ENVIRONMENTAL ASSESSMENT SUMMARY

Local Structure Plan
Lot 9036 and Part Lot 3054 Marmion Avenue, Jindee

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1.0 INTRODUCTION

1.1 Project

Estates Development Company proposes to develop an urban coastal node and innovative coastal community at Lot 9036 and Part Lot 3054 Marmion Avenue Jindalee (Figure 1). Lot 9036 and Part Lot 3054 Marmion Avenue are located within the City of Wanneroo (CoW) and comprise 112 hectares. The land was purchased by the current owner, Westminster Estates Pty Ltd in 1978. Estates Development Company (EDC) is the management company of Westminster Estates Pty Ltd.

1.2 Project History

Based on the recommendations of the 1977 report Planning Structure for the North West Corridor (MRPA), the land was subdivided in 1978 into superlots suitable for residential subdivision. One of these lots was Lot 9036 Marmion Avenue, Jindalee. A Parks and Recreation reserve was added to the coastal foreshore adjacent to the superlots. The Parks and Recreation reserve boundary created as a result of the subdivision was a macro level response to the then prevailing planning conditions and was simply a straight line drawn on a survey plan that did not reflect the local topographic or environmental conditions on the coast adjacent to Lot 9036.

The identification of a regional beach and coastal node at Jindee was contemplated in the Hames Sharley report (1992) and through the 1996 Enquiry by Design Workshop. Both the report and the workshop recognised Lot 9036 as being the single most appropriate location for coastal nodal development between Mindarie and Alkimos. It is adjacent to the future Brighton Town Centre and railway station, thereby offering access across the region. In addition, the geology of the coast adjacent to Lot 9036 is highly stable. The coastal environment within Lot 9036 includes both limestone cliffs and beaches underpinned by limestone formation, which can support development closer to the coast than contemplated by the former Metropolitan Region Scheme (MRS) boundary. An MRS amendment application was lodged in 2008 (1152/41) and approved in November 2009.

The shared vision of Jindee Innovation Project is to promote the creation of a community lifestyle and village premised on close interaction with the surrounding beach and landscape and an alternative to the conventional subdivision pattern contributing to the urban sprawl prevalent along the Perth coastline. The culmination of over 10 years of planning, design development, and the undertaking of workshops and consultation with key stakeholders has resulted in the development of the proposed Jindee Masterplan and was the basis for the MRS Amendment. This Jindee Local Structure Plan is a transect based code that more effectively allows for the implementation of transect based design that will deliver the Jindee Vision that could not be delivered through the traditional R coding for urban development.

1.3 EPA Assessment

The MRS amendment was referred to the Environmental Protection Authority (EPA) for assessment in March 2008 (Figure 2). The EPA assessed the proposed MRS amendment for Jindee in May 2008 at "scheme Amendment Not Assessed – Advice Given" level of assessment under Section 48a. A summary of the EPA advice is provided below. A full copy of the EPA advice is provided in Appendix 1.

1.3.1 EPA Advice and Recommendations Regarding Environmental Issues

1.3.1.1 Remnant Vegetation and Fauna

In summary, the EPA advised:

> The EPA supports the MRS amendment on the basis that the two areas of P&R reserve are being provided to offset the area of foreshore P&R reserve proposed to be zoned Urban. The two P&R reserves will be linked with native vegetation on private lots to ensure the ecological function of the eastern portion of P&R is retained.
>
> The EPA is satisfied that there are no Declared Rare Flora or Threatened Ecological Communities on Lot 9036.

1.3.1.2 Sustainability

In summary the EPA advised:

> The EPA is aware that the rationalisation of P&R boundaries is part of the landowner's efforts to develop a coastal node and an innovative coastal community that implements a range of sustainability principles. The EPA recommends a range of sustainability principles be incorporated in the Jindee development.

1.3.2 Deferred Factors

The issue of *Regional vegetation values (ecological linkages)* was identified but assessment was deferred "to ensure that an adequate mechanism is put in place during later stages of planning that will retain and protect the vegetation between the foreshore and inland area of P&R." A full copy of the EPA advice is provided in Appendix 1.

1.3.3 Outcome

The MRS amendment is now defined as an "assessed scheme amendment" under Part IV of the *Environmental Protection Act 1986*. As such, the EPA can not reassess the same environmental issues at subsequent stages of the planning process, with the exception of deferred factors.

The deferred factor of "Regional vegetation values (ecological linkages)" will be addressed in the Town Planning Scheme Amendment (Figure 3) and will be considered by the EPA through that process. The process and mechanisms for the protection of the ecological linkages are described in the Local Structure Plan and summarised in this report for completeness.

1.4 Jindee Local Structure Plan

The Jindee Local Structure Plan (LSP) is a transect - based Code intended to be a unified development ordinance that incorporates sustainable transect – based planning principles of Smart Growth and New Urbanism. The transect - based code was first conceived as a transect – of – nature at the close of the 18th century. The transect is a geographical cross-section of a region intended to reveal a sequence of environments moving from natural to the urban core. For the Jindee project the natural – to – urban transect is divided into six Transect Zones (T1 to T6) (Figure 4).

The preparation of a LSP for Jindee is in place of a conventional Structure Plan. The TPS Amendment is currently being progressed and subdivision plans will be submitted following endorsement of the Local Structure Plan and Detailed Area Plans.

The regulatory framework for Jindee is different to that of a "standard" development and is necessary to implement the vision for Jindee over the life of the project and the detailed design controls that are proposed to be introduced through the Local Structure Plan and Detailed Area Plans. The three inter-related tiers of provisions and controls are:

- Jindee related District Planning Scheme provisions
- Local Structure Plan
- Detailed Area Plan.

A description of the role of each level of planning and associated Regulating Plan is provided in Appendix 2.

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2.0 EXISTING ENVIRONMENT

2.1 Location

Jindee is located on Lot 9036 and Part Lot 3054 Marmion Avenue, Jindalee, within the City of Wanneroo, and comprises 112 hectares. The legal description of the land is Lot 9036 Marmion Avenue Jindalee being portion of Swan Location 1370 of Plan 12465, Volume 1508, Folio 908. Lot 9036 is owned by Westminster Estates Pty Ltd.

The subject land is located approximately 37 km north of the Perth Central Business District in the North West Corridor, and 14 km north-west of Joondalup City Centre, as depicted on the Site Location Plan.

The land has approximately 800 metres of frontage to the Indian Ocean. The beach frontage in the northern portion of Lot 9036 and the southern portion of Lot 9 (located to the north of Lot 9036) is identified as a regional beach in the 1992 Burns Beach to Jindalee Coastal Planning Study.

Principal access to the site is via Marmion Avenue, which is constructed to Yanchep Beach Road.

2.2 Topography

The topography of Lot 9036 and the adjacent Parks and Recreation Reserve area may be generally described as coastal dunes and undulating limestone ridge terrain (Figure 5). At the seaward margin of the adjacent Parks and Recreation reserve there are limestone cliffs and headlands, and sandy beach areas which merge with gently undulating primary dunes at the north of the site, and the lower slopes of limestone dunes in the south.

The site rises from an elevation of 16 m AHD in a depression on the western boundary of Lot 9036 to 56 m at Eglinton Hill in the south-east of the site. The site is characterised by a series of east–west oriented dune escarpments as highlighted in the Topography and Landforms Plan.

2.3 Landforms

The site contains a variety of coastal landforms associated with the Quindalup and Cottesloe landform units. The Quindalup unit is described as containing dunes and beach ridges composed of calcareous sand. The Cottesloe unit is typically a low hilly landscape with shallow sand over limestone (Churchward and McArthur, 1978).

The dunes oriented in an east–west direction are parabolic dunes of the Quindalup system. These aeolian Holocene dunes overlie the older Spearwood dunes. The foredunes are located immediately inland from the coastline and are derived form marine sediments and lie parallel to the coastline.

The site also contains transgressive dunes (superimposed sets of parabolic dunes) and inter-dunal valleys which comprise of dune swales (moist depressions between dunes) and dune hollows (dry depressions between dunes).

2.4 Geology and Geomorpholoy

The geology of this area can be summarised as a major coastal ridge of Pleistocene Tamala limestone and associated surface soils, variably overlain but most prominently in the west by a series of younger Holocene sand dune deposits (Figure 5).

Low et al. (1978) mapped the geological units on the site as Safety Bay Sand (slightly lithified aeolian and beach lime sand corresponding to the Quindalup dunes landform) and Coastal Limestone (aeolian calcarenite variably lithified, kankarised and leached to quartz sand corresponding to the Spearwood dune landform). The limestone is predominantly calcarenite and kankar on Lot 9036.

The geomorphic units on the site as mapped by McArthur and Bartle (1975-6) include:

- Q1 – Oldest phase of the Quindalup dune system
- Q2 – Second phase of the Quindalup dune system
- Q3 – Third phase of the Quindalup dune system
- Q4 – Youngest phase of the Quindalup dune system
- Q5 – Undulating landscapes with shallow calcareous sands over limestone and much rock outcrop
- Qp – Undulating landscapes with deep calcareous sands overlying limestone
- Ky – Karrakatta sand (yellow phase)
- Kls – Bare limestone and shallow brown soils over limestone.

The Geology and Geomorphology Plan depicts the locations of these units.

2.5 Soils

The characteristics of the soil types within the site vary depending on whether the soils are derived from the Quindalup or the Spearwood dune systems.

The Q4 dunes comprise loose sand consisting of quartz grains and fragments of sea shells and occur at the beach front. In contrast the Q1 dunes show some clay, humus and soil formation at the surface (Rippey, 1995). Older soils also have organic staining to greater depths and cementation commonly occurs (McArthur and Bartle 1980).

The Qp phase is represented by deep calcareous sands overlying limestone. The soils comprise dark grey-brown sand to a depth of about 50 cm and then pale brown sand. In contrast, the Qs phase consist shallow calcareous sand over limestone and much rock outcrop (McArthur and Bartle 1975–1976).

The central and eastern areas of the site contain Ky and Kls soil units of the Spearwood dune system. The Ky unit is characterised by grey-brown sandy surface that grades into bright yellow Karrakatta sand, often with limestone within two metres. The Kls is bare limestone and shallow brown sandy soils over limestone (McArthur and Bartle 1975–1976).

2.6 Surface Hydrology

There are no naturally occurring surface water courses or water bodies within the site. As a result of the highly porous nature of the dune sands and underlying limestone sediments, the dominant surface hydrological process within the site is rainfall infiltration and groundwater recharge.

2.7 Groundwater

An unconfined aquifer is developed in the Tamala Limestone sediments. The water table lies at around 1.5 m AHD along the eastern boundary and at around 0.5 m AHD at the western boundary, which is up to 50 m below ground level in some areas of the site. The direction of groundwater flow indicated by the contours is west-south-westerly, towards the coast.

The water table is located up to 50 m below the ground surface, shallowest in the western sections of the site, and deepest below the ridges in the eastern sector of the site (Water and Rivers Commission 1997).

Groundwater quality is generally fresh particularly in the upper part of the aquifer, with salinity in the range 500–1,000 mg/L TDS (Davidson 1995). A wedge of saline water from the ocean may exist at the base of the aquifer very close to the coast.

2.8 Statutory Protection

The eastern edge of the site lies within the Perth Underground Water Pollution Control Area, and is a Priority 3 public water supply groundwater catchment area (Water and Rivers Commission 1997). Priority 3 source protection areas were defined to minimise the risk of pollution to the water source. Urban development is considered to be "Compatible" within Priority 3 area provided that development is connected to deep sewerage (Water and Rivers Commission 2000).

Lot 9036 contains one existing Water Corporation public water supply bore. Land within a 300 m radius around each public water supply bore within the Priority area is designated a Wellhead Protection Zone. Decision-making authorities are required to have regard for these protection zones and restrict or exclude potentially polluting land uses such as petrol stations within these zones.

2.9 Vegetation and Flora

The site remains naturally vegetated apart from localised areas of clearing associated with tracks and off-road vehicle routes. The effect of off-road vehicle activity and associated uncontrolled recreation is particularly evident near the shoreline where historical and ongoing transit along the coast to northern destinations has created significant damage to vegetation and dune landforms.

In accordance with the requirements of the EPA's Guidance Statement No. 51 (EPA 2004), a Level 2 Vegetation and Flora Survey within the adjacent Parks and Recreation reserve (9917) and the southern portion of the site was undertaken in early October and late December 2004. Further investigation and verification of Declared Rare and Priority Flora and vegetation condition mapping for the site was also undertaken in September 2005 and December 2005, respectively.

The full Vegetation and Flora Assessment report is included as Appendix 3, however, a summary of the findings from this assessment is provided in the following subsections.

2.9.1 Vegetation Complexes

Regional scale mapping (1:250,000) indicates that two vegetation complexes occur on the site; the Quindalup Complex and Cottesloe Complex – Central and South (Heddle et al. 1980).

Quindalup Complex is a coastal dune complex consisting mainly of the strand and fore-dune alliance, and the mobile and stable dune alliance. Local variations include low closed forest of *Melaleuca lanceolata – Callitris preissii* and the closed scrub of *Acacia rostellifera*. The Quindalup Complex is mapped over most of the site extending from the coast inland, and occupies the landforms mapped as Quindalup dunes.

Vegetation of the Cottesloe Complex – Central and South is characterised by a closed heath on limestone areas with shrubs such as *Melaleuca huegelii*, Acacia species, *Grevillea thelemanniana* and *Trymalium ledifolium*. The deeper sands support a mosaic of Tuart, Jarrah and Marri. Banksia species are also common. The Cottesloe Complex – Central and South occurs in the areas mapped as Karrakatta sand which are located in the easternmost portion of the site.

2.9.2 Vegetation Units and Condition

The vegetation of the study area is varied considering the size of the area surveyed, reflecting the topography, distance inland and soils found.

Twelve vegetation units have been identified as occurring within the whole site and the adjacent Parks and Recreation reserve (Figure 6). Of the 12 vegetation units identified, five are found within the existing Parks and Recreation reserve and seven within the proposed Parks and Recreation reserves.

2.9.3 Floristic Community Types

Data collected from the four quadrats and the five releves surveyed was analysed by EA Griffin and Associates using the PATN suite of programs for multivariate analysis.

Bush Forever infers the presence of Floristic Community Types (FCTs) 29a and 29b in the adjacent Parks and Recreation reserve (Government of Western Australia, 2000). The vegetation and flora study confirmed that FCT 29a - Coastal shrublands on shallow dunes from Supergroup 4; Uplands centred on Spearwood and Quindalup Dunes, is present and appears to encompass all the vegetation in the existing Parks and Recreation reserve and the proposed Parks and Recreation reserves.

Gibson et al. (1994) list FCTs 29a as being "poorly reserved and susceptible". However, this FCT is not listed on the Department of Environment and Conservation's (DEC) Threatened Ecological Communities (TEC) Database or the Commonwealth's TEC list.

2.9.4 Declared Rare and Priority Flora

DEC's Rare and Priority Flora Database lists one Declared Rare Flora (DRF) species and five Priority Flora species or subspecies which may occur in the study area, these are:

- *Astroloma microcalyx* (Priority 3)
- *Comesperma acerosum* (Priority 3)
- *Conostylis pauciflora subsp eurhipis* (Priority 3)
- *Eucalyptus argutifolia* (DRF)
- *Jacksonia sericea* (Priority 4)
- *Stylidium maritium* (Priority 3).

No DRF were recorded within the site.

With respect to Priority Flora, two subspecies of *Conostylis pauciflora*; subspecies *euryrhipis* (P3) and subspecies *pauciflora* (P4) was recorded over most of the site. This included the existing and proposed Parks and Recreation reserves.

Conostylis bracteate (P3) was found in the stands of Banksia woodland on the eastern edge of Lot 9036 as well as the proposed Parks and Recreation reserve located within the south-east portion of the site.

2.9.5 Other Significant Flora

Two other significant flora species are mentioned in Bush Forever. These are *Melaleuca cardiophylla* and *Grevillea preissii* (typical Tamala limestone taxa).

Grevillea preissii was not recorded from any of the sites from this study, but its presence is recorded in Bush Forever Site No. 397 (Government of Western Australia 2000). However, *Melaleuca cardiophylla* was found within the existing and proposed Parks and Recreation reserves.

2.9.6 Dieback

Phytophthora cinnamomi (dieback) can cause significant changes to the structure of susceptible vegetation communities such as Banksia dominated communities. Dieback has not been identified on-site and is uncommon on free draining limestone soils. However a small risk of introduction of the fungus from earth moving equipment coming directly from an infected site does exist. Contractors will be required to certify all earth moving equipment brought to site is dieback free prior to entry to the site.

2.10 Fauna

In accordance with the EPA's Guidance Statement No. 51, a Level 2 Fauna Survey of the proposed Jindee Structure Plan area was conducted by Bamford Consulting Ecologists (2006) to identify fauna habitats and record conspicuous species and review fauna species known to occur in the region in the habitats present within the site. A copy of this report is included in Appendix 4. There were three sampling sessions: 1–6 December 2005, 18–20 December 2005, 27–30 December 2005 and 5–8 January 2006. It is noted that weather conditions were unseasonably cool throughout the three sampling sessions.

Three levels of conservation significance are recognised as part of the fauna survey undertaken (Bamford Consulting Ecologists 2006):

Conservation Significance (CS) 1

Species listed under state or Commonwealth Acts.

Conservation Significance (CS) 2

Species not listed under state or Commonwealth Acts, but listed in publications on threatened fauna or as Priority species by DEC.

Conservation Significance (CS) 3

Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution.

A summary of the results of the survey is provided here and the full report is included in Appendix 4.

2.10.1 Frogs

Only three frog species are thought likely to occur within the project area, and none of these was recorded. Of the three species expected, the Moaning Frog and Pobblebonk rely on wetlands for breeding but disperse widely as adults. The Turtle Frog breeds terrestrially. All three species are common in woodland on sandy soils within and on the northern outskirts of Perth. None of the frog species is of conservation significance.

2.10.2 Reptiles

The reptile assemblage may include up to 44 species, of which 22 were recorded during the field survey. Species expected but not recorded were mostly those that occur at low population densities and can be hard to catch, such as some of the snakes. The following species are known to exist in areas in Perth and have a Conservation Significance Level 1, 2 and 3 however, none were recorded on the subject land or adjacent Parks and Recreation reserve. No reptile species of conservation significance were recorded at Jindee.

2.10.2.1 Conservation Significance Level 1

The south-western race of the Carpet Python (Schedule 4 – Other Specially Protected Fauna – of WA Act) is reported to be locally common just north of Perth, particularly in areas of heath and limestone (Bush et al. 1995). This species was not recorded during the survey, but it is often a cryptic species that rarely enters traps.

2.10.2.2 Conservation Significance Level 2

The Black-striped Snake (Priority 3). This species is restricted to the west coast region from just north of Lancelin to Mandurah. It is fossorial and can be difficult to find. How and Shine (1999) have suggested that this species (and other fossorial snakes) requires large areas (>1000 ha) of continuous habitat to persist. Given this threshold, it is unlikely that the species is present in the subject area, given that the area surrounding Jindee has been developed consistent with the Urban zoning, and there would not be

1000 ha of continuous habitat surrounding the subject land to allow the species to persist. This species was not recorded during the survey, and it is reiterated that the land is already zoned for urban development.

2.10.2.3 Conservation Significance Level 3

Species that are of local significance are the geckoes *Diplodactylus alboguttatus, Diplodactylus polyopthalmus* and *Underwoodisaurus milii*, and the Jewelled Ctenotus *Ctenotus gemmula*. These species occur on the coastal plain north of Perth in isolated populations. None was caught during the field survey.

D. polyopthalmus and *U. milii* are associated with limestone areas (Bush et al. 1995) and therefore suitable habitat is present between location 75 and location 1. *D. alboguttatus* and the Jewelled Ctenotus occur on sandy soils so it is not possible to specify suitable habitat for them within the Jindee area.

2.10.3 Birds

The assemblage of birds that uses the Jindee site more or less regularly may include 96 species, although even among these species there are some that will be intermittent visitors. Included are 11 coastal species that may make regular use of the coastline but would only be affected by the Jindee development indirectly; through increased levels of human activity along the coast that will occur regardless of the proposed amendment.

Only 35 species were recorded during the field survey period. Of the species recorded, one was the Carnaby's (Short-billed) Black-Cockatoo which is recognised as having a level one conservation significance due it being listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Wildlife Conservation Act 1950* (WA).

Fifteen other bird species recognised as having a level three conservation significance were recorded. These are species not listed under any Acts or in publications, but are considered to be of local significance due to their pattern of distribution.

2.10.3.1 Conservation Significance Level 1

The Carnaby's (Short-billed) Black-Cockatoo is likely to be a regular non-breeding visitor and was observed during the field survey. This cockatoo is known to feed on seeding Banksia and Eucalyptus as well as proteaceous heaths (Johnstone and Storr 1998) and may thus forage in the Banksia woodland as well as the *B. sessilis* thickets. The loss of feeding habitat is identified as an important contributing factor to the decline of Carnaby's Cockatoo in Garnett and Crowley (2000).

The Peregrine Falcon is listed as Schedule 4 – Other Specially Protected Fauna – under the *Wildlife Conservation Act 1950*). This may be a regular visitor to the area, but there was no site suitable for nesting. As individuals forage very widely, it is the nest site that

is of greatest significance for the species' conservation, and will therefore, not be affected by the proposal for Jindee.

All other birds of Conservation Significance Level 1 are listed as migratory under the EPBC Act. Most will be infrequent visitors to the site.

Both Ospreys and White-bellied Sea-Eagles are known to nest in Tuart trees around the Peel Inlet, but there are no trees of suitable size on the Jindee site. They nest on the ground or on the tops of high dunes on islands, but are unlikely to do so on the mainland.

The Rainbow Bee-eater is almost certain to nest in the study area and will often construct its burrows on slopes that are sparsely vegetated, including slopes around construction sites. Therefore, nesting habitat is not critical for this species in the Perth area.

The Fork-tailed Swift is largely aerial while the three sandpipers and the Caspian Tern are restricted to coastal environments. The sandpipers and Caspian tern occur in only low numbers along the northern beaches of Perth.

2.10.3.2 Conservation Significance Level 2

The Hooded Plover (Priority 4 according to DEC) may be an occasional visitor to the ocean beaches. As with other coastal species, it could be affected by increased levels of disturbance associated with development. Hooded Plovers are rarely seen in Perth beaches, but it is not known to what extent this is due to existing levels of disturbance.

2.10.3.3 Conservation Significance Level 3

A total of 31 bird species are considered to be of local conservation significance. The majority of these were identified by Bush Forever as having declined in the Perth area due to impacts associated with urban development. A few of these are birds of prey, but the majority are small birds that rely on woodlands and shrublands where they are either residents (e.g. fairy-wrens and thornbills) or seasonal visitors (honeyeaters).

The fairy-wrens and thornbills are particularly sensitive to habitat loss and fragmentation, whereas the honeyeaters have a greater ability to access suitable habitat even when it is fragmented by urban development. The majority of the species listed in Bush Forever are also noted as having declined Australia-wide by more than 20% in the New Atlas of Australian Birds (Barrett et al. 2003).

Almost half (15) of the CS3 species were recorded during the field survey. These included three fairy-wren species, the White-browed Scrub-wren, two thornbills and the White-breasted Robin; all sedentary species that have poor powers of dispersal and thus rely upon continuity of habitat to persist.

2.10.4 Mammals

There are 22 species of mammal that may occur in the Jindee area, including five introduced species. Only three native species were recorded during the field survey with the presence of other species being uncertain. One mammal species of conservation significance was recorded.

2.10.4.1 Conservation Significance Level 1

No mammal species recognised within this level of conservation significance under legislation are expected. Such species are rare and regionally extinct.

2.10.4.2 Conservation Significance Level 2

The Brush Wallaby (Priority 4 according to DEC) was not observed and therefore probably not present. The Quenda (Priority 5 – Conservation Dependent – according to DEC occurs nearby, including in the Burns Beach area (M. Bamford unpubl. data)). Distinctive diggings of this species were not located, but it is commonly associated with dense, low vegetation, so it has the potential to occur across much of the site, especially in the thickets and near coastal shrublands. The lack of diggings, however, suggests that it may be locally extinct.

2.10.4.3 Conservation Significance Level 3

Of those listed as of Conservation Significance Level 3, only the Moodit was recorded, while the dunnarts, Honey Possum and Noodji may be locally extinct. The bat species have not been included as of local significance because at least some persist in remnant native vegetation in urban areas, while even their presence in a near-coastal area is uncertain.

2.10.5 Invertebrates

The fauna assessment did not consider invertebrates, but there are several species of conservation significance known from the general region on the basis of DEC's threatened fauna database. Please refer to Fauna Assessment Report in Appendix 4 for further detail on this matter.

2.11 Aboriginal Culture and Heritage

A search of the Department of Indigenous Affairs (DIA) Register of Aboriginal Sites identified a number of sites within or adjacent to the project area. An indigenous heritage survey (archaeological and ethnographic) has been undertaken and consultation with the Aboriginal representatives has been occurring since early in the planning process. The advice received has been incorporated into the project design. All activities and site works will be undertaken in accordance with the requirements of the *Aboriginal Heritage Act* (1972).

3.0 IMPACTS AND MANAGEMENT

3.1 Factors Previously Assessed

The EPA, in assessment of the MRS amendment, considered a range of environmental factors. The EPA's advice is included in Appendix 1. Factors assessed during the MRS amendment cannot be assessed again by the EPA during subsequent planning stages unless the design significantly changes or new information comes to light that was not previously available. Factors previously assessed by the EPA are described briefly below and are provided as background information only. "Deferred factors" are those issues that the EPA has specifically identified as having not been assessed, generally as they are more adequately dealt with later in the TPS amendment process when more detailed planning for the project has been undertaken. The EPA's assessment of the TPS amendment will be limited to these deferred factors. Factors deferred for Jindee are identified in Section 3.2.

3.1.1 Vegetation and Flora

3.1.1.1 EPA Objective

To maintain the abundance, diversity, geographic distribution and productivity of vegetation and flora at species and ecosystems levels through the avoidance or management of adverse impacts and improvement in knowledge.

3.1.1.2 Outcome

Implementation of the project will result in approximately 6.1 ha of vegetation, ranging from degraded to excellent condition, within the existing Parks and Recreation reserve (Bush Forever Site No. 397) being cleared.

Implementation of the project will lead to the creation of an east–west oriented Parks and Recreation reserve area which adjoins the coastal reserve in the south-west and a second Parks and Recreation reserve in the south-east (Figure 4). This will amount to approximately 6.1 ha of vegetation in good to very good condition being retained and a greater diversity in vegetation complexes, assemblages and flora being conserved than what is currently achieved under the existing Parks and Recreation reserve.

The direct impacts will be loss of vegetation within the adjacent existing Parks and Recreation reserve. However, the proposed amendment will retain some of the vegetation along the western margin of the proposed development which will remain as Parks and Recreation.

The proposed Parks and Recreation reserves will be joined together with larger T2 lots where there will be both partial retention of natural vegetation within lots and new landscaping in developed or disturbed areas which specifically mimics and blends with

the natural landscape character of the site. The outcome is that the proposed Parks and Recreation reserve areas will be strongly linked by an area comprising a mosaic of vegetated areas, both retained natural vegetation and new plantings of indigenous species.

The EPA objective for *"maintaining the abundance, diversity, geographic distribution and productivity of vegetation and flora at species and ecosystems levels through the avoidance or management of adverse impacts and improvement in knowledge"* can be achieved through the T2 lot provision and management measures identified above.

3.1.2 Fauna

3.1.2.1 EPA Objective

To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

3.1.2.2 Outcome

The proposed Parks and Recreation reserve provides for the protection and enhancement of the site's most significant environmental values by providing a sequence in fauna habitats, ranging from the coastal vegetation through to the more inland vegetation in the south-eastern portion of the site. Further to this, the proposed Parks and Recreation reserves contain vegetation in good to very good condition.

Therefore, the proposed Parks and Recreation areas will amount to approximately 6.1 ha of vegetation being retained and cleared track areas being revegetated and a greater diversity in fauna habitats being conserved than what is currently proposed under the existing Parks and Recreation reserve.

The EPA objective for *"maintaining the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge"* can be achieved under the proposed form based codes with larger T2 lots connecting the two ROS areas.

3.1.3 Coastal Zone

3.1.3.1 EPA Objective

To maintain the integrity, ecological functions and environmental values of the coast.

3.1.3.2 Outcome

The modification to the proposed foreshore reserve boundary responds better to the geomorphology of the land than the existing foreshore boundary. The proposed exchange of land within Lot 9036 for land along the foreshore in Lot 3054 will also allow for the protection of additional vegetation types and fauna assemblages within the proposed Parks and Recreation reservations.

The use of the foreshore reserve will evolve as a result of the development of the regional node. Public enjoyment of the coast will be significantly enhanced as a result of the creation of public access for recreation purposes, while providing protection to the coastal environment including the coastal dunes and vegetation through defined access points and paths.

On this basis, the EPA objective for "*maintaining the integrity, ecological functions and environmental values of the coast*" can be achieved under the proposed TPS amendment.

3.1.4 Topography and Landform

3.1.4.1 EPA Objective

To maintain the integrity, ecological functions and environmental values of the soil and landform.

To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable.

3.1.4.2 Outcome

Implementation of the project will result in an optimal design outcome for the site which leads to the creation of an east–west oriented Parks and Recreation reserve area which adjoins the coastal reserve in the south-west. In addition, a second Parks and Recreation reserve in the south-east which surrounds Trig Point is proposed. Trig Point is the highest point and is the most visually prominent landform feature within the site, and is the focal point of the design intent to optimise retention of topography and landform.

The major east–west dunal ridge landscape feature has been the focus of design attention in regard to retaining prominent landscape and landform features within the site. An optimal design outcome has been achieved by creating an east–west oriented reserve area joining the proposed Parks and Recreation reserve, at the western extent of the ridge, and the second proposed Parks and Recreation reserve at the eastern extent of the ridge. Joining the proposed reserves will be lots in which there will be both partial retention of natural vegetation within lots and new landscaping in developed or disturbed areas that specifically mimics and blends with the natural landscape character of the site.

Unlike conventional development, the ecological, landscape and seascape values that exist at Jindee are recognised and celebrated in the proposed design. Significant landforms are proposed to be retained and protected through the establishment of reserves, or through design techniques such as incorporating larger lot sizes along ridges and hills. The environmental values of the site are captured through the MRS amendment by securing reserves with a coastal focus. The TPS amendment will be consistent with the MRS with regard to the reserves. In addition, the T2 lots will deliver the connection of these reserves to the coastal areas through the transect based codes, with allowable and prohibited uses within each transect type.

On this basis, the EPA objectives for "*maintaining the integrity, ecological functions and environmental values of the soil and landform*" and "*ensuring that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable*" can be achieved through implementation of the form based codes of the LSP.

3.1.5 Surface and Groundwater

3.1.5.1 EPA Objective

To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected.

3.1.5.2 Outcome

No potentially polluting land uses such as petrol stations are proposed within any Wellhead Protection Zone. The proposed development will be connected to deep sewer and due to the water table being located up to 50 m below the ground surface and the presence of sandy soils underlying the limestone as well as the permeability of the shallow sediments, the site is suitable for stormwater management by infiltration, which is identified as Best Management Practice within the Department of Environment and Conservation's (2004) Stormwater Management Manual.

On this basis, the EPA objective for "*maintaining the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected*" can be achieved through implementation of the project.

3.2 Deferred Factor

As part of the EPA's assessment of the MRS amendment for Jindee there was one deferred factor. The EPA advised:

> The issue of ecological linkage has been deferred to ensure that an adequate mechanism is put in place during later stages of planning that will retain and protect the vegetation between the foreshore and inland area of P&R.

The function of the linkage, target species that may utilise the linkage, key requirements to maximise the utility of the linkage for its intended purpose and range of appropriate mechanisms to protect vegetation between the ROS areas that will be assessed and implemented through the TPS amendment is described below.

3.2.1 Regional Vegetation Values (Ecological Linkages)

In the advice provided by the EPA on the MRS amendment, the following statements were made:

> The EPA supports the Metropolitan Region Scheme Amendment 1152/41 on the basis that the two areas of Parks and Recreation (P&R) reserve are being provided to offset the area of foreshore P&R reserve (Bushforever Site No. 397) proposed to be zoned Urban. The two P&R reserves will be linked with native vegetation retained on private lots. The linkage is to ensure that the ecological function of the eastern portion of P&R is retained. Without the vegetated linkage the EPA does not consider the proposed P&R to be an adequate offset for the reduced foreshore reserve… The EPA is satisfied that there are no Declared Rare or Threatened Ecological Communities on Lot 9036. Priority flora species do occur on Lot 9036 including the area to be reserved as P&R.

The intent of the Jindee project has always been to offer a variety of housing types based around a coastal focussed neighbourhood design with varying density away from the neighbourhood centre. The area between the two new ROS areas has been identified as "T2" lots where large lot sizes dominate and the character of the precinct is "natural living" with retention of remnant vegetation within privately owned lots (refer to Figure 4). It is through these southern T2 lots (Protected Natural Living Area) that the linkage would be provided to enable the ecological function of the eastern P&R area to be retained.

3.2.1.1 Habitat Suitability for Significant Fauna in Trig Point ROS

In establishing the design requirements of the vegetated link between the two ROS areas it is first necessary to identify the species of significance that may inhabit the ROS areas.

The South-West Carpet Python may occur on-site. Home ranges for the Carpet Python average 15–20 ha (Pearson et al. 2006) therefore the Trig Point reserve would not support a population of Carpet Pythons. As such, provision of a vegetated link through to the ROS is not considered necessary for the support of this species.

Carnaby's Cockatoo may visit the site however, the Trig Point reserve supports only a very small area of the favoured *Banksia* community. The species is also highly mobile and the need for a vegetated link to support the movement of Carnaby's from the coastal reserve to Trig Point is not considered necessary.

Similarly, the mammal species of conservation significance are likely to require a home range in excess of the size of Trig Point and hence encouraging their movement into the area through the vegetated link is not considered to be in their best interests.

Smaller reptile species such as geckoes and skinks and invertebrates are likely to be the key fauna species that persist in Trig Point reserve. Many of these species co-exist in an urban environment. Therefore, should a catastrophic event such as fire through the ROS area occur, it is likely over time that a similar fauna community will re-establish as suitable habitat returns. To encourage this recolonisation, the T2 area will provide a vegetated corridor between the western ROS and Trig Point reserve.

3.2.1.2 Vegetated Linkage Requirements

To support the movement of small reptiles from the coastal ROS through the vegetated link to the Trig Point ROS, the following features need to be maintained.

To provide protection from predators, particularly from domestic and feral cats, a good density of ground cover or closed canopy low heath needs to be maintained in the vegetated link. The width and height of the vegetated corridor is less important than ensuring suitable cover for refuge and camouflage.

Minimise the distance of open ground (primarily roads) that needs to be traversed through the corridor. Suitable habitat will be provided as close to the edge of the road as possible without threatening road safety. The installation of a fauna underpass was considered but the ability to successfully funnel small reptiles towards such a device is very limited and hence not effective.

Areas of degradation within the vegetated link will be rehabilitated and weed species will be gradually removed to increase composition of locally native species.

Existing native vegetation outside of road reserves and identified building envelopes will be retained. During construction and infrastructure installation native vegetation will be clearly demarcated to ensure no inadvertent damage.

A "T2 Remnant Vegetation Protection Plan" will be prepared as part of the Detailed Area Plans (DAPs) over the southern T2 area. The plan will detail rehabilitation requirements, species to be used, establishment success criteria, vegetation protection measures during construction and long-term management measures for the vegetated link, ROS areas and coastal reserve.

3.2.2 Vegetation Protection in Southern T2 Precinct

As described in the MRS amendment documentation, T2 areas include residential uses located within the natural environment. In the southern T2 area, or the Protected Natural Living area, vegetation will be protected outside of building envelopes; housing set backs would be significant; roads, planning and engineering controls would allow for

roads to be freeform with no kerbing and open swales to take run-off; street trees would be naturalistic planted in clumps; pedestrian access would be provided in meandering paths rather than footpaths adjacent to roads; and road radii would be larger.

There are a range of options being considered for the design, establishment, management, ownership and ongoing responsibility for lots within the T2 precincts. There is correspondingly a range of options to give effect to the protection of remnant vegetation. Management for protection of the vegetated link needs to provide for retention and protection of the remnant vegetation during design and construction of the estate and long term management to prevent incremental degradation over time.

The objective for the protection of the southern T2 area will be:

> To retain a continuous vegetated link through private land between the Trig Point Reserve and the Foreshore Reserve to assist in the maintenance of the ecological function of the Trig Point Reserve.

It is intended that the objective for the T2 area will be enshrined through the City of Wanneroo's District Planning Scheme. There are a range of mechanisms available for achieving this objective for both the short and long term. The final mechanism to be used will be dependant on the ownership style and management of the T2 precinct. It is expected that a "southern T2 Remnant Vegetation Protection Plan" would be required as part of the DAPs for this area and will detail the final mechanisms used to achieve the objective stated above. This plan would be prepared in consultation with and to the satisfaction of the City of Wanneroo. The Plan will incorporate the environmental requirements to protect the landform and vegetation, as outlined in the District Structure Plan amendment report including:

a. The two Metropolitan Region Scheme Parks and Recreation reservations will be linked with native vegetation retained on private land.

b. Building Envelopes and Building Zones for Residential Development will be established in the applicable Detailed Area Plan.

c. The total area occupied by all Building Envelopes shall not comprise more than 30% of the total Land Area of the Protected Natural Living Area. The Land Area shall be defined as the Protected Natural Living Area less Thoroughfare reserves and Civic Spaces.

d. No Development shall occur in the Protected Natural Living Area unless there is an approved Detailed Area Plan for the area being developed or a Development Approval.

e. Development can only occur within the agreed Building Envelopes, Building Zones, Thoroughfares and Civic Spaces.

f. For the avoidance of doubt, clearing or disturbance of native vegetation can only occur within the agreed Building Envelopes, Building Zones, Thoroughfares and Civic Spaces.

g. All services and access to the Principal Building and/or Outbuilding will be undertaken within the nominated Building Zone only and involve minimum native vegetation clearing.

h. Any areas of native vegetation outside the Building Zone and Building Envelope that are damaged during construction will be rehabilitated to the satisfaction of the Council after installation of services or construction as the case may be.

i. Appropriate fencing will be detailed as part of the applicable Detailed Area Plan and shall allow, as far as practical, a corridor to assist the free passage of reptiles between the two regional reserves.

3.3 Southern T2 Urban Standards in the LSP

The T2 Protected Natural Living Area lots are larger lots and may vary from 600 m^2 to 3000 m^2 with the aim, where possible, to retain the natural coastal vegetation. The standards applying to T2 lots, as detailed and enforceable through the LSP include:

- building foot prints must be designated through the detailed area plan and preferably located on land already degraded
- thirty per cent of total T2 areas will be used for all building footprints not including public and private roads and paths
- buildings located on interior lots should be placed on land already degraded
- outbuilding structures may be divided into two not to exceed the total area allowed
- two or three lots can be consolidated not to exceed the total lot size allowed however, building footprints should be placed in accordance with the standards.

4.0 SUMMARY AND RECOMMENDATIONS

Estates Development Company proposes to develop the 112 ha Lot 9036 and Part Lot 3054 property in Jindalee as part of an innovative coastal village style estate. The associated Metropolitan Region Scheme Amendment (1152/41) was assessed by the EPA in May 2008 with a level of assessment set as "Scheme Amendment Not Assessed – Advice Given" and approved in November 2009. The EPA provided advice on the issues of remnant vegetation, fauna and sustainability. The issue of "Regional vegetation values (ecological linkages)" was considered an environmental issue not assessed, or a "deferred factor".

In accordance with Part IV Division 4 of the *Environmental Protection Act 1986*, the scheme amendment is now defined as an assessed scheme amendment. As such, the issues assessed by the EPA during the MRS amendment cannot be re-assessed by the EPA in subsequent planning stages, with assessment restricted to deferred factors only. The proposed TPS amendment will provide advice on how the issue of "Regional vegetation values (ecological linkages)" will be managed at the TPS amendment stage and is outlined in Section 3.2.

The objective of the protection of southern T2 "Protected Natural Living Area" will be:

> To retain a continuous vegetated link through private land between the Trig Point Reserve and the Foreshore Reserve to assist in the maintenance of the ecological function of the Trig Point Reserve.

In designing the linkage, it is important to identify the ecological function of the Trig Point Reserve and therefore the species that will potentially use the linkage and under what circumstances. Small reptiles were identified as the species likely to persist in the Trig Point Reserve once full urbanisation has occurred in the area. To support the movement of small reptiles through the vegetated link to the Trig Point Reserve and Coastal Reserve, the following features need to be maintained:

- a good density of ground cover for refuge and camouflage
- minimise the distance of open ground to be traversed, primarily roads
- rehabilitation of degraded areas
- retention of vegetation on private lots outside of defined building envelopes
- preparation of a "Southern T2 Remnant Vegetation Protection Plan".

The LSP provides a range of Urban Standards for the southern T2 lots which are described in Section 3.3. The enforceable mechanisms under the Standards include minimum lot areas, maximum of 30% of T2 area to be used for building footprint, and clearing to be restricted to degraded or cleared areas where possible.

The final suite of mechanisms to be used to protect remnant vegetation within the southern T2 lots will be dependant on the ownership style and management of the T2 precinct. It is expected that, in addition to the enforceable LSP Standards, a "Southern T2 Remnant Vegetation Protection Plan" would be required as a part of the Detailed Area Plan (DAP) that details the mechanisms used to achieve the objective stated above and prepared to the satisfaction of the City of Wanneroo.

The LSP does not raise any significant environmental impediments that have not been previously assessed and approved by the EPA through the MRS amendment process and to be addressed through the TPS amendment process.

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FIGURES

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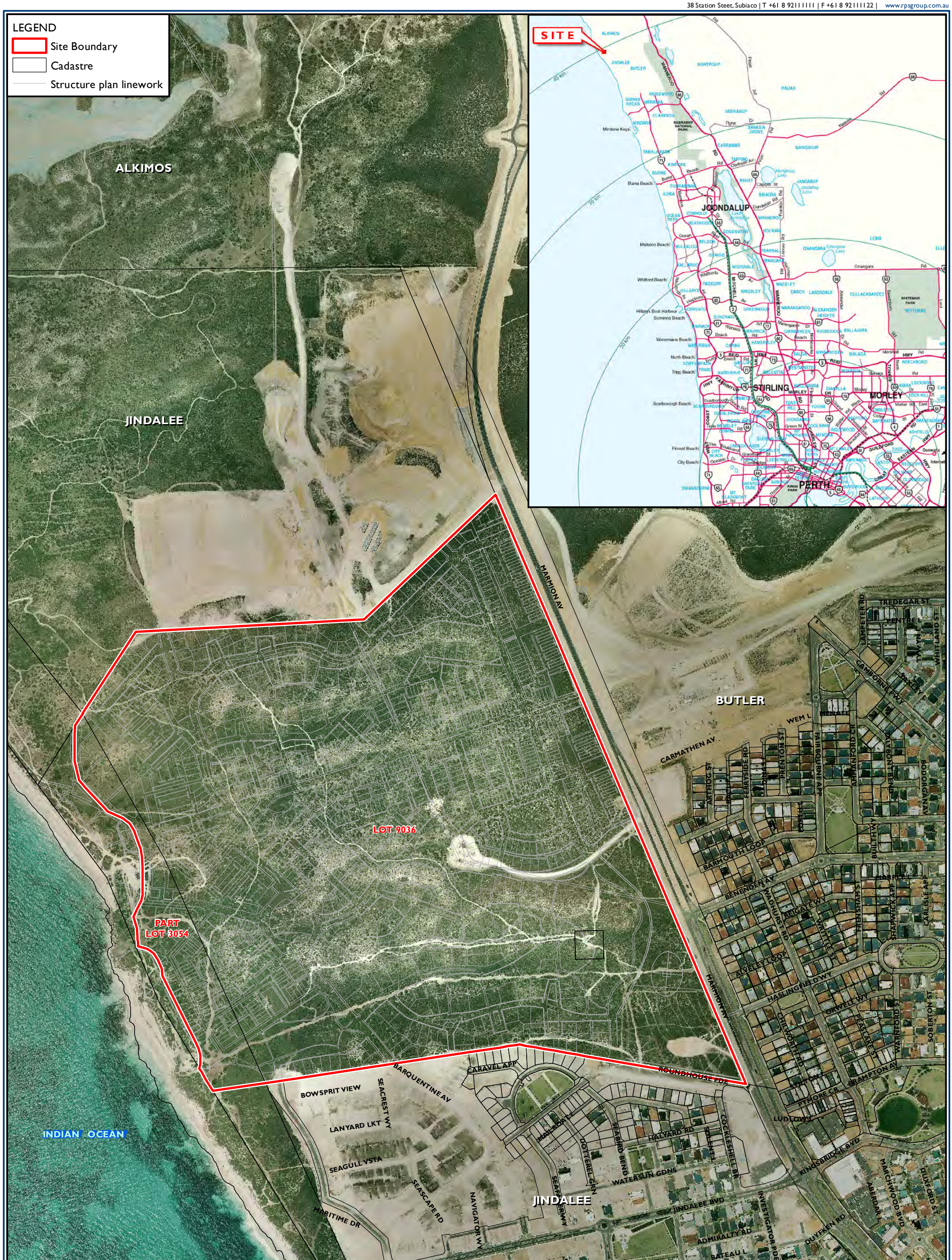

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Job Number: L07411
Date: 02.05.12
Scale: 1:7500 @ A3
Revision: A
Drafted by: SC
Source: Aerial, Cadastre - Landgate, 2010. Structure Plan, Robertsday - 11.06.10

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Figure 1

Site Location