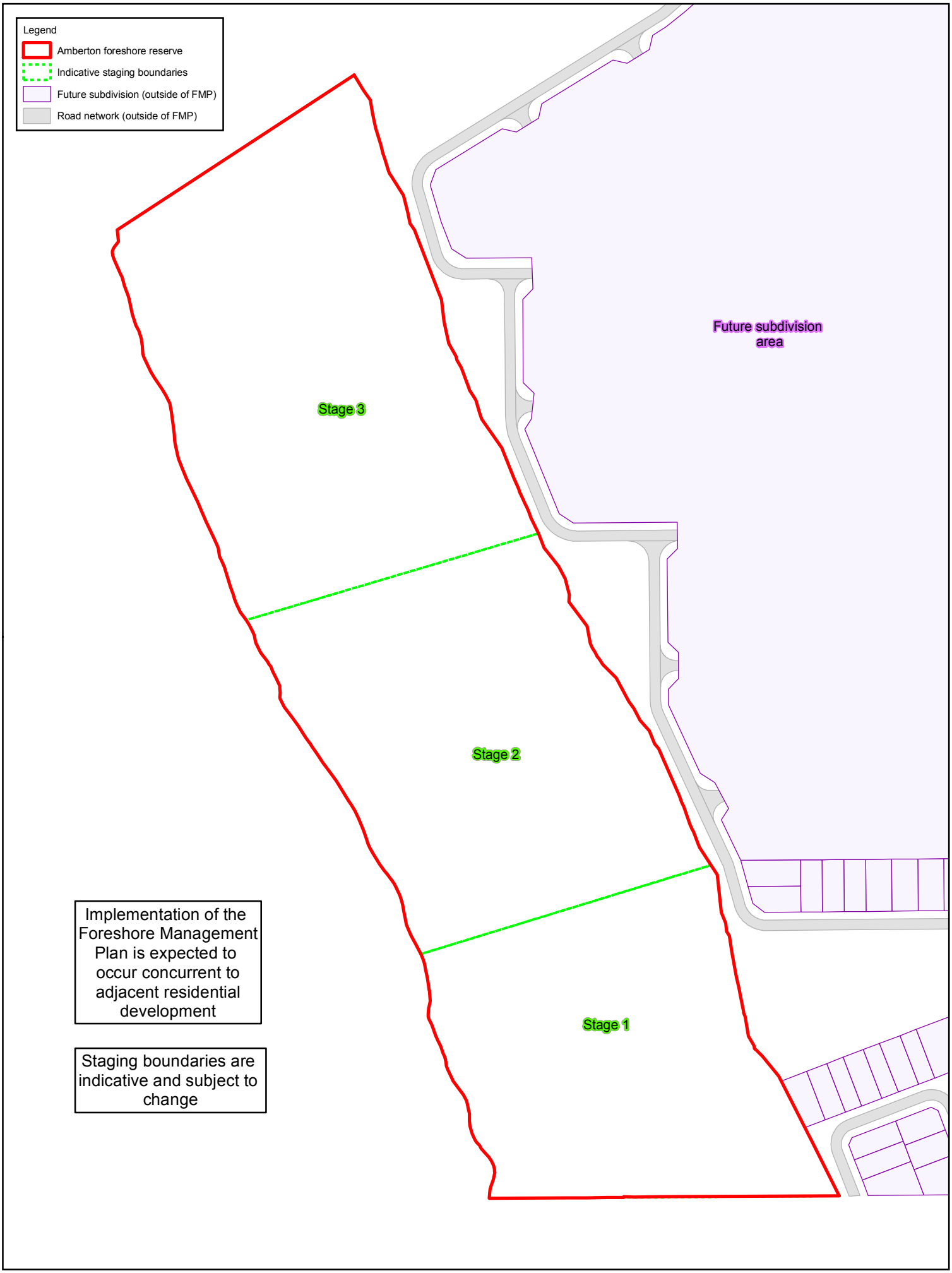

Figure 12: Staging of Foreshore Implementation

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F49b

Drawn:	ADB	Date:	28/07/15
Approved:	JDH	Date:	28/07/15
Checked:	ADB	Scale:	1:2,750@A4

0 25 50 100 Metres

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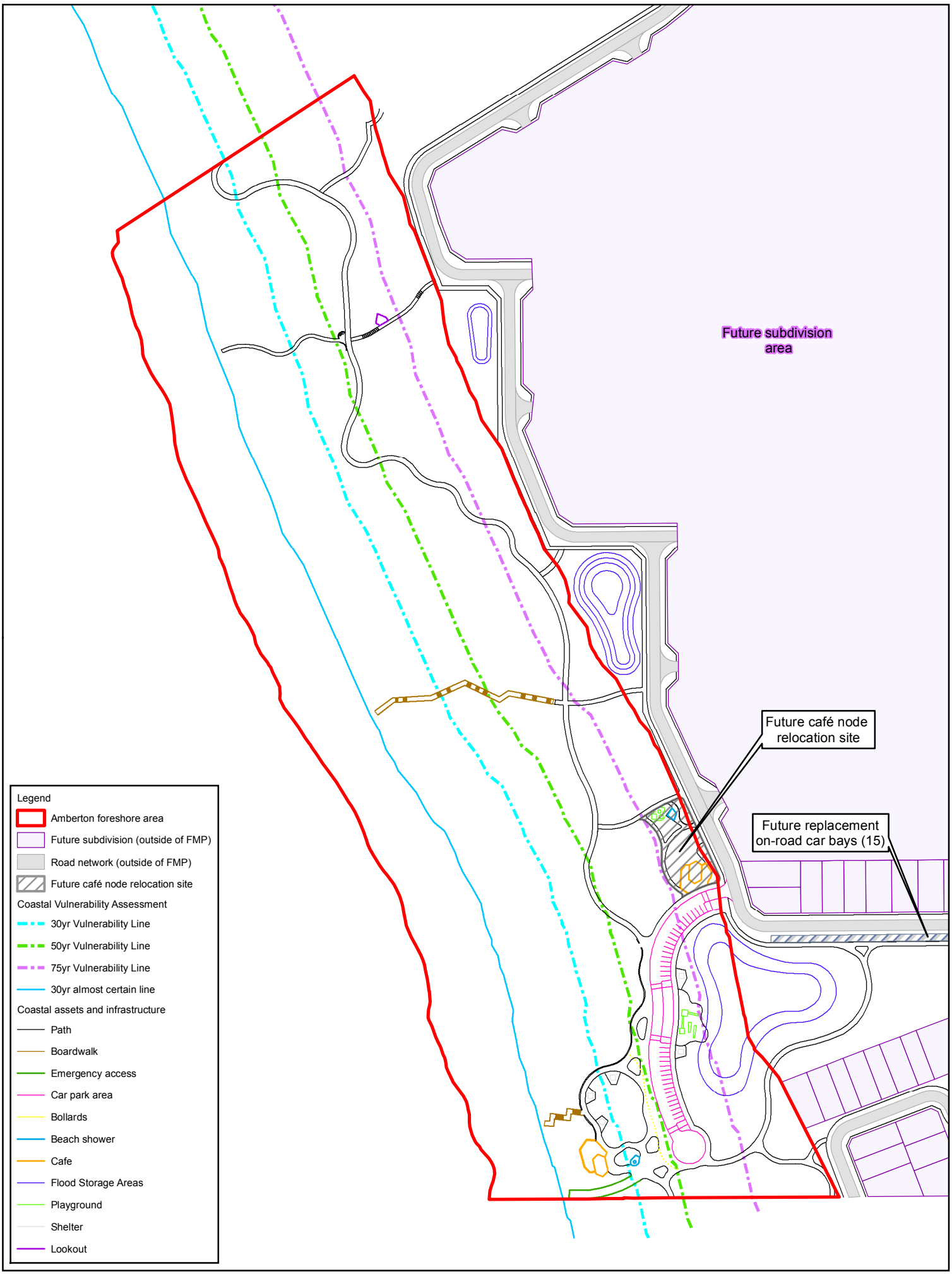

Figure 13: CHRMAP Summary

Project: Amberton Foreshore Management Plan

Client: Stockland Pty Ltd

Plan Number: EP12-032(01)--F51e

Drawn:	ADB	Date:	03/06/2016
Approved:	CKK	Date:	07/06/2016
Checked:	CKK	Scale:	1:2,750@A4

0 25 50 100 Metres

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APPENDIX A

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EGLINTON LOCAL STRUCTURE PLAN NO. 82

Land subject to MRS amendment (to rezone from Parks and Recreation to Urban) & land exchange for notated open space areas A & B.

The part of the Local Structure Plan (LSP) area shown extending beyond the existing Local Government Boundary (conforming with the MRS) will only become subject to this LSP once a proposed western extension to that boundary has been effected.

Physical Processes Setback Line

Area Subject to Environmental approval in accordance with Clause 6.1 of the Local Structure Plan

Indian Ocean

PIPIDINNY ROAD

MARMION AVENUE

EGLINTON DRIVE

MITCHELL FREEWAY

R25 - R40

R40 - R60

R25 - R60

R160

R100 - R60

R100

R60 - R100

R20 - R60

Alternative STS Route & Stop

A B C D E F G

PS

S K-12

1 2 3 4

15451 15450 1008 1007 1006 1005 13711

LEGEND

ZONES
- Residential
- Centre
- Commercial
- Mixed Use

RESERVES
- Parks & Recreation
- Railway

MOVEMENT
- Railway Station
- Primary Distributor
- Integrator Arterial (A)
- Integrator Arterial (B)
- Neighbourhood Connector
- Coastal Road
- Light Controlled Intersection
- Special Transit System/ Indicative Bus Stops
- Principal Shared Path
- Shared Path
- Regional Foreshore Shared Path
- Social/Pedestrian/Cyclist Linkages

OTHER
- Eglinton Local Structure Plan Boundary
- Proposed 132kV Transmission Line
- Proposed Zone Substation
- Primary School
- Inclusive School - Kindergarten to year 12
- Centre 1 - Eglinton Marina Centre
- Centre 2 - Neighbourhood Centre
- Centre 3 - Neighbourhood Centre
- Centre 4 - District Activity Centre
- Indicative Strategic Open Spaces
- Land to be subject to MRS Amendment
- Regional Road Drainage
- Possible Beachside Restaurant/ Cafe/Corner Store
- Proposed Water Corporation Groundwater Bore Sites
- 300 metre Well Head Protection Zones
- Possible Foreshore Recreation Development Node
- Walkable Catchment (400m - 5 min walk)
- Walkable Catchment (800m - 10 min walk)

NORTH

0 100 500m

Plan No: EGLEG-2-001 • Date: 10/05/2012 • Not to Scale@A3

Note: All areas and dimensions subject to detail survey.

NOTES

1) Areas identified as being of National Environmental Significance under the Environmental Protection and Biodiversity Conservation Act 1999 may be subject to assessment by the Federal Department of Sustainability, Environment, Water, Population and Communities, in accordance with this Act. The outcome of any such assessment may require either a modification to the LSP or minor variations from the LSP at the subdivision or development stage.

2) The taking of individual Graceful Sun Moths, as a result of the clearing of habitat such as Lomandra Hermaphrodita and Maritima, requires the permission of the Minister for Environment, or their delegate, pursuant to the Wildlife Conservation Act 1950.

3) An easement of up to 32 metres may be required for the proposed 132kV overhead transmission line. This may have implications on adjacent land uses. Final - width of the easement and the location of the substation will need to be confirmed as part of the future structure planning of Centre Zones.

4) Location of the proposed Water Corporation Groundwater Bore Sites and associated 300 metre Well Head Protection Zones is indicative only, to be confirmed at subdivision stage.

APPENDIX B

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EXISTING ENVIRONMENT

Existing Environment

Location and topography

Climate

The climate of the site is described as a Mediterranean climate, with hot, dry summers and moderately wet, mild winters.

The majority of rainfall within the region occurs between May and September each year, and on average is between 400 to 850 millimetres per year. However, in the last 40 years there has been a marked decrease in rainfall (approximately 11 per cent decrease), with a noticeable shift to a drier climate across the south-west of Western Australia (Water Corporation 2009). 2010 was one of the lowest years of rainfall on record, with only 503.8 millimetres recorded in Perth, compared to the long-term average of 852.6 millimetres per annum.

The closest weather station to the site which records rainfall is at Two Rocks, found approximately 11.5km kilometres north-west of the site. The annual rainfall at Two Rocks for the year 2011 was 654.2 millimetres, which is similar to the annual median of 684.8 millimetres (Bureau of Meteorology 2012).

The climate data from the closest station (Gingin) indicates that the annual maximum temperature is 26.3^0C which is a summary of data collected since 1996. In winter the area is affected by storm surges characterized by north westerly winds, and impacted by sea breeze during the summer months. These coastal processes cause changes to the foreshore reserve

The predominant winds come from the south-west and are a very important feature of coastal environments as they are a major determinant of landwards sand migration, influencing landforms and landscape. During summer, winds blow from the east to south east in the morning (4am to midday) and from the south-west in the afternoon (1pm to 6pm, the local sea breeze). Winter is characterized by north-westerly storm winds that back around to the west and south-west, interspersed with calmer periods.

Flora and Vegetation

Regional Context

The site lies within the Swan Coastal Plain (Drummond Botanical Subdistrict) Phytogeographical Subregion as described by Beard (1990). This region is characterised by banksia low woodlands on leached sands and marri (*Corymbia calophylla*) on less leached soils and Melaleuca swamps.

Vegetation complex mapping for the Swan Coastal Plain undertaken by Heddle et al. (1980) indicates that the Quindalup complex is predominant within the Amberton foreshore area. The Quindalup dune system consists of unconsolidated calcareous sand which form the parabolic dunes situated along the coast.

The foreshore reserve is located within the Bush Forever site indicated by the Metropolitan Regional Scheme (MRS).

Flora and Vegetation Survey

The foreshore vegetation consists generally of heaths and woodlands. Parts of the foreshore has been degraded and cleared, with the most significant contributor being uncontrolled dune access. The off road tracks have caused dunal blowouts in areas which were initially considered for conservation.

In order to determine the vegetation communities located within the Eglinton foreshore reserve, a flora and vegetation survey was conducted by E. Bennett to support the MRS amendment and reported by ATA Environmental (2005). Emerge Associates undertook a detailed inspection of the Amberton foreshore area in 2012 in order to update the vegetation communities and vegetation condition.

Significant Flora

Species of flora acquire DRF or PF conservation status where populations are restricted geographically or threatened by local processes. The Department of Environment and Conservation (DEC) recognises these threats and subsequently applies regulations towards population protection and species conservation. The DEC enforces regulations under the Wildlife Conservation Act 1950 (WC Act) to conserve DRF species and protect significant populations. PF are described as potentially rare or threatened species and are classified in order of threat. DRF and PF category definitions are listed below in **Table 1**.

Table 1 Definition of Rare and Priority Species (Atkins, 2008)

Conservation Code	Category
R	**Declared Rare Flora – Extant Taxa.** Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X	**Declared Rare Flora – Presumed Extinct Taxa** Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
P1	**Priority One – Poorly Known Taxa** Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verges, urban areas, farmland, active mineral leases etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as"rare flora", but are in urgent need of further survey.
P2	**Priority Two – Poorly Known Taxa** Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as "rare flora", but urgently need further survey.
P3	**Priority Three – Poorly Known Taxa** Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as "rare flora" but need further survey.
P4	**Priority Four – Rare Taxa** Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

No Declared Rare Flora Species was located within the site (RPS, 2008). There is evidence of Priority 4 (*Conostylis pauciflora* subsp. *Pauciflora*) being recorded in the site or within close proximity which was identified by E. Bennett as reported in ATA Environmental (2005).

Threatened Ecological Communities (TEC)

In Western Australia, Threatened Ecological Communities (TECs) are assessed by the Western Australian Threatened Ecological Communities Scientific Advisory Committee and endorsed by the Minister for the Environment. While they are not afforded direct statutory protection at a state level (unlike DRF under the Western Australia *Wildlife Conservation Act 1950* (WAWC Act)) their significance is acknowledged through other state environmental approval processes such as Environmental Impact Assessment pursuant to Part IV and Part V of the Environmental Protection Act 1986 (EP Act).

Some TECs are also afforded statutory protection at a Federal level pursuant to the Environment Protection and Conservation 1999 Act (EPBC Act). The EPBC Act provides for the protection of TECs, which are listed under section 181 of the Act, and are defined as “Critically Endangered”, “Endangered” or “Vulnerable” under Section 1820. There were no TEC’s located on the Eglinton foreshore site.

Weed Surveys

There are a number of weed species associated with various areas of the Amberton foreshore. The most common weed species associated with the Amberton foreshore are listed in **Table 2** below.

Table 2: Common Weed Species

Scientific Name	Common Name
Avena barbata	Slender Wild Oat
Cakile maritima	Sea Rocket
Carpobrotus edulis	Hottentot Fig
Euphorbia paralias	Sea Spruge
Euphorbia terracina	Geraldton Carnation Weed
Hypochaeris glabra	Smooth Catsear
Pelargonium capitatum	Rose Pelargonium
Sonchus oleraceus	Sowthistle
Tetragonia decumbens	Sea Spinach
Trachyandra divaricata	Dune Onion Weed

Terrestrial Fauna

Fauna Surveys

A vertebrate fauna survey was conducted for the Alkimos - Eglinton area by Alan Tingay & Associates in October 1996.The survey indicated the differences in diversity of species across the major habitat types including the Old Quindalup heaths located within the Amberton foreshore area. The old Quindalup heaths are seen as having a great amount of fauna diversity across the site.

Graceful Sun Moth Survey

The graceful sun moth is listed as “Endangered” under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Priority 4 by the DEC. The GSM was listed under the EPBC Act in 2009 and was recently removed from the Western Australia *Wildlife Conservation Act 1950*.

A graceful sun moth survey was conducted by Coffey Environmental (2010) in order to determine the presence and density of the graceful sun moth within the Eglinton Estate. The survey was conducted in accordance with newly released DEC methodology for the procedure, and took place over four days in March 2010. Weather conditions were favourable for surveys as temperature remained below 24^{o}c, cloud cover was present and wind speeds didn’t exceed 12km/h.

In total 93 graceful sun moth were recorded within the Eglinton LSP during March surveys. The foreshore is located within Lot 1008, which is abundant in the favoured graceful sun moth food species *Lomandra maritima*. However, no graceful sun moth were observed along any transects located within the Amberton foreshore area. This is likely due to the higher velocity winds experienced in the primary dunes.

Hydrology

Surface Water

There are no known surface water features within the Amberton foreshore area.

Infiltration testing

Infiltration testing was carried out within the Amberton foreshore area on 13th June 2013. Two areas of the Amberton foreshore area were tested for infiltration one in the north of the foreshore and one in the south. The field work comprised of in situ infiltration testing using a Wooding Infiltrometer and a dual ring infiltrometer. The Wooding infiltrometer was used twice at each test location, with a third measurement taken from the dual ring infiltrometer. The use of these two methods allows for greater certainty in the resulting infiltration rates.

The shallow soil profile at the each location consisted of pale yellow, medium grained sand. The top 10-15 cm of the soil profile was loose, presumably as a result of dry and windy conditions and disturbance from vehicle access. This layer was removed to allow the Wooding infiltrometer to be firmly seated, but was left in place for the dual ring infiltrometer. The loose material at the surface did not appear to influence the infiltration rate.

The results of the infiltration testing are summarised in **Table 3**.

Table 3: Summary of infiltration results

LOCATION	LOCATION (GDA)		ESTIMATED INFILTRATION RATE (M/DAY)	
	EASTING	NORTHING	WOODING INFILTROMETER	DUAL RING INFILTROMETER
Foreshore 01	372049	6503769	37.5	37.4
Foreshore 02	372281	6503270	22.2	19.3

The results from both methods of measurement are closely correlated, which provides confidence that the saturated infiltration rate has been accurately determined at each location. The estimated infiltration rates are within the ranges of those typically associated with medium grained coastal sands.

It is the intention that the infiltration testing provides site specific information for the City of Wanneroo to consider infiltration rates within drainage areas. The City of Wanneroo typically allows a design rate that is 20% of the measured infiltration rates. This would result in the stormwater infrastructure being sized according to infiltration rates of between 3.8 m/day and 7.5 m/day

APPENDIX C

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COASTAL AQUATIC RISK ASSESSMENT REPORT

Surf Lifesaving Western Australia 2014.

Coastal Aquatic Risk Assessment

Amberton Development

SURF LIFE SAVING
WESTERN AUSTRALIA

Commercial-in-confidence

Prepared For:
Stockland: Amberton

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Date	Version	Number	Author/Reviewer	Organisation
06/03/2014	DRAFT	0.1	R. Duczynski	SLSWA
06/03/2014	FINAL DRAFT	0.2	C. Peck	SLSWA
11/03/2014	FINAL DRAFT	0.3	C.Peck	SLSWA
31/03/2014	FINAL DRAFT	0.4	T. Barry	Stockland
14/04/2014	FINAL DRAFT	0.4	C.Peck	SLSWA
16/04/2014	FINAL	1.0	C.Peck	SLSWA
17/06/2014	REVISION	1.1	C. King C. Peck	Emerge & Assoc SLSWA

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1. Summary

Assessed Locations:

1 Alkimos-Pipidinny-Yanchep (S) [Amberton beach]

1.1 BACKGROUND

Amberton is a residential site currently under development by Stockland. The site is situated within the City of Wanneroo, some 8km from the Yanchep SLSC in the north and 7.5 km from Quinns Mindarie SLSC in the south. The Amberton development has approximately 700 metres of ocean frontage.

This stretch of coastline beyond the fore dune is being developed by Stockland for residential purposes and sale of lots. The beach access and use is considered a centre piece to the recreational and leisure opportunities the Amberton development will provide residents and the surrounding community.

Amberton beach fronting the Amberton development is approximately 700m in length. For most of its length it is backed by a 10m to 20m high foredune with a few blowouts, then vegetated, undeveloped transgressive dunes extending 2km to 3km inland. There is development on the western side of Marmion Avenue which is moving towards the beach area. The beach is relatively wide however the northern half of the shoreline and further north for approximately 1.3 kilometres is littered with rock platforms and reef along the swash and surf zone.

The beach is not patrolled and is not yet a beach that has a high frequency of visitation for swimming activities; although the outer reefs and Amberton wreck provide some attraction to surf board riders for surfing and fishing related activities.

Stockland has engaged Surf Life Saving Western Australia to conduct an assessment of the Amberton foreshore to provide advice on:

i. **The most suitable location to be designated as s recreational and leisure beach primarily for swimming and wading activities; and within the Amberton Beach development boundaries.**

ii. **The best location for a surf lifesaving club and additional outpost facilities based on the risk profile and proposed use by the community across the Alkimos-Eglinton region.**

iii. **An assessment of coastal aquatic risk present at Amberton Beach and development of risk management plan and treatments including beach accessibility, proposed access signage, prevention and lifesaving services and awareness and education.**

This report contains findings and recommendations specific to current standards, guidelines and best practice regarding risk management pertinent to the characteristics and designed applicative use of the assessed location. The report contains information specific to Amberton Beach only.

A set of risk treatment options is proposed for the Amberton beach. The following risk treatments are offered for consideration and are representative of the key recommendations tabled:

1. Beach Access and Ongoing Maintenance (Section 4.2.4)
2. System of Safety Signage (4.2.5)
3. System of Supervision - Lifesaving Service Level Analysis (Section 4.2.6)
4. Existence of Coastal/Beach Emergency Action Plans (Section 4.2.7)
5. Education and Awareness Programs (Section 4.2.8)
6. Public Rescue Equipment (Section 4.2.9)
7. Dune Vegetation Maintenance, Beach Scarping/Tunneling (Section 4.2.10)
8. Emergency Response Beacons, Alarms and Phones (Section 4.2.11)
9. Monitor and Review (Section 4.2.12)

As a consequence of the continuing growth and changing usage patterns it is the view of SLSWA that Stockland should periodically review this coastal public safety risk assessment and treatment plan, in particular when a milestone development occurs or is imminent.

1.2 SUMMARY OF PROPOSED KEY RISK TREATMENTS

1.2.1 Beach Access Ongoing Maintenance

There are currently no defined access paths to Amberton Beach although the dunes are littered with informal pedestrian and four wheel drive tracks. As development continues, these tracks will be closed off to the public with the introduction of formal roads and pathways into the area.

SLSWA has assessed the southern area of Amberton Beach to be the most 'friendly' to a range of beach users. For this reason SLSWA have recommended the southern boundary of Amberton as the best location for major access points and associated infrastructure. Formal access paths must be developed for pedestrian use and a wider, gated beach access for emergency vehicles and other approved users.

Please refer to Section 4.2.4 for more information on access infrastructure and ongoing maintenance.

1.2.2 System of Safety Signage

As the site is under development, much of the formalised roadways, car parks, recreational pathways or beach access are not yet under construction. Reasonably, little or no formalised signage was in place at the time of the site visits. Once formalised access ways are developed the appropriate signage needs to be put in place.

Suitable future signage includes:

- Beach and aquatic safety signage
- Location signage
- Marine zoning signage
- Signage relating to location of toilets/disabled access
- Signage relating to location of nearest lifesaving service
- Local government regulation signage
- Environmental and conservation signage
- Dune management signage
- Community information signage including safety, security and crime prevention.

Please refer to section 4.2.5 for more information on systems of safety signage.

1.2.3 Lifesaving and Surveillance Outpost

SLSWA recommend that a community lifesaving storage facility and surveillance outpost is located on or near the southern boundary of the Amberton development. This facility could be designed to operate alongside or as part of any development of other beach infrastructure such as cafés, public changing facility in the Amberton area. This type of building is considered by SLSWA to be an outpost to a larger regional type surf life saving facility and clubhouse which is planned for future location in the neighbouring Alkimos beach development.

The advantages of locating a lifesaving and surveillance outpost near or on the southern boundary of the Amberton beach development includes:

- The elevations at this part of the beach provide for improved outcomes of emergency and

lifesaving activity beach access requirements. Entry and exit of plant and equipment on and off the beach and an appropriately sealed access way is likely to be safely provided for with lower elevations.

- The facility and services that can be provided will be more proximally located to where beach users are being channelled, requiring less transportation of equipment and people to activate and manage the beach.
- Transportation of injured persons along the undulating and often bumpy shoreline is less if the lifesaving facility is more proximal to the main beach user area.
- The lifesaving facility and benefit to the community is likely to be enhanced if it is proximal to the public open space and formalised recreational and/or commercial areas.
- Public are more likely to enter at and remain positioned near this section of the beach if the lifesaving facility is also located proximal to the recreational space.
- Despite the developer having limited or no responsibility for the beach area south of the Amberton Beach development boundary, any lifesaving service will by default have to take responsibility for beach users along this stretch of coastline. The placement of a facility nearer the southern boundary of the Amberton development will enable lifesaving services to better manage beach users that seek to use this stretch.
- The natural bluff provides excellent observation and surveillance to the north and south.

An outpost facility will allow remote surveillance and lifesaving service to be planned and implemented well before the development of a community regional lifesaving facility at Alkimos beach. As access to the beach is provided via through roads, parking and beach access paths, the outpost will also allow lifesaving and response services to be implemented at Amberton Beach. These may initially commence as a surveillance and response service only which could readily escalate to an on beach prevention and rescue service.

Typically, a lifesaving and surveillance outpost facility should have in summary the following form and function:

1. Have sufficient elevation that provides vision of the shoreline and ocean when streamed from an automated camera or when a trained lifesaver is insitu.
2. Provide for the secure storage of lifesaving, rescue and emergency care equipment:
    i. Jet Ski and trailer.
    ii. ATV (All-Terrain Vehicle).
    iii. 2 x Rescue Boards.
    iv. 2 x Rescue Tubes.
    v. First aid kit.
    vi. Stretcher and spinal board.
    vii. Oxygen Resuscitation equipment.
    viii. Semi-automated defibrillator.
    ix. Communications equipment (handheld RF radios, tablets).
    x. Beach hazard and warning signs.
    xi. Emergency Response Point.
3. Provide for an area to enable first aid and prolonged pre-hospital care treatments.
4. Have sufficient GPO and electrical access to:
    i. Re-charge equipment.
    ii. Operate tablets and telecommunication devices.
    iii. Operate temperature control equipment.
    iv. Provide adequate illumination of spaces, with illumination relevant to the space required, including external to the facility.
5. Have appropriate telecommunication and data access within the building and to the highest point of the facility.
6. Have appropriate storage cabinets for:
    i. Emergency care equipment and medical supplies.
    ii. Storage of up to 100L of unleaded fuel.
7. Have appropriate access to water for maintenance of equipment, including drainage space and wash down area.

8. Allow a one direction entry/exit into the storage space for plant and equipment.

Should Stockland accept this recommendation SLSWA can provide a more detailed outcome statement on the form and function of a facility of this type.

Note: 700m foreshore area of Amberton with Southern Boundary identifier

= Indicator of Southern Boundary of Amberton

1.2.4 Education and Awareness Programs

Education and awareness programs for residents, especially school aged children, and tourists alike have been shown to be effective in mitigating risks at aquatic coastal locations.

This Section highlights and tables the SLSWA BeachSAFE intiaitive in addressesing education and awareness pertaining to improved coastal aquatic recreation. When consistently implemented it will assist to build the capacity of the community to mitigate these risks.

Education and awareness programs currently delivered within the City of Wanneroo have been identintified so they can be mapped and built upon. Stockland should cooperate with The City of Wanneroo and give strong consideration to actively investing in coastal aquatic safety education and awareness programs to improve coastal aquatic risk mitigation at Amberton beach. This strategy should seek to provide opportunites to undertake safe aquatic activity at any beach location within the City of Wanneroo.

For more information on education and awareness programs please refer to Section 4.2.8.

1.2.5 Monitoring and review

Monitoring and review provides information on the extent to which risk treatment options are meeting their objectives, new hazards and risks being identified in a timely manner and evolving strategies being developed in line with community expectations.

Monitoring and review activity should not be limited to maintenance programs and should actively seek to record and analyse objective data relating to the how, why, what and when Amberton beach is being used, so that objective decisions and medium to long term planned strategies can be developed by Stockland to assist in managing coastal aquatic and recreational risk at Amberton beach.

Please refer to Section 4.2.12 for more information on monitoring and review.

1.3 SUMMARY OF KEY RECOMMENDATIONS

Recommendations made in this report look at the broader context of coastal aquatic safety and make assumptions that the risk need to be mitigated no matter where the line of responsibility exists for management of the foreshore reserves. If the owner of the report is not the responsibly body for the considerations, implementation and management of risk treatments then the recommendations should be shared with the likely owner of the risks and associated treatment options (i.e. City of Wanneroo).

The following recommendations are also made noting that there is currently no formal public beach access to the Amberton coastline and that the recommendations can be investigated closer to public access being provided.

1.3.1 RECOMMENDATION 1

Engage broader input into beach safety issues along the coast through periodic inclusion of other representative groups such as City of Wanneroo Ranger Services, Residential Representative Groups, Volunteer Marine Rescue, Local Surf Life Saving Clubs and Local Police.

1.3.2 RECOMMENDATION 2

When developed and constructed, identified hazards specific to access tracks should be removed where appropriate. Access tracks that are no longer in use, unnecessary or that lead people to any high-risk location/s should be considered for closure. If closure cannot be achieved then barriers should be installed to restrict or discourage access.

1.3.3 RECOMMENDATION 3

The party responsible for implementing and maintaining beach accesses and therefore communication of risk (i.e. aquatic safety signage) must implement an inspection regime to assess the installation, adequacy and visibility of in-situ aquatic and recreational safety signage. Records of the inspections and actions should be maintained.

1.3.4 RECOMMENDATION 4

The number of individual signs at any one location should be maintained to a minimum, wherever possible. A single point of information for warning, regulation and information signage reduces confusion and visual pollution.

1.3.5 RECOMMENDATION 5

The party responsible for implementing and maintaining beach safety signs adopts and maintains Emergency location signage identifiers, as shown in the National Aquatic and ~~Recreational Signage and Style Manual (NARSSM).~~

These should be incorporated into any new safety signage at Amberton beach. This should be done in consultation with relevant emergency services agencies.

A numbering system will need to be developed and adopted by the City of Wanneroo. Future municipal/residential developments need to be taken into account (to avoid out of sync codes/location identifiers associated with future developments).

1.3.6 RECOMMENDATION 6

The party responsible for implementing and maintaining coastal aquatic beach safety should carefully consider the implementation of electronic surveillance/monitoring solutions, including, but not limited to, recorded closed circuit television (CCTV). This system should form part of a lifesaving surveillance and outpost facility.

1.3.7 RECOMMENDATION 7

The party responsible for implementing and maintaining coastal aquatic beach safety should develop, implement and review Emergency Action Plans (EAPs) for Amberton beach. This activity is to assure a coordinated response to localised coastal emergencies at Amberton beach.

The EAPs should take into account the difficulties in accessing locations, delay of response and the inherent risks of the locations.

1.3.8 RECOMMENDATION 8

The party responsible for implementing and maintaining coastal aquatic beach safety should, in association with other water safety and emergency response organisations develop a planned and adequately resourced approach to improving long term education and awareness opportunities as they relate to safe aquatic recreation at Amberton beach.

1.3.9 RECOMMENDATION 9

Stockland to fund and develop a resident beach safety booklet or flyer to be distributed to new home owners in the Amberton development. This booklet will contain beach safety information specific to Amberton beach.

1.3.10 RECOMMENDATION 10

The party responsible for implementing and maintaining coastal aquatic beach safety should implement the use of Quick Reader (QR) codes on aquatic and recreational safety signage at Amberton beach. Users of this technology are taken to coastal aquatic safety information and in languages and translations that are relevant to their culture and language. The use of QR codes should form part of any aquatic education and awareness programs.

1.3.11 RECOMMENDATION 11

The party responsible for implementing and maintaining coastal aquatic beach safety should consider, and where practicable, implement engineered options to minimise the risks associated with dune and beach scarping presenting a risk of tunnelling, sand collapse and falls, or access to rock overhang areas.

1.3.12 RECOMMENDATION 12

The party responsible for implementing and maintaining coastal aquatic beach safety should consider that vegetation species planted in dune revegetation programs should be regularly monitored to ensure that they are not negatively impacting on the provision of safety and emergency services at a location. In particular the monitoring should ensure that plant foliage does not obscure vision of signs and reduce the effectiveness of the messaging.

1.3.13 RECOMMENDATION 13

The party responsible for implementing and maintaining coastal aquatic beach safety should review and continue to enhance aquatic recreation public safety injury data and information collection. This should include the collation and analyses deemed necessary to underpin accurate risk assessment and effective risk treatment plans and actions.

1.3.14 RECOMMENDATION 14

The party responsible for implementing and maintaining coastal aquatic beach safety should investigate and where practical implement activity zoning measures at Amberton beach. Zoning of incompatible activity will assist to reduce conflict and the incidence of injury by users of this location. This action can assist in directing swimmers into a safer swimming area south of Amberton beach.

2. Introduction, Scope & Context

Assessed Locations:

1 Alkimos-Pipidinny-Yanchep (S) [Amberton beach]

2.1 Introduction

In 2012/2013 summer season Western Australia (WA) accounted for 10% of the national coastal rescue statistics drowning toll annually[1]. In 2013 Western Australia had the second highest number of reported drowning's accounting for 20% of the national figure[2].

The vast majority of these fatal drowning's can be attributed to swimming/rip-currents and rock-fishing, with almost all occurring at unpatrolled locations/times, where no expert assistance is immediately available.

Accidental drowning deaths in the coastal aquatic environment can be accounted for through a number of causal factors known as the *drowning chain*.

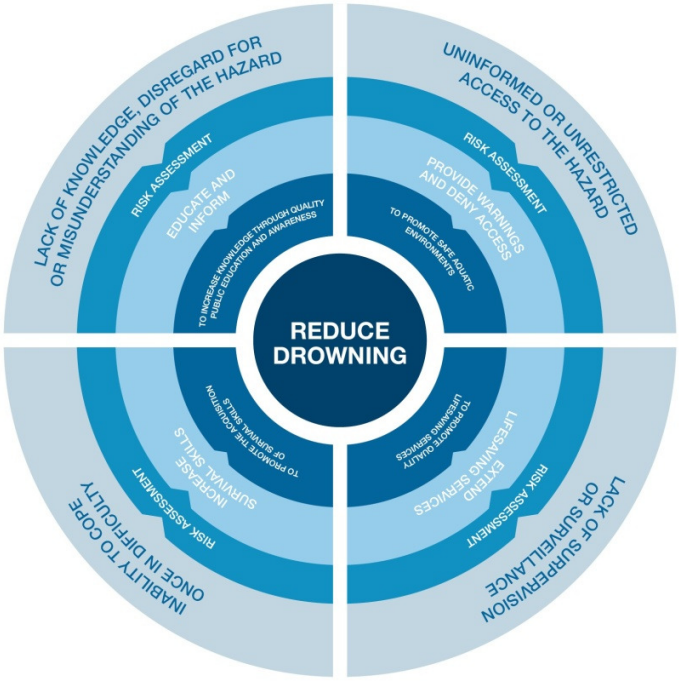

Figure 1: The International Life Saving Federation Drowning Chain (Source: ILSF Drowning Prevention Strategies, 2008)

Causal factors include:

- Lack of knowledge, disregard or misunderstanding of the hazard
- Uninformed or unrestricted access to the hazard
- Lack of supervision or surveillance
- Inability to cope once in difficulty.

Any of the above, either alone or in combination, could lead to a death by drowning. The strategies that have been identified to address the drowning chain include:

- Education and information
- Denial of access
- Improvement of infrastructure and/or provision of warnings
- Provision of supervision

[1] Surf Life Saving Australia. Annual Report 2012/13.
[2] Surf Life Surf Life Saving Australia (2013) National Coastal Safety Report 2013. SLSA: Sydney. Surf Life Saving Australia.

- Acquisition of survival skills.

This document is a coastal public safety risk assessment and treatment plan specific to water safety related issues identified at unpatrolled locations of Amberton Beach located on the coast of Wanneroo in Western Australia.

This coastal risk assessment and treatment plan has been prepared following an on-site risk assessment undertaken by SLSWA for Stockland. The on-site assessments were based upon good practice risk management practices.

Both the on-site risk assessment and compilation of the risk assessment and treatment plan report have received contributions and input by SLSWA personnel including Mr Chris Peck, Ms Rachel Duczynski, Mr Matt du Plessis and Ms Belinda Fleay.

The identified risks are rated against a semi-qualitative assessment matrix and given a numerical value between 1 and 25, with 25 representing the highest risk and 1 the lowest. For the purposes of this risk assessment the Surf Life Saving Enterprise-Wide Risk Management – Risk Ranking Tool was used to assign risk scores and rankings.

The assessment of risks and their potential treatments are detailed in the risk register and risk treatment plan section. Risks and the potential risk treatments are grouped into one table for ease of understanding.

The risk register and risk treatment plan is a tabular summary of risks identified by SLSWA and how to possibly best deal with them. It includes a list of **potential** risk treatments as identified by SLSWA and those risk treatments identified that are already in place.

The Overview of Principal Risk Treatments section details SLSWA's recommendations for a coordinated system of access control (Section 4.2.4) and safety signage (Section 4.2.5), which reflects current good practice. Although an effective risk treatment, signage should not be the only method used in minimizing the identified risks.

2.2 Scope and Context

The risk assessment is based on available information and conditions as observed on several site visits between October 2013 and February 2014.

This report provides treatment recommendations about how to improve risk and safety management in line with current industry aquatic risk management good practices and international standards and Australian water safety signage standards.

Risk treatments are guiding recommendations only and are representative of SLSWA's opinion in relation to water safety at Amberton Beach.

Stockland in consultation with its key stakeholders should determine which risk treatments are appropriate and can feasibly be implemented at Amberton Beach.

2.3 Definition of Terms

The following is a summary of the definition of key terms used within this report.

ABSAMP means the Australian Beach Safety and Management Program.

Emergency Action Plan, means a plan that outlines the procedures to be used in the event of an emergency.

Fringe, means the periods between the summer school holidays and both the spring and autumn school holidays, excluding the actual school holidays and Easter. The fringe season is usually characterised by periods of high level beach activity on weekends and public holidays and medium level beach activity on week days.

Hazard, means a potential to threaten human life, health, property or the environment.

Hazard symbols, means a graphical symbol used together with a safety colour and safety shape to form a safety sign.

Lifesaving Service, means an organised and structured service comprised of volunteer lifesavers and/or paid lifeguards and appropriate rescue and first aid equipment supported by a coordinated backup team.

Off peak, means the winter period generally from May through to August and which traditionally has low levels of beach activity.

Peak, means the spring, summer and autumn school holiday periods, and Easter where not included within the autumn school holiday period. The peak season is usually characterised by a high level of beach activity on all days.

Observation tower, means an elevated platform from which provides a lifesaver or lifeguard with an unobstructed view of an area of water and/or beach from either a seated or standing position.

Recreational waters, means those natural waters used not only swimming, windsurfing, and water-skiing, but also for boating and fishing.

Rescue, means to withdraw, remove, free, save or deliver from a state of exposure to a hazardous or potentially hazardous event.

Rescue watercraft, means a watercraft designed and used for rescue; in this instance the rescue of people.

Rip, (aka rip current) means channelled currents of water flowing away from shore, typically extending from the shoreline, through the surf zone, and past the line of breaking waves.

Risk Register, means a table summarising the identified risks, the location, why it has been identified as a risk, what current treatments are in place to lessen the risk and an overall hazard rating.

Risk Treatment Plan, means a table summarising how to deal with the identified risks, including a list of potential risk treatments, the risk treatments currently and any residual risk.

SLSC, means a surf life saving club from which seasonal volunteer based lifesaving services are provided.

2.4 Report Authors

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3. Assessment Methodology

Assessed Beaches:

1 Alkimos-Pipidinny-Yanchep (S) [Amberton]

3.1 Site Identification

Beach WA 893 commences on the northern side of the sandy foreland initially curving to the north for 1.5km to the lee of the prominent Amberton wreck, then continues north-northwest for another 6.5km past Pipidinny Beach and the southern side of Yanchep to the beginning of the Yanchep beachrock. The beach totals 8.3km in length with vehicle access at Pipidinny and Yanchep, as well as 4WD tracks backing most of the beach.

Amberton Beach is a relatively wide beach (40-50m) and for most of its 700m length is backed by a 10-20m high foredune. There is some evidence of dune erosion at the informal access points through the dunes with some dunes being well vegetated with minimal signs of erosion. The area surveyed in regards to the Amberton development starts just north of the Shorehaven development and continues north along the coast for approximately 700m. The northern section of Amberton Beach and for approximately another 1.3 kilometres north to Pipidinny Road is littered with rock platforms at the shoreline and in the water creating a series of hazards for swimmers and beach goers. The southern section of the beach (extending for approximately 200m from the southern boundary of the Amberton development) is largely sandy with significantly less or no rock platforms and would potentially be the best location for a designated swimming zone for beach users (refer to Appendix C).

Information and documentation has been provided to SLSWA to review in the completion of this report. The documentation provides context to coastal planning policies and plans that broadly guide any coastal development. In some instances district and local plans have specific reference to the beach development along the Alkimos- Pipidinny and Yanchep foreshore and in particular the placements of a Lifesaving facility, of relevant form and function, alongside other coastal node infra-structure or facilities. As the Amberton Beach development grows and matures within the context of the regional development of the Alkimos – Eglinton area, in the opinion of SLSWA, it is likely to attract local residents and other users to Amberton Beach. In the documentation reviewed by SLSWA it appears there is consistency in statement that Surf Life Saving facilities are a key consideration in any coastal development. In the broader context of Amberton Beach being a local beach but very much a part of a coastal stretch that is regional in designation, SLSWA identify that Amberton Beach will require a lifesaving and surveillance outpost to service the local beach use and the overflow that is likely to result from Amberton being a part of a broader regional beach development (within Alkimos –Eglinton).

Review of the following documentation provides the strategic context in which the development is being activated and confined;

1. Draft Perth Coastal Planning Strategy (December 2008).
2. City of Wanneroo Draft Coastal Management Plan. Part 1. July 2012.
3. City of Wanneroo Local Laws. Local Government Act 1995. Dog Act 1976. City of Wanneroo Animal Local Law 1999.
4. Identification of subdivision, timing of release and expected population.
5. Stockland Communities (Amberton) Pty. Ltd. Amberton Coastal Setback Assessment.
6. Eglinton Marina – Comments for local structure plan.
7. Eglinton Local Structure Plan.

3.1.1 Swimming

The beaches in the Amberton area are not easily accessible for swimming as the site is un developed with a lack of direct beach access. Access is generally via any of a series of 4WD tracks, or from Pipidinny Beach or Yanchep area in the north. There is currently no direct access and supporting infrastructure (paths/stairways, car parks, amenities, ablution facilities). The origin of users is unknown, but is likely to be a combination of local residents and visitors to the area. As access becomes more prevalent and formalised it is likely new members of the Amberton community will become frequent users of Amberton Beach.

The Amberton beach area is generally considered a suitable beach for swimming under average conditions; however, this can change depending on the prevailing swell, wind direction and strength, tide position, time of the year and ultimately the fitness and capability of each individual beach user. There is a large section of beach at the northern end of Amberton which is exposed to rock platforms in the surf and swash zone. Beach users should be discouraged from swimming in this area.

3.1.2 Surfing

Surfers are known to visit the area, however not in the same numbers as the more accessible beaches further north (the Spot) and south. Access is via a series of 4WD tracks which, in itself, presents hazards due to the poor conditions, range of visibility and gradient of some areas of the track. There are no facilities or infrastructure behind the beach.

The wreck of the Amberton and the surrounding reefs are known to be more frequented by surfers than the beach; however, a boat is usually required to access these surf breaks. It is highly likely that as the development is opened with roads and access paths a range of recreational beach and aquatic users are more likely to use this area of coastline such as:

- Kite surfers
- Wind surfers
- Ocean paddlers
- Water walkers
- Fitness groups

3.1.3 Fishing

There is first hand and anecdotal evidence that fishing occurs along this area of coastline, however similar access issues as those confronting swimmers and surfers are present. Historically, this area is accessed by beach fisherman when four wheel drive access was frequent and available.

The rocky sections of beach to the north are likely to be frequented by fisherman as beach visitation rates increase. Signage is recommended to warn fisherman of the hazards (slippery and uneven surfaces, dumping waves). Zoning is advised to separate swimmers and fishers and is another reason to discourage swimmers from using these areas.

3.1.4 Beach/Track Walking and Recreation

There are no existing formal tracks in the area, however 4WD tracks are abundant.

During site visits by SLSWA, 4WD access was witnessed.

Figure 2: Overview of Beach WA 893 and specifically highlighting the Amberton beach development frontage (yellow line) (Google Earth)

This report systematically progresses through the risk management steps with regard to Amberton Beach.

3.2 Site Inspection

Site visits were completed on the following dates:

Location	Date
Alkimos-Pipidinny-Yanchep (S) [Amberton Beach]	29th October 2013 7th, 8th and 18th November 2013 18th February 2014

At no time during the inspection was the water entered. The inspection area was limited to the area outlined within the *'Site Identification'* section of the report.

All inspections were performed from the land, along the edges of the water, along the rocks outcrops, headlands, and pertinent access tracks and informal access points.

3.3 Hazard Identification and Risk Assessment

During the site inspection hazards were identified within the area inspected and assessed in terms of their individual risk to public safety (extreme, high, medium, low) using a risk assessment matrix (see Appendix B). The risk assessment matrix considers both the type of

harm that could be sustained as a result of an individual hazard and the likelihood of this harm actually occurring. The matrix is not specific to Stockland risk tolerances.

International Life Saving (ILS) endorses the Surf Life Saving Australia (SLSA) Aquatic Public Safety Risk Assessment program. The methodology is as follows:

1. Determine the minimum acceptable level of risks and potential injuries through completion of a risk assessment in accordance with recognised guidelines and standards.

2. Provide economically sustainable risk mitigation options

3. Provide recommended staging plans considering the environmental conditions, forecast settlement areas, beach access and usage

4. Review the status of aquatic safety and signage management

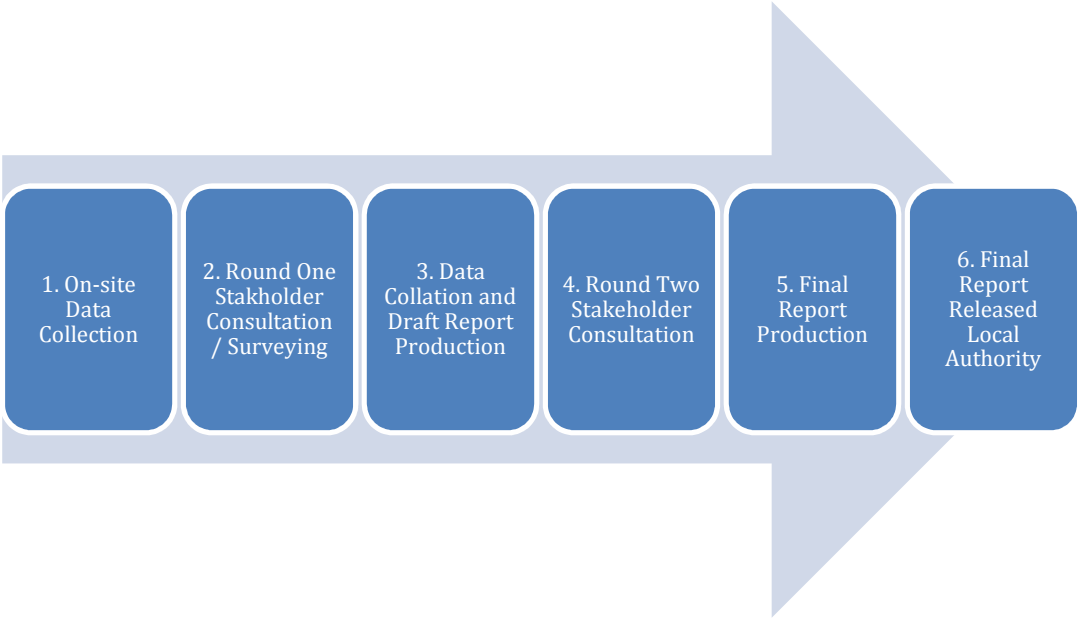
5. Evaluate the level of compliance or noncompliance with relevant regulations and standards

6. The assessment will include reference to:

    a) The Australian Beach Safety and Management Program (ABSAMP)
    b) The Australian Coastal Public Safety Guidelines
    c) Beaches of the Australian Coast-A guide to their nature, characteristics, surf and safety
    d) The National Aquatic and Recreation Signage Style manual
    e) Relevant standards including AS/NZS 2416:2010 Water Safety Signs and Beach Safety Flags (Parts 1, 2, 3) and AS/NZS ISO 31000:2009 Risk Management-Principles and Guidelines; and

7. Consult with relevant community stakeholders including volunteer surf life saving services and other community organisations involved in or impacted by beach safety

The diagram below shows the steps involved for the Project. These steps were repeated for each assessment area.



3.4 Data Analysis

Data relevant to risk assessment has been considered in the production of this report. This includes:

- News and media information
- SLSA Incident Reporting Database
- National Coronial Information System
- Coronial recommendations
- City of Wanneroo future local development
- City of Wanneroo beach usage statistics
- City of Wanneroo community profile data
- On-line local community survey
- Formal and informal interviews with identified stakeholders

All of these areas, factors and associated data have been taken into consideration within the risk register and risk treatment plans.

3.5 Beach Hazard Ratings and Overview

The hazards present at any given beach are very often determined by its geomorphology and the impact of water and weather conditions. Therefore it is important for land managers to understand the risks presented by these hazards. Since the late 1980s, Surf Life Saving Australia and the University of Sydney have partnered to identify the beach hazard ratings of every known beach in Australia.

The ABSAMP (Australian Beach Safety and Management Programme) was developed by Professor Andrew Short from the University of Sydney Coastal Studies Unit in conjunction with Surf Life Saving Australia and the State Associations. The programme has identified coastal hazards that affect bathers and rates the safety of the beach on a scale of one to ten, where one (1) is the least hazardous and ten (10) is the most hazardous.

The beach hazard ratings and definitions are provided in Table 1 below.

Table 1: ABSAMP Beach Hazard Ratings

Hazard Rating	Details
1 - 3	Least Hazardous: Low danger posed by water depth and/or weak currents; however, supervision still required, in particular for children and poor swimmers.
4 - 6	Moderately Hazardous: The level of hazard depends on wave and weather conditions, with the possibility of strong rips and currents posing a moderate risk.
7 - 8	Highly Hazardous: Experience in strong surf, rips and currents required, with beaches in this category considered dangerous.
9 - 10	Extremely Hazardous: Identifies beaches that are considered extremely dangerous due to strong rips and currents, and large breakers.

The beach hazard rating is calculated by determining the beach type and wave height. This can be done under either modal (average) or prevailing (current) conditions. The beach hazard rating is then calculated by using the following tables:

Table 2: Beach hazard rating calculation matrices for wave dominated beaches.

Wave Height / Beach Type	< 0.5 (m)	0.5 (m)	1.0 (m)	1.5 (m)	2.0 (m)	2.5 (m)	3.0 (m)	> 3.0 (m)
Dissipative	4	5	6	7	8	9	10	10
Long Shore Bar Trough	4	5	6	7	7	8	9	10
Rhythmic Bar Beach	4	5	6	6	7	8	9	10
Transverse Bar Rip	4	4	5	6	7	8	9	10
Low Tide Terrace	3	3	4	5	6	7	8	10
Reflective	2	3	4	5	6	7	8	10

It should be noted that the beach hazard ratings presented in this report relate to modal beach conditions and as such the hazard rating of a beach may increase when conditions alter *e.g.* with increasing wave height, winds, strong tides and high tide.

Furthermore, a hazard rating is also applied to an average person and therefore depending upon an individual's own skill, understanding and competence in relation to a certain area the hazard may in fact be greater or less.

The ABSAMP hazard ratings for the inspected areas of Amberton Beach are detailed within the next section of the report.

3.6 ABSAMP Beach Types and Ratings for Amberton Beach

The ABSAMP Hazard Rating for Amberton Beach is listed in Table 3. The table provides an ABSAMP rating and descriptive label/name type for each specific beach location.

Table 3: ABSAMP Beach Hazard Ratings – Amberton

Location Name	ABSAMP no.	ABSAMP Rating	ABSAMP type
Alkimos-Pipidinny-Yanchep (S) [Amberton beach]	WA 893	4	Reflective plus low tide terrace

3.7 ABSAMP Beach Type Characteristic Overview and Hazards for Amberton Beach

Amberton beach characteristics and associated hazards are:

Table 4: Table description of Reflective Beach Type

Beach Type	Details
Reflective Beach (R) plus Low Tide Terrace (LTT)	**Summary – Reflective Beach and Low Tide Terrace** Characteristics: Consists of waves that tend to reflect back off the beach with 0.0m-1.0m breakers. These beaches generally only occur on very low wave beaches and on harbor beaches. Hazards: Normally the safest for bathing, apart from deep water close inshore and when the shore break is higher during periods of high wave conditions. Beach Hazard Hints: Caution as a steep beach and abrupt drop off to deeper water can make access hazardous for the young, elderly or infirm/disabled.
	Reflective Beach **Characteristics:** Reflective sandy beaches lie at the lower end of the wave dominated beach spectrum. They are characterized by relatively steep narrow beaches usually composed of coarser sand. On the WA open coast, sandy beaches require waves to be less than 0.5m to be reflective. For this reason they are normally found at entrance to bays, at the lower energy end of some ocean beaches and in the lee of the many calcarenite reefs and rock platforms. Reflective beaches always have a steep, narrow beach and swash zone. **Hazards:** Reflective beaches usually offer relatively safe swimming conditions due to the low waves and generally protected locations. Changing waves and currents can produce a number of hazards to both swimmers and surfers. These are summarised: • Steep, soft beach face may be a problem for toddlers, the elderly and disabled people, • Relatively strong swash and backwash can knock children and unwary people off their feet, • Swash zone step can cause a sudden drop off from shallow water into deeper water, • Deep water – the absence of a sand bar means deeper water close into shore, which can be a problem for non-swimmers and children, • Surging waves and shore break – when waves exceed 0.5m they break increasingly heavily over the step and lower beach face. The can knock unsuspecting people over. If swimming seaward of the break, swimmers may experience problems returning to shore, • Most hazardous when waves exceed 1m and shore break becomes increasingly powerful; and • When fronted by a rock platform or reef, additional hazards are associated with the presence of rock/reef.

	Summary: Reflective beaches present low hazards under low wave conditions, provided users are competent swimmers and experienced at swimming in the surf. Parents/guardians need to monitor children carefully due to the proximity of deep water to the shore. A hazardous shore break and strong surging swash is commonly present where waves are greater than 1m in height.

Beach Type	Details
	Low Tide Terrace **Characteristics:** Low Tide Terrace beaches are the lowest energy intermediate beach type and the most common intermediate type in Western Australia. These beaches occur on the open coast where the sand is fine to medium and wave height averages between 0.5m and 1m, and particularly where near shore reefs and headlands lower waves to less than 1m at the shore. Low Tide Terrace beaches are characterised by a moderately steep beach face, which is joined at the low tide level to an attached bar or terrace. The bar usually extends between 20m and 50m seaward and continues along shore, attached to the beach. Mid tide conditions result in water being returned seaward, both by reflection off the beach and via the mini rips, even if no rip channels are present. The rips are usually weak, ephemeral (short-lived) and shallow. **Hazards:** Low Tide Terrace beaches are the least hazardous of the intermediate beaches because of their characteristically low waves and shallow terrace. Changing wave and tide conditions produce a number of hazards to both swimmers and surfers. These are summarised: • High tide: deep water close to shore; behaves like a reflective beach, • Low tide: waves may plunge heavily on the outer edge of the bar, with deep water beyond. Extreme care should be taken if body surfing or body boarding in plunging waves – the consequence is likely to be spinal injuries, • Mid tide: more gently breaking waves and waist deep water; weak mini rips return some water seaward, • Diving: care is required if diving into the surf as the water is usually shallow and can result in head/spinal injuries, • Higher waves: mini rips increase in strength and frequency, and may be variable in location; and • Oblique waves: rips and currents are skewed and may shift along the beach, causing a longshore and seaward drag *Summary:* Low Tide Terrace beaches are most hazardous at mid to high tide when waves exceed 1m and are oblique to shore, e.g. during summer when the winds are stronger.

3.8 Facility Visitation Rates (FVR) for Amberton Beach

The Facility Visitation Rate (FVR) is a term, which has been developed to provide a quantitative assessment that can be used to determine the most appropriate signage schedule for a facility (venue or location). The FVR is a calculated using data collected during the assessment process and includes site population use, and frequency of use. As the FVR calculation is used to determine aquatic recreational warning signage requirements the figures used are those of the peak period of beach usage. The following calculation is derived using:

I. Stakeholder observation, consultation and feedback relative to the table values outlined , and;
II. Utilisation of the Facility Visitation Rate (FVR) formula, where:

Facility Visitation Rate = (ABSAMP Rating x Population) + Frequency

The values and calculations are outlined as follows:

Table 5: Facility Visitation Rates – Amberton

LOCATION NAME	ABSAMP RATING	*	POPULATION	+	FREQUENCY	=	FVR
Amberton-Pipidinny-Yanchep (S) [Amberton beach]	4	*	1	+	**1**	=	**6**

Given the FVR scores, shown in the above table, listed below is an outline of the most appropriate sign characteristics pertinent to each location:

FVR Score between 7 and 10 –

This score would generally indicate that *where access cannot be controlled*, entrances to the beach provided by council have signage and spaced no greater than 500 metres apart around the beach perimeter. Additionally the signage should contain the following:

- The name of the facility
- A general warning message
- All Council's Ordinances that apply to the facility should appear on the sign as prohibition pictograms
- All potential hazards identified within the facility that have a risk rating of HIGH should appear on the sign as warning symbols. If no highs then the top hazard should appear
- Any information symbols relevant to the facility

3.9 Communication and consultation

Communicating with stakeholders about risk perception and tolerance is the heart of the risk management process.

During the onsite visits for the assessment from October 2013 to February 2014, consultation with a number of stakeholders was undertaken to ensure the report process was transparent and to gain local knowledge, background and visitor statistics on the areas inspected. Stakeholder interviews were conducted with:

- Chris Peck, Community Safety Manager, SLSWA
- Belinda Fleay, Health Promotion and Research Coordinator, SLSWA
- Matt du Plessis, Lifesaving Operations Coordinator, SLSWA
- Shane Spinks, Manager Community Programs and Services, City of Wanneroo
- Tom Barry, Development Manager, Stockland
- Chrystal King, Senior Environmental Consultant, Emerge Associates
- Chris Newton, Director, Senior Landscape Architect, Emerge Associates

The process of communicating risk estimates from the assessment process to decision-makers and ultimately to the public, sometimes referred to as risk education, is only one part of the communication process.

However, in getting those affected by risk to accept risk mitigation measures, and in providing decision-makers and communities with the information they need to tolerate and deal with risks, there needs to be two-way communications that includes those affected by risk, the public, into the decision-making process.
There is a great opportunity to have this wealth of knowledge actively participate in the implementation of many of the potential risk treatment options. In particular it would be strongly recommended that the recommendations of this report are discussed on a regular basis at the City of Wanneroo coastal aquatic risk review meetings.

4. Risk Assessment Findings

Assessed Locations:

1 Alkimos-Pipidinny-Yanchep (S) [Amberton beach]

4.1 Action Planning Priority (Gross Risk)

It must be noted that the below calculation of action planning priority index reflects the current status of the beach. Being a greenfield site with no formal access tracks, facilities or amenities and very little housing nearby the number of beach users is minimal. This will result in a 'very low' priority index for the region. Given the proposed residential development and the associated development in the coastal region over the next 10 years, visitation rates and conflicting activities on the beach will increase. For this reason consideration needs to be given to potential numbers and incorporate this in planning of the coastal zone at Amberton.

4.1.1 Action Planning Priority Index

The action planning priority index can be viewed as the gross risk score for a beach. The index seeks to identify the risks associated with the broader coastal environment under assessment, rather than specific hazards and risks present at a particular location or site. The majority of information detailed in this section of the report will be identified through pre-existing data (where available), with new data sourced where gaps are present or the data is not reliable.

The information is based on modal data for peak visitation during the busiest season(s). Appendix D of this report is site/hazard specific and will give greater detail for local control measures best suited to local requirements, including factors such as; weather, seasonal adjustments, times, activities etc.

The action planning priority index uses the following risk identification information (RII) - (where available):

1. Australian Beach Safety & Aquatic Management Program Rating (ABSAMP Rating)
2. Local Population Rating (LPR)
3. Human/Activity Interaction Rating (HAIR)
4. Access Rating (AR)

4.1.1.1 Australian Beach Safety & Aquatic Management Program Rating (ABSAMP Rating)

The University of Sydney Coastal Studies Unit developed ABSAMP (Australian Beach Safety and Management Program) in conjunction with Surf Life Saving Australia and the State Associations. The program has identified coastal hazards that affect bathers and rates the safety of the beach on a scale of one to ten, where one (1) is the least hazardous and ten (10) is the most hazardous (see appendix A for ABSAMP beach type characteristic overview). The scales are tabled below:

Location Name	ABSAMP no.	ABSAMP Rating	ABSAMP type
Alkimos-Pipidinny-Yanchep (S) [Amberton beach]	WA 893	**4**	Reflective plus low tide terrace

4.1.1.2 Local Population Rating

The Local Population Rating (LPR) expands on the information obtained from the Facility Visitation Rating (RII part 2). This additional population rating identifies the population of residents and/or non-residents located within 2km's of a coastal location under assessment. The highest figure (resident or non-resident) will be recorded.

Population Rating	Qualifying Description (all staying/living within 2km of beach)
1	< 50 residents and/or < 20 non-residents (domestic or overseas tourists)
2	50 - 250 residents and/or 21 - 100 non-residents (domestic or overseas tourists)
3	250 - 1000 residents and/or 100 – 500 non-residents (domestic or overseas tourists)
4	1000 – 2500 residents and/or 500 – 1000 non-residents (domestic or overseas tourists)
5	2500 + residents and/or 1000 non-residents (domestic or overseas tourists)

Location	LPR Total
Alkimos-Pipidinny-Yanchep (S) [Amberton beach]	**1**

4.1.1.3 Human/Activity Interaction Rating

The Human/Activity Interaction Rating (HAIR) identifies any conflicts present at the coastal environment between the number of people and activities taking place. Activities include both those in the water and those on the beach. A conflict may include a passive activity such as picnicking and ball games.

Population (in-water)		Conflicting activities		Population (on beach)		Conflicting activities	
100+	5	Persistent and dangerous	5	1000+	5	Persistent and dangerous	5
75-100	4	Persistent	4	750-1000	4	Persistent	4
50-75	3	Regular	3	500-750	3	Regular	3
25-50	2	Isolated conflicts	2	250-500	2	Isolated conflicts	2
1-25	**1**	No conflicts reported	**1**	1-250	**1**	No conflicts reported	**1**

Location	Population (in water)	Conflict	Population (on beach)	Conflict	HAI Total
Alkimos-Pipidinny-Yanchep (S) [Amberton beach]	**1**	**1**	**1**	**1**	**4**

4.1.1.4 Access Rating

Beaches or coastal environments that have increased accessibility (i.e. near major roads, cities, public transport, car parks, boat ramps, maintained access paths etc) increase the likelihood of users at that beach. This directly increases the level of risk of drowning and or injury and should be assessed as part of a wider risk assessment.

Access Rating	Qualifying Description
1	No identifiable access via road or track, no facilities, car parking or obvious access points
2	Access via un-maintained track with no facilities and/or via water access
3	Access via any form of track or walkway (either maintained or un-maintained) AND any provision of facilities or services including (but not limited to) public transport, shower, public toilet, payphone, kiosk, significant roadway, parking
4	Access via maintained tracks with clearly identified parking area AND/OR provision of basic facilities (i.e. public toilets, public shower/ wash down area) AND/OR within 10km of moderate sized town or city (population greater than 5,000)
5	Clearly evident, marked or signposted and maintained access points AND/OR within 10km of major town or city (population greater than 25,000) AND / OR car parking for 50 or more vehicles/boat trailers. Public transport provided within 250m of a beach access point

Location	Access Rating
Alkimos-Pipidinny-Yanchep (S) [Amberton beach]	**2**

4.1.1.5 Action Planning Priority Score

The action planning priority score provides an indicator for the overall level of risk of the location. The scores range from 0 to 60. These scores can be used to prioritise the order in which risk treatments described in Section 3 of this report are implemented.

Location	AMSAMP X 2 (Out of 20)	Population Support X 2 (Out of 10)	Human Activity/ Interaction (Out of 20)	Access X 2 (Out of 10)	Total Score (Out of 60)
Alkimos-Pipidinny-Yanchep (S) [Amberton beach]	**8**	**4**	**4**	**4**	**20**

Two beaches have an action planning priority score greater than 40. Scores of 40 or higher indicate a high overall level of risk. Where limited resources prohibit the implementation of all risk treatments recommended in this report, those beaches that have received a high action planning priority score should be treated first, then beaches with a medium score.

Priority	Priority location	Priority Action & Total Score	Comments
1	Alkimos-Pipidinny-Yanchep (S) [Amberton beach]	20	The lower frequency and population use and low conflicting activities keep this beach and mitigation options in the very low range. As the frequency, population loading and conflicting activity increase so will the priority of action.

Key to Action Planning Priority	High 40+	Medium 31-40	Low 21-30	Very Low 0-20

4.2 Overview of Principal Risk Treatments

4.2.1 Overview of Principal Risk Treatments

There are ranges of risk treatment options that can be considered in the context of coastal risk management. The selection of the most appropriate option involves balancing the financial, social and environmental impacts of implementing each against the benefits derived from each. These may include any combination of the following

- Spread (share) risk – insurance
- Engineer (structural and technological) risk treatment – include modified practices
- Regulatory and institutional – change through revised regulations and planning
- Avoid – isolate the risk, move people away
- Research to better understand
- Educate and inform stakeholders

4.2.2 Hierarchy of risk treatments (controls)

In determining the most appropriate and cost effective option, it is important to consider the hierarchy of risk treatments (controls). The hierarchy is a sequence of options which offer a number of ways to approach the hazard control process.

- Hard controls deal with the tangible such as
    - Eliminate the hazard which in a coastal context is often difficult to achieve
    - Isolate the hazard which in a coastal context can be difficult due to the dynamic nature of environmental and weather conditions.
    - Use engineering controls such as design of access paths, installation of appropriate signage, and revegetation
    - Use administrative controls such as supervision, emergency action plans, other documented policies, practices and procedures
- Soft controls deal with human behaviour such as:
    - Awareness and education
    - Community and individual capacity building: and
    - Use of effective leadership, management, trust, ethics, integrity, and building relationships

Outlined below are principal risk treatment solutions that expand upon those listed within the Summary of Proposed Key Risk Treatments in Section 1.2 of this report. The solutions outlined endeavour to provide specific and detailed information relative to Amberton beach; however, due to the diverse nature of location characteristics, recommendations are at times generic in nature and may extend to risk mitigation at other City of Wanneroo beaches.

Stockland, as the land manager, should endeavour to adopt the most appropriate treatments specific to their organisations capabilities, and in consultation with all relevant stakeholders.

4.2.3 Haddon's Matrix Applied to the Amberton Beach

William Haddon Jr developed a conceptual model, The Haddon Matrix, over 40 years ago. The matrix applies basic principles of public health management to the problem of traffic safety (Runyan, 1998). The framework can be applied to any source of injury.

The Table below provides an overview of countermeasures for coastal aquatic hazards, as assessed using Haddon's Matrix.

Table 6: An overview of countermeasures, as assessed using Haddon's Matrix

	Host (Beach user)	Agent/Vehicle (Water, waves, rocks)	Physical Environment (Beach, rock platform)	Social Environment (Community norms, policies, rules)
Primary: Pre-Event **(Prior to the beach user entering the water)**	Education to choose appropriate locations and conditions Signage Weather warning systems Systems of supervision Dune vegetation maintenance; management of beach scarping and tunnelling	Activity Zoning Maintain access points	Restrict access Install safer access Maintenance programs Remove hazards	Regulate usage at times of heightened risk Cultural resistance to swimming at patrolled locations
Secondary: Event **(Once the beach user has entered the water)**	Provision of survival skills - education Swimming skill development Systems of supervision	Appropriate clothing/equipment Activity Zoning	Emergency Response Beacons / Alarms / Phones	Use of PFDs while engaging in other aquatic activity (especially if inexperienced)
Tertiary: Post Event **(Once the beach user is in difficulty and requires assistance)**	Education to teach others how to assist or advise the patient CPR and first aid Basic rescue techniques Systems of supervision	Public Rescue Equipment	Emergency markers Install better access for emergency services Emergency alarm/alert devices/systems	Improve response of emergency services Prompt/timely notification of an emergency

4.2.4 Beach Access and Public Amenity

The provision of access to the coast is a major contributor to the creation of risk in that access methods will guide people to the area and to any hazards that may be present. Access treatment, or otherwise, is a major contributor to managing coastal risk.

Currently there are no formal access tracks in place in the Amberton coastal zone, however there were a number of informal 4WD tracks observed during site visits (Figure 3). A full detail of access tracks observed at Amberton beach can be seen in Appendix F.

SLSWA has assessed the southern boundary of Amberton beach (proximal to the area 31°35'55.75"S, 115°39'7.84"E) (refer to Appendix C) to be the most suitable location for a recreational and leisure beach. In order to direct swimmers and beach users to the safest areas the southern boundary is recommended as the site for the primary access points and associated infrastructure.

This area is optimal as it has:

- Less exposure to submerged rocks and reef along the shoreline and in the surf zone
- A more gentle gradient in to the water with an extended bank
- Lower dune elevation

These characteristics will create a more positive experience for swimmers and beach users and make entry and exit of the water easier and safer. The lower elevation of the dunes at the southern end will potentially allow for the construction of a multi-use access path for pedestrians, disabled and emergency service and other approved vehicles.

With the existence of public access infrastructure (defined and open access), and amenities comes the necessity to maintain existing infrastructure/capital works and further develop infrastructure to match that of the growing and changing community/stakeholders' needs. A key outcome of the implementation of access tracks and safety signage is the need for a periodic inspection, maintenance and replacement program.

Access tracks will require periodic inspection and maintenance. Common issues include sand drift, overgrown vegetation, degraded footings and damaged fencing. Continual upkeep of defined access paths and associated barriers, including the grading of access paths and sweeping of stairs/steps will ensure continued usage of formal tracks and prevent the creation of additional hazards.

Once defined access tracks have been developed any informal tracks should be closed off. Fences along the base of dunes on the beach and road side would help prevent future use of these tracks, stop the creation of new tracks and also help protect the dunes from further erosion. Revegetation of the dunes in these areas is also advised to deter use of the informal tracks and improve the stability of the dunes.

Figure 3: Example of an informal access track observed at Amberton Beach

RECOMMENDATION 1
Engage broader input into beach safety issues along the coast through periodic inclusion of other representative groups such as City of Wanneroo Ranger Services, Residential Representative Groups, Volunteer Marine Rescue, Local Surf Life Saving Clubs and Local Police.

RECOMMENDATION 2
The party responsible for implementing and maintaining beach access should identify hazards specific to access tracks should be removed where appropriate. Access tracks that are no longer in use, unnecessary or that lead people to any high-risk location/s should be considered for closure. If closure cannot be achieved then barriers should be installed to restrict or discourage access.

4.2.5 System of Safety Signage

A coordinated approach to signage, with strategically placed signs which are clearly visible, is a very important part of and the first stage toward more effective coastal aquatic risk management.

Due to the undeveloped nature of the Amberton site there are currently no formal tracks in place to access the beach, understandably there is no signage either. As the Amberton coastal zone is developed SLSWA advise Stockland to install informative and hazard signage at all access points, on entry roads and at individual hazards (refer to Appendix E). Emergency markers are also recommended at each access track to aid emergency services in the case of an incident. Once paths, roads and other infrastructure is in place SLSWA can undertake a signage audit to advise on types of signage and the exact GPS locations of these.

Examples of suitable future signs include:

- Beach and aquatic safety signage
- Location signage
- Marine zoning signage
- Signage relating to location of toilets/disabled access
- Signage relating to location of nearest lifesaving service
- Local government regulation signage
- Environmental and conservation signage
- Dune management signage
- Community information signage including safety, security and crime prevention.

RECOMMENDATION 3
The party responsible for implementing and maintaining beach access and therefore communication of risk (i.e. aquatic safety signage) must implement an inspection regime to assess the installation, adequacy and visibility of in-situ aquatic and recreational safety signage. Records of the inspections and actions should be maintained.

RECOMMENDATION 4
The number of individual signs at any one location should be maintained to a minimum, wherever possible. A single point of information for warning, regulation and information signage reduces confusion and visual pollution.

RECOMMENDATION 5
The party responsible for implementing and maintaining beach safety signs adopts and maintains Emergency location signage identifiers, as shown in the National Aquatic and Recreational Signage and Style Manual (NARSSM). These should be incorporated within existing safety signage at Amberton beach and the City of Wanneroo beaches generally. This should be done in consultation with relevant emergency services agencies.

A numbering system will need to be developed and adopted by the City of Wanneroo. Future municipal/residential developments need to be taken into account (to avoid out of sync codes/location identifiers associated with future developments).

Below are examples of the types of signage and hazard symbols to be installed at Amberton Beach.

Recommended Signage Types

Provided below are examples of the types of signs recommended within each of the coastal aquatic locations.

Level 3: Defined Access
Type B: 3 or 4 Hazard Symbols

Level 3 Open Access/Car Park
Type C: 3 or 4 Hazard Symbols

Level 1: Road Sign

Level 4: Individual Hazard and Regulation Signs

Recommended Hazard Symbols

In reference to the hazard symbol pictorials they are listed in summary below. The alpha numerical code relates to how they are coded within *A/NZS 2416:2012 Water Safety Signs and Beach Safety Flags – Part 1 – Specifications for water safety signs used in public areas* and the *National Aquatic and Recreational Signage Style Manual, Third Edition*.

Swimming Not Advised (AWS,1)

Unstable Cliffs (WSW010)

Submerged Objects (WSW007)

Warning (WS,15)

Unstable Cliffs / Falling Rocks (WSW011)

Shallow Water (WSW006)

Slippery Area (WS,11)

High Surf, Large Waves (WSW023)

Slippery Stairs (WS,37)

Outfall (WSW013)

Strong Currents (WSW015)

Deep shelving beach (WSW024)

Access and Signage Schedule – Access Specific Risk Treatments

The following signage schedules include existing and proposed risk treatments that are specific to accesses. These include, but are not limited to:

- **Closure (Elimination)** – involving revegetation of eroded ground and preventative measures (such as fencing and the removal of existing signage) that would prevent a reasonable person from concluding that access is provided.
- **Formalisation** – involving provision of access control measures (such as fencing and signage) that would allow a reasonable person to conclude that access is provided the desired location.
- **Maintenance** – existing signage & formal access tracks requiring maintenance to ensure they continue to provide the desired controlling of access, and ensure they do not become a hazard themselves.
- **Routine Maintenance** – Monitoring of implemented signage and formalised access to ensure a satisfactory condition is maintained.
- **Signage** – as described in "System of Safety Signage" (page 42). This may also involve the removal of non-standard signage that could cause confusion or detract from the desired purpose of standard aquatic and recreational signage.

Access and Signage Schedule – Recommendations for all signs

All signage should incorporate the following information:

- **General Information** – for example, the location and direction of the nearest patrolled location,
- **Regulations** – As required by Wanneroo ordinances,
- **Facility Manager** – If desired, the signs can incorporate the Wanneroo logo.

Emergency Location Indicators/Markers

Numbering of access tracks aids location of the incident in the case of an emergency. The City of Wanneroo must be contacted before any system of numbering is implemented to avoid out of sync codes or location identifiers associated with current or future development.

Emergency Vehicle Access to the Location

Access tracks for emergency vehicles are highly recommended. The ideal location for a main access track for vehicles would be near the allocated swimming area at the southern end of Amberton beach. Another reason why the southern section was recommended as the designated swimming zone is the reduced dune elevation. The lower dune heights allow for the construction of a vehicle access track in this location.

Those tracks that are used for emergency vehicles should be identified by appropriate signage at the nearest contact with the roadway. These signs should have an emergency location indicator/marker in accordance with the recommendations contained within this report and numbering scheme approved by the relevant emergency service providers.

Distance to closest Lifesaving Service Patrolled Area
The following signage should be used to direct the coastal users to permanent lifesaving services such as that provided by the four volunteer surf lifesaving clubs.

Where multiple signs are positioned at a location they will compete for the attention of visitors. More signs at a location not only create visual pollution, but may reduce the likelihood of any messages being understood. For this reason *A/NZS 2416:2010 Water Safety Signs and beach Safety Flags – Part 3 – Guidance for use*, provides options for the consolidation of signage onto a single multiple symbol sign. The use of such signs, in conjunction with the removal of any unnecessary signage, can reduce the overall number of signs used at a location and therefore reduce visual pollution. Most importantly, however, consolidation of signage may increase the likelihood of the messages on the signs being sighted by visitors and also may increase comprehension.

The recommended signage is, in the opinion of SLSWA, in compliance with both the Australian and International standards for Water Safety Signs and Beach Safety Flags and also mirrors the style guidance in the National Aquatic Recreational Signage Style Manual.

For more specific information on proposed signage at Amberton beach refer to Appendix E.

4.2.6 System of Supervision – Lifesaving Service Level Analysis

The direct or indirect supervision of aquatic coastal locations is often required to manage the risk of the location. The elevation in risk can be due to prevailing water conditions, the proximity to large populations of people, attendance at the beach/coastal area due to its proximity or attractiveness, seasonal fluctuations, the low capability and experience of beach users or due to the mix of activities in the same location.

The management of preventative and rescue services at coastal aquatic and recreational areas should distinguish between those areas that will receive a lifesaving service and those areas that will not receive such a service.

Levels of supervision that may be considered for Amberton Beach include:

- Beach access and point of hazard signage,
- Beach Camera streams/CCTV/ and other technologies
- Paid Lifeguard Roving Patrols,

- Paid Lifeguard in-situ services,
- Volunteer Lifesaving roving patrols; and
- Volunteer Lifesaving in-situ services;

The primary decision to be made by Stockland before establishing a lifesaving service is to decide which areas will be denoted as **guarded** (direct supervision) and which will be **unguarded** (indirect or no supervision).

A lifeguarded beach or designated safer bathing (swimming) area is one at which a trained lifesaver and/or lifeguard is stationed during prescribed times, with associated facility, plant and equipment and is designated by the erection of a pair of red and yellow flags. A mobile lifesaver/lifeguard or lifeguard vehicle that periodically visits or checks a location may be effective as a proactive prevention strategy.

Data gathering and education initiatives should not be considered as providing a guarded swimming location by either the land manager or the population served. The objective data collected; however, serves as a very important analysis and review tool to allow Stockland to make objective decisions around the cost benefits of implementing direct or in-direct supervision strategies.

Signage compliant with ***AS/NZS 2416:2010 Water Safety Signs and Beach Safety Flags*** is required at accessible beach locations. Signage is the first and most basic form of supervision.

Signage is known to increase the awareness of bathers at the location of the guarded/unguarded sites and the hazards present at each location, so that they may make an informed choice as to where to swim. This can be achieved through advertising in local media, and public awareness through residential, tourism and accommodation promotions.

The provision of supervision is difficult to establish, or may not be provided, for some or all of the following reasons:

- The provision of a service may encourage attendance at an unsuitable location, such as when the beach topography and morphology create a highly hazardous location,
- Difficulty resourcing lifeguards and/or lifesavers,
- Determined to be too cost prohibitive and therefore not provided by the responsible land manager; and
- The patronage of the location is low and the assessed risk level is minimal.

There is a range of aquatic supervisory services that should be considered - as one size does NOT fit all.

These include:

- **Full time Comprehensive Lifesaving Service** with appropriate levels of trained personnel, fixed and portable facilities, equipment, craft, vehicles and links to central command and emergency services.
- **Seasonal Lifesaving Service** with appropriate levels of trained personnel, portable facilities, equipment, craft, vehicles and links to central command and emergency services.
- **Seasonal Lifesaving Outpost Service with trained personnel**, portable facilities, some equipment and craft, and links to a command centre.
- A **flexible demand based service** with trained personnel which allocate resources to where they are most needed.

- **Beach Camera/CCTV recorded surveillance**;
- **Other technologies** which may include any combination of periodic monitoring, emergency response points/alerting and communication devices and on-line or other community surveys; and
- **No Service**, with the provision of safety signs and controlled access only.

VOLUNTEER LIFESAVING SERVICES

The City of Wanneroo currently provides resources to implement a comprehensive lifeguard service at two (2) ocean beaches (Quinn's beach and Yanchep Lagoon). Surf Life Saving Clubs (SLSCs) provide a voluntary highly skilled rescue service on weekends and public holidays through the patrol season. Neither of the beaches is patrolled 365 days a year.

These services collect data for days they are actively patrolling, which is logged into SLSA Surfguard database. Since Surf Life Saving Clubs offer voluntary services over wider period of time than current contracted lifesaving services, the statistics collected by these clubs can been used to quantify beach usage levels outside of the peak summer season. Even though the statistics collected by the Surf Life Saving Clubs pertain only to weekends and public holidays, it would be reasonable to expect that these figures could be used as a guide for mid-week usage, particularly during the school holiday periods.

Voluntary services provide an invaluable service to the community, and where possible should be used in conjunction with paid lifesaving services (Lifeguards) who are able to provide services throughout the week.

Currently no direct volunteer lifesaving services are provided at Amberton Beach. There are provisions for an outpost facility to be installed at Amberton Beach.

Table 7 below shows the current volunteer lifesaving service dates and times.

Table 8 below shows the current City of Wanneroo lifeguard service dates and times.

Table 7: Surf Life Saving Club patrol times

Location	Start Date	End Date	Days	Times
Quinns-Mindarie	3-Nov	30-Nov	Sun/PH (Exc Christmas)	0900 - 1500
	7-Dec	31-Mar	Sat	1000 - 1300
	7-Dec	31-Mar	Sun/PH	0900 - 1400
	1-Apr	21-Apr	Sun/PH	1000 - 1400
Yanchep	3-Nov	30-Mar	Sun	0800 - 1200

Table 8: SLSWA/City of Wanneroo lifeguards patrol times

Location	Start Date	End Date	Days	Times
Quinns	2-Dec	30-Mar	Mon – Fri (Inc Christmas)	0800 - 1300
Yanchep	2-Dec	30-Apr	Mon – Sat /PH	0900 - 1600
	2-Dec	28-Apr	Sun	1200 – 1600
	18- Apr	21-Apr	Fri – Mon (Easter)	0900 - 1600

Most likely the City of Wanneroo will be the responsible agency, long term, to meet the cost of developing and implementing a lifesaving service and this will require significant initial and ongoing financial commitment. There a number of challenges with the Amberton beach site regarding the placement and storage of lifesaving assets and equipment to operate the service. The inclusion of appropriate infrastructure will also require significant planning, development and financial contribution to adequately support the delivery of a direct surveillance service at Amberton beach.

In the opinion of SLSWA there is not yet sufficient data or infrastructure to support the implementation of a lifesaving service to provide direct supervision of beach users at Amberton beach.

SLSWA believe the immediate and ongoing cost to support a direct surveillance service currently outweighs the benefit of investment. SLSWA believe that any investment in coastal safety for Amberton beach would be better directed to supporting the outcomes of recommendations for long term awareness and education programs and beach camera surveillance. However an outpost facility may be an option as beach visitation rates increase.

BEACH CAMERA/CCTV

Cameras through open and closed circuit television (CCTV) can aid supervision through remote periodic monitoring of screens. There are limitations as the effectiveness of this method as it is often only as good as the person watching the monitor, as well as the appropriateness of the response procedures and practices in place to respond to an alert initiated by the person watching the screen/s.

Camera streams can be effective for incident investigation and review. Beach cameras can also be used to stream a video feed to the public who can then virtually assess beach conditions prior to attending the site and make appropriate decisions regarding their attendance.

In the opinion of SLSWA the implementation of a camera stream will assist Stockland to collect additional objective evidence on beach usage and activity, population loading and the frequency of the loading at Amberton beach. This information can be analysed and used to assist in the development and planning for future risk mitigation strategies and infrastructure requirements at Amberton beach. Collection of objective data with this technology is cost effective, flexible, frequent and sensitive to seasonal fluctuations.

RECOMMENDATION 6

The party responsible for implementing and maintaining coastal aquatic beach safety should carefully consider the implementation of electronic surveillance/monitoring solutions, including, but not limited to, recorded closed circuit television (CCTV). This system should form part of a lifesaving surveillance and outpost facility.

Lifeguard service

The nature of the volunteer lifesaving service means that it is most difficult to provide a lifesaving service on days and times when volunteers may be working or studying. As a consequence it is vital that lifeguards be employed to provide a lifesaving service during these times and at locations where beach conditions and attendances dictate.

City of Wanneroo currently provides a paid lifeguard service at the following locations during peak summertime and school holiday periods:

1. Quinns Beach; and
2. Yanchep Lagoon

No paid lifeguard service is currently in place at Amberton Beach, however with development of a surveillance and outpost facility, paid services are the most logical first step.

Lifesaving Service Assessment:

The following table identifies the peak season (Summer, Autumn and Spring School Holiday periods, as defined in Section 1.3) calculated Lifesaving Service Level Scores for Amberton Beach using the ABSAMP Beach Hazard Ratings; Visitation Levels; Frequency of Use; Residency of Visitors; Incident History; and Remoteness of Location to determine best practice lifesaving service levels, and for which the information was available.

Table 9: Lifesaving Service Level scores – Amberton Beach

Alkimos-Pipidinny-Yanchep (S) [Amberton beach]: LIFESAVING SERVICE LEVEL CALCULATOR

Dates	ABSAMP Rating	Visitation Rating	Frequency Rating	Residency Rating	Incident History Rating		Remoteness Rating	Total LSSL Score
					New	Existing		
Summer – 2014/2015	4	1	1	1	0	0	4	11

NOTES TO Table 9:

Note 1: When Visitations and Frequencies are low yet rating is high consideration should be given to some form of surveillance patrols or IT solutions to overcome variations of population/visitation numbers.

Note 2*: The option to have one lifeguard on a beach is only permissible under specific circumstances, these being:

- The ABSAMP beach hazard rating is **less than 4,** *or*
- Access to other rescue services is **less than 5 minutes**, direct communication with services is in place, and a Rescue Water Craft is in place.

Otherwise the minimum number of lifeguards at a given location would be **two**.

Detailed analysis of lifesaving service level scores for Fringe and Off-Peak seasons have not been assessed in this report as this was outside of the scope of this assessment. SLSWA is able to provide this service; alternatively your lifesaving service provider can assist you with determining these levels.

Lifesaving service level descriptors

The following lifesaving service level descriptors provide the recommended lifesaving service level for the scores/rating as calculated in Table 9 above. The scores are not absolute and are to be used as a guide in determining the actual levels.

Table 10: Lifesaving Service Level scores

Rating	Lifesaving Service Level Description
</= 10	Warning Signage to Aquatic & Recreational Signage Style Guide standard
11-14	Emergency Beacons and/or Camera Surveillance or Swimming Enclosure (where applicable)
	Routine monitoring/surveillance patrols (land, sea, air) to also be considered
15-19	Lifesaving service = 1 x Lifeguard personnel during period assessed (refer to note 2)
20-25	Lifesaving service = 2 x Lifeguard personnel during period assessed
26-30	Lifesaving service = 3 x Lifeguard personnel during period assessed
31 and >	Lifesaving service= more than 3 Lifeguard personnel during period assessed

Where the number of people in the patrolled area is over 1,000, the lifesaving service provider should increase the number of lifesaving personnel in line with the following table.

Table 11: Impact of beach attendance on lifesaving service levels

No. of People on Beach	No. of additional lifeguards
1,000 - 5,000	2
5,000 - 10,000	4
> 10,000	6

Crowds can become in themselves hazardous as a result of difficulties of surveillance and heightened crowd interaction

Activity zoning

Activity zoning provides a beach management tool to isolate or separate activities that may be incompatible with the other activities or to isolate hazards or activities that are required to be contained to a particular area. Zoning of activities can be considered in lieu of direct lifesaving services establishing daily beach management plans and zones; however, compliance to the zoning may be much harder to enforce if persons of authority are not in-situ.

However, despite a direct lifesaving service not being in place the seasonal, temporary or permanent use of zoning should not be discounted by Stockland to assist in risk mitigation at Amberton Beach.

There are two ways that zoning should be applied:

a. Confining a particular aquatic activity to a specific location; and
b. The segregation of activities that are a risk to other aquatic users.

The activities that are most commonly zoned include:

- Swimming,
- Surf boards (stand, stand up),
- Wind craft,
- Paddle craft,
- Fishing,
- Powercraft (including personal water craft [PWC] and water-skiing),

Primary zones for water-based recreation should include:

- Kite surfing
- Sailboarding
- Surfing
- Sub-aqua
- Fishing and/or spear fishing
- Water-skiing
- PWC

Consultation with the local community is essential before putting any zoning in place.

RECOMMENDATION 14

The party responsible for implementing and maintaining coastal aquatic beach safety should investigate and where practical implement activity zoning measures at Amberton beach. Zoning of incompatible activity will assist to reduce conflict and the incidence of injury by users of this location. This action can assist in directing swimmers into a safer swimming area south of Amberton beach.

4.2.7 Existence of Coastal/Beach Emergency Action Plans

Coastal emergencies can vary between land and water, and may be the result of natural processes or human action.

A well-planned and rehearsed Emergency Action Plan (EAP) can greatly minimise the extent of injury and damage if an incident does occur.

While SLSWA and the Surf Life Saving Clubs have well-developed Emergency Action Plans for Quinns and Yanchep beaches, these plans do not extent to or have been tested at Amberton beach. The developed plans and associated procedures should give consideration to:

- The identification and response to emergencies,
- The nature and types of emergencies,
- Protocols in responding to each emergency,
- The competency and proficiency of responders,
- The type of plant and equipment required for each identified emergency,
- Emergency access to beach locations,
- Planned and scheduled training/practice opportunities; and
- Monitoring and review opportunities.

RECOMMENDATION 7
Stockland to develop, implement and periodically test the effectiveness of an Emergency Action Plan (EAP) specific to identified emergency scenarios at Amberton beach. The development and implementation of EAP's should take into account the difficulties in accessing locations and the inherent risks of the locations.

4.2.8 Education and Awareness Programs

The City of Wanneroo has a substantial base of residents that are new arrivals to Australia who many have selected to live in a suburb promising a beach lifestyle. The same can be expected in Stockland's Amberton development. The City of Wanneroo jurisdiction therefore offers a unique occurrence where many people are frequently accessing the coast and have poor water safety skills and beach safety awareness.

SLSWA recommend that Stockland and the City of Wanneroo in consultation and cooperation with education institutions and learning centres within the City's boundaries, develop a funded plan that leads to the delivery of programs with students from grades K – 10 and that serve to improve and build resilience to drowning.

SLSWA recommend the program needs to be delivered annually with some of the presentations completed by a facilitator external to that educational institution. The external facilitator must have suitable knowledge and experience in water safety and have access to resources that support the delivery of these programs.

SLSWA recommend the key outcome of this program must be to increase;

1. Awareness of key coastal aquatic safety messages and information portals, (i.e. BeachSAFE, Twitter, RecFish West)
2. Awareness of coastal aquatic recreational risks and hazards at Amberton beach,
3. Awareness of safety signage and the meaning of specific hazard symbols in a coastal setting,

4. Awareness of locations at Amberton and that lead to knowledge of the appropriate areas to undertake aquatic recreation; and
5. Awareness of the need to build individual capability to recreate in a coastal aquatic setting through participation in:
    a. Learn to swim programs,
    b. Swimming fitness programs, and
    c. Surf activity and survival programs.

The development of a resident beach safety booklet or flyer with information specific to Amberton beach is another education tool. This booklet could be distributed to home owners in the area and assist in educating the wider community on the potential hazards at their local beach.

Items covered in the handbook or flyer may include:

- Beach access
- Hazards and warnings
- "Friendly" part of the beach for swimming
- Map showing beach zoning (for fishing, swimming, surfing, dog beach)
- Parking and other facilities
- Emergency Information
- Lifesaving services

Surf Life Saving Western Australia have investigated various education and awareness programs that are currently, or have been previously, in place to educate and inform beach users coming from both within and outside the City of Wanneroo boundaries, during the assessment and consultation phases of the project.

These include:

- School Education – Life Skills for Life at Mercy College (2012),
- Community Education (2012)
    - CPR Course – Irene McCormack Catholic College, Woodvale Senior High School, Mindarie Quinns Super Clinic
    - Senior First Aid – Woodvale Senior High School, Brightwater Care Group
    - Basic First Aid – Seacrest Homes, Bethanie
    - Remote First Aid – Irene McCormack Catholic College
- Edith Cowan University – Campus Surf Awareness Programs (Surf Educators Australia)

Existing programs should be regularly monitored and reviewed to confirm their effectiveness and ensure they are delivering the desired results.

A number of existing programs have been developed or are offered by various agencies, including Surf Life Saving WA that can assist Stockland to increase beach safety awareness and lifesaving skills. These programs which are imbedded in the SLSWA **BeachSAFE Initiative** include:

- **SurfBabies and SurfKids:** A six week program aimed at children from 2-7 years of age and their parents to increase awareness, confidence and safety at the beach.
- **Surf's Up:** A holiday program for participants between the ages of 7 & 10 years. Over a three day period, participants learn about and enjoy the beach environment with fun games on the beach and in the water, under the supervision of qualified Surf Lifesavers and trainers.
- **Beach Activities**: A way to educate students on the important aspects of sun and beach safety, while increasing their skills and fitness in the water and on the beach. Important safety

information is integrated into activities such as board riding, surf negotiation, swimming and beach games.

- **Life Skills for Life:** The program is an interactive two hour program designed to teach school children resuscitation and basic first aid.
- The **SunSmart SurfSmart Presentation:** An interactive PowerPoint presentation covering important topics of sun and beach safety. This includes dangers at the beach, warning signs and meanings, surf environments, identification of lifesavers, wave types, rips, sea creatures, sun protection and safety at the beach.
- The **On the Same Wave:** This program is a beach safety and awareness program aimed at people from multicultural backgrounds. The program can be tailored to suit each groups needs and includes any combination of the SunSmart SurfSmart Presentation, Beach Activities and Life Skills for Life programs using multilingual and culturally appropriate resources.
- The **Nippers Program**: Children aged 5 to 13 years participate in beach activities where they learn about beach safety, surf sports and the beach environment.
- **Indigenous Sports Program:** Aimed at educating indigenous students in rural communities by increasing their knowledge of beach safety and Basic first aid skills, through the SunSmart SurfSmart Presentation and the Life Skills for Life program.
- The **SLSWA School Cadets**: Aims to engage secondary school aged children to participate in personal development and leadership, and aims to foster qualities of community responsibility and service in the way of coastal aquatic safety.
- The **Ocean Paddling – Be Safe Project**: Aims to provide a safety framework and guidelines aimed at the recreational paddler in how to safely participate in recreational paddling activities at the WA coast.
- The **Kite Boarding – Be Safe Project:** Aims to provide a safety framework and guidelines aimed at the recreational kite boarder in how to safely participate in recreational kite boarding activities at the WA coast.
- **Community Surf Rescue Certificate:** Provides participants with the skills and knowledge of basic prevention/rescue and surf awareness in order to be able to participate in aquatic activity and supervise others; and
- The **BeachSAFE website and app**: Information portals that target at all beach users. People can find their nearest patrolled beach and check the associated hazards and recommended activities appropriate for that beach at any time. Other information is provided which allows beach users to make an informed decision about whether or not to recreate at the beach including; weather, UV index, patrol timetable, activities, beach hazard rating and beach facilities such as car parks and café's.

Table 12: Example template of education and awareness program

Program	Target audience	Location	Delivery (Who)
School based safety programs	Lifesavers/Lifeguards attending local LGA primary schools	All locations	SLSWA/Stockland
Indigenous safety awareness program	Visit by local lifesavers/lifeguards to indigenous communities to provide beach safety information	All locations	SLSWA/Stockland
Car park tickets	Use car parking ticketing to deliver key safety messages, e.g. ***always swim between the red and yellow flags***	All locations	City of Wanneroo
QR Codes	Use of QR codes on signage and other infrastructure to link to location based beach safety information		SLSWA/Stockland
Media/Promotion	Use local media and promotional opportunities to deliver safety messages during the peak summer season, i.e. local newspapers, local radio, community publications and billboards Multi Media – Internet Social Media	All locations	Locally significant cultural events SLSWA/Stockland
Nipper programs	Encourage local children to join local SLSCs and take part in Nipper activities.	All locations	SLSWA and SLSCs
Surf survival program	Promote SLSAs surf survival program at local SLSCs and surf shops no tomb stoning message	All locations	SLSWA and SLSCs
Beach and ocean safety warnings	Media (e.g. Radio and TV), Internet, digital road signage, BeachSAFE, Digital information screens Edith Cowan University, SLSWA/CoW Lifeguards on local TV news doing beach reports – also promotes safety, conditions and the profile/capabilities of lifeguards and lifesavers	All locations	SLSWA and Stockland

<u>QR Codes</u>

There are many opportunities at present to make use of technology in innovative ways for education and awareness programs. One such opportunity is the use of smart phones to provide location based safety messaging. One method of delivering this would be to implement a system of Quick Response (QR) Codes. These codes can be included on signage and linked to specific beach safety information relating to the beach. The codes can be scanned by smart phones with freely available QR scanning applications installed, such as QR Reader on the iPhone. Below is an actual example of a QR code. This system would be relatively easy and cost effective to implement and would create opportunities for the media to increase public awareness of beach safety related issues. The Shire of Augusta-Margaret River has successfully retro fitted QR Codes to existing signage at beach access points.

Figure 4: An example of a QR Code linked to beach safety information

RECOMMENDATION 8
The party responsible for implementing and maintaining coastal aquatic beach safety should, in association with other water safety and emergency response organisations develop a planned and adequately resourced approach to improving long term education and awareness opportunities as they relate to safe aquatic recreation at Amberton beach.

RECOMMENDATION 9
Stockland to fund and develop a resident beach safety booklet or flyer to be distributed to new home owners in the Amberton development. This booklet will contain beach safety information specific to Amberton beach.

RECOMMENDATION 10
The party responsible for implementing and maintaining coastal aquatic beach safety should implement the use of Quick Reader (QR) codes on aquatic and recreational safety signage at Amberton beach. Users of this technology are taken to coastal aquatic safety information and in languages and translations that are relevant to their culture and language. The use of QR codes should form part of any aquatic education and awareness programs.

4.2.9 Public Rescue Equipment (PRE)

Public rescue equipment in coastal areas must be appropriate for the features and conditions of the coastline and water. The equipment should be easy to use by members of the public with minimal hesitation and without putting the safety of the rescuer at risk. Not only the type of PRE that is important, but also that it is positioned in the correct location and that maintenance and checking procedures are addressed and in place.

Primary considerations for the adoption of PRE at a coastal location include:

- PRE that requires the rescuer to enter the water to reach a casualty should not be used, for example a personal flotation device with line attached,
- PRE should have inherent buoyancy to support an adult casualty whilst in water,
- PRE device should be retrievable once deployed and then reusable,
- The traditional large life ring is less effective when a rescuer is required to throw rather than lower the equipment to a casualty,
- Line should float and have a breaking strain of no less than 0.5 tonne,
- The line should be no longer than 25m plus any additional drop to the water,
- PRE should be of a weight that is not overly affected by wind conditions and should not present a danger to the casualty,

- Minimum instructions should be presented in order, to reduce confusion and deployment time,
- PRE is not a suitable control measure for some types of shallow shelving beaches,
- The need for strategies to reduce the occurrence of vandalism,
    - Displacing and enforcing by-laws,
    - Electronic warning systems,
    - Awareness and education; and
    - Repositioning/removal of PRE.

Most rescue equipment that is available is for two types of rescue – reach rescue and throw rescue. This is because there is an element of danger associated with any rescue. Other rescue equipment is intended for use by trained lifeguards/lifesavers.

There is limited research, literature or guidelines available in Australia on the use of PRE. The Royal National Lifeboat Institute (RNLI) in the UK has published ***A guide to coastal public rescue equipment*** (2007). The New South Wales Department of Primary Industries commissioned a report titled a *Research Review of Rock Fishing in New South Wales* (2012). This report was named NSW Water Safety Research Project of the Year at the NSW Water Safety Awards in 2012. Page 47 of this report discusses tertiary prevention strategies (post event). This report also notes "Australia currently lacks a rigorous methodology or guideline for the installation of public rescue equipment". Action item 1.16 of the report makes the recommendation to "develop, including necessary field testing, and implement a guideline for the use of public rescue equipment to ensure adequate methodology for the citing, installation, and maintenance of public rescue equipment".

Rescue tubes are not recommended for public use for the following reasons:

1. Rescue tubes are a piece of lifesaving equipment requiring training for safe and proper use,
2. Lifeguards and lifesavers are trained to use rescue tubes in conjunction with swim fins; and
3. Rescue tubes require a rescuer to enter the water to perform a rescue and retrieve the victim by swimming back to shore.

The instalment of public rescue equipment is not recommended at this stage of development due to the lack of visitors to Amberton beach. As development of the region continues with the creation of paths, roads and other infrastructure leading to an increase in visitation rates to Amberton the use of public rescue equipment should be revised.

4.2.10 Dune Vegetation Maintenance, Beach Scarping and Tunnelling

People like to have fun on the beach and often dig holes, sculpture the sand or climb amongst the dunes. It is safe as long as people do not excavate or build structures that can collapse and bury them.

- Slopes of dry sand are extremely unstable because there is no attraction between the grains,
- Wet sand dries out quickly,
- Vibrations (from wind, waves or footsteps) can make sand slopes collapse, even when wet; and
- A tunnel or hole in sand can cave in at any time, without warning, when anyone tunnels or digs deep holes.

Dune and beach scarping has been identified as a hazard at Amberton beach fore dune, with the potential risk of tunnelling, sand collapse and fall injury.

Options to reduce the risk of tunnelling, sand collapse and falls in relation to erosion issues are limited. Some options may include:

- Individual hazard and/or temporary signage,
- Access restriction barriers (permanent or temporary); and

- Periodic monitoring of specific locations where this has been identified as a potential risk.

RECOMMENDATION 11
The party responsible for implementing and maintaining coastal aquatic beach safety should consider, and where practicable, implement engineered options to minimise the risks associated with dune and beach scarping presenting a risk of tunnelling, sand collapse and falls, or access to rock overhang areas.

RECOMMENDATION 12
The party responsible for implementing and maintaining coastal aquatic beach safety should consider that vegetation species planted in dune revegetation programs should be regularly monitored to ensure that they are not negatively impacting on the provision of safety and emergency services at a location. In particular the monitoring should ensure that plant foliage does not obscure vision of signs and reduce the effectiveness of the messaging.

4.2.11 Emergency Response Beacons, Alarms and Phones

Emergency response beacons are a mobile or fixed unit capable of providing emergency communications to high-risk unguarded localities where there is a history of fatal drowning or other coastal death. The time taken to raise the alarm and achieve an emergency service response in such locations is a contributing factor to the chance of survival. These types of units (pictured below in Figure 5) are capable of communicating over two-way radio network, GSM or fixed line network.

Public education and information as to the location of the lifesaving service, including typical response times, should be provided near/on the ERP, along with other emergency service information.

A suitable Standard Operating Procedure (SOP) and Emergency Action Plan must be developed if this mitigation strategy is adopted.

Simple and effective use of these technologies allows emergency reporting and voice information to be received by emergency communication centres using a range of technology. Field evaluation has proved the community recognises these devices, as they are common on motorways, public transport and access areas throughout the world today.

Any program initiated and supported by Stockland will need to monitor and review any malicious activations and vandalism of the device before determining this strategy as permanent.

Figure 5: An example of a mobile Emergency Reporting in place at a beach(s)

At this stage SLSWA does not recommend the installation of an Emergency Response Beacon. When the facility visitation rates and priority action score for Amberton beach increase the instalment of an Emergency Response Beacon should be revised.

4.2.12 Monitor and review

Monitoring and review activity are an important part of risk mitigation to ensure that risk treatment options are meeting their objectives, new hazards and risks are identified and addressed in a timely manner and evolving strategies are in line with community expectations.

Stockland should ensure there is a process of regular review of the effectiveness of any risk treatments implemented. This should include a process for the collection of data regarding any incidents affecting public safety.

RECOMMENDATION 13
The party responsible for implementing and maintaining coastal aquatic beach safety should review and continue to enhance aquatic recreation public safety injury data and information collection. This should include the collation and analyses deemed necessary to underpin accurate risk assessment and effective risk treatment plans and actions.

5. Actions Register

Assessed Locations

1 Alkimos-Pipidinny-Yanchep (S) [Amberton beach]

5.1 Implementation Priorities

This section provides an example only of the charting and recording of actions taken in implementing a consistent risk mitigation program at Amberton beach. The actual implementation and records taken against actions is left to Stockland to confirm.

Priority 1

- Acceptance or otherwise of report recommendations to be completed by Stockland officers.
- Control measure implementation charts, to be completed and responsibilities assigned.
- Works programmes to be developed or re-affirmed from recommended control measure implementation charts, and in conjunction with relevant internal (or where appropriate) external stakeholder groups.
- High priority works to be commenced as soon as is practical.
- Communication with relevant stakeholders be maintained or increased.
- Risk monitoring practices and procedures is implemented with records retained.
- Enhanced data collection and collation procedures are implemented.
- Monitoring and review activity completed periodically and results documented.

Priority 2

Education and awareness

- Education and awareness program be identified, developed and implemented (development may be commenced earlier).

Risk Assessment Update

- An updated risk assessment to be conducted and information collected to be collated with the inclusion of relevant and up to date data collected and collated in the intervening period.

The following chart is provided as one example of how Stockland could log and manage its coastal aquatic risk management program at Amberton beach.

Table 5.1.1: Control Measure Implementation

Hazard Description (Location)		Recommended Additional Controls/Treatment Plans	Refer to section	Priority			Person responsible for implementing control measures	Complete by date	Details of action taken (date completed)	Review date
Ref				H	M	L				
	Amberton	Emergency Marker Sign: Stockland to identify each formal beach access track and provide each one with a unique identifier that can be posted onto access warning signs.								
	Amberton	Restrict access: Informal access points to the beach are to have barriers put in place to restrict in direct access to the beach via these locations.								
	Amberton	Education Program: SLSWA recommend that the Stockland (and land managers generally) in consultation and cooperation with education institutions and learning centres within the City of Wanneroo boundaries, develop a funded plan that leads to the delivery of programs with students from grades K -10 and that serve to improve and build resilience to drowning.								

	Amberton	Residents Booklet: SLSWA recommend the development of a beach safety booklet/flyer containing coastal safety information specific to Amberton Beach to be distributed to new home owners in the area.							
	Amberton	Maintained access tracks: Maintain growth of foliage from trees along formalised access tracks, especially so they do not obscure hazard warning signage. Maintain access track surface so they are evenly graded and relatively free from any significant changes in levels or rocks or boulders protruding up from the ground.							
	Amberton	Emergency Action Plans: Stockland to develop an emergency action plan that specifically addresses the need to respond to emergencies that are likely to occur at Amberton beach.							
	Amberton	Beach camera stream: The City of Wanneroo to install and maintain a beach camera that can be periodically monitored to collect data for beach conditions, use and activity.							

	Amberton	Activity Zoning: The City of Wanneroo through its formalised policy framework actively work to separate incompatible activity though the use of activity zones (i.e. fishing, surfing, swimming, kite boarding)							
		Access and Signage: • Access paths to be clearly defined. • Appropriate safety signage be installed at the entrance to the pool • Inappropriate, damaged or vandalised signs to be replaced/removed							

6. Documentation and Reference Material

The following documentation was provided by Stockland to assist in compilation of this interim report:

- City of Wanneroo. Coastal Management Plan – Part 1 (July 2012)
- City of Wanneroo Local Laws. Local Government Act 1995. Dog Act 1976. City of Wanneroo Animal Local Law 1999.
- Identification of subdivision, timing of release and expected population.
- Stockland Communities (Amberton) Pty. Ltd. Amberton Coastal Setback Assessment.
- Amberton Marina – Comments for local structure plan.
- South Amberton Local Structure Plan.
- South Amberton Local Structure Plan
- Draft Perth Coastal Planning Strategy. December 2008.

Other documentation and reference points include:

- SLSA Australian Coastal Public Safety Guidelines (2007) 1st Edition
- Australian Beach Safety and Management Program. SLSA and Dr. Andrew Short (University of NSW). Beaches of the Western Australia Coast: Eucla to Roebuck Bay (2005). University of Sydney Publications. SLSA Coastal Aquatic Risk Assessment Process
- AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas (ISO 20712-1:2008, MOD)
- AS/NZS 2416.3:2010 Water safety signs and beach safety flags - Guidance for use
- National Aquatic and Recreation Signage Style Guide; Third Edition (July 2006)
- AS/NZS 2416.3:2010 Water safety signs and beach safety flags - Guidance for use
- ISO 7010: 2011. Graphical symbols – Safety colours and safety signs – Registered safety signs
- Beach Safety and the Law: Australian Evidence. Wilkes. J (Ed). (2008)
- Google Earth: Datum reference points and images
- SLSA Australian Coastal Public Safety Guidelines (2007) 1st Edition
- SLSA - 33rd Edition Public Safety and Aquatic Rescue
- SLSA Surfguard Database
- Australian Beach Safety and Management Program. SLSA and Dr. Andrew Short (University of NSW). Beaches of the Western Australia Coast: Eucla to Roebuck Bay (2005). University of Sydney Publications. SLSA Coastal Aquatic Risk Assessment Process
- National Coastal Safety Report 2012 (SLSA)
- National Aquatic and Recreation Signage Style Guide; Third Edition (July 2006)
- A Guide to Coastal Public Rescue Equipment. Version 1. 2007. Royal National Lifeboat Institute.
- BeachSAFE Initiative. Version 1. 2013. Surf Life Saving Western Australia.
- WA Coastal Safety Report 2013. Surf Life Saving Western Australia.
- Surf Life Saving Australia (2013) National Coastal Safety Report 2013. SLSA: Sydney.
- www.coastsafe.org.au
- www.ripcurrents.com.au
- www.beachsafe.org.au
- www.bom.gov.au

7. Appendices

APPENDIX A: Facility Visitation Rating (FVR) Reference Tables

Table 1 - Typical Development and Natural Hazards Rating for Reserves

Rating	Development	Natural Hazards
1	Virginal bush, cleared land, no infrastructure	No hazardous features
2	Cleared land, static infrastructure e.g. grass area with tables and chairs, toilet block, lookout	Sloping ground; no natural water; walking track around reserve
3	Cleared land with mobile infrastructure e.g. grassed area with play equipment, cycle way, market, leash free dog areas	Reserve contains natural waterway that runs during wet weather, drops less than 1 metre
4	Council owned infrastructure with no artificial lighting e.g. golf course, football field, recreational ground, caravan park	Creeks, ponds and ledges between 1 metre and 3 metres
5	Extensively developed infrastructure with artificial lighting e.g. sporting complex, artificially lit courts	Contains rivers, dams and cliffs greater than 3 metres

Table 2- a typical population use within a facility provided by Council. It is important that Council's table reflects as accurately as possible its actual situation.

Rating	Population Use
1	Less than 5 people at a time
2	5 to 50 people at a time
3	50 to 100 people at a time
4	100 to 500 people at a time
5	Greater than 500 people at a time

Table 3 - Suggested Frequency of use rating for a Facility

Rating	Frequency of Use
1	An annual activity or event in held at the facility
2	An activity event takes place in the facility on a monthly basis
3	An activity event takes place in the facility on a weekly basis
4	An activity event takes place in the facility on a daily basis
5	The facility is in continuous use for the majority of the day

APPENDIX B: Enterprise Wide Risk Ranking Tool

Australian for life.

ENTERPRISE-WIDE RISK MANAGEMENT – RISK RANKING TOOL

IMPACT TABLE

DESCRIPTOR	PEOPLE (Social) Due to SLSA Culpability or Negligence	PROPERTY & FINANCIAL Property loss; Increased expenses; lost revenue	ENVIRONMENTAL (Environment) e.g. Dune and Back beach; Creeks; Lagoons; Bushland; Air; Vegetation; Wildlife	REPUTATION (Governance) Social; Ethical; Heritage; Cultural; Leadership
Extreme	Death or total permanent disability	> $1 million; Massive financial loss	Catastrophic event (e.g. habitat destruction) with national significance (e.g. endangered species) attracting national media attention	Wholesale resignation of Board Members and Senior Management Major State or National media coverage 1,000 + complaints Financial loss or fraud > $100,000
High	Critical injury resulting in long-term partial disability	> $100,000 - $1 Million; Major financial loss	Major event (e.g. creek contamination, chemical spill, > 20lt oil spill) with regional impact (e.g. lake, lagoon, creek) requiring external emergency agency clean up support	External Agency Inquiry with adverse finding Significant regional media coverage 50 – 1,000 complaints Financial loss or fraud > $50,000 <- $100,000
Medium	Very serious injury, e.g. broken arm, leg, wrist, etc which could result in hospitalisation and/or greater than 7 days off work	> $10,000 - $100,000; High financial rate	Major event (e.g. 10 - 20lt oil spill) with localised impact (e.g. street, precinct)	External Agency request for clarification Regional & suburban media coverage 20 – 50 complaints Financial loss or fraud > $5,000 < $50,000
Minor	Minor injury, e.g. strain, sprain, gash, etc resulting in between 1-7 days off work	> $1,000 - $10,000; Minor financial loss	Minor event (e.g. < 10lt oil spill) with localised impact (e.g. street, precinct)	Suburban media coverage 10 – 20 complaints Financial loss or fraud > $1,000 < $5,000
Insignificant	Minor injury, e.g. cuts, abrasions, etc requiring first-aid and/or resulting in less than 1 day off work	< $1,000; Low financial loss	Negligible event (e.g. noise pollution) with localised impact (e.g. street, precinct)	Media enquiry / Letter to the Editor 0 – 10 complaints Financial loss or fraud < $1,000

LIKELIHOOD TABLE

DESCRIPTOR	DESCRIPTION
Almost Certain	• Will probably occur more than once • 100% chance of occurrence • Common or Frequent Occurrence • Is expected to occur in most circumstances
Likely	• High probability that will occur at least once • 1 in 10 chance of occurrence (10%) • Likely to occur or "has happened to us a number of times in the past" • Might occur in a 2-3 year timeframe
Possible	• Reasonable likelihood that could occur more than once • 1 in 100 chance of occurrence (1%) • Could occur or "I've heard of it happening elsewhere" • Might occur in a 5 year timeframe
Unlikely	• May occur once or less • 1 in 1000 chance of occurrence (0.1%) • Not likely to occur • Might occur in a 10 year timeframe
Rare	• May occur in exceptional circumstances • Practically impossible • 1 in 10,000 chance of occurrence (0.01%) • Could happen but probably never will

RISK SCORE MATRIX*

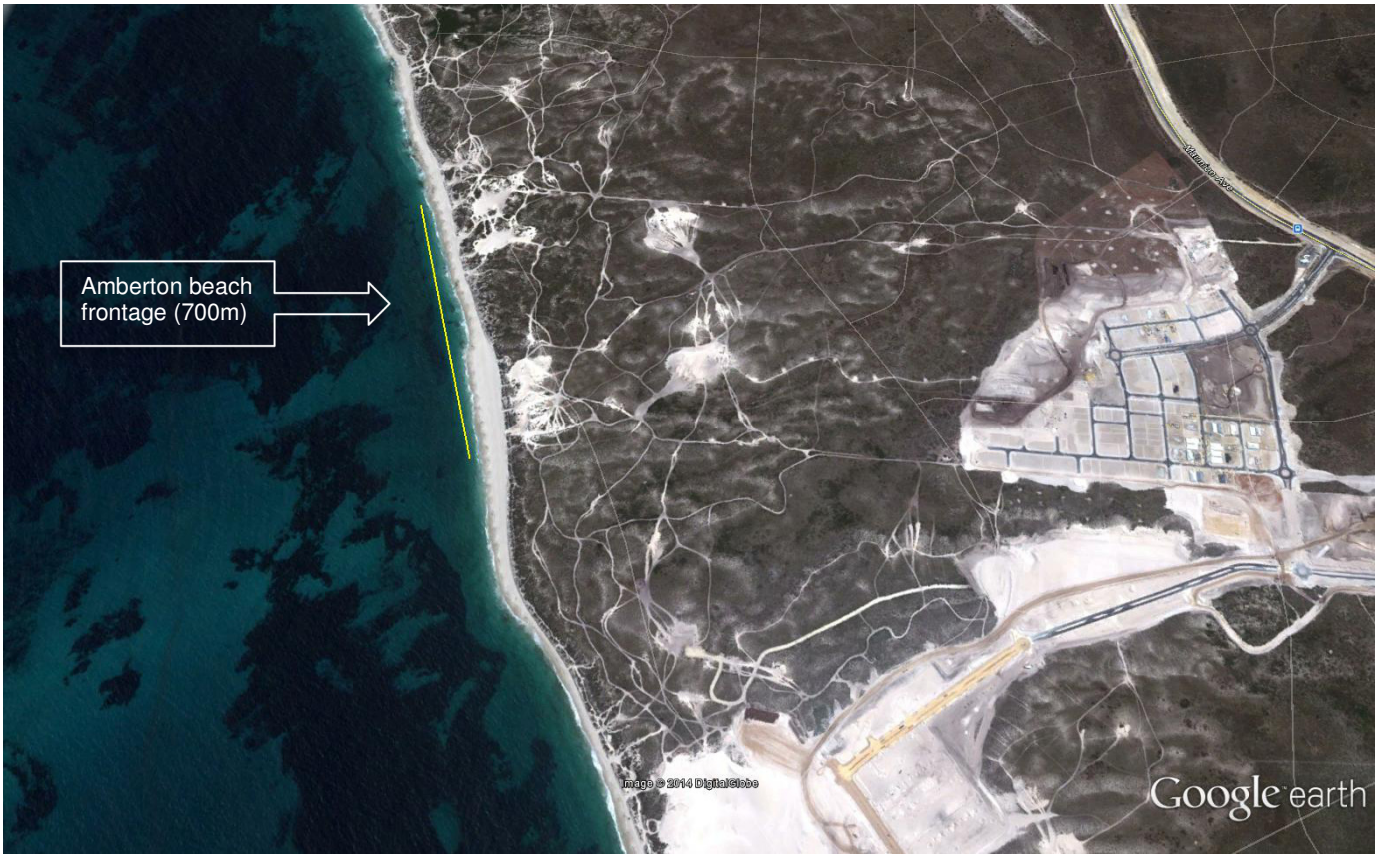
LIKELIHOOD \ IMPACT	1. INSIGNIFICANT	2. MINOR	3. MEDIUM	4. HIGH	5. EXTREME
5. ALMOST CERTAIN	M5	H10	H15	E20	E25
4. LIKELY	L4	M8	H12	E16	E20
3. POSSIBLE	L3	M6	H9	H12	E15
2. UNLIKELY	L2	L4	M6	H8	H10
1. RARE	L1	L2	L3	M4	M5

RISK LEVEL	ACTION YOU SHOULD TAKE
EXTREME – (E15-25)	Consider discontinuing - Immediate correction required
HIGH - (H8 –H15)	Immediate corrective action required
MODERATE – (M4 - M8)	Attention needed - correction required
LOW – (L1 – L4)	Perhaps acceptable as is

* Risk Score Matrix consistent with ISO 31000: Risk Management

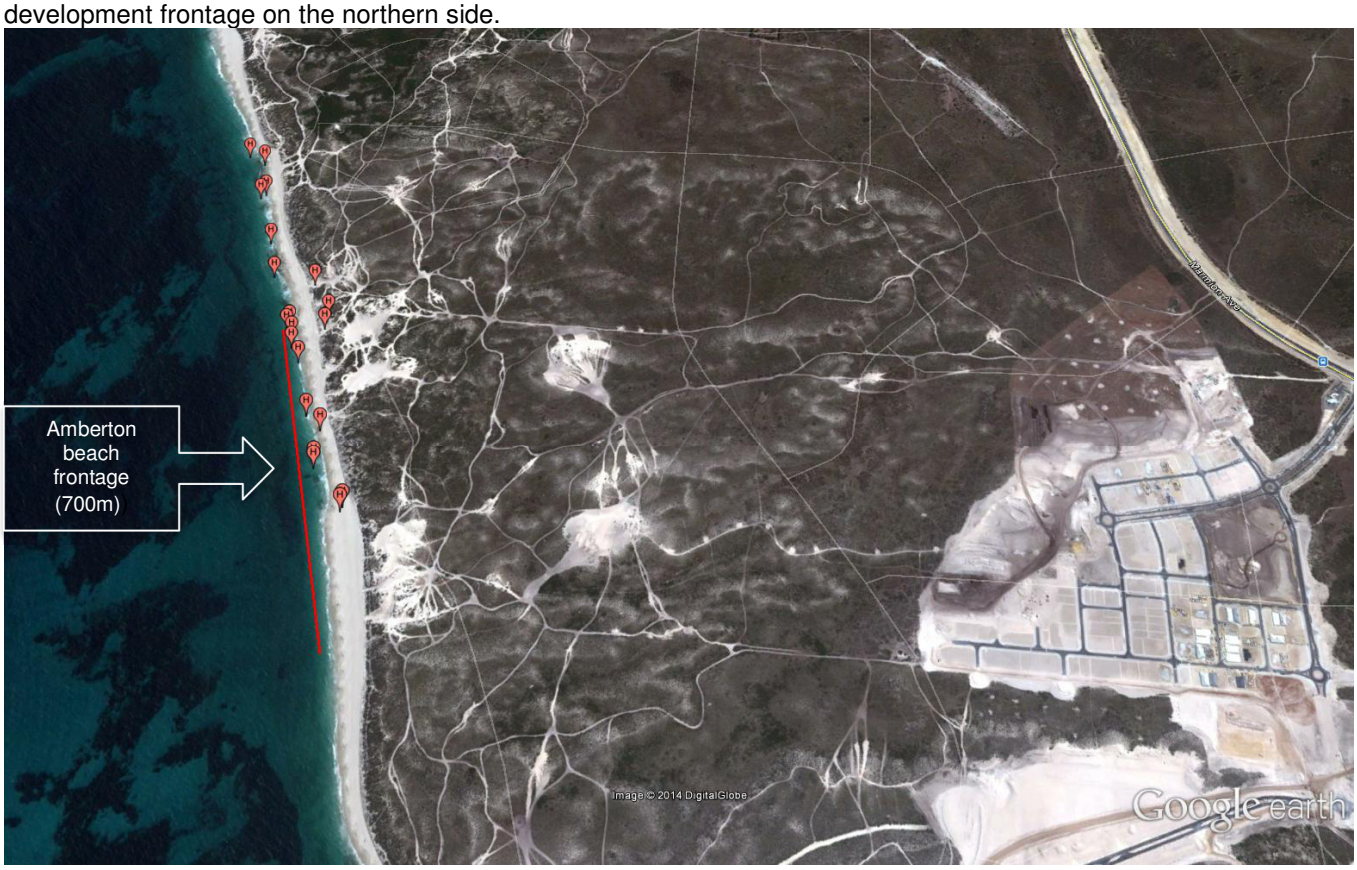
Appendix C: Amberton Beach Assessment Area

C1: Image of Beach WA 893 and Amberton Beach development frontage (yellow line) (Google Earth)



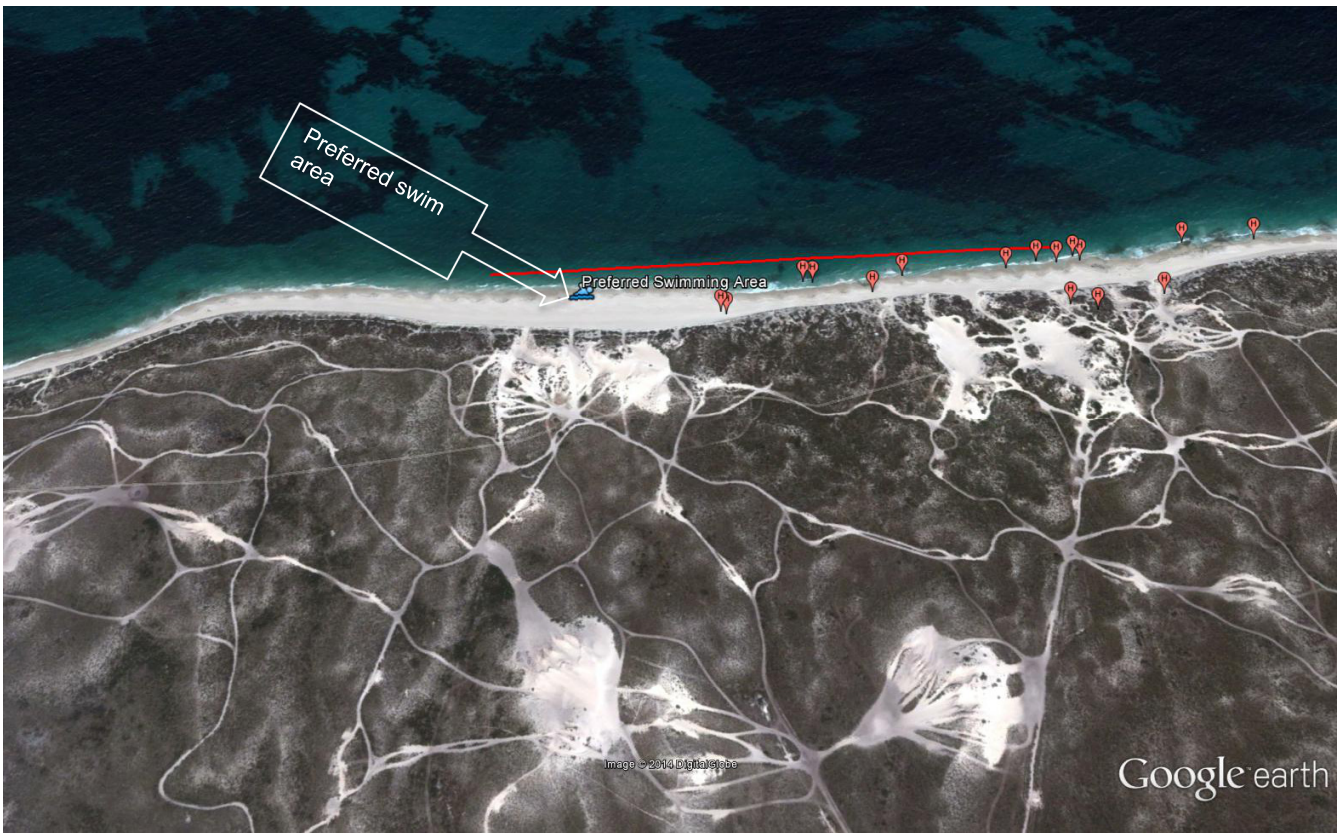
C2: Hazard and access data for Amberton overlayed on Google Earth.

Note: Hazards of the broader beach area are denoted with some hazards outside of the Amberton beach development frontage on the northern side.



C3: Map showing preferred swimming area at Amberton.

Note: Preferred swimming area location against 700m beach frontage for Amberton and in context of identified hazards.



C4: Graphical Observations

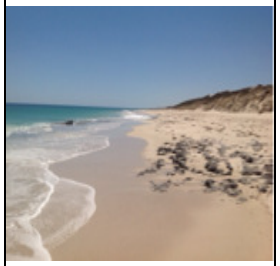
View south showing wide beach face and steep dunes

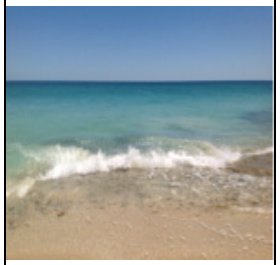
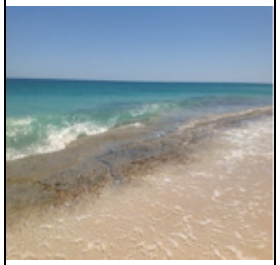
Rock platforms present in the swash zone at middle to northern sections of Amberton beach

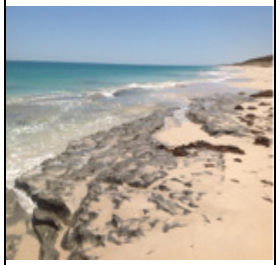
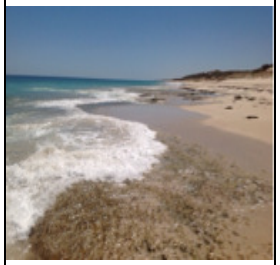
Appendix D: Risk Register* and Risk Treatment Plan**

Assessed Beaches:
1 Alkimos-Pipidinny-Yanchep (S) [Amberton beach]

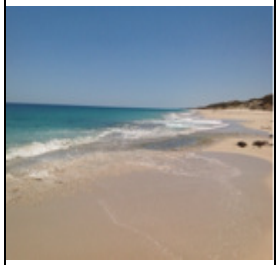
D1 Risk Register and Risk Treatment Plan – Alkimos-Pipidinny-Yanchep (S) [Amberton Beach]

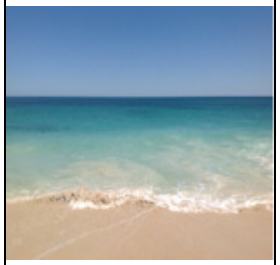
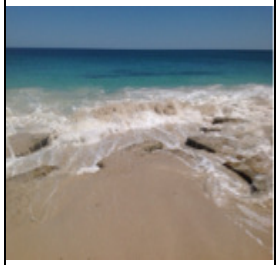
Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment Plans	Action Priority & Residual Risk Level
				C	L	Risk Level				
1	Rock Shelves / Platforms		Spinal injury Slips, trips, falls Dislocation Minor First Aid Head Injury Major injuries / Hospitalisation Cuts and abrasions Broken Bones	Extreme	Possible	Extreme	Swimmers Walkers Children Beach users Elderly	Nil	Access restrictions Beach safety signage	**High**
2	Rock shelves/ platforms		Head Injury Major injuries / Hospitalisation Dislocation Spinal injury Broken Bones Cuts and abrasions Minor First Aid Slips, trips, falls	Extreme	Possible	Extreme	Children Swimmers Disabled Elderly Beach user	Nil	Beach safety signage Access restrictions	**High**

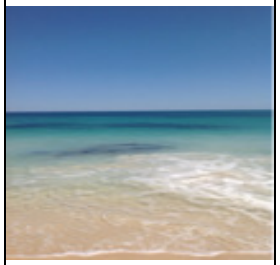
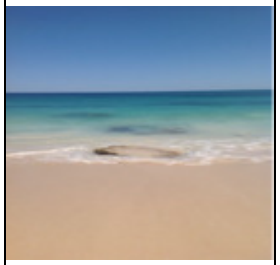
Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
3	Dumping waves		Dislocation Spinal injury Head Injury	High	Likely	Extreme	Weak swimmers Elderly Children Swimmers Surfcraft users	Nil	Access restrictions Education Program Beach safety signage	**High**
4	Rock shelves/ platforms		Major injuries / Hospitalisation Spinal injury Broken Bones Dislocation Head Injury Cuts and abrasions Minor First Aid Slips, trips, falls	Extreme	Possible	Extreme	Disabled Rock platform users Children Swimmers Elderly	Nil	Activity Zoning Access restrictions Beach safety signage	**High**

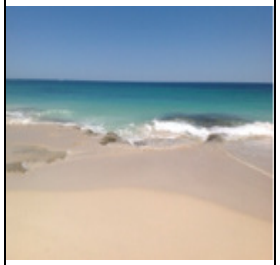
Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
5	Rock Shelves / Platforms		Broken Bones Slips, trips, falls Cuts and abrasions Minor First Aid Spinal injury Head Injury Head Injury	Extreme	Possible	Extreme	Elderly Disabled Children Swimmers	Nil	Activity Zoning Beach safety signage Access restrictions	**High**
6	Rock Shelves / Platforms		Minor First Aid Broken Bones Spinal injury Slips, trips, falls Cuts and abrasions Major injuries / Hospitalisation Head Injury	Extreme	Possible	Extreme	Disabled Children Fishers Elderly Swimmers	Nil	Beach safety signage Slippery rocks sign Controlled Access	**High**

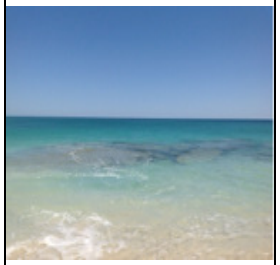
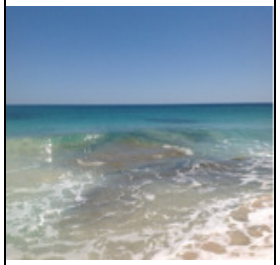
Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
7	Unstable and / or Eroded Dunes		Sand collapse Environmental damage	Medium	Possible	High	Beach user 4WD/ATV operator	Nil	Fence Dunal Restoration Create formal access paths	**Medium**
8	Snakes	No picture	Poisonous bite Minor First Aid	Medium	Unlikely	Medium	Walkers Beach user	Nil	Fence Restrict access	**Low**

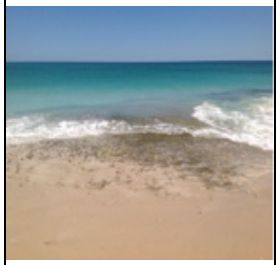
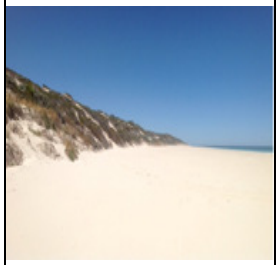
Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
9	Rock Shelves / Platforms		Dislocation Spinal injury Cuts and abrasions Major injuries / Hospitalisation Minor First Aid Slips, trips, falls Broken Bones Head Injury	Extreme	Possible	Extreme	Beach user Children Walkers Rock fishermen Rock platform users Disabled Elderly	Nil	Beach safety signage Access restrictions Activity Zoning	**High**
10	Unstable and / or Eroded Dunes		Environmental damage Sand collapse	Medium	Possible	High	4WD/ATV Operator Beach user	Nil	Access restrictions Dunal Restoration Controlled Access	**Medium**

Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
11	Drop off in water		Non-Fatal Drowning Drowning Death	Extreme	Possible	Extreme	Children Elderly Weak swimmers	Nil	Education Program Access restrictions Beach safety signage	**High**
12	Rock shelves/ platforms		Slips, trips, falls Head Injury Minor First Aid Spinal injury Major injuries / Hospitalisation Cuts and abrasions Dislocation Broken Bones	Extreme	Possible	Extreme	Beach user Walkers Fishers Disabled Swimmers Elderly	Nil	Activity Zoning Access restrictions Beach safety signage	**High**

Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
13	Rock Shelves / Platforms		Dislocation Slips, trips, falls Spinal injury Minor First Aid Broken Bones Cuts and abrasions Major injuries / Hospitalisation Head Injury	Extreme	Possible	Extreme	Elderly Swimmers Beach user Children Fishers Disabled	Nil	Access restrictions Activity Zoning Beach safety signage	**High**
14	Rock shelves/ platforms		Cuts and abrasions Broken Bones Dislocation Head Injury Minor First Aid Major injuries / Hospitalisation Slips, trips, falls Spinal injury	Extreme	Possible	Extreme	Beach user Disabled Walkers Elderly Swimmers Children	Nil	Controlled Access Safety signage Activity Zoning	**High**

Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
15	Rock shelves/ platforms		Dislocation Slips, trips, falls Major injuries / Hospitalisation Cuts and abrasions Head Injury Spinal injury Missing person/s Minor First Aid	Extreme	Possible	Extreme	Disabled Elderly Swimmers Children	Nil	Access restrictions Beach safety signage Activity Zoning	**High**
16	Rock Shelves / Platforms		Spinal injury Broken Bones Cuts and abrasions Slips, trips, falls Head Injury	High	Possible	High	Elderly Rock platform users Disabled Children	Nil	Access restrictions Beach safety signage Activity Zoning	**High**

Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
17	Submerged Reef		Minor First Aid Broken Bones Cuts and abrasions Head Injury Spinal injury	Extreme	Possible	Extreme	Children Elderly Swimmers Disabled	None	Activity Zoning Access restrictions Beach safety signage	**High**
18	Rock Shelves / Platforms		Minor First Aid Broken Bones Spinal injury Major injuries / Hospitalisation Head Injury Dislocation Slips, trips, falls Cuts and abrasions	Extreme	Possible	Extreme	Beach user Swimmers Rock fishermen Rock platform users	None	Slippery rocks sign Access restrictions Beach safety signage	**High**

Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
19	Rock Shelves / Platforms		Cuts and abrasions Broken Bones Major injuries / Hospitalisation Head Injury Slips, trips, falls Minor First Aid Spinal injury	Extreme	Possible	Extreme	Children Beach user Fishers Water users Disabled Elderly	None	Access restrictions Beach safety signage	**High**
20	Dune drop off		Environmental damage Sand collapse	Medium	Possible	High	Beach users 4WD/ATV Operator	None	Dunal Restoration Controlled Access Create formal access paths Dunal Restoration	**Medium**

Ref	Hazard Description (location)	Photo	Risk(s)	Risk Matrix's			Risk Groups	Existing Controls/Treatment Plans	Recommended Additional Controls/Treatment	Action Priority & Residual
21	Rock Platforms		Slips, trips, falls Spinal injury Cuts and abrasions Broken Bones Head Injury	High	Possible	High	Elderly Children Disabled Rock platform users	Nil	Controlled Access Beach safety signage	**High**

Appendix E: Proposed Signage

Assessed Locations:

1 Alkimos-Pipidinny-Yanchep (S) [Amberton beach]

Example Only 	**Location Identification:**	
	Beach Name:	Amberton Beach
	Site Reference:	N/A
	Sign Type:	**Level 1 - Road Sign**
	GPS Location:	
	Location Description and Siting:	Road signs may be used to direct swimmers to certain areas (e.g. patrolled beaches) or can be warning signs (e.g. 'no lifesaving service'). Road signs are dispayed along local roads leading to the beach.

Hazards and Warnings:

No Lifesaving Service

AS/NZ: ZZW3

Information:

Regulations:

General Notes on location:

Reference:

1. AS/NZS: 2416.1. 2010. Water safety signs and beach safety flags. Specifications for water safety signs used in workplaces and public areas (ISO 20712-1: 2008 MOD)
    a. Where available use symbols in diamond enclosure from this standard.
2. AS/NZS: 2416.3. 2010. Water safety signs and beach safety flags. Guidance for use
    a. Where available use symbols in diamond enclosure from this standard.
3. National Aquatic and Recreational Style Guide Manual (Version 3. July 2006).
    a. Use this manual to guide the development of the sign style.

Example Only	**Location Identification:**	
	**Beach Name:**	Amberton Beach
	Site Reference:	<Street Name>. In case of emergency dial '000'
	Sign Type:	**Level 2 - Carpark Sign**
	GPS Location:	
	Location Description and Siting:	Designed to attract attention and to display important. Contains location name and emergency marker, hazards, lifesaving service/safety information and regulations.

Hazards and Warnings:

					
No Lifesaving Service NARSSM WS 15	Deep Water AS/NZS: 2416.1 WSW005	Submerged Rocks AS/NZS: 2416.1 WSW007	Dumping waves AS/NZS: 2416.1 WSW023	Unstable cliff AS/NZS: 2416.1 WSW011	Snakes AS/NZ: 2416.1 WSW013

Information:

	Yanchep Lagoon (Yanchep SLSC) is patrolled only when red and yellow flags are displayed. *??km North. Refer www.beachsafe.org.au or www.wanneroo.wa.gov.au. *Approximate assessment		Keep children under supervision at all times.
NARRSSM IS, 1		AS/NZS: 2416.1 WSM002	

Regulations:

					
No Animals ISO 7010 PO21	No Horses NARSSM RS 17	No Vehicles NARSSM RS 03	No Motorbikes/Quad bikes NARSSM RS 04	No Littering NARSSM RS, 10	No camping NARSSM RS 43

Reference:

1. AS/NZS: 2416.1. 2010. Water safety signs and beach safety flags. Specifications for water safety signs used in workplaces and public areas (ISO 20712-1: 2008 MOD)
    a. Where available use symbols in diamond enclosure from this standard.
2. ISO 7010: 2011. Graphical symbols – Safety colours and safety signs – Registered safety signs
3. National Aquatic and Recreational Style Guide Manual (Version 3. July 2006).
    b. Use this manual to guide the development of the sign style.

<<INSERT GIS GRAPHIC>>

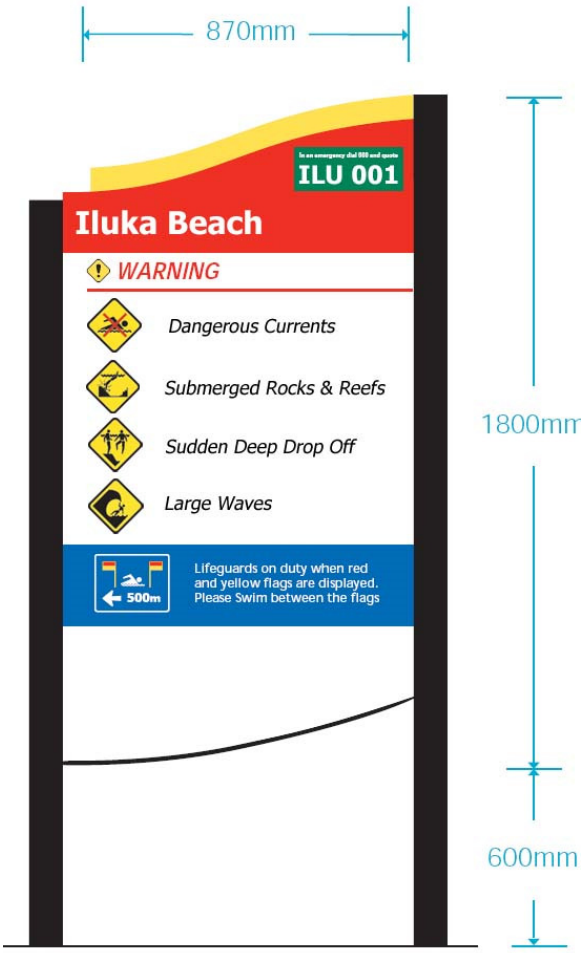


Figure 6: Example of Level 3 Open Access/Car Park signage for Amberton Beach

Example Only	**Location Identification:**	
	**Beach Name:**	Amberton Beach
	Site Reference:	<Street Name>. In case of emergency dial '000'
	Sign Type:	**Level 3 - Access Sign: Type A (defined access)**
	GPS Location:	
	Location Description and Siting:	For use where access to the beach is controlled via a narrow pathway. Sign includes location identification, hazards and warnings, information, regulations and facility manager.

Hazards and Warnings:

					
No Lifesaving Service NARSSM WS 15	Deep Water AS/NZS: 2416.1 WSW005	Submerged Rocks AS/NZS: 2416.1 WSW007	Dumping waves AS/NZS: 2416.1 WSW023	Unstable cliff AS/NZS: 2416.1 WSW011	Snakes AS/NZ: 2416.1 WSW013

Information:

 NARRSSM IS, 1	Quinns Beach (Quinns Mindarie SLSC) is patrolled only when red and yellow flags are displayed. ??km South. Refer www.beachsafe.org.au or www.wanneroo.wa.gov.au. *Approximate assessment	 AS/NZS: 2416.1 WSM002	Keep children under supervision at all times.

Regulations:

					
No Animals ISO 7010 PO21	No Horses NARSSM RS 17	No Vehicles NARSSM RS 03	No Motorbikes/Quad bikes NARSSM RS 04	No Littering NARSSM RS, 10	No camping NARSSM RS 43

Reference:

1. AS/NZS: 2416.1. 2010. Water safety signs and beach safety flags. Specifications for water safety signs used in workplaces and public areas (ISO 20712-1: 2008 MOD)
    a. Where available use symbols in diamond enclosure from this standard.
2. ISO 7010: 2011. Graphical symbols – Safety colours and safety signs – Registered safety signs
3. National Aquatic and Recreational Style Guide Manual (Version 3. July 2006). (NARSSM)
    c. Use this manual to guide the development of the sign style.

<<INSERT GIS GRAPHIC>>

Figure 7: Example of Level 3: Defined Access Signage for Amberton Beach

Example Only

Location Identification:	
Beach Name:	Amberton Beach
Site Reference:	N/A
Sign Type:	**Level 4 - Individual Hazard Sign**
GPS Location:	
Location Description and Siting:	Used where a hazard is localised and identified at a level of risk that warrants sign posting. Also used for displaying regulations at known trouble spots or to indicate regulation boundaries (e.g. dogs permitted past this point)

Hazards and Warnings:

Unstable rock

AS/NZS: 2416.1

WSW011

Information:

 AS/NZS: 2416.1 WSM002	Keep children under supervision at all times.

Regulations:

General Notes on location:

Reference:

1. AS/NZS: 2416.1. 2010. Water safety signs and beach safety flags. Specifications for water safety signs used in workplaces and public areas (ISO 20712-1: 2008 MOD)

a. Where available use symbols in diamond enclosure from this standard. 2. AS/NZS: 2416.3. 2010. Water safety signs and beach safety flags. Guidance for use a. Where available use symbols in diamond enclosure from this standard. 3. National Aquatic and Recreational Style Guide Manual (Version 3. July 2006). a. Use this manual to guide the development of the sign style.
<<INSERT GIS GRAPHIC>>

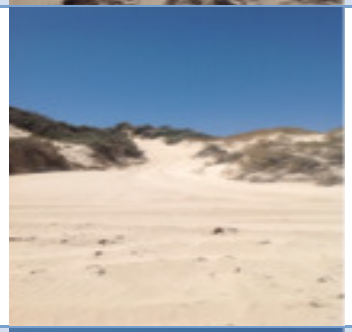
Appendix F: Access Schedule

Assessed Locations:

1 Alkimos-Pipidinny-Yanchep (S) [Amberton beach]

Note: GPS Datum is WGS 84. Additionally, the GPS device used was an iPad 3 with a margin error of ±5.0 metres.

F1: Access Schedule – Alkimos-Pipidinny-Yanchep (S) [Amberton Beach]

Access Reference	Photo	Access Location Description	GPS Position	Current Access Risk Treatment	Proposed Risk Treatment for Access	Type	Hazards
1			31.590137,115.648453	Nil	Dunal Restoration Access restrictions Create formal access paths	Informal 4WD track	Unstable and / or Eroded Dunes Dune drop off
2			31.595648,115.651138	Nil	Dunal Restoration Access restrictions Create formal access paths	Informal 4WD track	Unstable and / or Eroded Dunes Dune drop off
3			31.866183,115.808713	Nil	Fence Create formal access paths Dunal Restoration	Informal Access	Dune drop off Unstable and / or Eroded Dunes