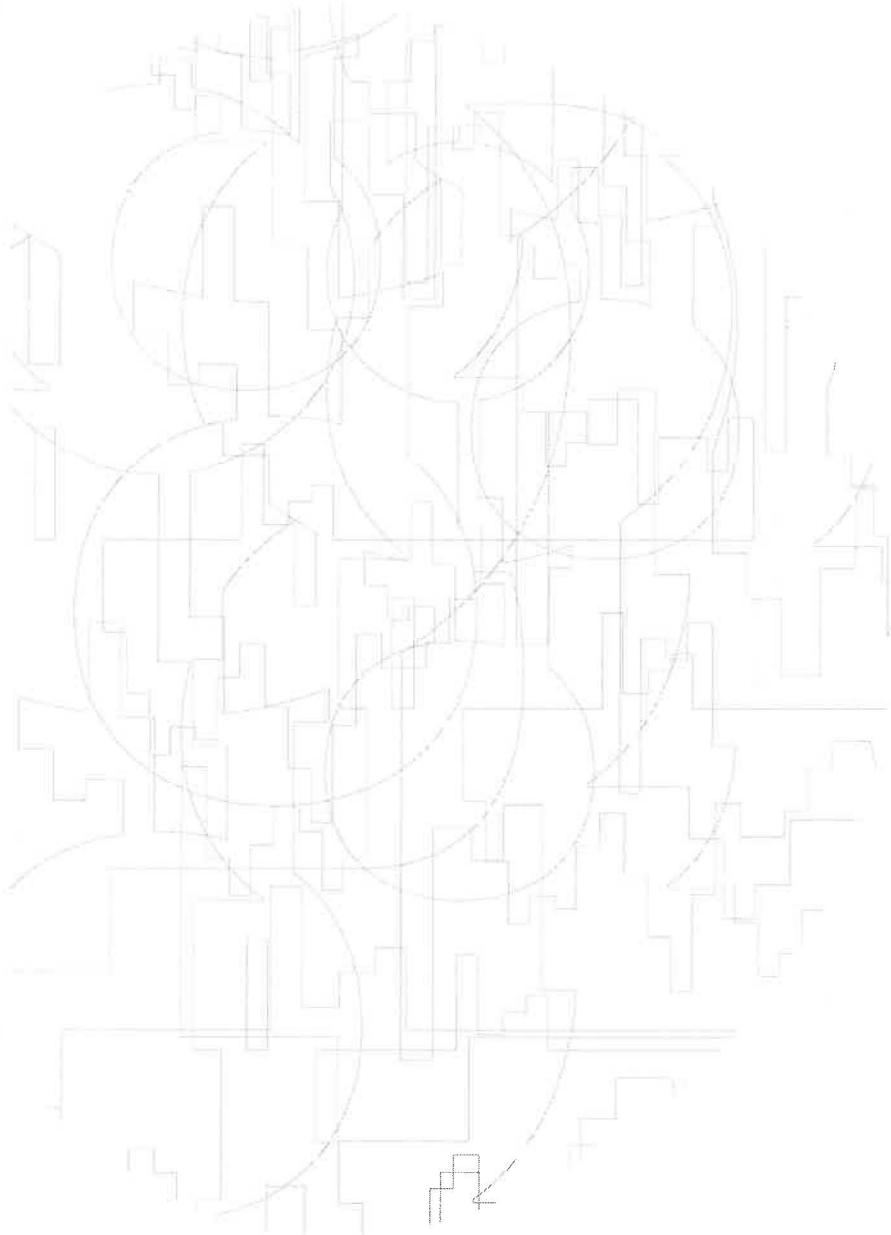




TOWN PLANNING  
AND URBAN DESIGN



## DEVELOPMENT PLAN

THE RANGES, STOVE HILL

711-149  
JULY 2012

perth  
sydney



## **ENDORSEMENT PAGE**

This structure plan is prepared under the provisions of the City of Karratha  
Local Planning Scheme No.8

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE  
WESTERN AUSTRALIAN PLANNING COMMISSION ON:

**2 AUGUST 2012**

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the  
*Planning and Development (Local Planning Schemes) Regulations 2015.*

Date of Expiry:

**19 OCTOBER 2028**

## DOCUMENT CONTROL

Document ID: PLANNING/PG 2011/ 711-149 Stove Hill, Karratha Road/Final Documents/Lodged/Development Plan/ 711-149 Stove Hill, Karratha Road 25.05.12.indd						
Issue	Date	Status	Prepared by		Approved by	
			Name	Initials	Name	Initials
1	01.02.12	Final	Eleanor Richards		David Read	
2	19.03.12	Final	Eleanor Richards		David Read	
3	23.04.12	Final	Eleanor Richards		David Read	
4	25.05.12	Final	Eleanor Richards		David Read	
5	13.07.12	Final	Eleanor Richards		David Read	
<p>This report has been prepared for the exclusive use of the Client, in accordance with the agreement between the Client and TPG ('Agreement').</p> <p>TPG accepts no liability or responsibility whatsoever in respect of any use of or reliance upon this report by any person who is not a party to the Agreement or an intended recipient.</p> <p>In particular, it should be noted that this report is a qualitative assessment only, based on the scope and timing of services defined by the Client and is based on information supplied by the Client and its agents.</p> <p>TPG cannot be held accountable for information supplied by others and relied upon by TPG.</p> <p>Copyright and any other Intellectual Property arising from the report and the provision of the services in accordance with the Agreement belongs exclusively to TPG unless otherwise agreed and may not be reproduced or disclosed to any person other than the Client without the express written authority of TPG.</p>						

TPG reports are printed on:

## EXECUTIVE SUMMARY

This Development Plan comprises two parts, being:

Part 1: Statutory Planning Section

Part 2: Explanatory Report

Clause 7.2.3.2 of the Shire of Roebourne Town Planning Scheme No. 8 (herein called 'the Scheme') requires a Development Plan to be adopted and approved prior to Council being able to support a subdivision application or approving development on land within a Development Area, which will include the subject site following the gazettal of Amendment 25 to the Scheme.

Clause 7.2.11.3 prescribes that a provision, standard or requirement of an approved Development Plan shall be enforced in the same way as corresponding provisions incorporated within the Scheme. This requirement is addressed in Part 1 of the Report. Part 2 of this Development Plan is for explanatory purposes only, providing a descriptive analysis of this Development Plan.

This Development Plan is for a portion of land including Lot 400 Karratha Road, Stove Hill as well as Unallocated Crown Land to the west and south. It will facilitate the development of a high quality village in a resort setting, to be predominantly used as White Collar Workers Accommodation in the first instance, but will have the ability to transition to tourist accommodation should it no longer be required for workers accommodation.

This development complements and expands the already approved 'The Ranges' development on Lot 1090 Karratha Road, the former drive-in site to the east of the subject site. Expanding this development into the adjoining valley helps provide the original development greater context and purpose firstly, as a conveniently located workers village strategically located in close proximity to the Karratha Light Industrial Area and major transport routes to Anketell and The Burrup, but also as an accommodation village nestled in the Karratha Ranges on the main tourist entry route to town where the development benefits from the unique amenity and picturesque character provided by The Karratha Ranges.

Whilst Amendment 25 contemplates development expanding over some 19ha of the valley, it is proposed to concentrate development to just over 7ha of land being Lot 400 and protect the 'Excellent - Pristine' vegetation in the remainder of the Amendment 25 area.

In order for the development of the 7ha site to take place, it is essential that there be no stay restrictions placed on the final development. Workers who initially reside in the village may do so for 6-8 months in any 12 month period, or only a week every other month. As the development is to be strata titled and then leased, having no stay restrictions will enable the purchasers to obtain bank finance, thus enabling the units to be sold and developed. However, in order to discourage use by families except on a short term tourism basis, which is



considered appropriate given the sites location and distance from schools and other community facilities, the dwellings are to be designed to be only one and two bedroom/dual key dwellings, which are ideally suited for tourists, single persons, couples or two non-related workers.

The site is considered ideal for such a development, being located on Karratha Road, only 1km from the Karratha Light Industrial Area and with excellent direct access to Dampier Road, which leads to The Burrup, and North West Coastal Highway which leads to Cape Lambert and Anketell. Including Lot 1090 abutting Karratha Road, once 'The Ranges' development is complete, it will eventually contain some 430 units with accommodation for up to approximately 500 people in a quality village resort with swimming pool, tennis courts, restaurant, tavern all nestled in the valley surrounded by the protected picturesque Karratha Hills.

Accommodation and Housing pressure has been identified as one of Karratha's key issues, as evidenced by a tight and expensive rental market and average house price of \$775,500 compared with \$470, 000 in Perth's metropolitan area and \$370,000 in other parts of regional Western Australia. These pressures are likely to increase in the future, particularly with the development of Anketell Port. These pressures are known and have been widely reported.

## CONTENTS

<b>PART 1 – STATUTORY PLANNING SECTION</b>	<b>3</b>
Title	3
Relationship to the Shire of Roebourne Town Planning Scheme No. 8	3
Development Plan	3
Land Use Permissibility	4
Development Provisions	5
<b>APPENDIX 1</b>	<b>9</b>
Development Plan	9
<b>PART 2 - EXPLANATORY REPORT</b>	<b>13</b>
<b>INTRODUCTION</b>	<b>13</b>
Preamble	14
<b>SUBJECT SITE</b>	<b>17</b>
Site Location	17
Land Use and Topography	17
Local Context	17
Native Title	21
Mining Tenements (Department of Mineral and Petroleum Resources)	21
<b>PLANNING FRAMEWORK</b>	<b>23</b>
Shire of Roebourne Town Planning Scheme No.8	23
Strategic Framework	25
<b>CONTEXT ANALYSIS</b>	<b>31</b>
Natural and Cultural Heritage Analysis	31
Environmental Analysis	31
<b>THE DEVELOPMENT PLAN</b>	<b>37</b>
Project Objectives	37
Development Plan Design Rationale	38
Vehicle Access and Traffic	46
Urban Water Management	46
Servicing	47

<b>PLANNING ASSESSMENT</b>	<b>51</b>
Statutory Compliance	51
Orderly and Proper Planning	51
Visual Analysis	52
Site Suitability and Relationship to Adjoining Development	58
<b>CONCLUSION</b>	<b>59</b>
<b>APPENDIX 1</b>	<b>61</b>
Department of Indigenous Affairs Correspondence	61
<b>APPENDIX 2</b>	<b>63</b>
Flora and Fauna Assessment	63
<b>APPENDIX 3</b>	<b>65</b>
Air Quality Impact Assessment and Noise Impact Assessment	65
<b>APPENDIX 4</b>	<b>67</b>
Demand Analysis	67
<b>APPENDIX 5</b>	<b>69</b>
DVC Traffic Report	69
<b>APPENDIX 6</b>	<b>71</b>
Local Water Management Strategy	71
<b>APPENDIX 7</b>	<b>73</b>
Indicative Recommended Plant Species	73

# CERTIFICATION OF DEVELOPMENT PLAN

IT IS HEREBY CERTIFIED THAT THE DEVELOPMENT PLAN FOR 'THE RANGES' BEING LOT 400 ON  
DEPOSITED PLAN 72956 AND UNALLOCATED CROWN LAND TO THE WEST AND SOUTH OF LOT 400  
WAS ADOPTED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION

ON

3 September 2012

[Signature]

BEING AN OFFICER OF THE COMMISSION DULY

AUTHORISED BY THE COMMISSION PURSUANT TO

SECTION 16 OF THE PLANNING AND DEVELOPMENT ACT 2005

AND BY

RESOLUTION OF THE COUNCIL OF THE SHIRE OF ROEBOURNE ON

16 July 2012

AND THE SEAL OF THE MUNICIPALITY WAS PURSUANT TO THE COUNCIL'S RESOLUTION HERETO

AFFIXED IN THE PRESENCE OF:

[Signature]

PRESIDENT, SHIRE OF ROEBOURNE

[Signature]

CHIEF EXECUTIVE OFFICER, SHIRE OF ROEBOURNE



This page has been left blank intentionally.

## PART 1 – STATUTORY PLANNING SECTION

### TITLE

This Development Plan shall have the formal title of 'The Ranges Development Plan' (hereafter referred to as the 'Development Plan').

### RELATIONSHIP TO THE SHIRE OF ROEBOURNE TOWN PLANNING SCHEME NO. 8

Unless specified by a requirement of this Development Plan, all land uses and development shall occur in accordance with the standards and requirements specified by the Shire of Roebourne Town Planning Scheme No. 8 (TPS8 or the Scheme).

### DEVELOPMENT PLAN

The Development Plan is attached as Appendix 1 to this Part and comprises Lot 400 on Deposited Plan 72956 and a portion of Unallocated Crown Land to the west and south of Lot 400. Whilst the total area comprises some 19.8611ha in area, this Development Plan relates to only 7.14ha immediately abutting Lot 1090 Karratha Road. For the remainder of the Development Plan area, generally west of the existing power lines as shown on the plan in Appendix 1, the area is shown as 'Conservation, Recreation and Natural Landscapes' although an additional Development Plan may be prepared to facilitate further development taking place.

Any subsequent Development Plan will need to demonstrate that all of the following matters have been addressed to the Shire's satisfaction (and if involving subdivision also the satisfaction of the Western Australian Planning Commission):

- Native Title and Aboriginal Heritage;
- Flora and Fauna;
- Storm water disposal, including storm water modelling;
- Access arrangements to Stove Hill Road or other road excluding direct access to Karratha Road;
- Adequate servicing, in particular the availability of water and sewerage infrastructure;
- Land use suitability; and
- Any buffer requirements to the Horizon Power Stove Hill Power Station.

## LAND USE PERMISSIBILITY

The use classes listed below will be considered within the area designated as 'Tourism' within the Development Plan:

Use	Permissibility	Use	Permissibility
Accommodation Resort (refer below)	P	On-site Canteen	IP
Car Park	IP	Place of Public Meeting, Assembly or Worship	IP
Caretakers Dwelling	P	Private Recreation	IP
Consulting Rooms	IP	Reception Centre	AA
Display Home	P	Residential Building	P
Dry Cleaning Premises	IP	Restaurant	P
Emergency Services	IP	Shop	IP
Grouped Dwelling	AA	Short Stay Accommodation	P
Hotel	P	Take-away Food Outlet	IP
Minor Utility Installation	AA	Tavern	AA
Motor Vehicle and/or Marine Repair	IP	Tourist Resort	P
Multiple Dwelling	AA		
Office	IP		

Where:

Accommodation Resort is defined as

*"One or more accommodation units together with a range of recreational and/or cultural facilities in a resort style setting. The units may be used on either a long or short stay basis and may be used for the temporary accommodation of transient workers or tourists. The facility shall also include associated facilities such as a restaurant, tavern or functions room whether or not licensed under the Liquor Control Act 1988, which may be used by the occupants of the premises and may also be made available for use with or without charge by non occupant members of the public."*

'P' means the development is permitted by the Scheme.

'AA' means the development is not permitted unless the local government has granted planning approval.

'IP' means the development is not permitted unless the use to which it is put is incidental to the predominate use as decided by the Shire.

All other uses are not permitted.



## DEVELOPMENT PROVISIONS

Within the portion of the Development Plan area identified as 'Tourism' the following provisions shall apply:

- There shall be no limits on the duration of any stay provided there are no 3 bedroom accommodation units or units with 2 living room areas on the site which may encourage use by families on a permanent basis.
- The developer and Strata company must at all times ensure management and facilities are in place to allow owners to let their apartment on a short stay basis.
- The minimum provision of recreational amenities and facilities for residents shall include those listed below, at least one of which must be accessible (with or without charge as determined by the operator) to the general public:
  - A swimming pool; and
  - A tennis court; and
  - Tavern; and/or
  - Restaurant.
- Prior to the completion of the first unit the developer shall be responsible for the construction of a 1.2m wide pathway from the entrance of the development at Karratha Road to Dampier Road;
- The maximum height of development shall be 2 storeys;
- The development shall contain a mix of one and two storey development. Development of accommodation units shall have a wall height no greater than 7 metres and a roof ridge height of no greater than 8 metres above natural ground level. The communal facilities building shall have a maximum roof ridge height of 12.6m above natural ground level, but a wall height of no greater than 6 metres (excluding any vertical roof feature such as louvred windows).
- The maximum number of residential strata modules on the subject Development Plan Area shall be no more than 270.
- Prior to occupation of any stage of the subject development, public art using local indigenous artists shall be installed in the development on a pro rata basis with the total cost of art not to be less than \$100,000.
- Provision shall be made for a pipe and pump from the development to the Water Corporation's Waste Water Treatment Plant No. 1 (WWTP1) suitable to take treated water from WWTP1 for use on landscaping within the development.
- Building Architecture and Climatic Design shall be consistent with the objectives of the Karratha Vernacular (May 2011).
  - Roofing shall be light coloured roofing (excluding white or zincalume) such as 'Evening Haze', 'Shale Grey', 'Paperbark', 'Sandbank', 'Pale Eucalypt', 'Windspray' from the current Colorbond range or equivalent like colours.
  - Walls shall be of an 'earth tone'. For Colorbond panels the roofing colours permitted above are permitted, but may also include 'Bushland', 'Jasper', 'Wilderness'

and 'Woodland Grey'. Smaller feature wall panels of contrasting materials and colours are permitted at the Shire's discretion where they add to the aesthetic appearance of the building.

- A more detailed Visual Impact Assessment of the proposed development shall be undertaken in accordance with the Western Australian Planning Commission Guidelines "Visual Landscape Planning in Western Australia" 2007. The assessment shall consider the potential visual impact of the development on the Karratha Hills as viewed from Karratha Road with the aim of maintaining a clear line of sight to the ridge line and land form behind the built form and provide design responses to ensure the development blends into the natural landscape, with the aim that landscape vegetation and landscape features utilised in the development reflect the colour, character and habitats found in the Karratha hills.
- Ceiling fans shall be incorporated throughout the development.
- Earthworks shall be minimized and the final development levels shall have regard to the natural direction of storm water flow, clearance above flood levels in the southern portion of the development area and building cell footprints shall reflect existing natural ground levels.
- Flyscreens and flywire doors shall be fitted to all units to maximise natural ventilation opportunities.
- Eaves, balconies, verandah, porches and awnings shall be provided to provide solar protection to all major openings as defined by the R-Codes.
- Landscaping shall include a mix of endemic and introduced species that are suitable to a dry and arid climate with particular attention to endemic species being planted on the periphery of the site. Reference shall be made to Council Policy DP6 'Landscaping Requirements for Industrial and Commercial Areas' in determining the preferred species for the preparation and assessment of any detailed landscaping plan for the site.
- Landscaping comprising predominately native trees such as the Eucalyptus Victrix shall be planted between the current Lot 1090 Karratha Road and the culvert under Karratha Road immediately south of this Lot between Karratha Road and the eastern boundary of the proposed development area as shown on the Development Plan. Such vegetation shall be planted prior to occupation of the development the subject of the Development Plan and be maintained in a healthy condition by the developer for a minimum period of 12 months. The planting shall be undertaken by the developer in conjunction with the Shire of Roebourne and in consultation with the Crown and Native Title holders.
- Perimeter fencing shall be visually permeable and be a maximum height of 1200mm above the finished earthworked/retaining wall level.
- For an 'Accommodation Resort" car parking shall be provided at the rate of 1 bay per 1 bedroom unit, 1.5 bays per 2 bedroom (or dual key) unit, 1 bay per 2 staff and visitor parking at the rate of 1 bay per 10 units. No additional visitor parking is required for communal amenities and facilities provided at least 15 visitor parking bays are conveniently located near the central amenities area.

- A Parking and Traffic Management Plan shall be submitted to support an application for planning approval where Council consider this necessary. The Parking and Traffic Management Plan shall specifically demonstrate the number of parking bays proposed will be sufficient to cater for occupants and visitors to the development, including visitors to facilities which will be made open to the general public. Pedestrian access to the remainder of the Development Plan area shall be provided from Lot 400.
- All internal roads shall have a minimum seal width of 6m.
- Pathways shall be provided throughout the development and be of a minimum width of 1.2m.
- A Detailed Stormwater Management Plan and Drainage Design Specifications consistent with the approved Local Water Management Strategy and to the specification and satisfaction of the Shire of Roebourne shall be submitted with an application for planning approval where Council considers appropriate. The management plan shall include management of drainage between Stage 1 (Lot 1090) and Stage 2 (Lot 400).
- At the Shire's discretion any development in the subject Development Plan area may be advertised pursuant to Clause 4.3.2 of the Scheme.
- Within the balance 'Conservation, Recreation and Natural Landscapes' area of the Development Plan Part II - Reservations of the scheme shall apply but no significant development is permitted that may fetter its ultimate development until a second Development Plan is approved, which addresses the following issues:
  - Native Title and Aboriginal Heritage;
  - Flora and Fauna;
  - Storm water disposal, including a Local Water Management strategy for the balance DA42 area;
  - Access arrangements to Stove Hill Road or other road excluding direct access to Karratha Road;
  - Adequate servicing, in particular the availability of water and sewerage infrastructure;
  - Land use suitability; and
  - Any buffer requirements to the Horizon Power Stove Hill Power Station.
- Should R-Code Open Space or other related provisions require relaxation, Council will require a cash in lieu contribution determined according to criteria to the satisfaction of the Shire of Roebourne in accordance with Planning Bulletin 100 State Planning Policy 3.6 Development Contributions for Infrastructure.
- Prior to the creation of strata titles for Lot 400 or occupation of any unit on Lot 400, a Shire Deed is to be prepared at the proponent's expense and to the Shire's satisfaction, which stipulates that the predominant use of the site shall not be for Transient Workforce Accommodation at any one time.
- An annual statement of occupancy is to be provided to the Shire to monitor use and demand at the facility for tourist accommodation.

This page has been left blank intentionally.

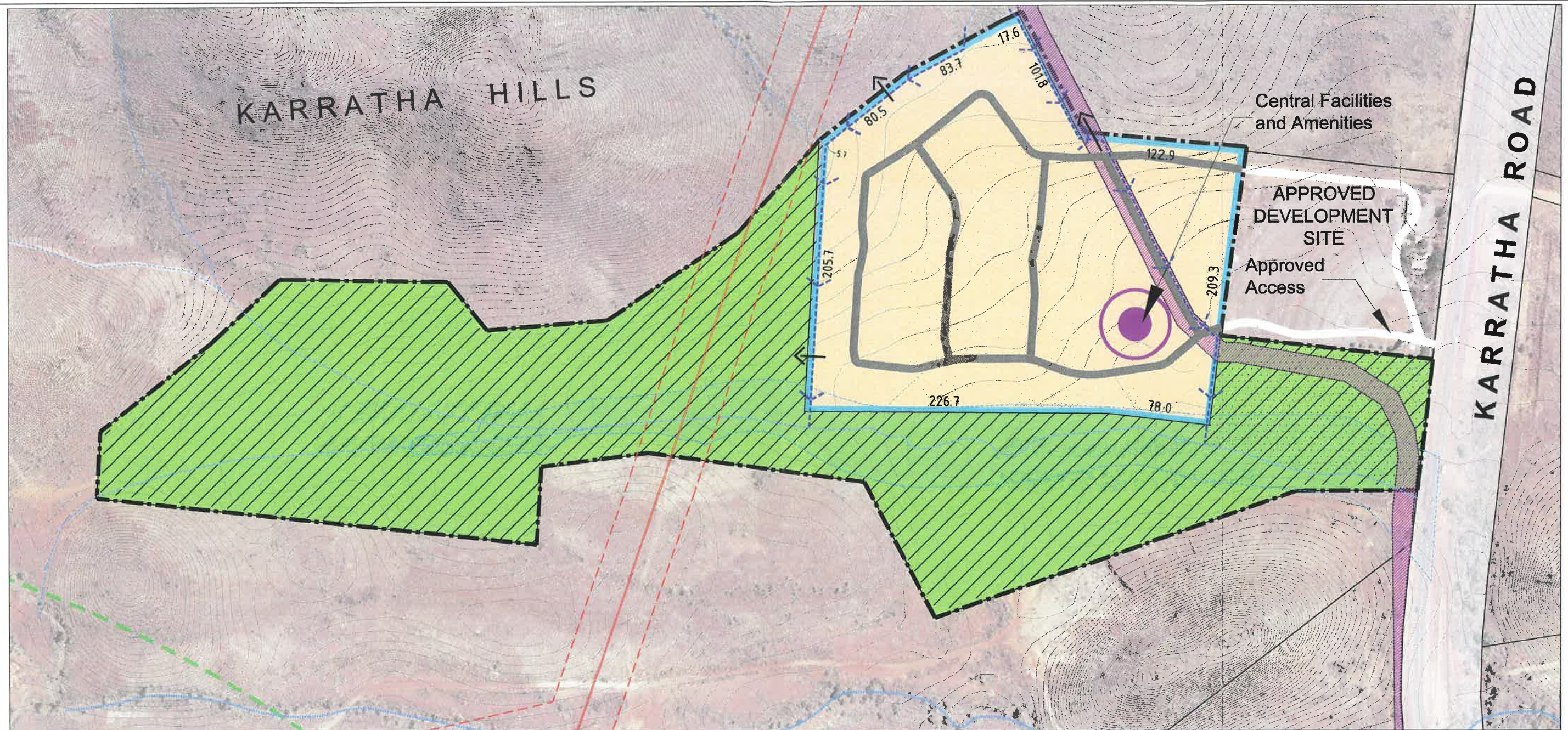
## APPENDIX 1

### DEVELOPMENT PLAN

---

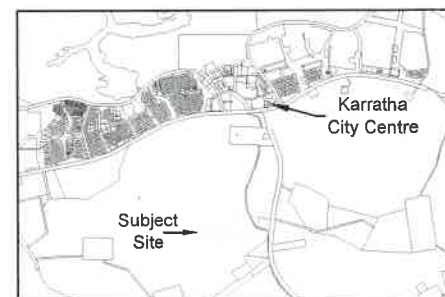
This page has been left blank intentionally.





# LEGEND

Development Plan Area		1000m Power Station Buffer	
Indicative Road Layout		Existing Drainage Lines	
Tourism Area		Key Drainage Lines	
Conservation, Recreation and Nature Landscape		Mapped Creekline	
Contours		50m Wide Power Corridor	
Central Facilities + Amenities		Easement Gas Infrastructure (Disused)	
Area to be Re-vegetated by Developer in conjunction with the Shire of Roebourne and in consultation with the Crown and Native title holders		Existing Cadastre	
		Potential Future Pedestrian Connections	



Context Plan - Scale 1:100,000



This concept has been prepared for the purpose of meeting client specifications. The drawing does not constitute an invitation, agreement or contract (or any part thereof) of any kind whatsoever.

Although care has been taken in the compilation of this drawing by The Planning Group WA Pty Ltd, all parties associated with the proposed property development disclaim all responsibility for any errors or omissions. The right is reserved to change the plan at any time.

Liability is expressly disclaimed by The Planning Group WA Pty Ltd for any loss or damage which may be sustained by any person acting on any visual impression gained from this drawing.

'The Ranges' Development Plan  
Stove Hill, Karratha  
Shire of Roebourne

Date: 16/03/2012  
Scale: 1:3000 @ A3  
Drawing No. 711-149 CP2 Dev Plan 160312.pdf

Designer: DR

Drawn: PR







## PART 2 - EXPLANATORY REPORT

### INTRODUCTION

This Development Plan has been prepared by TPG Town Planning and Urban Design (TPG) on behalf of Greenvalley Asset Pty Ltd to facilitate the development of accommodation units Lot 400 Karratha Road Stove Hill and thereby help in addressing the significant shortage of accommodation in Karratha. The Development Plan will facilitate the development of a high quality village in a resort setting, that may be used by both working residents and tourists, whilst protecting the remainder of the valley within a 'Conservation Recreation and Natural Landscapes' area.

The subject site is currently vacant and unused land. A development application for accommodation units has recently been approved on Lot 1090 (being the disused drive in site), and this Development Plan would facilitate the logical extension of that development. Expanding this development into the adjoining valley helps provide the original development greater context and purpose as firstly a conveniently located village being strategically located in close proximity to the Karratha Light Industrial Area and major transport routes to key employment areas, but also as an accommodation village nestled in the Karratha Ranges on the main tourist entry route to town where the development benefits from the unique amenity and picturesque character provided by the Karratha Ranges.

The subject site is currently reserved for 'Conservation Recreation and Natural Landscapes'. The Shire of Roebourne has initiated Amendment 25, which amends the current 'Conservation Recreation and Natural Landscapes' reserve to the 'Urban Development' zone. Amendment 25 was adopted by the Shire of Roebourne in December 2011 and forwarded to the Western Australian Planning Commission (WAPC) for final approval in early 2012.

This Development Plan has been prepared in anticipation of the gazettal of Amendment 25 and in accordance with the requirements of the Shire of Roebourne's Town Planning Scheme No.8 for the 'Urban Development' zone, as discussed in detail in this report.

This report addresses relevant planning requirements, as well as traffic, environmental and engineering matters. This Development Plan has been prepared with input from the following:

- Emerge and Associates – Environmental;
- Simon Tan and Associates - Consulting Engineers – Engineer;
- Whelans - Surveying.

## PREAMBLE

In November 2009, the State Government launched its Blueprint for the Pilbara Cities, seeking to transform the region by creating modern, diverse and sustainable centres that are supported by all the services and facilities enjoyed by other Australian cities. This Blueprint specifically addressed the revitalisation of Karratha where it is envisaged that the population will increase to 50,000 people in the medium to long term.

Arising out of the City of the North Blueprint, the Shire, in conjunction with Landcorp undertook a cursory review of its Scheme to put in place provisions that would facilitate development in an orderly and proper manner. This review resulted in Amendment No.18 to the Shire of Roebourne's Town Planning Scheme No. 8 being adopted.

Amongst other provisions, Amendment 18 inserted into the Scheme numerous provisions in relation to the preparation, adoption and operation of Development Plans including the Zoning Table being amended so that uses are determined in accordance with a Development Plan. The Amendment also created 'Development Areas' as Special Control Areas for each Urban Development zone area to allow for the implementation of Special Conditions, to be imposed to ensure each area is developed in accordance with the vision outlined in the Blueprint. Amendment 18 was gazetted in March 2011.

A second scheme amendment – Amendment No. 21 has also been prepared and initiated to insert growth areas identified in the Growth Plan (as discussed below) into the Scheme. This Amendment included rezoning the subject site to Urban Development, but a separate amendment (Amendment 25) was proposed given the importance of expediting the provision of residential accommodation in Karratha, the potential for Amendment 21 to have a lengthy approval process given its extent and complexity, and the fact that Amendment 21 proposes to rezone significant areas of the Karratha Hills surrounding the subject site which are no longer considered to be suitable for development. At the time of writing this report Amendment 25 had been adopted by the Shire and is expected to be adopted by the WAPC and gazetted early in 2012.

In June 2010 development approval was granted to Greenvalley Asset Pty Ltd to develop 108 accommodation units along with associated facilities on the former Drive-In site on Lot 1090 Karratha Road abutting the site. The approved development is under construction and also includes a manager's residence, office, reception building, swimming pool, ancillary buildings and associated works.

Given the demand for accommodation within Karratha, Greenvalley sought to investigate the potential for an expanded development proposal over a larger parcel of land. A preliminary site of approximately 7.14ha, (now Lot 400) was identified immediately west of Lot 1090 and agreement reached with the Department for Regional Development and Lands for the conditional transfer of the land to Greenvalley. This conditional Option to Purchase has been granted subject to the land being appropriately zoned, agreement being reached on native title issues, protection and amalgamation of the easement through the site held by Australian Telecommunications Corporation, Robe River Joint Venture Consortium and Epic Energy Pty Ltd, and all costs of the land assembly and development being borne by the developer.



This page has been left blank intentionally.

## SUBJECT SITE

### SITE LOCATION

The subject site comprises Lot 400 on Deposited Plan 72956 and Unallocated Crown Land to the west and south of Lot 400, as shown on the site plan below. The site is located on the western side of Karratha Road, approximately 1.7km south of the Karratha City Centre.

REFER TO FIGURE 1 – LOCATION PLAN

REFER TO FIGURE 2 – SITE PLAN

The site is to be accessed from the existing crossover approved for Lot 1090 from Karratha Road. As part of the rezoning of the site, Main Roads WA has advised that it is not possible to gain any additional access points to Karratha Road, which means any potential future access points that may be required for the balance land may need to be provided to Stove Hill Road or some other new road envisaged further south or west by the Karratha City of the North City Growth Plan.

### LAND USE AND TOPOGRAPHY

The site is gently undulating, sloping from the Karratha Hills situated to the north, down towards natural creek lines and to a secondary ridge which runs east-west just south of the site. Site levels range from approximately 36m AHD at the foot of the hills to 26m AHD at the creek.

There are no improvements within the site with the exception of the easement, which is presumed to contain a disused pipe(s). Improvements contained within the adjoining Lot 1090 to the east of the site consisted of a disused drive-in cinema. Whilst still shown on the most recent aerial photograph these have all been removed in accordance with the current development approval.

REFER TO FIGURE 3 – AERIAL PLAN

### LOCAL CONTEXT

The subject site is situated to south of the Karratha Hills within the locality of Stove Hill. The site is predominantly surrounded by undeveloped land, with the Karratha Visitor Centre and Karratha City Centre being located approximately 1.2km to 1.7km north of the site and Karratha Industrial Estate being located less than 2km south east of the site. The Stove Hill Power Station is located over 1km to the south west of the site. The KCN Growth Plan identifies the site subject as being located within the 'Regals Valley' Precinct and is identified to accommodate future residential, tourism, recreational and institutional activities.

Karratha Road is the main entry to Karratha from the North West Coastal Highway with Madigan Road being the only other road into Karratha from the Highway, but this is used more for commercial vehicles accessing Dampier and the Burrup.

REFER TO FIGURE 4 – CONTEXT PLAN

FIGURE 1 - LOCATION PLAN





FIGURE 2 - SITE PLAN

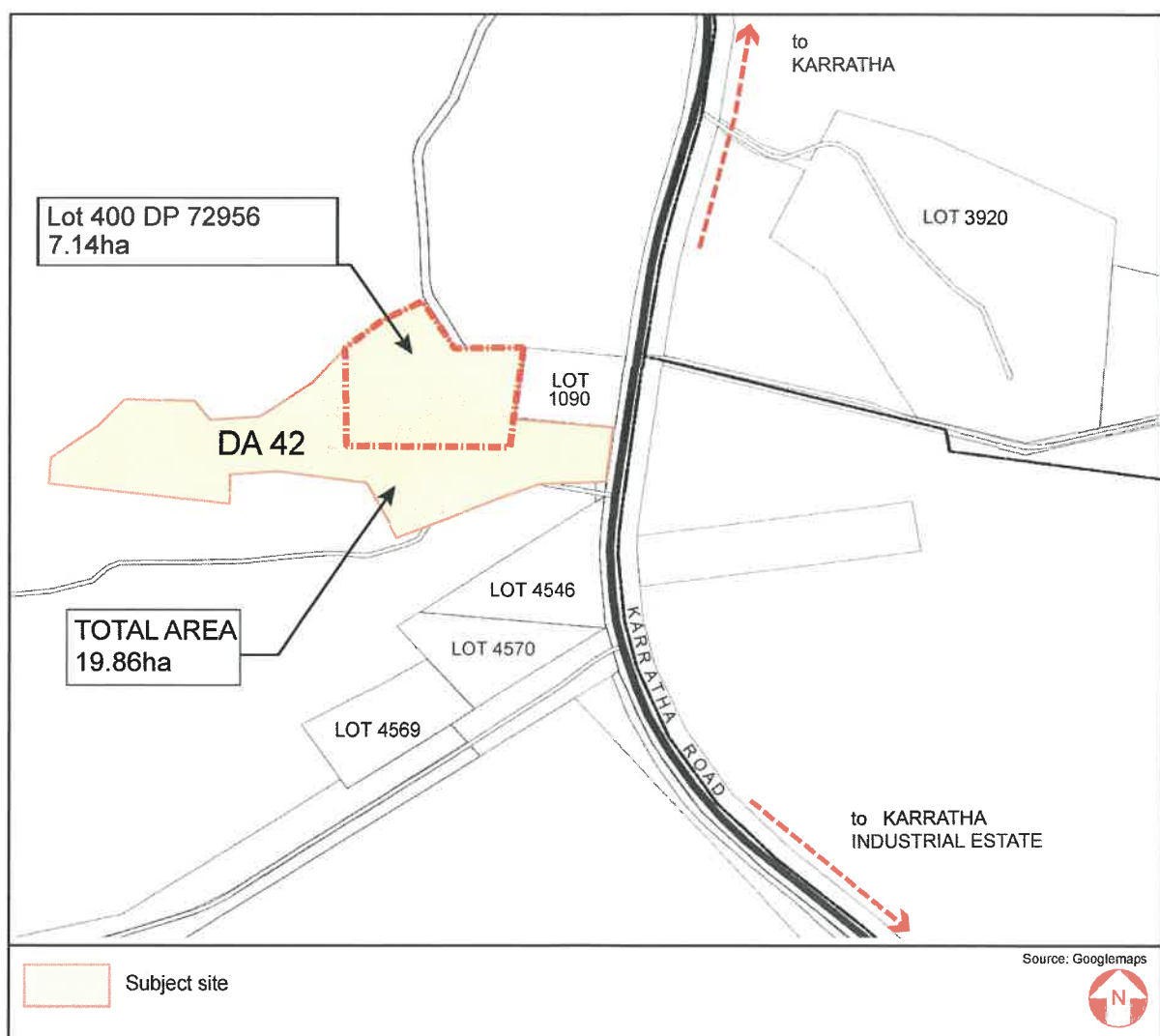
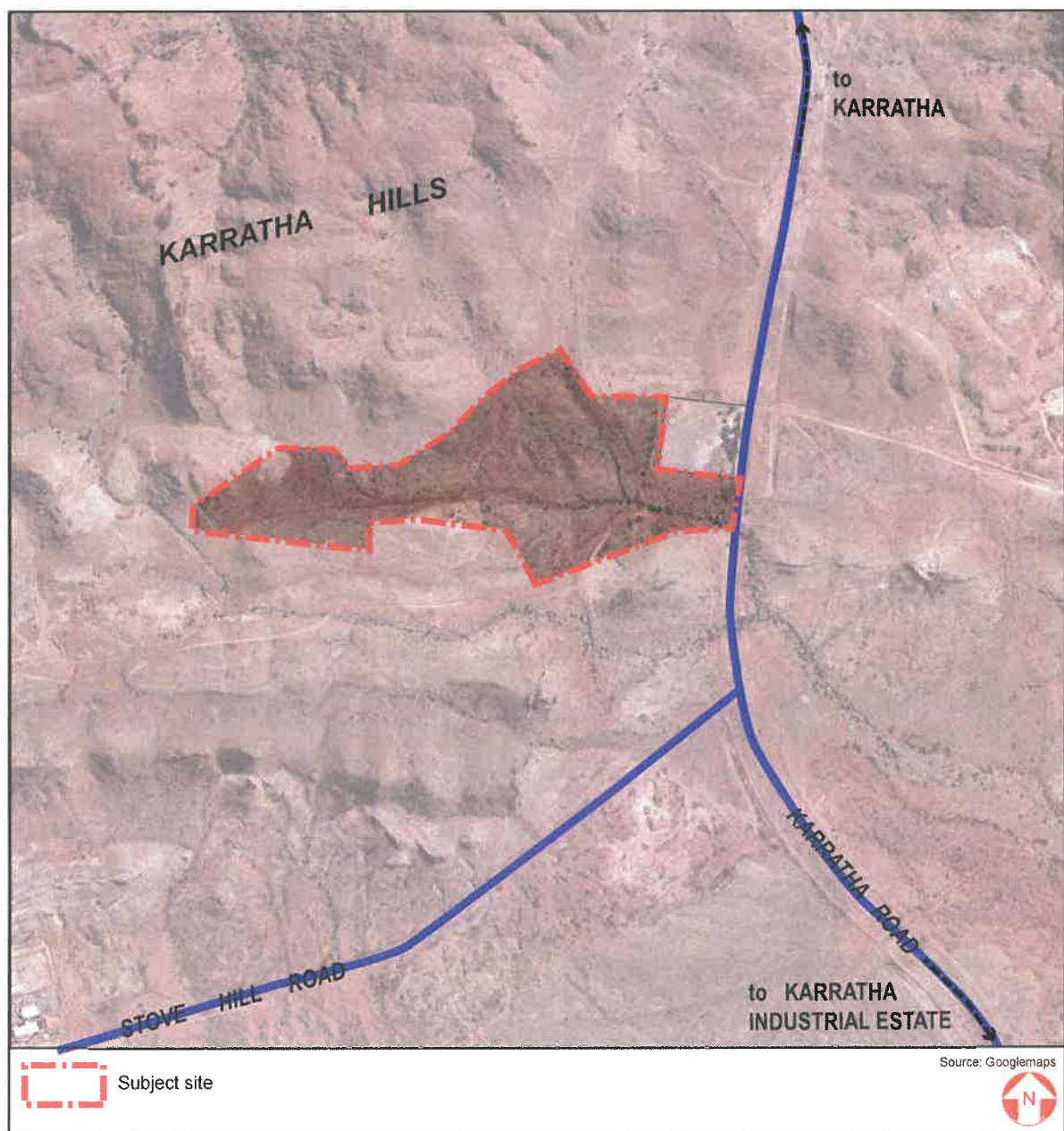


FIGURE 3 - AERIAL PLAN



## **NATIVE TITLE**

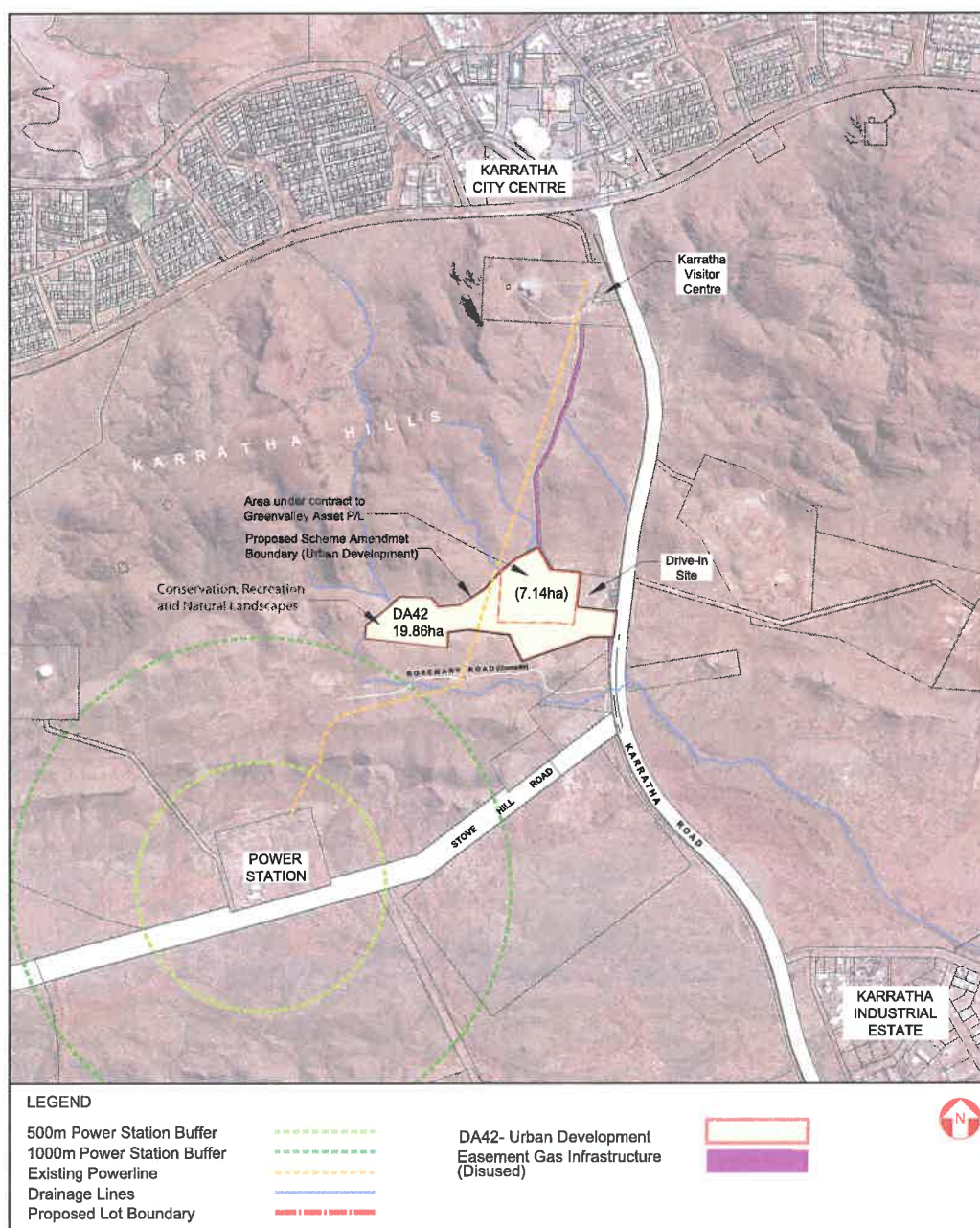
The Ngarluma people are the original inhabitants of the coastal areas around Roebourne and hold Native title over this wider area, which includes the subject site. Discussions are currently being held with the Ngarluma people as traditional owners of the land and relevant approvals and agreements are being obtained by the Department of Regional Development and Lands. Such approvals will need to be obtained prior to development commencing on site.

It should also be noted that the Department of Indigenous Affairs has confirmed there are no registered sites of significance within the proposed development area.

## **MINING TENEMENTS (DEPARTMENT OF MINERAL AND PETROLEUM RESOURCES)**

A desktop review of the Department of Mines and Petroleum website indicates that there are no live mining tenements over the subject site.

FIGURE 4 - CONTEXT PLAN





## PLANNING FRAMEWORK

### SHIRE OF ROEBOURNE TOWN PLANNING SCHEME NO.8

Amendment 25 proposes to rezone the Development Plan area from its existing 'Conservation and Natural Landscapes' reservation to the 'Urban Development' zone, with a corresponding Development Application number of DA42.

Arising out of the City of the North Blueprint, the Shire, in conjunction with Landcorp, undertook a cursory review of its Scheme to put in place provisions that would facilitate development advocated by the blueprint (primarily in the Karratha town centre) in an orderly and proper manner. This review resulted in Amendment No.18 to the Shire of Roebourne's Town Planning Scheme No.8 being prepared and gazetted in March 2011.

Under the Scheme the subject site, and its surrounds to the north, west and south, is currently reserved for 'Conservation Recreation and Natural Landscapes' with Lot 1090 to the west of the site being zoned 'Tourism'. Amendment 25 has been adopted and is currently being processed by the WAPC. Amendment 25 proposes to amend the zoning of the subject site to 'Urban Development', with a corresponding Development Area number of 42 as discussed below.

Pursuant to Section 3.2 of the Scheme the permissibility of land use in the Urban Development zone is to be as prescribed by an approved Development Plan rather than the zoning table.

Section 6.4 stipulates the following requirements for development in the Urban Development zone:

- 6.4.1 Before considering any proposal for subdivision or development of land within the Urban Development zone, the Council may prepare or require the preparation of a Development Plan for the entire development area or any part or parts as is considered appropriate by Council.
- 6.4.2 Land zoned Urban Development may be affected by development constraints, the extent and nature of which will need to be identified through the preparation of a Development Plan. The provisions of clause 7.2 apply in relation to the preparation, advertising, adoption, endorsement and implementation of any such Development Plan.

Section 7.2 of the Scheme provides guidance for development in 'Development Areas', which following the gazettal of Amendment 25 (as detailed below) will include the subject site. Section 7.7.2.1 states that development in these areas is to be in accordance with the purpose and requirements as stipulated in Appendix 7. The requirements of Appendix 7, in reference to the subject site, are yet to be gazetted and are discussed in detail below.

Appendix 8 of the Scheme lists matters which are to be addressed by Development Plans. It states that all development plans shall address the following:

- i. Landform, topography, landscape, vegetation and soils of the area;
- ii. Location, existing roads, land uses and surrounding land uses and features;
- iii. Legal considerations, ownership, title description, area and encumbrances;
- iv. Existing and proposed services and infrastructure including reticulated or other potable water supply, sewerage, energy, communications, drainage and catchment considerations;
- v. Existing places and features of Aboriginal and non-Aboriginal heritage and/or cultural significance, including natural landscapes, flora and fauna in addition to built structures and other modified environments;
- vi. Road layouts and traffic assessments, communal and incidental parking areas, pedestrian/cycle network/underpasses, including impacts on the surrounding movement network;
- vii. Public open space and recreation provision, environmental protection areas, and relationships to natural features;
- viii. Assessment of the impact of the proposal on the natural environment, including management of potential effluent, emissions and other forms of pollution;
- ix. Comprehensive drainage systems for storm water runoff and natural drainage lines;
- x. Indicate the design of the proposal including lot layout, major buildings, roads and landscaping proposals;
- xi. The demand for the development in relation to the overall market for similar developments;
- xii. The method of carrying out the development including the projected times of completion of each stage;
- xiii. Provide provisions, as may be considered appropriate by Council, for inclusion in the Policy Manual; and
- xiv. Any other information as may be required by Council.

Where applicable, the above are all addressed in this Development Plan and report.

In addition, Development Plans in the Urban Development zone should provide:

- i. Location and density of housing areas, including lot and dwelling yield, population outcomes, net residential density and detailed subdivision standards relating to solar access, efficient use of water resources, design features and density rationale; and
- ii. Indicate demand for commercial and community facilities, including schools, generated by the proposal and implications for the provision of these within the development area or elsewhere.

### PROPOSED AMENDMENT No. 25

Amendment 25 proposes to limit the DA42 area to the 'valley' area that is potentially suitable for development and leave the balance within its existing 'Conservation and Natural Landscapes' reservation. This Development Plan proposes development only the eastern portion of DA42, though the remaining portion may be developed at a later stage if a subsequent Development Plan is prepared.

Amendment 25 also proposed to amend Appendix 7 of the Scheme to include DA42 and appropriate provisions to reflect the planning intentions for the site. In this regard the following special conditions were proposed as part of Amendment 25:

1. An approved Development Plan together with all approved amendments shall apply to the land in order to guide subdivision and development.
2. To primarily provide for a permanent high quality resort style development with environmentally and culturally responsive short stay or tourist accommodation; and allow for other future uses such as educational, community, recreation, drainage and conservation.
3. Development Plan(s) shall have respect for heritage sensitive areas, drainage lines and modelled buffer requirements to the adjoining power station.
4. Land uses classified on the Development Plan apply in accordance with clause 7.2.11.4.

5. Development Plans affecting this area are to be considered by the elected Council.

This Development Plan has been prepared as would be required after the gazettal of Amendment 25. The predominant use will be conservation as per Amendment 25 with transient worker and tourist type accommodation being entirely consistent with the intent of DA42 under the Amendment.

Amendment 25 has been initiated by the Shire, reviewed by the EPA, advertised and has now recently been adopted by the Shire. The Amendment is now being considered by the WAPC. It is anticipated that Amendment 25 will be gazetted in early 2012.

### STRATEGIC FRAMEWORK

There are a number of strategic documents that are relevant to the planning and development of the subject site. An overview of the documents is provided below.

#### STATE PLANNING STRATEGY (1997)

The State Planning Strategy provides the basis for long-term State and regional land use planning and coordinates a whole-of government approach to planning. The vision for the Pilbara Region as identified in the State Planning Strategy is as follows:

*"In the next three decades, the Pilbara Region will be a world leading resource development area focusing on mineral extraction, petroleum exploration and production*



*and the primary stages of downstream processing. The region's population will grow in the future, fuelled by specific resource development projects, the sustainable development of Karratha and Port Hedland and a more diverse economy. A growing tourism industry will have developed based on the region's unique natural environment."*

The document identifies a series of strategies to achieve the above vision, which are based on environment and resources, community, economic and infrastructure principles.

The strategies relevant to the proposal include: response

- Protecting sensitive environmental and heritage areas;
- Addressing the need for the provision of social facilities;
- Improving town amenity;
- Giving greater emphasis to local recruitment and training of the work-force;
- Promoting opportunities for economic development; and
- Minimising the detrimental impact of fly-in, fly-out resource development projects.

The Development Plan will allow for the development of high quality accommodation for use by workers and tourists. By providing facilities for a long term use the Development Plan will minimise the potentially detrimental impact of FIFO projects, and promote long term opportunities for economic development. The detailed planning and development of the site

will also be guided by the above strategies. Environmental, heritage, social and other amenity issues have been considered and addressed in this report.

#### PILBARA PLANNING AND INFRASTRUCTURE FRAMEWORK (2012)

The 'Pilbara Framework' for the Pilbara region, prepared by the WAPC, defines a strategic direction for the future development of the Pilbara region over the next 25 years. The document, which will set out a settlement-focused development structure for the region, provides a framework for public and private sector investment, as well as context for the preparation of local planning strategies and local planning schemes by local authorities.

The Framework is built on detailed profiles of the region's major settlements in which Karratha is designated as a regional centre providing facilities and services not only to the five nearby satellite settlements of Dampier, Roebourne, Wickham, Point Samson and Cossack, but also to Pannawonica, Onslow and Cape Preston. The framework also incorporates findings from a range of exiting Pilbara-wide studies and strategies including the Pilbara Plan document.

The document states that there is a severe shortage of housing opportunities in the Pilbara. The document also recognised that the use of fly-in fly-out workers is an important means of accommodating constantly changing labour requirements, particularly for specialist skills and during the construction stage, but

that is important that short-term transient workforce accommodation is aligned with long-term planning and community outcomes.

This Development Plan will facilitate the provision of accommodation for both workers and tourists in the region to facilitate economic growth, with the potential for increased tourism in the future. The proposed development will therefore assist in achieving the recommendations contained within the document, by providing additional accommodation for white collar FIFO workers in the short-term, whilst also providing accommodation that can be used for tourists, which will then continue to contribute to the local economy.

#### KARRATHA CITY OF THE NORTH PLAN (2010)

The Karratha City of the North Plan (KCNP), adopted by the Shire of Roebourne and the Western Australian Planning Commission, comprises a series of documents being the Karratha City Growth Plan, the Karratha City Centre Master Plan and the Implementation Blueprint. Together, these documents identify a range of spatial and non-spatial requirements to guide the future growth of Karratha into a regional city of 50,000 residents.

The KCNP will provide a basis for guiding decision makers in assessing rezoning, subdivision and development applications as well as the provision of infrastructure and community facilities over time.

#### KARRATHA CITY GROWTH PLAN (2010)

The Karratha City Growth Plan (CGP) was undertaken as part of the KCNP and is a city-wide strategy to guide the future spatial and non-spatial development requirements for the growth of Karratha. This includes identifying the need for land supply, housing diversity, open spaces, commercial nodes, entertainment and retail areas, as well as the provision of community and servicing infrastructure.

The subject site, falls within the 'Regals Valley' Precinct, south of the Karratha Hills. The 'Regals Valley' Precinct area was reflected by the proposed Amendment 21, and therefore extends much further west, and includes a great deal more land than the subject site itself.

The 'Intent Statement' for this Precinct relates to a broader area that extends south of Baynton (west), south of the Hills eastward up to Karratha Road.

*"This area is a future extension of Karratha into a landscape valley, with built form responding to the topography and landscape.*

*The intended uses are tourism activities and recreation with some resort style villas and housing. The precinct will also include a new neighborhood at its western end.*

*The Precinct is largely affected by the preliminary buffer to the Power Station. It is envisaged that development on land affected by the buffer may incorporate non-residential uses such as institutions (e.g. universities or public purpose/community*

*facilities, possibly recreation based). Further detailed assessment of the power station buffer requirements may allow for tourism and other short stay uses.*

*Attention to architectural detail needs to ensure development sits comfortably within the landscape and managed to ensure least amount of disruption to the topography and visual aesthetics of the foothills”.*

The Development Plan will allow for the expanded development of the site for resort style villas and housing as envisaged by the CGP. The proposed development area is separated from the Karratha Power Station by over 1km and a significant ridgeline, which shields the development from any noise impacts as discussed later in this report. It will also facilitate future development of the remainder of the precinct for institutional uses as envisaged by the KCP by allowing for a simple amendment to the Development Plan once the uses and development issues are known and resolved. This Development Plan responds to the sites topography and landscape and also demonstrates (as discussed later in this report) that the development is appropriately separated from the power station.

#### KARRATHA REGIONAL HOTSPOTS LAND SUPPLY UPDATE (2011)

The Karratha Regional HotSpots Land Supply Update (Hotspots) prepared by the WAPC in 2010 with an update in 2011, provides an overview of land supply within Karratha based on the status of major projects, current and anticipated lot

creation activity and the recommendations of the City of the North City Growth Plan.

Hotspots identifies that land release and housing supply within Karratha is subject to several key challenges including population growth, the shortage of serviced land, housing scarcity and constrained infrastructure. The document states that the limited capacity of Karratha's infrastructure is imposing critical constraints on residential, industrial and business growth, although major upgrades are in progress or planned.

Based on the WAPC's population projections, the population of the Shire of Roebourne in 2010 is estimated as 16,200 persons, which is expected to rise to 21,300 persons by 2030. Hotspots also identifies the significant housing and accommodation shortages in Karratha with demand from tourists estimated at 300-700 rooms.

Hotspots identifies adjoining Lot 1090 as being intended for 'Tourism' use (as per the approved Development) and within 'KA32' which is identified as being for the purposes of 'Tourism with a potential yield of 103 units (it is understood this is soon to be updated to 108 units) and owned by Greenvalley Assets Pty Ltd. The subject site itself is identified in Hotspots as public purpose/ community/ institutional which corresponds to the original designated use under the growth plan and Amendment 21 however, it is expected that following the gazettal of Amendment 25 (as discussed above) this will be amended.

### KARRATHA 2020 (2009)

The Karratha 2020 Vision and Community Plan ('K2020'), prepared by the Shire of Roebourne in partnership with the State Government and industry in 2009, assesses Karratha's infrastructure and service needs in response to anticipated future population growth.

The document aspirationally identifies transforming Karratha from a principally resource driven settlement to a sustainable, economically diverse regional city of some 30-50,000 people by 2020.

The document categorises these needs around six themes for which a number of initiatives are identified to address the needs requirements for a growing population. The six themes comprise:

- Business, Entrepreneurialism and Economic Development;
- Infrastructure Investment and Transport;
- Leadership and Capacity;
- Liveability and Lifestyle;
- Natural Capital; and
- Community Health and Wellbeing.

In addition, a number of specific major projects to enhance the town's liveability, diversify the economy and assist with meeting the needs of major industry are identified. The document found that Karratha was still functioning as a 'resource town' rather than a regional centre. It was as a consequence of this document that the KCNP was developed.

This Development Plan provides for accommodation in resort setting nestled amongst the Karratha Hills. This development will not only provide much needed accommodation, but will also provide local employment opportunities, amenities and lifestyle opportunities in line with the objectives of the Karratha 2020 Vision.

This page has been left blank intentionally.

## CONTEXT ANALYSIS

### NATURAL AND CULTURAL HERITAGE ANALYSIS

The Australian Heritage Database does not identify any areas of cultural heritage significance on the site or the surrounding area.

An online search for relevant Aboriginal heritage information was undertaken using the Department of Indigenous Affairs (DIA) Aboriginal Inquiry System that incorporates 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) and contains information on over 22,000 listed Aboriginal sites throughout Western Australia.

The subject site is within two Aboriginal dithered heritage sites. These sites are outlined below:

- DIA 11565 which is mapped over the entire subject site. This Aboriginal site is described as a man-made structure, engraving, quarry, artefacts/scatter and is 'Closed' access and therefore no coordinates on the sites location are provided.
- DIA 11575 which is mapped over the very western portion of the subject site. This Aboriginal site is described as ceremonial, man-made structure, engraving, quarry, artefacts/scatter, midden/scatter, grinding patches/grooves and has 'Closed' access, meaning no coordinates are provided on the location of the site.
- Confirmation from the DIA has been received confirming that neither of these sites are within the subject land parcel.

REFER TO APPENDIX 1 - DEPARTMENT OF INDIGENOUS AFFAIRS CORRESPONDENCE

Several discussions have been held with the local Ngarluma Aboriginal Corporation (NAC) regarding the development. Over the past 12 months of discussion the NAC has not raised any concerns that there may be any sites of aboriginal significance which may be impacted on by the development. Native Title matters are currently being negotiated between the Department of Regional Development and Lands and the NAC and final clearance for the development will be gained during this process. It is understood that development cannot occur until this clearance has been issued.

### ENVIRONMENTAL ANALYSIS

#### SOILS AND LANDFORMS

The subject site is found within the Western Region and the Fortescue Province, which is described as undulating plateau (with plains, hills and ranges and coastal plains) on the rocks of the Yilgarn and Pilbara Cratons, Capricorn and Albany-Fraser Orogens and Carnarvon Rocks and Perth Basins (Tille 2006). Mapping provided by the Department of Agriculture and Food (Tille 2006) indicates that the subject site is likely to be found within two landform zones:

- De Grey Roebourne Lowlands Zone – This zone is described as alluvial plains and sandplains (and some floodplains and stony plains) on alluvial marine deposits over rocks of the northern Pilbara Craton. Soils within this zone include red deep sandy duplexes with red loamy earths and some red/brown non-cracking clays,

cracking clays, red sandy earths and red deep loam complexes. This zone is located between Karratha and the De Grey River.

- Karratha Coast Zone – This zone is described as coastal mudflats (with sandy coastal plains and some hills) on marine deposits (and some sedimentary and volcanic rocks of the Pilbara Craton). It contains tidal soils with calcareous loamy earths, salt lake soils and red/brown non-cracking clays. Generally this zone is composed of bare mudflats (with some spinifex, tussock grasses, samphire and mangroves) and is located between Cape Preston and the De Grey River.

## CONTAMINATION AND ACID SULPHATE SOILS

### Contamination

The subject site or surrounds has not been reported as a known or suspected contaminated site within the Department of Environment and Conservation's (DEC) Contaminated Sites Database.

As mentioned above, Lot 1090 has been historically utilised as a drive-in cinema and included infrastructure such as the former projection building, projection screen, offices and ancillary infrastructure. This infrastructure has been demolished in line with the current development approval, and is not considered to be a risk with regard to contamination.

The Development Plan area itself has not been utilised for any known or specific purposes, and there is not expected to be a risk of contamination.

### Acid Sulphate Soils

Acid Sulphate Soils (ASS) is the name commonly given to naturally occurring soils and sediments that contain iron sulphide (iron pyrite) materials. In their natural state ASS are generally present in waterlogged anoxic conditions and do not present a risk to the environment. ASS can present issues when they are oxidised, producing sulphuric acid, which can impart a range of impacts on the surrounding environment, infrastructure and human health.

The WA Atlas (Landgate 2011) Acid Sulphate Soil (ASS) risk mapping classifies the majority of the study area as a having no risk of ASS within three metres of ground surface. Adjacent to the south-eastern boundary of the property (adjacent to Karratha Road) the area is described as having a 'moderate to low risk of ASS occurring within 3 metres of the natural soil surface'. The above assessment is consistent with observations made onsite, which indicate that the soil profile is largely hard impermeable rock that shows no evidence of existing or historic shallow groundwater.

## HYDROLOGY

### Surface Water

The subject site is found within the Karratha Coast surface water allocation area and subarea. Potable water supply for this area comes from the Harding Dam and Millstream borefield, located inland and east of the subject site.

Four minor, non-perennial waterways are found within the subject site. These four waterways are likely to convey water from the upstream catchment during high intensity rainfall events, as evidenced by the minor vegetation observed within the waterways and minor erosion. Three of these waterways occur in a north-south direction and convey water from the elevated Karratha Hills (located to the north of the subject site) to a fourth waterway, which occurs in an east-west direction, and conveys water to the east towards Lulu Creek.

In support of the proposed future development and the Better Urban Water Management framework, and in line with recent discussions with the Shire of Roebourne for a similar development within the Karratha area, the consideration and provision for the conveyance of high intensity rainfall events and clearance to these areas will form a primary component of the water management for the subject site.

#### Ground Water

The subject site is found within the Pilbara groundwater area and the Ashburton groundwater subarea. Groundwater is not considered a major source of water in the area as within the Karratha area, groundwater is found within a fractured and weathered rock aquifer. Whilst groundwater is generally considered an important water source in the Pilbara, the fractured and weathered rock aquifer is generally only recharged during rainfall events and periods of stream flow, and is therefore largely reliant on localised rainfall. The amount of water available from this type

of aquifer is highly variable and unreliable, hence the primary source of water within the wider Karratha area is the Harding Dam and Millstream borefield (mentioned above).

Based on available information, groundwater appears to occur between five and ten metres below the natural surface. It is unlikely to be affected by the proposed development.

#### FLORA AND VEGETATION

The subject site is located within the broader Pilbara Interim Biogeographical Regionalisation Area (IBRA), which is characterised by an arid tropical climate and summer rain. The Pilbara IBRA largely aligns with the Fortescue Botanical Province (Beard 1990), which is described as tree and shrub- steepe communities with Eucalyptus trees, Acacia shrubs, Triodia pungens and T. wiseana, with some mulga in valleys and short-grass plains on alluvia.

Within the Pilbara IBRA, there are four sub-region zones, two of which align with the subject site and are described as:

- Chichester – Achaean granite and basalt plains supporting shrub steepe characterised by Acacia pyrifolia over Triodia pungens, hummock grasses, and Snappy Gum tree steepes occur on the ranges; and
- Roebourne – Quaternary alluvial plains with a grass savannah of mixed bunch and hummock grasses and dwarf shrub steepe of Acacia translucens over Triodia pungens, with samphire, sporobolus and mangal on alluvial marine flats.



The subject site is largely uncleared, apart from the historic drive-in site, minor creeklines and tracks which are found throughout, which are predominantly cleared.

A Flora and Fauna Assessment was undertaken by Emerge and Greg Harewood in August 2011, the results of which are appended to this report.

#### REFER TO APPENDIX 2 – FLORA AND FAUNA ASSESSMENT

This report found that no Threatened or Priority Flora, PEC or TEC's, or other botanical features of high conservation significance were recorded across the site, but the large area of the valley to the west of the proposed development area contained vegetation that was in pristine condition.

### FAUNA

The conservation status of fauna species in Western Australia is assessed under the State administered Wildlife Conservation Act 1950 (WC Act), and also through a list of priority species produced by the DEC for which there is concern regarding the long term survival of these species.

In addition to those species protected under the WC Act, the Federal government also maintains a list of protected species under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

A search of the Federal and State online resources indicated that a number of species of conservation significance may occur within or

potentially use the study site. These significant species include:

- Northern Quoll (*Dasyurus hallucatus*) – Endangered (WC Act), Endangered (EPBC Act);
- Pilbara (orange) leaf-nosed bat (*Rhynonictis aurantius*) – Endangered (WC Act), Vulnerable (EPBC Act);
- Eastern Curlew (*Numenius madagascariensis*) – Priority 4 (State); and
- Western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4 (State).

As stated above, the assessment undertaken by Emerge and Greg Harewood in August 2011 included an assessment of Fauna species and found the following:

With respect to native vertebrate fauna, 18 mammals (includes 9 bats species), 78 bird, 57 reptile and two frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise the proposed development area at times. Based on habitat preferences, a range of previous survey results and currently documented distributions, it has been concluded to be unlikely that any threatened (vulnerable, endangered, rare or likely to become extinct) species frequent the study area except possibly as vagrants, on rare occasions.

No significant impact to any EPBC Act Threatened Fauna species is anticipated, principally because none can be considered likely to be using the site to any significant degree. The site also does not appear to contain

habitat that could be considered critical for the recovery of any listed threatened species.

Other species of conservation significance that may be present at times include one species considered in need of special protection under state legislation (Peregrine Falcon), three DEC priority species (Lined Soil-crevice Skink, Australian Bustard and the Bush Stone Curlew) and three migratory bird species (Fork-tailed Swift, Rainbow Bee-eater, Barn Swallow). Development at the site may result in the loss/modification of some habitat utilised by these species at times but this is very unlikely to alter their conservation status on a local or regional scale.

The broadly defined plant communities present within the development area were identified as being common and widespread in the wider area and the faunal assemblage identified as potentially present is unlikely to be different to that found in similar habitat located elsewhere in the region. It can therefore be concluded that the site does not contain habitat of high ecological significance from a faunal perspective or contain faunal assemblages that are regionally significant.

### STOVE HILL POWER STATION

Horizon Power is currently seeking a works approval to install an additional 20MW of temporarily generation by either a diesel and/or gas fuel generator at its Stovehill Road, Stove Hill site located approximately 1.5km south west of the site. As part of this application

to the EPA Horizon Power commissioned Strategen Environmental Consultants to undertake a complete Environmental Impact Assessment (December 2011) which included an assessment of buffer requirements.

A copy of the Air Quality Impact Assessment and the Noise Impact Assessment prepared for Strategen by Environ Australia Pty Ltd and SVT Engineering Consultants are contained in Appendix 3 of this report. Both conclude that the expanded power facility will not cause any non-compliance with the relevant standards for any development on or near the existing drive in site development.

**REFER TO APPENDIX 3 – AIR QUALITY IMPACT ASSESSMENT AND NOISE IMPACT ASSESSMENT**



This page has been left blank intentionally.

## THE DEVELOPMENT PLAN

The following section of this report provides a description of the Development Plan, its design rational and objectives, land uses, estimated population, movement networks, servicing considerations and built form considerations.

### PROJECT OBJECTIVES

The project site is located approximately 1.7km south of the Karratha City Centre, which is experiencing significant accommodation shortages due to the economic expansion of the resource industry in the region.

As stated above, the main vision of the Karratha City of the North Plan is that by 2020 Karratha will be:

*"A liveable, compact, Regional City of 50,000+ people, with a diversified economy, a healthy local community which demonstrates demographic balance, affordability, high quality amenity, and infrastructure. It is a place of choice, to work, visit, grow up, raise families and age gracefully."*

The Karratha Growth Plan identifies that the population of Karratha will grow to between 30,000 to 50,000 people by 2020.

The Development Plan will provide for high quality resort style accommodation on Lot 400, capable of being used as both tourist accommodation and by local workers, forming a logical extension to the similar development already approved on the adjacent Lot 1090. This Development Plan will help guide the orderly

and proper development of the site and also protects the remainder of the Amendment No. 25 area for conservation.

The main objectives of the Development Plan are to:

- Address the need for accommodation, particularly key worker and white collar worker accommodation, whilst also providing tourist accommodation;
- Address the objectives of the Karratha City of the North Blueprint;
- Facilitate the timely, orderly and proper delivery of additional accommodation;
- Meet the provisions of a Development Plan required in accordance with the Shire of Roebourne Town Planning Scheme No 8; and
- Provide guidance as to what needs to be resolved before the possible expansion of development west in the remainder of the valley and in the interim protect the valley for conservation purposes.

## DEVELOPMENT PLAN DESIGN RATIONALE

The design of the Development Plan is predominantly based around the topography of DA 42 and related drainage. The Development Plan indicates the most developable portion of the site, Lot 400, as 'Tourism' (being the most commensurate zone under the Scheme) in which TWA type and tourist accommodation are both permitted, with the balance of the DA 42 area (the Unallocated Crown Land portion) being identified as 'Conservation, Recreation and Natural Landscapes'. Should however, issues such as native title, heritage, flora and fauna, access etc be resolved this area could potentially be developed in the future.

### REFER TO APPENDIX 1 OF STATUTORY SECTION

The 'Tourism' portion will provide for the logical extension of development already approved on the adjoining Lot 1090 and is further discussed below. This zoning and Development Plan will facilitate the development of a high quality resort style development, being 'The Ranges' (comprising the Lot 400 and 1090 to the east), which is intended to be used for key worker/ white collar accommodation also allow for the seasonal tourism accommodation.

It is considered far more desirable to confine and concentrate development to an area of approximately 7ha rather than spread the development over 19ha of the valley outlined in Amendment No. 25. This strategy protects a much greater area of the pristine vegetation in the valley and ensures that development does not encroach into culturally sensitive areas.

As demonstrated by the development approval by Council on Lot 1090 resort development is typically more intense as once in the resort it becomes more of a walking environment and less car orientated. Spreading development throughout the valley will not only result in the creation of more roads and remove more vegetation, residents will need to drive to use the communal facilities.

The development is intended to fill a gap in accommodation demand in Karratha above the current 'worker's camp' model and equivalent to the existing hotels in the town. To facilitate the short term use as white collar workers accommodation it is required that the stay restrictions usually applied to strategic tourist accommodation sites not be applied in this instance for the reasons outlined below.

### ZONING/USE

Land use permissibility within the Development Plan area is to be as per the Table contained within Part 1 of this report (being the statutory section). Whilst the development is not intended to be used solely for tourism accommodation, the 'Tourism' zone best reflects the permissibility of uses under the Shire's Scheme as it reflects the zoning of the adjoining Lot 1090 and best represents the style of development proposed. The proposed development however does not adhere to any definition in the Scheme as the proposed development is to accommodate tourists, owner- occupiers, business travellers, white collar transient workers and key workers.

The Ranges will not be used as Transient Workforce Accommodation as defined in the Scheme as it will include units which can be leased on a short term basis to tourists and business travellers, and will also accommodate owner-occupiers. The developer, Greenvalley Asset will enter into a Shire Deed, which will stipulate that the predominate use of the site shall not be for Transient Workforce Accommodation at any one time.

The development could not be defined as a 'Tourist Resort' either as the accommodation is not just for tourists who typically reside in such premises only for short periods and does not include owner-occupiers as tenants who may live primarily at The Ranges. Finally, the development is not 'grouped or multiple dwellings' either as some of the dwellings are not going to be used for permanent accommodation. If assessed under the current Scheme in a zone other than the 'Urban Development' zone it would be considered as a 'Use Not Listed'. It is therefore proposed to insert a new definition into the Development Plan for 'Accommodation Resort' being:

*"One or more accommodation units together with a range of recreational and/or cultural facilities in a resort style setting. The units may be used on either a long or short stay basis and may be used for the temporary accommodation of transient workers or tourists. The facility shall also include associated facilities such as a restaurant, bar or functions room whether or not licensed under the Liquor Control Act 1988, which may be used by the occupants of*

*the premises and may also be made available for use with or without charge by non occupant members of the public."*

It is considered that this definition draws from the relevant portion of the definition for 'Tourist Resort', will not trigger stay restrictions and therefore allows for owner-occupiers and workforce and best reflects the use of the development proposed. Clause 3.2 being the 'Zoning Table' states that for the 'Urban Development' zone '*Development and Use of land to be in accordance with an endorsed Development Plan*'. This enables the definition of 'Resort Accommodation' to be inserted into the Development Plan provisions and then a planning approval to be issued for such use without the need for the Development Application to be considered as a 'Use Not Listed' under Clause 3.2.6 of the Scheme.

It should also be noted that as the site is newly formed, it is not a strategically listed site under the Shire's or WAPC's Tourism Policy and therefore there is no requirement for the land to have stay restrictions to ensure that at least 25% of the site is used for tourism purposes. This notwithstanding, it is envisaged that the development will provide additional tourist accommodation, especially in the peak tourist season and a provision has therefore been inserted into the statutory section of the Development Plan provisions to ensure that management and facilities are in place to enable owners to let their apartment on a short stay basis.



In order for the development to be established and operate, it is essential that there be no stay restrictions placed on the development which may limit the length of stay possible in any of the units. Workers who may reside in the village may do so for 6-8 months in any 12 month period if they are key workers, all year if they are key essential workers without families, or only a few days every other month if they are business executives or tourists. As the development is to be strata titled and then leased, having no stay restrictions will enable the purchasers of each unit to obtain bank finance, thus enabling the units to be sold and developed. Having no stay restrictions would be consistent with the definition of 'Accommodation Resort' previously discussed.

While in the Perth winter it is envisaged that the site will primarily provide accommodation for tourists, given the initial cost of the development and that the high season for tourism in Karratha lasts for only three months of the year (with only a limited demand for the remainder of the year), in order to make the development viable it is essential that it also be able to provide accommodation for workers, for which there is considerable demand year round.

In addition, given the townsite revitalisation projects currently being undertaken in Karratha, the demand for accommodation for workers associated with the local industry and support services is expected to be particularly high at least for the next 5 years or so, while a significant amount of construction works are being undertaken and the housing market returns to 'more natural market conditions'.

In this time period it is anticipated that a number of the rooms will be utilised by white and blue collar workers on a mix of long stay and short stay basis. It is expected however, that companies with blue collar workers will continue to seek accommodation options within TWA development elsewhere as the high-standard resort accommodation proposed is likely to be cost prohibiting. White collar or executive employees are more likely to settle in Karratha long term if the appropriate level of accommodation is available and more affordable such as The Ranges.

The capitalisation of this demand for accommodation for workers will be vital in ensuring this development is economically viable.

Refer to Appendix 4 - Demand Analysis

The permanent occupation of the development by families is not considered appropriate given the site's relative isolation from schools, sporting facilities and other community facilities children need to access often by bicycle or on foot. Ensuring the development is not attractive for families, removes the need for the Shire and other community service providers to cater for such demand as a result of this development. It is therefore proposed that restrictions be placed on the development to ensure that there are no 3 bedroom accommodation units or units with 2 living areas on the site which may encourage use by families on a permanent basis.

Greenvally Asset Pty Ltd being the manager of the proposed facility, will provide an Annual

Statement of Occupancy to the Shire to allow the Shire to monitor the use and demand of the facility.

Under the proposed definition of 'Accommodation Resort' communal amenities are to be provided to compensate for the smaller kitchen and living facilities in the units and add to the resort feel. Such facilities are reflected in the indicative development proposal discussed below, and it is proposed to make their provision mandatory by including the following provisions in the Development Plan:

*The minimum provision of recreational amenities and facilities for residents shall include those listed below, at least one of which must be accessible (with or without charge as determined by the operator) to the general public:*

- A swimming pool; and
- A tennis court; and
- Tavern; and/or
- Restaurant.

Such facilities are considered sufficient to cater for the needs of the residents, whilst also adding to the amenity of existing residents within the Shire. Indeed, the tavern/ restaurant facility 'Clubhouse' will be the first major new restaurant/ bar facility built in the area for a number of years.

Additional provisions/restrictions are also proposed to ensure that development on Lot 400 is consistent with the Special Control Area provisions of DA42 as outlined by the scheme.

In this regard provisions are proposed to address environmental sensitivities by:

- Providing infrastructure to use recycled water;
- Requiring light coloured roofs;
- Providing higher ceilings and ceiling fans;
- Providing flyscreens and doors for cross ventilation;
- Providing protection for walls and openings by eaves, verandahs and landscaping.

And address cultural sensitivities and visual aesthetics by:

- Landscaping the area outside the Development Plan area between Karratha Road and the site;
- Retaining development to only a 7.14ha area of the DA42 area and ensuring no development occurs in the more sensitive hills or along the seasonal watercourse;
- Limiting perimeter fencing to only 1.2m in height;
- Having appropriate landscaping in the site including areas of endemic species on the periphery where landscaping can transition from the endemic to the introduced; and
- Having appropriate 'earth tones' for walls and not allowing white or zincalume roofs.

Within the balance area of the DA 42 Urban Development zone, no development is contemplated at this stage with the area to be reserved as 'Conservation, Recreation and Natural Landscapes'. Although there is the potential for this area to be used, particularly for institutional uses as envisaged by the KCN

documents, at a later date if a new Development Plan is prepared, that plan will need to address a number of criteria. These matters include:

- Native Title and Aboriginal Heritage;
- Flora and Fauna;
- Storm water disposal, including storm water modelling;
- Access arrangements to Stove Hill Road or other road excluding direct access to Karratha Road as Main Roads WA will not permit a second connection point to Karratha Road in this vicinity;
- Adequate servicing, in particular the availability of water and sewerage infrastructure;
- Land use suitability; and
- Any buffer requirements to the Horizon Power Stove Hill Power Station.

This will all need to be addressed as part of any subsequent Development Plan before any development can occur, otherwise the land remains reserved for conservation as it was previously reserved under the Scheme.

### INDICATIVE DESIGN CONCEPT

The Development Plan will facilitate the provision of a high quality accommodation in a resort setting, which will offer a range of different facilities in a sustainable manner as they are capable of being suitable for both workers and tourists.

An indicative design concept, created by MPS Architects, is included below, however the

details are to be finalised at a later date with a development application to be lodged with the Shire for approval.

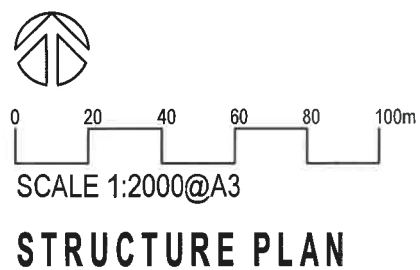
### REFER TO FIGURE 5 - INDICATIVE DESIGN CONCEPT

The design concept shows a total of 261 units on Lot 400, with a maximum height of two storeys, and indicates how the development will link in with development already approved on Lot 1090. The concept plan shows up to 270 1 and 2 bedroom units being developed on the site. Car parking is to be provided at the rate of 1 bay per 1 bedroom unit and 1.5 bays for each 2 bedroom unit or bed sit in pockets around the development with a mix of covered and open bays provided and is appropriately landscaped. Additional trailer parking bays, staff parking and visitor parking is also provided on site.



YIELD		
STAGE 1	UNITS	KEYS
1 BED	108	108
STAGE 2 (7.14ha)		
1 BED	48	48
2 BED	44	88
BED SIT (2 STOREY)	169	338
TOTAL	369	582

PARKING	
CAR PARKING REQUIREMENTS	
48 - 1 BED @ 1.0 CAR/UNIT	= 48
44 - 2 BED @ 1.5 CAR/UNIT	= 66
169 - BED SIT @ 1.5 CAR/UNIT	= 254
TOTAL	=368 CARS
VISITORS CARPARK	= 55
STAFF CAR PARKING	= 11
TOTAL	=434 CARS
TRAILER PARKING	=23 TRAILERS



# THE RANGES KARRATHA

## GREENVALLEY ASSET TRUST





### Occupancy Rates and Anticipated Populations

The Concept Design indicates up to 270 apartments on Lot 400 Karratha Road Stove Hill, as 'Stage 2' of the Ranges development. It is estimated that the maximum population, if all units are occupied with one person per bedroom, is approximately 550 persons, but some units could accommodate two people.

In terms of demand at the initial Stage 1 108 unit development on Lot 1090, at the time of writing this report, 54 have been sold off the plan with limited advertising. It is anticipated that sales will increase dramatically once development works commence on site and even more so once projects such as Anketell come to fruition.

### Central Facilities

As indicated on the concept plan the development would include central facilities for the use of the residents guests and the general public (particularly the restaurant/ bar). These are shown in the north eastern section of the concept plan area and include a central restaurant and bar/tavern, back of house facilities as well as recreation facilities such as courts, a gym and a pool.

### Internal Movement Network

Vehicular movement through the development is to be provided by a number of internal roads which are not to be gazetted, but will be part of common property. The movement network can be broadly described as a link road which wraps around the sides of the land parcel,

with an additional three link roads extending in a generally north-south pattern. All internal roads will be a 6 metre wide seal which will allow for passing vehicles.

Provision will also be made for larger service vehicles to enter and exit the site in forward gear with a central servicing 'back of house' area to be provided at the rear of the central amenities building.

Pedestrian pathways are also to be provided throughout the development with 1.2m wide concrete footpaths to be provided separate to the vehicle carriageways.

### Staging and Timing

The staging and timing of development is dependent on market forces. It is envisaged that Stage 1 on the former Drive in site will be complete by the end of 2012 and will include the first 41 units, Managers residence and amenities. The remaining units on Lot 1090 are envisaged to be complete at the end of 2013.

Stage 2 on Lot 400 will then commence in 2014 and be rolled out slowly with approximately 50 units each time, until all are complete.



## VEHICLE ACCESS AND TRAFFIC

Vehicle access to Lot 400 is provided from two places, one in the north-eastern corner and one in the south eastern corner both via the approved development on Lot 1090, from Karratha Road. The proposed road shown on the concept plan will have the potential for another link road with Stove Hill Road to be built at a future date if required. As the Development Plan indicates, this road will need to link with Stove Hill Road further south as Main Roads WA will not allow for another connection to Karratha Road.

Should it be required by future development, there is also the potential for a link onto Rosemary Road to be provided as envisaged by the KCN document, but this will need to be resolved as part of any subsequent Development Plan.

In January 2012, Donald Veal Consultants (DVC) updated their 2009 study of the operation of Lot 1090's intersection with Karratha Road to have regard for the proposed extended development. It's report 'Updated Assessment of Intersection Requirements for Proposed Short Stay Development' is appended to this report, and found that the proposed connection will still operate satisfactorily under both the existing traffic volumes on Karratha Road and those anticipated in the future.

Despite the forecast traffic volume on Karratha Road in the vicinity of the development being expected to increase from its current 12,000 vpd to some 14,000 vpd the report concluded

that during the am peak where the driveway experiences the highest degree of saturation as the majority of development traffic is exiting the site, the connection will still operate at a reasonable level of service with the maximum anticipated delay being less than 30 seconds. The report also notes that the concept intersection layout that has been approved and accepted by Main Roads will still be acceptable for the development.

REFER TO APPENDIX 5 – DVC TRAFFIC REPORT

## URBAN WATER MANAGEMENT

The subject site is found within the Karratha Coast surface water allocation area and sub-area. Potable supply for this area comes from the Harding Dam and Millstream borefield, located inland and east of the subject site.

The subject site is found within the Pilbara groundwater area and in Ashburton groundwater sub-area. The Shire of Roebourne has advised that interaction with groundwater is not of concern, and that the primary driver for subdivision design is surface runoff parameters. This is supported by observations of the soil profile made onsite, which indicate that the study area is underlain by impermeable rock at a shallow depth, and hence there is no significant shallow aquifer to be managed.

A Water Management Strategy (WMS) has been created by Emerge Associates (September 2011) and is appended to this report. The Water Management Strategy (WMS) is intended to satisfy the requirements of Better Urban Water

Management (WAPC 2008) and has now been approved by the Department of Water.

#### REFER TO APPENDIX 6 – LOCAL WATER MANAGEMENT STRATEGY

The primary objective for water management within the Development Plan area is to ensure that life and property is protected from major event and high intensity runoff. This will be achieved by providing adequate conveyance of flow both upstream and within the study area via open swales and within road pavement.

The objectives of the WMS are:

- Provide a broad level storm water management framework to support future development;
- Incorporate best management practices into the drainage systems that address the environmental and storm water management issues identified;
- Minimise development construction costs, which will result in reduced land costs for future home owners;
- Minimise ongoing operation and maintenance costs for the land owners and the Shire of Roebourne;
- Develop a water conservation strategy for the study area that will accommodate existing groundwater allocation constraints for the region; and
- Gain support from the Department of Water and the Shire of Roebourne for the proposed method to manage storm water within the study area and potential impacts on downstream areas (Emerge Associates 2011).

Surface water runoff and storm water will be managed through road pavement conveyance and open swales. Swales provide conveyance of storm water and will be located in an alignment that is generally consistent with the pre-development flow pathways. Waste water discharge from the development will be managed by connecting to the existing Water Corporation sewer system.

The WMS will ensure that the substantial waste water which can be discharged from urban areas is managed appropriately.

## SERVICING

---

### UTILITIES

#### Stormwater Drainage

---

Stormwater drainage is usually designed to discharge via overland open channel and road flow in Karratha, where road pavements and swales are designed to be able to accommodate the infrequent but large flows typical of the severe cyclones often experienced in Karratha.

To enable overland flow of storm water via paved surfaces and swales, the development must be laid out in such a way as to be sympathetic to the contours of the land so that suitable continuous flow gradients can occur, which do not impede the flow of storm water.

Within The Ranges development, road pavements and swales have therefore generally been designed to fall consistently with the existing land contours. Storm water drainage is further discussed in the Floodway Assessment section of this report below and the attached LWMS.

#### Water Supply

A letter received from the Water Corporation following the referral of Amendment 25, dated 23 November 2011, stated that water supply capacity and wastewater treatment and disposal capacity in Karratha is currently severely limited and close to maximum capacity, and that services may not be provided to this and other development in the town until major upgrades have been completed. The advice also stated that the Corporation is currently upgrading the capacity of the towns water storage and supply systems to meet the expected growth in demand. In the interim, any additional connections and demands on the water system will be considered on their merits and subject to the available capacity at the time. Consideration will be given to, amongst other matters, the certainty of the development proceeding, and it is anticipated that following the approval of the Development Plan the Corporation will review its infrastructure planning to service the area.

Water has also been allocated to the Stage 1 development on Lot 1090 and it is envisaged that new upgrades will be available by the time the water is needed for the remainder of The Ranges development.

It is also noted that a Media Statement released by the Government on 9 September 2011 announced Rio Tinto's agreement to surrender its priority entitlement to the Millstream water supply system for use by towns in the Pilbara increasing the short term availability of water.

Water for fire services will also be required and such facilities will be provided to the relevant standards.

#### Sewer Disposal

The Water Corporation are unable to confirm whether the existing sewerage system has adequate capacity to service the proposed development until the provision of a potable water service is determined. Connection for Stage 1 on Lot 1090 involves the installation of a private pump station and the installation of a sewer pipe to the Water Corporations Waste Water Treatment Plant No.1 to the east of the site. As part of this installation a second pipe will also be laid in the same trench to accommodate flows from Stage 2. It is envisaged that by the time relevant approvals are obtained and the service is required there will be capacity in Waste Water Treatment Plant No.1 as a result of the substantial upgrades due for completion in 2014.

#### Electricity Supply

Discussions with Horizon Power have been held, with Horizon Power confirming that a 1MV transformer will be installed to service Stages 1 and 2 of The Ranges development.

The implementation of the Karratha 22kV power upgrade as part of the Pilbara Underground Power Project is currently underway. These works have commenced and it is anticipated that the upgraded system will be available at the time of construction of the development. As evidenced by its application for a works approval it is also undertaking temporary works to ensure sufficient power capacity is always available.

Details relating to the lighting of internal streets and paths will be provided at the detailed design stage.

#### Telecommunication

On the basis of the National Broadband Network (NBN) Government initiative, all telecommunications infrastructure is capable of being provided to the development site by NBN Co subject to a formal application being made and an agreement being negotiated with the Developer.

### **FLOODWAY ASSESSMENT AND EARTHWORKS**

#### Earthworks

Analysis of the general earth works requirements for the site was also undertaken by Emerge in the Local Water Management Strategy appended to this report. The finished floor levels within the study area will need to achieve a 500mm clearance from the 100 year ARI flows within the streamline, and 300mm clearance from flows within road pavement.

The pre-development modelling suggests that some measure of fill may be required along the southern boundary of the site to ensure that buildings in this area are able to achieve the required separation distance.

### Floodway Assessment

The principle behind the storm water management strategy for the Development Plan aims to maintain the existing hydrology by continuing the existing surface flow regime through the area. The primary objective for storm water management onsite is to adequately convey runoff from all events up to the 100 year ARI event, this objective will be achieved by open swale and road pavement conveyance, by providing adequate fill to provide sufficient separation from flood levels and by providing protection against erosion (as stated above).

The post-development peak discharge from the entire Development Plan area aims to be comparable to the pre-development peak discharge for rainfall events greater than the 5 year ARI up to the 100 year ARI. This is achieved by design of the conveyance swales. Swales provide conveyance of storm water and will be located in an alignment that is generally consistent with the pre-development flow pathways. The swales will convey runoff from upstream catchments and from within the study area.



## PLANNING ASSESSMENT

### STATUTORY COMPLIANCE

As stated above, following the gazettal of Amendment 25 the following conditions will apply to the Development Plan area:

1. An approved Development Plan together with all approved amendments shall apply to the land in order to guide subdivision and development.
2. To primarily provide for a permanent high quality resort style development with environmentally and culturally responsive short stay or tourist accommodation; and allow for other future uses such as educational, community, recreation, drainage and conservation.
3. Development Plan(s) shall have respect for heritage sensitive areas, drainage lines and modelled buffer requirements to the adjoining power station.
4. Land uses classified on the Development Plan apply in accordance with clause 7.2.11.4.
5. Development Plans affecting this area are to be considered by the elected Council.

This Development Plan fulfils the above objectives as:

- It will guide the development and subdivision of the land, including providing boundaries for the crown subdivision of site as well as the location of the easement for gas infrastructure;

- It provides permanent high quality Resort Accommodation for use on a long and short stay basis for tourists and those who may work in Karratha as well as providing a significant area for 'Conservation, Recreation and Natural Landscapes'.
- The Development Plan shows respect for Aboriginal Heritage areas, drainage lines and buffers to the power station as previously discussed; and
- The permissibility of land uses defined in the Development Plan area will be as per Part 1 (being the statutory section) of this report.

### ORDERLY AND PROPER PLANNING

The proposed Development Plan represents the logical, orderly and proper development of land that is consistent with both the current strategic vision prescribed by the Karratha City of the North Blueprint and also the statutory objectives highlighted by the Scheme and Amendment 25.

Firstly at the strategic level, the proposed Development Plan will facilitate achieving the objectives of the recently endorsed KCN Blueprint City Growth Plan, which highlights the site as being developed for a mix of uses including a variety of tourism based uses and associated recreation facilities. The development of the site as proposed will provide accommodation for a growing population and also for tourism purposes which is currently under significant pressure in Karratha.



In order to ensure the development of the site is viable, it is proposed for the site to be used for both workers accommodation, for which there is significant demand all year round, and also tourism accommodation, which can be seasonal. The demand for accommodation for workers is particularly high at present due to the number of large development and infrastructure projects taking place in town. This construction phase is expected to begin to wind down in a few years, which will then make the predominant use of the site as tourist and key worker accommodation.

To allow for the sale of the units on this basis it is required that no stay restrictions be placed on the approval, a condition for which has been stipulated in the Statutory section of this report.

Given the expected use of the site it is considered that the zonings indicated on the Development Plan, particularly the 'Tourism' designation on the eastern portion of the site, is highly appropriate.

## **VISUAL ANALYSIS**

Given the development is on Lot 400 the main visitor entry into Karratha and is nestled within the Karratha Hills it is necessary to consider the visual amenity the development will have on the landscape. In this regard a visual analysis has been undertaken to identify what parts of the development may be visible from Karratha Road and what amelioration measures can be undertaken to ensure that the development is compatible with its surroundings.

A visual analysis has therefore been prepared which shows the development site viewed from various locations along Karratha Road and then a cross section prepared to identify what height the development could be whilst still maintaining a view to the ridgelines.

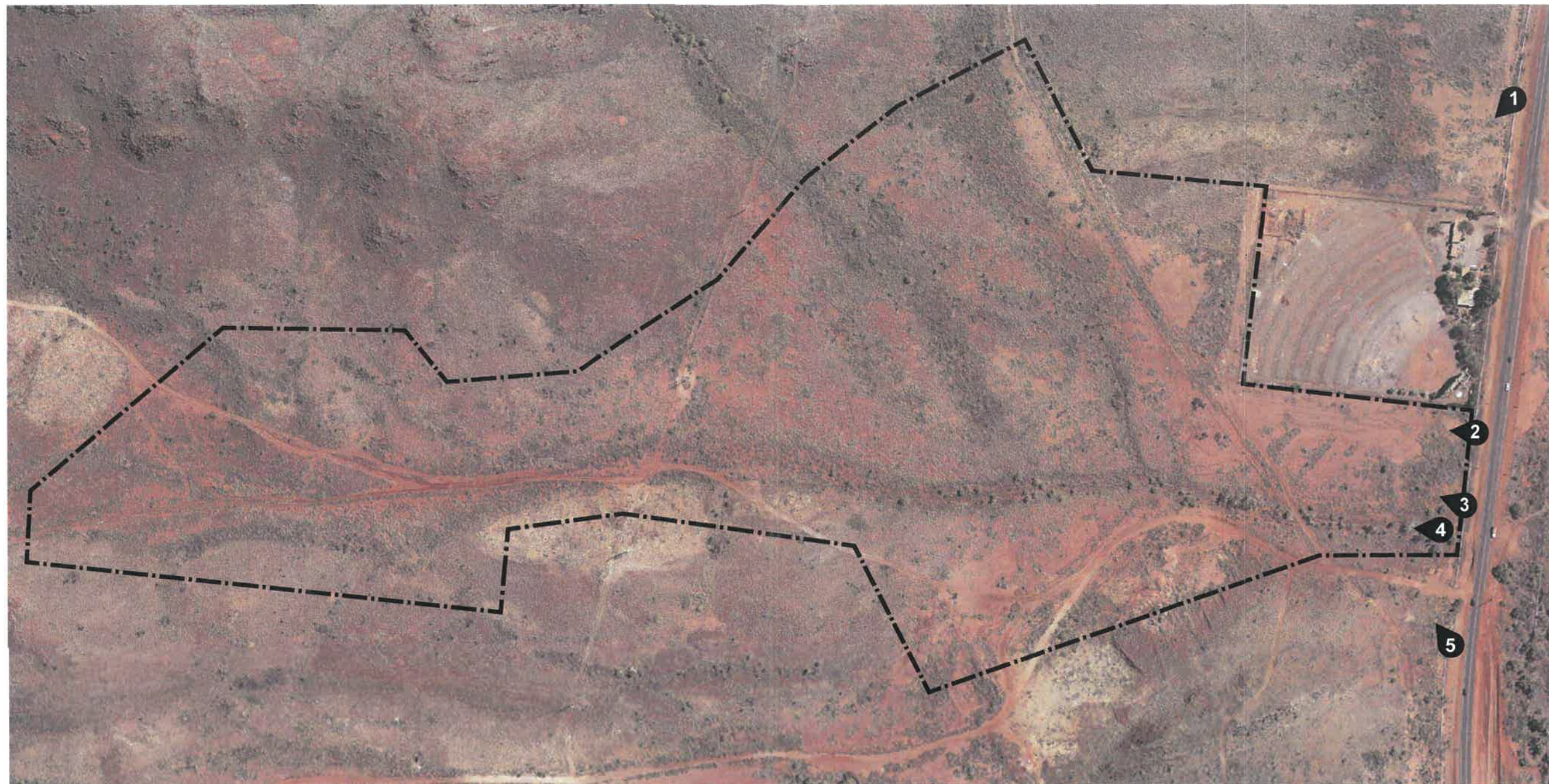
**REFER TO FIGURE 6 – VISUAL ANALYSIS – PHOTOS**

**REFER TO FIGURE 7 – VISUAL ANALYSIS – CROSS SECTION**

From the photos it is evident that the development can only be possibly seen for a short distance between two ridgelines which run east and west from Karratha Road immediately north of Stovehill Road. Heading north into Karratha it will not be until you are past the vegetation in the creek line that you will be able to see the site and then it is a requirement of this Development Plan for this area to be re-vegetated which will completely obscure the site from view.

Past this re-vegetation area the view into the valley will be dominated by the approved development on the former drive in site and once you are past this site heading into Karratha the development will then be behind you. Heading south on Karratha Road out of Karratha the view will again be dominated by the development on the former drive in site although before you get to this development there is a small window between the ridge line and the development where you may be able to catch a glimpse of the proposed development although this will be very limited given it is over 150 metres away, will contain peripheral landscaping and the focus (if it's not on the





# Views of The Ranges Stovehill Development Plan

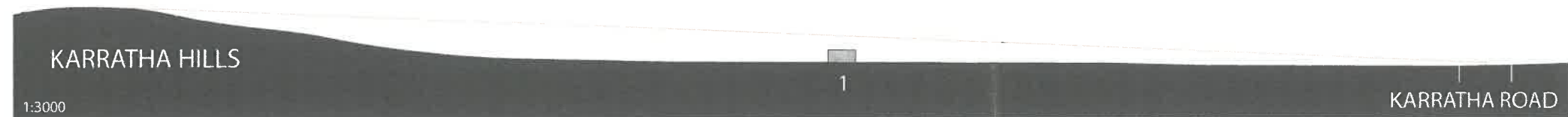
Date: 19th March 2012 Designer: DR  
Scale: NTS @ A3 Drawn: PR  
Drawing No. 711-149 ST2 Views of Stovehill 160312.ai



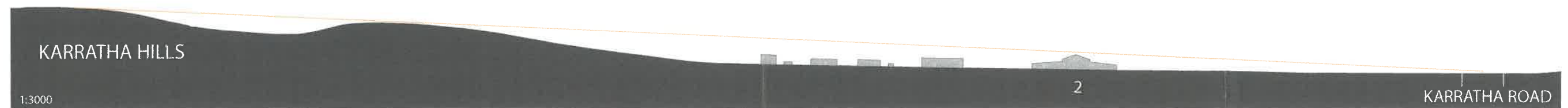
This concept has been prepared for the purpose of meeting client specifications. The drawing does not constitute an invitation, agreement or contract (or any part thereof) of any kind whatsoever.  
Although care has been taken in the compilation of this drawing by The Planning Group WA Pty Ltd, all parties associated with the proposed property development disclaim all responsibility for any errors or omissions. The right is reserved to change the plan at any time.  
Liability is expressly disclaimed by The Planning Group WA Pty Ltd for any loss or damage which may be sustained by any person acting on any visual impression gained from this drawing.



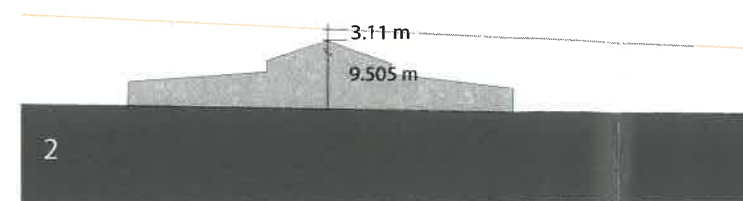
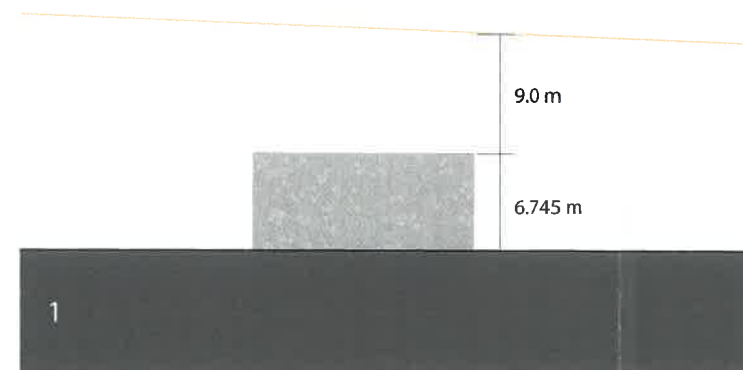
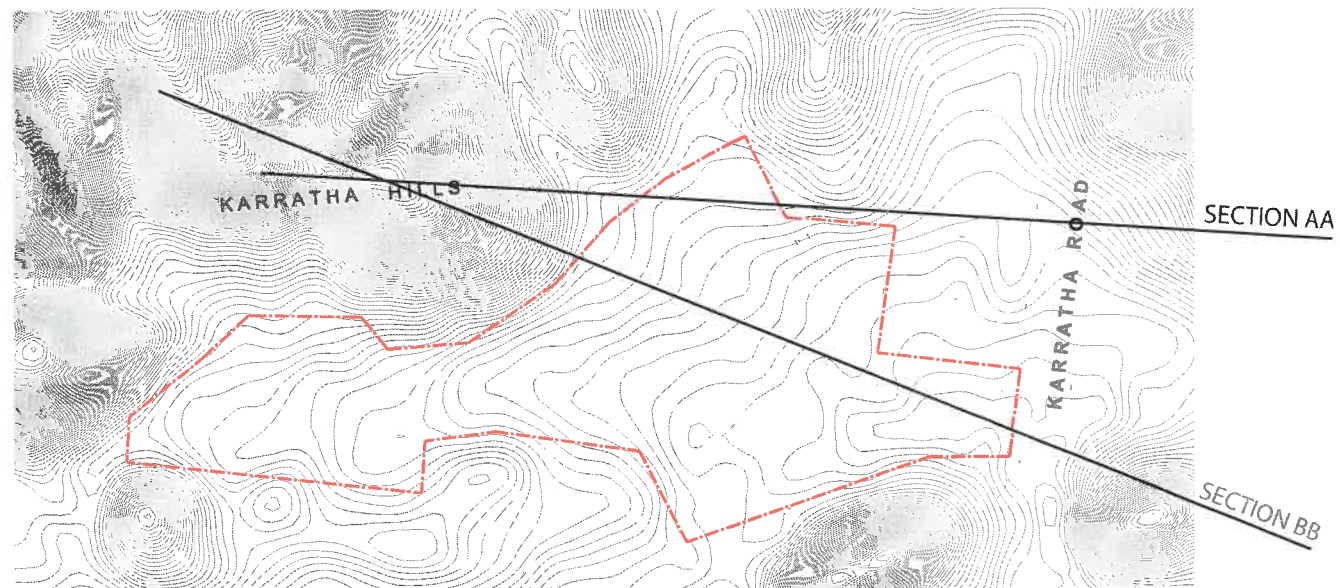




SECTION AA



SECTION BB



0 MID ENDm

This concept has been prepared for the purpose of meeting client specifications. The drawing does not constitute an invitation, agreement or contract (or any part thereof) of any kind whatsoever.

Although care has been taken in the compilation of this drawing by The Planning Group WA Pty Ltd, all parties associated with the proposed property development disclaim all responsibility for any errors or omissions. The right is reserved to change the plan at any time.

Liability is expressly disclaimed by The Planning Group WA Pty Ltd for any loss or damage which may be sustained by any person acting on any visual impression gained from this drawing.

© The Planning Group WA Pty Ltd



**'The Ranges' Sight Line Plan**  
Stove Hill, Karratha  
Shire of Roebourne

Date: 10 May 2012

Designer: DR

Scale: 1:3000 @ A3

Drawn: MP

Drawing No. 711-149 CP1 Dev Plan Site views.ai

TOWN PLANNING  
AND URBAN DESIGN

Level 11, 143 St Georges Terrace  
Perth Western Australia 6000

PO Box 7275, Deane's Square  
Perth Western Australia 6150

Telephone +61 8 9201 5300  
Facsimile +61 8 9201 4796  
www.tpgwa.com.au

The Planning Group WA Pty Ltd  
ABN 56 087 013 320





road] will be to the approved development. A list of species has been included in Appendix 6 as a guide to what species are suitable to the area that the Shire will have regard to as part of the landscaping plan for the site to be submitted with the Development Application.

REFER APPENDIX 7 – INDICATIVE RECOMMENDED PLANT SPECIES

In terms of height, the cross section in Figure 6 indicates that from eye height looking east towards the Karratha Ranges the development could be 12.6 metres high before it protruded above the view to the ridgeline and the tallest part of the development is to the roof of the communal amenities building which is only 11.8 metres high. Provisions have been inserted into the Development Plan to ensure that the Community Facilities Building does not exceed 12.6 metres above Natural Ground Level and to also limit the height of the remainder of the development on the site to below 8 metres above natural ground level which will assist in ensuring that the majority of development will be screened from view from Karratha Road, especially once the landscaping is established. It should also be noted that provisions have been inserted into the Development Plan regarding the colours and materials of the development. A number of 'earth tone' colours have been selected based on the Colorbond® range of colours including for roofs:

- Evening Haze



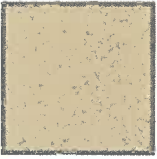
- Shale Grey



- Paperbark



- Sandbank



- Pale Eucalypt



- Windspray



And for walls, in addition to the above colours the following are also considered acceptable:

- Bushland
- Jasper
- Wilderness
- Woodland Grey



The colours have been selected based not only to ensure that the development does not clash with the natural landscape, but also with regard to its aesthetic appearance and passive solar performance.

It is therefore considered that given all of the above that the development will have virtually no impact on the view from Karratha Road.

## SITE SUITABILITY AND RELATIONSHIP TO ADJOINING DEVELOPMENT

Orderly and proper planning requires that new development be a logical and efficient extension of existing development. The proposed Development Plan will facilitate the logical extension of development already approved on Lot 1090 to the east, and the proposed zoning under the Development Plan for Lot 400, being 'Tourism' is consistent with the adjoining zone.

The 'Tourism' portion of the site, Lot 400 is also separated from the Karratha Power Station by a significant ridge and is over 1km from the Power Station where air quality and noise levels will not impact on amenity, making the proposed location within the Development Plan ideal, considering it is within this area that may have longer term residents.

The remainder of the site is to be protected as Conservation but will require a Development Plan to be prepared before any further development can take place.

There are no buffers or adjoining land uses, which will preclude residential development on the site.



## CONCLUSION

This Development Plan has been prepared in order to facilitate the orderly future subdivision, land use and development of Lot 400 Karratha Road, Stove Hill (DP 72956) and Unallocated Crown Land to the west and south of Lot 400. The Development Plan and this supporting report demonstrate how the proposed development is in accordance with State and Local Government vision for the site, in particular the Karratha City of the North Plan.

The high costs of housing in Karratha as well as numerous planning documents including the Pilbara Framework indicates that there is a strong demand for accommodation in Karratha and the surrounding areas. The Development Plan will facilitate the development of accommodation for up to 550 persons, which will help to ease this demand as well as providing for seasonal tourist accommodation.

The proposed land use, being a high quality resort providing both permanent accommodation for owner-occupier, key worker/white collar worker and tourism accommodation, represents the highest and best use for the property and the design and layout is based on sound design intent where units are provided in a landscaped setting. An application for the development of the site will be lodged with the Shire concurrent with the WAPC consideration of this Development Plan. Following gazettal of Amendment 25, approval of this Development Plan and a Development Application of the site can be strata titled to enable the sale of these Stage 1 units. The 'rollout' of the balance of the development can then occur as demand dictates.

Based on the consistency of the Development Plan with the agreed vision for the site and that the design represents the optimal development outcome for the site, it is requested that the Shire and the WAPC approved the Development Plan at their earliest convenience to enable subdivision and development to occur.



This page has been left blank intentionally.

## APPENDIX 1

### DEPARTMENT OF INDIGENOUS AFFAIRS CORRESPONDENCE

This page has been left blank intentionally.



Search Criteria

Easting: 484146mE; Northing: 7705342mN; Zone: 50  
Easting: 483998mE; Northing: 7705371mN; Zone: 50  
Easting: 483946mE; Northing: 7705436mN; Zone: 50  
Easting: 483820mE; Northing: 7705356mN; Zone: 50  
Easting: 483820mE; Northing: 7705141mN; Zone: 50  
Easting: 484147mE; Northing: 7705141mN; Zone: 50

Assessment Status ("Status")

L = Lodged: Lodged with Registrar, placed on Register, not assessed.

I = Insufficient Information: Lodged with Registrar, placed on Register, has insufficient information to complete assessment in terms of section 5 of AHA.

R = Registered Site: Lodged with Registrar, placed on Register, lodged information assessed as meeting terms of section 5 of AHA.

S = Stored Data: Lodged with Registrar, placed on Register, lodged information assessed as not meeting terms of section 5 of AHA.

REGISTRAR ASSESSMENTS ONLY. NOTE: THESE SITES NEED TO GO TO ACHM FOR FINAL ASSESSMENT.

IR = Insufficient Information (SAG): Provisionally considered to have insufficient information to complete assessment.

RR = Registered Site (SAG): Provisionally assessed as meeting terms of section 5 of AHA.

SR = Stored Data (SAG): Provisionally assessed as not meeting terms of section 5 of AHA.

Site Assessment Group (SAG) - Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not to be considered the final assessment.

Final assessment will be determined by the Aboriginal Cultural Material Committee (ACMC).

Access ("Acc")

C = Closed: Access to site file requires the written consent of persons recorded in the site file as primary Aboriginal informants. Contact DIA for details.

O = Open: Access to site file is open to the public.

V = Vulnerable: The current physical condition of the site may prevent access to the site.

Restriction ("Res")

N = No restriction: No restrictions are placed on viewing the information in the site file.

M = Male access only: Access to the site file is restricted to males.

F = Female access only: Access to the site file is restricted to females.

Legend

Copyright - Copyright in the information contained herein is and shall remain the property of the State of Western Australia. This includes, but is not limited to, information from the Register of Aboriginal Sites established and maintained under the Aboriginal Heritage Act 1972 (AHA).

Disclaimer - The AHA protects all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some sites that appear on the register may no longer physically exist. Consultation with Aboriginal people is on-going to identify additional sites or changes to registered sites.

Spatial Accuracy - Map coordinates (Easting/Northing) listed in this report only represent indicative locations of sites. They should not be interpreted as the centre of a site. All sites on the Sites Register have an area and should not be represented as points. The coordinates are based on the GDA94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map in this report, i.e., '5000000Z50' means Easting=5000000, Zone=50.

Coordinate Accuracy.

[Reliable] or "RE": The spatial information recorded in the site file is deemed to be reliable due to the methods of capture.

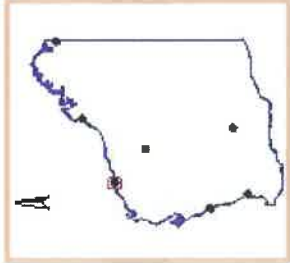
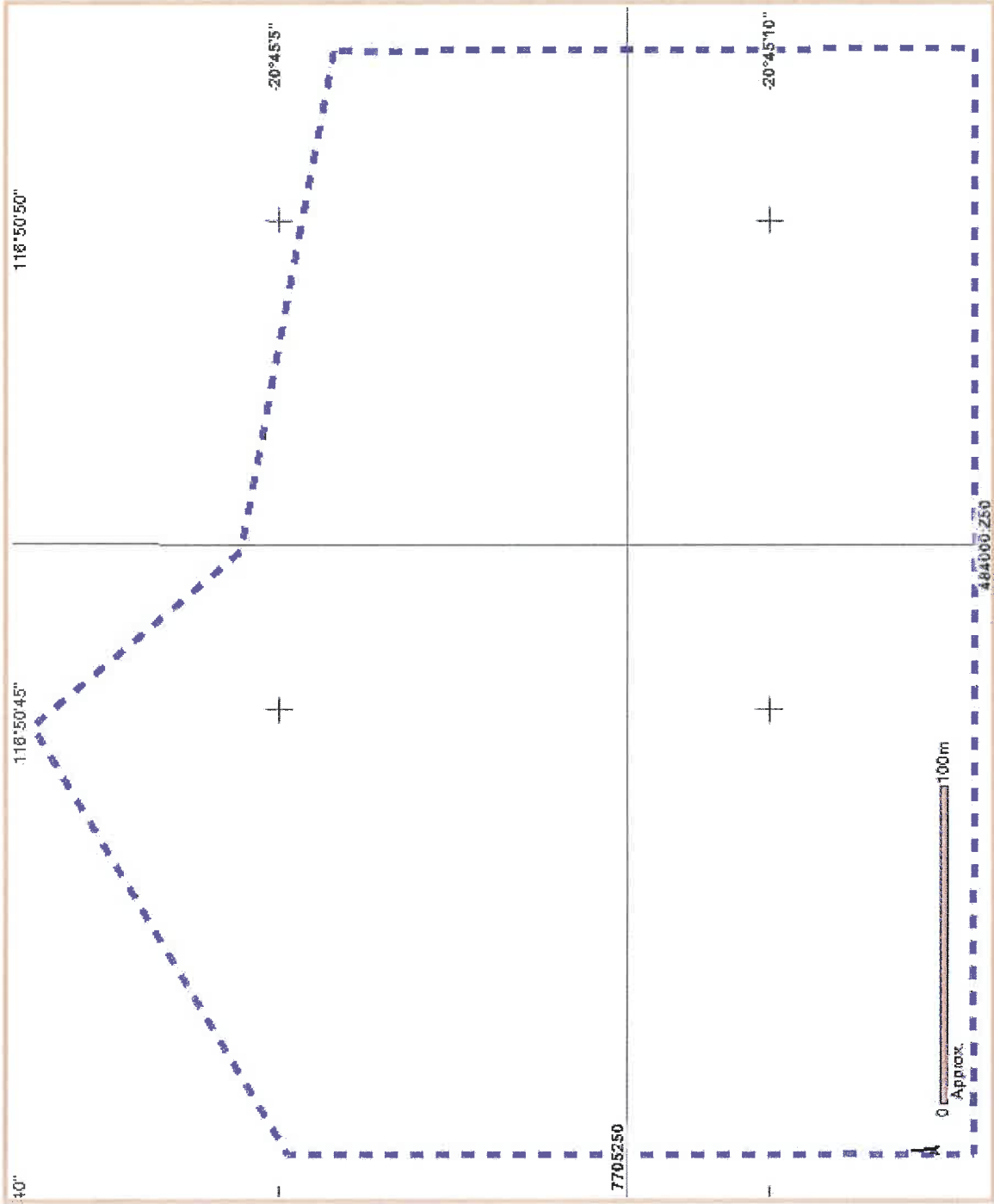
[Unreliable] or "U": The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Site ID	Site Name	Acc	Res	Status	Resolution	W/NA	05	39	Site Type	Additional Information	Informants	Recorders	Easting Northing	Field Code	Site No.
---------	-----------	-----	-----	--------	------------	------	----	----	-----------	------------------------	------------	-----------	------------------	------------	----------

NO SITES FOUND WITHIN SPECIFIED AREA



# REGISTER OF ABORIGINAL SITES SITE SEARCH MAP



- Legend**
- Selected Site
  - Town
  - Map Area
  - Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Copyright for Native Title Land Claim and Local Government Authority boundaries shall at all times remain the property of the State of Western Australia, Dept of Land Information. All rights reserved.

Copyright for Mining Tenement boundaries shall at all times remain the property of the State of Western Australia, Dept of Industry and Resources. All rights reserved.

## 0 Aboriginal Heritage Sites found in Polygon

### Coordinates:

Easting	Northing	Zone
484146	7705342	50
483998	7705371	50
483946	7705436	50
483820	7705356	50
483820	7705141	50
484147	7705141	50

## APPENDIX 2

### FLORA AND FAUNA ASSESSMENT

---



This page has been left blank intentionally.

# FLORA AND FAUNA ASSESSMENT

STOVE HILL, KARRATHA

Project Number EP11-018

Prepared for Greenvalley Asset Pty Ltd.  
September 2011



**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA**Document Control**

DOC NAME	FLORA AND FAUNA ASSESSMENT STOVE HILL, KARRATHA				
DOC NO.	EP11-018--007				
REVISION	DATE	AUTHOR		REVIEWER	
1	September 2011	Sarah Paul	SKP	Jason Hick	JDH
A					
B					
C					
D					

© 2011 Emerge Associates All Rights Reserved. Copyright in the whole and every part of this document belongs to Emerge Associates and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Emerge Associates.

FLORA AND FAUNA ASSESSMENT  
STOVE HILL, KARRATHA

## Executive Summary

Greenvalley Asset Pty Ltd (Greenvalley Asset) is in the process of negotiating the acquisition of a 7.14 ha parcel of land to the west of Lot 1090 Karratha Road, Stove Hill (shown as 'Greenvalley Asset Site' on **Figure 1**) to be developed for residential purposes. This land parcel is currently 'Unallocated Crown Land' that is reserved under the Shire of Roebourne's Town Planning Scheme No. 8 (TPS 8) for 'Conservation Recreation and Natural Landscapes'. A scheme amendment initiation report (rezoning request) was prepared by TPG and has been lodged with the Shire of Roebourne. This report covers an area referred to as "DA42" and requests this area be rezoned to 'Urban Development'. DA42 is a wider area than the land being acquired by Greenvalley Asset and comprises 19.861 ha. Greenvalley Asset has no involvement with the balance of the DA42 area (outside of the 7.14 ha parcel). For contextual purposes, and to support the broader scheme amendment process, the whole DA42 area (as shown in **Figure 1**) was included in this assessment and will herein be referred to as 'the site'.

This assessment included both a flora and fauna survey. A 'Level 1' flora and vegetation assessment was undertaken in accordance with the Environmental Protection Authority's (EPA's) Guidance Statement No. 51 - *Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia (EPA 2004a)*. To assess faunal values of the site a 'Level 1' fauna survey was conducted by a qualified zoologist in accordance with EPA Guidance Statement No. 56 - *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b)*.

As part of the flora and vegetation assessment, the site was visited by a botanist from Emerge Associates (Emerge) on the 19 August 2011 and the vegetation was assessed at six survey locations. A total of 57 native and 2 introduced (weed) species were recorded during the 2011 survey. No Threatened, Priority or other conservation significant flora was recorded on the site.

Three intact plant communities and one degraded plant community were described and mapped across the site. These communities were described as follows:

**C1** - Emergent *Eucalyptus victrix* and *Corymbia hamersleyana* over open shrubland of *Santalum lanceolatum*, *Acacia inaequilatera*, *Acacia colei* and *Grevillea pyramidalis* over closed tussock grassland of *\*Cenchrus ciliaris* and *Dichanthium sericeum* subsp. *humilius* in major flow pathways

**C2** - Open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* with isolated trees of *Corymbia hamersleyana*, over hummock grassland of *Triodia wiseana* and open tussock grassland of *Chrysopogon fallax* and *\*Cenchrus ciliaris* in minor flow pathways

**T1** - Hummock grassland *Triodia wiseana* and isolated tussock grasses of *Enneapogon caeruleus* and *Aristida contorta* within emergent open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* and *Acacia ancistrocarpa* with sparse forbland of *Ptilotus exaltatus*, *Ptilotus helipteroides*, *Stackhousia intermedia* and *Indigofera monophylla* on rocky slopes of Karratha Hills

**B** - Degraded closed tussock grassland of *\*Cenchrus ciliaris* (Buffel grass).

The assessment of the regional representation and conservation significance of the vegetation units defined by this study was limited by the lack of regional mapping of geology, land systems or vegetation at a similar scale. The plant communities detailed above represent the generally dominant communities and flora species found across much of the Pilbara region. For this reason they are not

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

considered to be particularly conservation significant. Despite this, much of vegetation present on site is in excellent condition with little previous disturbance or weed invasion and thus is of local environmental value.

Based on species composition of PEC community 'Roebourne Plains coastal grasslands with gilgai micro-relief occur on deep cracking clays', as described within **Section 2.6**, none of the plant communities identified within the site are likely to represent this community. There are no other listed Threatened or Priority Ecological Communities in the area.

Vegetation condition across the site ranges from 'Completely Degraded' to 'Excellent to Pristine'. The majority of the site (and especially the western part of the site) was found to be in 'Excellent' condition. The main areas of disturbance were located close to the flow lines, near Karratha Road and adjacent to the former Drive-In cinema. The major flow line in the south of the site was in 'Very Good to Excellent' condition with some weed invasion from *Cenchrus ciliaris*. Vegetation condition along this flow line declines closer to Karratha Road where it is in 'Degraded to Good' condition, mainly due to increased weed cover. A large proportion of the eastern most area within the site is in 'Degraded to Good' or 'Good' condition. Several narrow strips were in 'Completely Degraded' condition where vegetation has been cleared for vehicle tracks.

The fauna assessment included both a desktop search of known fauna in the area and a field survey. A Level 1 fauna survey was undertaken by zoologist Greg Harewood in August 2011. Of the 155 native animal species that were listed as potentially occurring in the area, one (Peregrine Falcon) is considered to be in need of special protection under the WC Act. In addition three migratory bird species (Fork-tailed Swift, Rainbow Bee-eater, Barn Swallow) may frequent the area at times and three DEC priority species (Lined Soil-crevice Skink, Australian Bustard and the Bush Stone Curlew) were identified as possibly present. Development at the site may result in the loss/modification of some habitat utilised by these species at times but this is very unlikely to alter their conservation status on a local or regional scale.

No significant impact to any EPBC Act Threatened Fauna species is anticipated, principally because none can be considered likely to be using the site to any significant degree. The site also does not appear to contain habitat that could be considered critical for the recovery of any listed threatened species.

The broadly defined plant communities present within the development area were identified as being common and widespread in the wider area and the faunal assemblage identified as potentially present is unlikely to be different to that found in similar habitat located elsewhere in the region. It can therefore be concluded that the site does not contain habitat of high ecological significance from a faunal perspective or contain faunal assemblages that are regionally significant.

Any proposed development will necessarily require the clearing of existing vegetation and fauna habitat, and the Greenvalley Asset site will be almost entirely cleared. Planning for the proposal should take into account the presence of native fauna and flora so that impacts can be minimised and managed.

Whilst no floral or faunal values of regional conservation significance were found, Emerge recommends that within the context of a planning and development framework, consideration is given to:

- Retention of as much vegetation as is reasonable and practical in 'Very Good' to 'Pristine', preferably in a single large area rather than smaller, fragmented and scattered areas (**Figure 3**).



**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

From a fauna habitat perspective larger trees and dense vegetation should be retained where possible.

- Control of the weed *Cenchrus ciliaris* adjacent to the creek lines and in degraded areas within the site is recommended.
- Retention of and foreshore setback from the major flow pathway running along the southern edge of the site will be required by local and state planning policy in order to protect water resources. In addition, foreshore setback from the minor flow lines, or alternative water management, is recommended in order to prevent flooding of any developed areas and runoff into larger waterways. A Local Water Management Strategy (Emerge Associates 2011) has been developed to manage hydrological attributes within the site.
- Disruption to surface and sub-surface hydrology should be minimised where possible and levees and drains designed to mimic natural drainage flows where disruptions will occur. See the Local Water Management Strategy (Emerge Associates 2011) for further information.

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

## Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Project Background .....	1
1.2	Scope of Assessment.....	1
<b>2</b>	<b>Background.....</b>	<b>2</b>
2.1	Climate .....	2
2.2	Geomorphology and Soils .....	2
2.3	Regional Vegetation .....	2
2.4	Hydrology .....	3
2.5	Significant Flora Species .....	3
2.6	Threatened Ecological Communities (TEC's) and Priority Ecological Communities (PEC's) .....	5
2.7	Conservation Significant Fauna.....	7
2.7.1	Vertebrate Fauna.....	7
2.7.2	Invertebrate Fauna .....	8
2.8	Local and Regional Significance .....	9
2.8.1	Flora .....	9
2.8.2	Fauna .....	9
<b>3</b>	<b>Methods.....</b>	<b>10</b>
3.1	Field Survey .....	10
3.1.1	Flora and Vegetation .....	10
3.1.2	Fauna .....	11
3.1.2.1	Fauna Habitat Assessment.....	11
3.1.2.2	Opportunistic Fauna Observations .....	11
3.2	Mapping and Data Analysis.....	11
<b>4</b>	<b>Results.....</b>	<b>13</b>
4.1	Flora .....	13
4.1.1	Threatened, Priority Flora and Species of Significance .....	13
4.1.2	Plant Communities .....	13
4.1.3	Conservation Significance of Plant Communities .....	16
4.1.4	Vegetation Condition .....	16
4.2	Fauna.....	16
4.2.1	Fauna Habitat Assessment .....	16
4.2.2	Opportunistic Fauna Surveys .....	16
<b>5</b>	<b>Discussion .....</b>	<b>17</b>
5.1	Flora and Vegetation .....	17
5.2	Fauna .....	17
5.2.1	Commonwealth Environment Protection & Biodiversity Conservation Act 1999.....	19
5.2.1.1	Listed Threatened Species .....	19
5.2.1.2	Listed Migratory Species .....	19
<b>6</b>	<b>Conclusions and Recommendations.....</b>	<b>21</b>
<b>7</b>	<b>References .....</b>	<b>23</b>



## FLORA AND FAUNA ASSESSMENT STOVE HILL, KARRATHA

### List of Tables

Table 1: Definition of Threatened and Priority Flora Species (Smith 2010) .....	4
Table 2: Significant flora species known to occur within the general area .....	5
Table 3: Categories of Threatened Ecological Communities (English and Blyth 1997) .....	6
Table 4: Categories of Priority Ecological Communities (DEC 2009) .....	6
Table 5: Vegetation condition scale (Keighery 1994) .....	10
Table 6: Likelihood of occurrence and degree of potential impact – fauna species of conservation significance .....	18

### List of Plates

<b>Plate 1:</b> Plant community C1 - Emergent <i>Eucalyptus victrix</i> and <i>Corymbia hamersleyana</i> over open shrubland of <i>Santalum lanceolatum</i> , <i>Acacia inaequilatera</i> , <i>Acacia colei</i> and <i>Grevillea pyramidalis</i> over closed tussock grassland of <i>*Cenchrus ciliaris</i> and <i>Dichanthium sericeum</i> subsp. <i>humilius</i> . Found in major flow pathways. Located at 484107 E; 7705127 N facing east. ....	14
<b>Plate 2:</b> Plant community C2 - Open shrubland of <i>Acacia bivenosa</i> , <i>Acacia inaequilatera</i> with isolated trees of <i>Corymbia hamersleyana</i> , over hummock grassland of <i>Triodia wiseana</i> and open tussock grassland of <i>Chrysopogon fallax</i> and <i>*Cenchrus ciliaris</i> . Found in minor flow pathways. Located at 483765 E; 7705153 N. ....	14
<b>Plate 3:</b> Plant community T1 - Hummock grassland of <i>Triodia wiseana</i> and isolated tussock grasses of <i>Enneapogon caerulescens</i> and <i>Aristida contorta</i> within emergent open shrubland of <i>Acacia bivenosa</i> , <i>Acacia inaequilatera</i> and <i>Acacia ancistrocarpa</i> with sparse forbland of <i>Ptilotus exaltatus</i> , <i>Ptilotus helipteroides</i> , <i>Stackhousia intermedia</i> and <i>Indigofera monophylla</i> . Located on flats and rocky slopes. Located at 484071 E; 7705156 N. ....	15
<b>Plate 4:</b> Plant community B – Degraded closed tussock grassland of <i>*Cenchrus ciliaris</i> . Located at 484099 E; 7705238 N. ....	15

### Figures

- Figure 1: Site Locality and Plan
- Figure 2: Plant Communities
- Figure 3: Vegetation Condition

### Appendices

#### Appendix A

Harewood 2011 Terrestrial Fauna Assessment Stovehill Karratha

#### Appendix B

Cluster Analysis Dendrogram

#### Appendix C

Flora Species List

#### Appendix D

Flora Species by Plant Community

#### Appendix E

Individual Site Data

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

## 1 Introduction

### 1.1 Project Background

Greenvalley Asset Pty Ltd (Greenvalley Asset) is in the process of negotiating the acquisition of a 7.14 ha parcel of land from the State Government to be developed for residential purposes. This land parcel is currently 'Unallocated Crown Land' that is reserved under the Shire of Roebourne's Town Planning Scheme No. 8 (TPS 8) for 'Conservation Recreation and Natural Landscapes'. A scheme amendment initiation report (rezoning request) was prepared by TPG and has been lodged with the Shire of Roebourne. This report covers an area referred to as "DA42" and requests this area be rezoned to 'Urban Development'. The DA42 is involved a wider area than the land being acquired by Greenvalley Asset and comprises 19.861 ha. Greenvalley Asset has no involvement with the balance of the DA42 area (outside of the 7.14 ha parcel). For contextual purposes and to support the broader scheme amendment process, the whole DA42 area (as shown in **Figure 1**) was included in this assessment and will herein be referred to as 'the site'.

The site is situated to the south of the Karratha Hills within the locality of Stove Hill. The site is predominantly surrounded by undeveloped land, however a former drive-in cinema directly adjoins the site to the east (Lot 1090 Karratha Road), which is also being redeveloped by Greenvalley Asset. The Karratha Visitor Centre is located approximately 1.2km north of the site, and Karratha Industrial Estate occurs approximately 2 km south east of the site. The Stove Hill power station is located over 1 km to the south west of the site.

As part of the scheme amendment process and the preparation and approval of the associated development plan there is the need for supporting environmental information, including flora and fauna values located within the site and their conservation significance. The purpose of this assessment is to provide this information to inform the scheme amendment process and development plan.

### 1.2 Scope of Assessment

This assessment included both a flora and fauna survey. A 'Level 1' flora and vegetation assessment was undertaken in accordance with the Environmental Protection Authority's (EPA's) Guidance Statement No. 51 - *Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia (EPA 2004a)*. To assess faunal values of the site a 'Level 1' fauna survey was conducted by a qualified zoologist in accordance with EPA Guidance Statement No. 56 – *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b)*.

This report documents the botanical and faunal values of the site including the results of a Level 1 flora and vegetation assessment and Level 1 fauna assessment, conducted in August 2011.

FLORA AND FAUNA ASSESSMENT  
STOVE HILL, KARRATHA

## 2 Background

### 2.1 Climate

The site occurs within the northern province of Western Australia, which experiences an arid tropical climate of hot wet summers and relatively dry winters. Long-term climatic averages indicate the site is located in an area of low rainfall, receiving 289.7 mm on average annually (data for Karratha Aero, the nearest current reporting station (Bureau of Meteorology 2011)) with the majority of rainfall received between January and June. Mean maximum temperatures range from 26.3 °C in July to 36.1 °C in February. Mean minimum temperatures range from 13.8 °C in July to 26.8 °C in January (Bureau of Meteorology 2011).

### 2.2 Geomorphology and Soils

The site occurs within the Pilbara natural region of Western Australia as defined by Beard (1990). The Pilbara region occupies the northernmost portion of the ancient Western Shield and is bordered to the east and west by the Canning and Carnarvon Basins with their sedimentary rocks. The southern edge of the region is determined by the *Acacia-Triodia* line, to the north of which *Triodia* vegetation is predominant and to the south *Acacia*-dominated vegetation.

The geology that characterises the Pilbara region is a basement of Archaean granite and volcanics, overlain by massive deposits of Proterozoic sediments (including jaspilite and dolomite) and volcanics. The topography is mountainous, largely with hard, alkaline red soils on plains and pediments, shallow and skeletal soils on the ranges (Beard 1990).

The Interim Biogeographic Regionalisation of Australia (IBRA) further divides the Pilbara region into smaller areas. The site is contained within the *PIL4 – Roebourne subregion* which occurs along the northern coast of the Pilbara and is described as consisting of “quaternary alluvial and older colluvial coastal and subcoastal plains” (McKenzie *et al.* 2003).

At a local scale, topography within site is gently undulating, sloping from the Karratha Hills situated to the north of the site down towards natural creek lines and to a secondary ridge which runs east-west just south of the site. Site levels range from approximately 36 m Australian Height Datum (AHD) at the foot of the hills to 26 m AHD at the creek.

### 2.3 Regional Vegetation

In terms of biogeographic provinces (provinces delineated on the distribution of species spatially and temporally), the site lies within the Fortescue Botanical District as defined by Beard (1990). The PIL4 - Roebourne IBRA region, as described in **Section 2.2**, falls within the Fortescue Botanical District and more precisely characterises the vegetation found on the site. The Roebourne IBRA region is characterised by;

*“Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of Acacia stellaticeps or A. pyrifolia and A. inaequilatera. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support Eucalyptus victrix or *Corymbia hamersleyana* woodlands. Samphire, Sporobolus and mangal occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains,*

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

*with minor exposures of granite. Islands are either Quaternary sand accumulations, or composed of basalt or limestone, or combinations of any of these three plains, with minor exposures of granite" (McKenzie et al. 2003).*

## 2.4 Hydrology

The site is found within the Karratha Coast surface water allocation area and subarea (Emerge Associates 2011). There is one major flow pathway and two minor flow pathways within the site. The two minor flow pathways are poorly defined and not clearly visible as hydrological features. The exception to this is the southernmost part of the pathways, which are slightly incised. Both pathways are likely to convey water from the upstream catchment during high intensity rainfall events, as evidenced by the minor vegetation observed within the southern portion of the waterways and minor erosion. These flow pathways occur in a north-south direction and convey water from the elevated Karratha Hills (located to the north of the subject site) to the major streamline which occurs in an east-west direction, and conveys water to the east towards Lulu Creek. This streamline has the potential to inundate the south western corner of the natural surface levels of the site during a 100 year ARI storm event (Emerge Associates 2011). The locations of the hydrological features on the site are shown on **Figure 1**.

The Department of Water (DoW) recognizes that the protection and management of foreshore areas is important for maintaining the diversity and ecological function of waterways. These areas are particularly important for preserving aquatic, littoral and terrestrial habitat for native flora and fauna and reducing the impacts of erosion, sedimentation and nutrient influx into waterways (WRC 2001a).

In order to protect waterways, the DoW requires buffers to be established across the foreshore area (land that adjoins or directly influences a waterway) for the protection and management of these areas. The Western Australian Government, Western Australian Planning Commission (WAPC) and DoW provide a number of policy and guidance documents to enable adequate buffering of a waterway and protection of water resources. The documents include:

- *A State Water Strategy for Western Australia* (Gov. of WA 2003)
- *State Planning Policy 2.9 Water Resources* (WAPC 2005)
- *Pilbara Regional Water Plan 2010–2030* (DoW 2010)
- *Water Quality Protection Note Number 6: Vegetation Buffers to Sensitive Water Resources* (DoW 2006)
- *Foreshore Policy 1: Identifying the Foreshore area* (WRC 2002)
- *Water Note 23: Determining Foreshore Reserves* (WRC 2001b).

These policies and guidance documents will be relevant for the major streamline running along the southern boundary of the site.

A Local Water Management Strategy has also been prepared by Emerge for the broader Karratha Local Structure Plan (Emerge Associates 2011). This document should be consulted for further details regarding water management and policy requirements.

## 2.5 Significant Flora Species

Species of flora acquire "Threatened" or "Priority" conservation status where populations are restricted geographically or threatened by local processes. The Department of Environment and Conservation



## FLORA AND FAUNA ASSESSMENT

### STOVE HILL, KARRATHA

(DEC) recognise these threats and subsequently considers population protection and species conservation. The DEC enforces the *Wildlife Conservation Act 1950* (WC Act) to conserve Threatened Flora and protect all populations. Priority flora species are potentially rare or threatened and are classified in order of threat. Threatened and Priority Flora category definitions are listed in **Table 1**.

Threatened Flora are gazetted as 'Declared Rare Flora' under subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and therefore it is an offence to "take" or damage rare flora without Ministerial approval. Section 23F of the Act defines "to take" as "... to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora to cause or permit the same to be done by any means". Species of flora may also be listed pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These are listed as 'Critically Endangered', 'Endangered' or 'Vulnerable'. Any action likely to have a significant impact on a species listed under the EPBC Act requires approval from the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities.

Table 1: Definition of Threatened and Priority Flora Species (Smith 2010)

CONSERVATION CODE	CATEGORY
T	<b>Threatened Flora – Extant Taxa</b> 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	<b>Threatened Flora – Presumed Extinct Taxa</b> 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	<b>Priority One – Poorly Known Taxa</b> 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	<b>Priority Two – Poorly Known Taxa</b> 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	<b>Priority Three – Poorly Known Taxa</b> 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 needs further survey.
P4	<b>Priority Four – Rare Taxa</b> 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.

A search was conducted of the DEC's databases for Threatened and Priority Flora and the EPBC Act list of Matters of National Environmental Significance (MNES) that occur within the wider local area and the results are listed in **Table 2**. Eleven Threatened and Priority Flora were identified as potentially occurring within the wider local area, these are all considered to be 'Priority 3' and 'Priority 4' under the WC Act. None of these species are listed under the EPBC Act.

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

Table 2: Significant flora species known to occur within the general area

SPECIES	LEVEL OF SIGNIFICANCE		LIFE STRATEGY	SUBSTRATE	FLOWERING PERIOD
	STATE	EPBC ACT LISTING			
<i>Acacia glaucocaesia</i>	P3	-	P	Red loam, sandy loam, clay. Floodplains.	Jul-Sep
<i>Atriplex lindleyi</i> subsp. <i>conduplicata</i>	P3	-	P/A	Crabhole plains.	-
<i>Eragrostis lanicaulis</i>	P3	-	P	Red sandy clay. Flats.	Mar-May/Aug-Oct
<i>Eragrostis surreyana</i>	P3	-	A	Seasonally wet, shallow, grey alluvial soils over rock, with some from deeper soils in a seasonally wet creek line.	May-Sep
<i>Eriochloa fatmensis</i>	P3	-	A	Damp and swampy places in grassland and on lake shores, on heavy soils.	-
<i>Rhynchosia bungarensis</i>	P4	-	P	Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	May-Dec
<i>Stackhousia clementii</i>	P3	-	P	Skeletal soils. Sandstone hills.	-
<i>Tephrosia bidwillii</i>	P3	-	P	-	May, Aug
<i>Terminalia supranitifolia</i>	P3	-	P	Sand. Among basalt rocks.	May-Jul/Dec
<i>Themeda</i> sp. Hamersley Station	P3	-	P	Red clay. Clay pan, grass plain.	Aug
<i>Vigna</i> sp. Rockpiles	P3	-	P	-	May

Note: P=Perennial, A=Annual.

## 2.6 Threatened Ecological Communities (TEC's) and Priority Ecological Communities (PEC's)

In Western Australia, Threatened Ecological Communities (TECs) are assessed by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (within the DEC) and endorsed by the Minister for the Environment. They are assigned to one of the categories outlined in **Table 3** relating to their status of threat. While they are not afforded direct statutory protection at a state level (unlike Threatened Flora under the *Wildlife Conservation Act 1950*) their significance is acknowledged through other state environmental approval processes such as Environmental Impact Assessment pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the Part V Clearing Regulations.

In addition to listing as a TEC, a community may be listed as a Priority Ecological Community (PEC). This is an ecological community that is under consideration for listing as a TEC, but does not yet meet survey criteria or has not been adequately defined, it can be placed on the list of PECs in either Category 1, 2 or 3 (these are described in **Table 4**). Ecological communities that are adequately

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

known and are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the Threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5 (DEC 2009).

Table 3: Categories of Threatened Ecological Communities (English and Blyth 1997)

CONSERVATION CATEGORY	DESCRIPTION
<b>PD</b>	<b>Presumably Totally Destroyed</b> An ecological community that has been adequately searched for but for which no representative occurrences have been located.
<b>CE</b>	<b>Critically Endangered</b> An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
<b>E</b>	<b>Endangered</b> An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future.
<b>V</b>	<b>Vulnerable</b> An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

Table 4: Categories of Priority Ecological Communities (DEC 2009)

PRIORITY CATEGORIES	DESCRIPTION
<b>Priority 1</b>	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
<b>Priority 2</b>	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
<b>Priority 3</b>	Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
<b>Priority 4</b>	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened or that have been recently removed from the threatened list. These communities require regular monitoring.



**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

PRIORITY CATEGORIES	DESCRIPTION
Priority 5	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Selected TECs are also afforded statutory protection at a Federal level pursuant to the EPBC Act. The EPBC Act provides for the protection of TECs, which are listed under section 181 of the Act. As with Threatened Flora, they are categorised as 'Critically Endangered', 'Endangered' or 'Vulnerable'.

A search was conducted of the DEC's TEC and PEC database, as well as the EPBC Act list of MNES. One PEC was found to occur in close proximity to the site. This was Priority 1 community 'Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays'. This community is not listed under the EPBC Act.

The Roebourne Plains coastal grasslands with gilgai micro-relief occur on deep cracking clays that are self-mulching and emerge on depositional surfaces. The Roebourne Plains gilgai grasslands occur on microrelief of deep cracking clays, surrounded by clay plains/flats and sandy coastal and alluvial plains. The gilgai depressions supports ephemeral and perennial tussock grasslands dominated by *Sorghum* sp. and *Eragrostis xerophila* (Roebourne Plains grass) along with other native species including *Astrelba pectinata* (barley mitchell grass), *Eriachne benthamii* (swamp wanderrie grass), *Chrysopogon fallax* (golden beard grass) and *Panicum decompositum* (native millet). Restricted to the Karratha area, this community differs from the surrounding clay flats of the Horseflat land system which are dominated by *Eragrostis xerophila* and other perennial tussock grass species (*Eragrostis* mostly). This community is under threat from grazing, clearing for mining and infrastructure and urban development, weed invasion and basic raw material extraction (DEC 2010).

## 2.7 Conservation Significant Fauna

### 2.7.1 Vertebrate Fauna

The conservation significance of fauna species has been assessed using data from the following sources:

- *EPBC Act*. Administered by the Commonwealth Government's Department of Sustainability, Environment, Water, Population and Communities (SEWPaC)
- *WC Act*. Administered by the Western Australian Department of Environment and Conservation (DEC)
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List - the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no specific legislative recognition in Australia but is used as a framework for State and Commonwealth categories and criteria
- DEC Priority Fauna list. A non-statutory list maintained by the DEC for management purposes.

The EPBC Act also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA)
- China Australia Migratory Bird Agreement 1998 (CAMBA)
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA)

## FLORA AND FAUNA ASSESSMENT

### STOVE HILL, KARRATHA

- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

Note that species listed under JAMBA are also protected under Schedule 3 of the WC Act. All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance (NES) under the EPBC Act.

A review of the EPBC Act's threatened fauna list, DEC's Threatened Fauna Database and Priority List, unpublished reports and scientific publications identified 21 specially protected, priority or migratory vertebrate fauna species as potentially occurring in the general vicinity of the study area. Based on the habitats present and documented distributions it is considered possible that seven (7) of these species may use the study area for some purpose at times, these species are listed below.

- *Notoscincus butleri* Lined Soil-Crevise Skink – P4 (DEC Priority Species).
- *Falco peregrinus* Peregrine Falcon - S4 (WC Act).
- *Ardeotis australis* Australian Bustard - P4 (DEC Priority Species).
- *Burhinus grallarius* Bush Stone Curlew - P4 (DEC Priority Species).
- *Apus pacificus* Fork-tailed Swift – S3 (WC Act), Migratory (EPBC Act).
- *Merops ornatus* Rainbow Bee-eater – S3 (WC Act), Migratory (EPBC Act).
- *Hirundo rustica* Barn Swallow – S3 (WC Act), Migratory (EPBC Act).

The following species of conservation significance, while possibly present in the general area and/or the wider region are not listed as potential species due to the study area being outside of their currently recognised range, a lack of suitable habitat or known/very likely local or regional extinction (and no subsequent recruitment from adjoining areas):

- *Liasis olivaceus barroni* Pilbara Olive Python – S1 (WC Act), Vulnerable (EPBC Act)
- *Ardea alba* Great Egret – S3 (WC Act), Migratory (EPBC Act)
- *Ardea ibis* Cattle Egret – S3 (WC Act), Migratory (EPBC Act)
- *Haliaeetus leucogaster* White-bellied Sea-Eagle – S3 (WC Act), Migratory (EPBC Act)
- *Pandion haliaetus* Osprey – S3 (WC Act), Migratory (EPBC Act)
- *Numenius madagascariensis* Eastern Curlew – S3 (WC Act), Migratory (EPBC Act)
- *Charadrius veredus* Oriental Plover – S3 (WC Act), Migratory (EPBC Act)
- *Glareola maldivarum* Oriental Pratincole – S3 (WC Act), Migratory (EPBC Act)
- *Phaps histrionica* Flock Bronzewing – P4 (DEC Priority Species)
- *Dasyurus hallucatus* Northern Quoll – S1 (WC Act), Endangered (EPBC Act)
- *Pseudomys chapmani* Western Pebble-mound Mouse – P4 (DEC Priority Species)
- *Mormopterus loriae cobourgiana* Little North-western Mastiff Bat – P1 (DEC Priority Species)
- *Rhinonicteris aurantius* Pilbara Leaf-nosed Bat – S1 (WC Act), Vulnerable (EPBC Act)
- *Macroderma gigas* Ghost Bat – P4 (DEC Priority Species).

### 2.7.2 Invertebrate Fauna

No listed threatened or priority invertebrate species appeared in the DEC and EPBC Act database searches.

The results of all fauna searches are provided in Appendix C of Harewood (2011) provided in Appendix A.

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

## 2.8 Local and Regional Significance

### 2.8.1 Flora

Apart from being listed as either Threatened or Priority Flora, plant species may be significant for a number of other reasons. The EPA in *Guidance Statement No. 51* (2004a) stated that significant flora may include taxa that have:

- *A keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species.*
- *Relic status.*
- *Anomalous features that indicate a potential new discovery.*
- *Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range).*
- *The presence of restricted subspecies, varieties or naturally occurring hybrid.*
- *Local endemism/a restricted distribution.*
- *Being poorly reserved.*

Similarly, plant communities or vegetation may be significant for reasons other than a listing as a TEC or PEC. The EPA (2004a) stated that these reasons include:

- *Scarcity.*
- *Unusual species.*
- *Novel combinations of species.*
- *A role as a refuge.*
- *A role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species.*
- *Being representative of the range of a unit (particularly, a good local and/or regional example.*
- *Of a unit in 'prime' habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range).*
- *A restricted distribution.*

### 2.8.2 Fauna

A number of species not listed in official lists can also be considered of local or regional conservation significance. These include species that have a restricted range, those that occur in breeding colonies and those at the limit of their range.

## FLORA AND FAUNA ASSESSMENT STOVE HILL, KARRATHA

### 3 Methods

#### 3.1 Field Survey

##### 3.1.1 Flora and Vegetation

A botanist from Emerge visited the site on the 19 August 2011 and undertook a Level 1 flora and vegetation assessment. The site was traversed on foot and a detailed survey of the vegetation was undertaken at six locations using non-permanent relevés, selected to adequately sample each plant community observed (as shown on **Figure 2**) and provides replication in plant communities. The position of each survey location was recorded with a hand-held GPS unit and all vascular plant species were recorded within a radius of at least 10 m from that point. In addition, opportunistic plant taxa that were observed, but not located at a particular survey location, were also recorded through the course of the survey. An estimate of the percentage Foliage Projective Cover (FPC) was made for each species at each survey location.

Environmental data recorded from each site included:

- Site details (site name, site number, observers, date, location).
- Environmental data (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event).
- Biological data (vegetation structure and condition, degree of disturbance, species cover percentages).

The condition of the vegetation was assessed to assist in determining the conservation values of the site. The vegetation condition was rated according to Keighery (1994), a scale that was developed primarily for areas within the Perth metropolitan area, however the principles remain relevant state wide. The categories are listed and defined in **Table 5**.

All plant specimens collected during the field survey were dried, pressed and then named in accordance with requirements of the Western Australian Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys.

Table 5: Vegetation condition scale (Keighery 1994)

VEGETATION CONDITION	DEFINITION
<b>Pristine</b>	Pristine or nearly so, no obvious signs of disturbance.
<b>Excellent</b>	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
<b>Very Good</b>	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.
<b>Good</b>	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. 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.



**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

VEGETATION CONDITION	DEFINITION
<b>Degraded</b>	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 very aggressive weeds, partial clearing, dieback and grazing.
<b>Completely Degraded</b>	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

### 3.1.2 Fauna

The fauna assessment involved both a desktop assessment and a field survey. The field survey was carried out by Greg Harewood (B.Sc. Zoology) on the 19 August 2011. The full assessment is provided in **Appendix A**.

#### 3.1.2.1 Fauna Habitat Assessment

Plant communities identified during the flora and vegetation survey were used to define broad fauna habitat types across the site. This information has been supplemented with observations made during the fauna survey.

The main aim of the habitat assessment was to determine if it was likely that any species of conservation significance would be utilising the areas that could be impacted on as a consequence of development at the site.

As part of the desktop literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was compiled. During the field survey the habitats within the study area were assessed and specific elements identified, if present, to determine the likelihood of listed threatened species utilising the area and its significance to them.

#### 3.1.2.2 Opportunistic Fauna Observations

Opportunistic observations of fauna species were made during a series of transects across the site while searching under logs, rocks, leaf litter and observations of bird species with binoculars.

## 3.2 Mapping and Data Analysis

Aerial photography (1:5 000) was used to map the local plant community types for the survey area. Plant communities were identified from the relevés sampled in the August site visit and were described according to the dominant species present. The vegetation structural description follows that of the National Vegetation Information System (Thackway *et al.* 2006). A cluster analysis was performed by converting the percentage Foliage Projected Cover for each species at each sample location to a Domin value (Kent and Coker 1994). Classification was undertaken using hierarchical clustering within the analysis package PRIMER 6 (Clarke and Gorley 2006), with groups defined using the Bray Curtis similarity measure and a 60% similarity cut-off between plant communities. The resulting dendrogram is provided in **Appendix B**.

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

The identified plant communities were then mapped on aerial photography (1: 5 000) from the relevé data points and interpretation of the aerial photograph. As no dataset exists to statistically identify Floristic Community Types (FCT) for the Pilbara region, comparisons with the DEC's TEC and PEC database were made using dominant species composition and soil and landform descriptions.

FLORA AND FAUNA ASSESSMENT  
STOVE HILL, KARRATHA

## 4 Results

### 4.1 Flora

A total of 57 native and 2 introduced (weed) species were recorded within the site in 2011, representing 19 families and 44 genera. The dominant families containing mostly native taxa were Fabaceae (18 native taxa), Poaceae (8 native, 1 weed taxa), Malvaceae (6 native taxa) and Amaranthaceae (4 native, 1 weed taxa). The most common genus was *Acacia* spp. (9 taxa). For a complete species list, species list by plant community and individual survey site data refer to **Appendix C**, **Appendix D** and **Appendix E** respectively.

#### 4.1.1 Threatened, Priority Flora and Species of Significance

No Threatened, Priority Flora or species of significance were recorded on the site.

#### 4.1.2 Plant Communities

Three plant communities plus areas of disturbed closed tussock grassland were separated through the analysis, and these are shown on **Figure 2** and are described as follows:

**C1** - Emergent *Eucalyptus victrix* and *Corymbia hamersleyana* over open shrubland of *Santalum lanceolatum*, *Acacia inaequilatera*, *Acacia colei* and *Grevillea pyramidalis* over closed tussock grassland of *\*Cenchrus ciliaris* and *Dichanthium sericeum* subsp. *humilius* in major flow pathways (**Plate 1**).

**C2** - Open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* with isolated trees of *Corymbia hamersleyana*, over hummock grassland of *Triodia wiseana* and open tussock grassland of *Chrysopogon fallax* and *\*Cenchrus ciliaris* in minor flow pathways (**Plate 2**).

**T1** - Hummock grassland *Triodia wiseana* and isolated tussock grasses of *Enneapogon caerulescens* and *Aristida contorta* within emergent open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* and *Acacia ancistrocarpa* with sparse forbland of *Ptilotus exaltatus*, *Ptilotus helipteroides*, *Stackhousia intermedia* and *Indigofera monophylla* on rocky slopes of Karratha Hills (**Plate 3**).

**B** - Degraded closed tussock grassland of *\*Cenchrus ciliaris* (Buffel grass) (**Plate 4**).



**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

**Plate 1:** Plant community C1 - Emergent *Eucalyptus victrix* and *Corymbia hamersleyana* over open shrubland of *Santalum lanceolatum*, *Acacia inaequilatera*, *Acacia colej* and *Grevillea pyramidalis* over closed tussock grassland of *\*Cenchrus ciliaris* and *Dichanthium sericeum* subsp. *humilius*. Found in major flow pathways. Located at 484107 E; 7705127 N facing east.



**Plate 2:** Plant community C2 - Open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* with isolated trees of *Corymbia hamersleyana*, over hummock grassland of *Triodia wiseana* and open tussock grassland of *Chrysopogon fallax* and *\*Cenchrus ciliaris*. Found in minor flow pathways. Located at 483765 E; 7705153 N.

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

**Plate 3:** Plant community T1 - Hummock grassland of *Triodia wiseana* and isolated tussock grasses of *Enneapogon caerulescens* and *Aristida contorta* within emergent open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* and *Acacia ancistrocarpa* with sparse forbland of *Ptilotus exaltatus*, *Ptilotus helipteroides*, *Stackhousia intermedia* and *Indigofera monophylla*. Located on flats and rocky slopes. Located at 484071 E; 7705156 N.



**Plate 4:** Plant community B – Degraded closed tussock grassland of *\*Cenchrus ciliaris*. Located at 484099 E; 7705238 N.



## FLORA AND FAUNA ASSESSMENT STOVE HILL, KARRATHA

### 4.1.3 Conservation Significance of Plant Communities

Based on species composition and soil and landform descriptions of PEC community 'Roebourne Plains coastal grasslands with gilgai micro-relief occur on deep cracking clays', as described within Section 2.6, none of the plant communities identified within the site are likely to represent this community. There are no other listed Threatened or Priority Ecological Communities in the area.

The assessment of the regional representation and conservation significance of the vegetation units defined by this study is limited by the lack of regional mapping of geology, land systems or vegetation at a similar scale. The plant communities detailed above represent the generally dominant communities and flora species found across much of the Pilbara region. For this reason they are not considered to be particularly conservation significant. Despite this, much of vegetation present on site is in excellent condition with little previous disturbance or weed invasion and thus is of local environmental value.

### 4.1.4 Vegetation Condition

Vegetation condition across the site ranges from 'Completely Degraded' to 'Excellent to Pristine'. The majority of the site (and especially the western part of the site) was found to be in 'Excellent' condition. The main areas of disturbance were located close to the flow lines, near Karratha Road and adjacent to the former Drive-In cinema. Along the major flow line vegetation was in 'Very Good to Excellent' condition with some weed invasion from Buffel grass in the west, with vegetation condition declining closer to Karratha Road in the east where it is in 'Degraded to Good' condition. This is due to invasion of Buffel grass along the flow line. A large proportion of the eastern most area within the site is in 'Degraded to Good' or 'Good' condition due to past clearing and invasion by Buffel grass. Several narrow strips were consisted to be in "Completely Degraded" condition where vegetation has been cleared for vehicle tracks. Vegetation condition across the site is shown on Figure 3.

## 4.2 Fauna

### 4.2.1 Fauna Habitat Assessment

The broad scale fauna habitats within the study area are based on vegetation structure as identified during the flora and vegetation survey and described in Section 4.1.2.

### 4.2.2 Opportunistic Fauna Surveys

The results of the opportunistic fauna survey are listed in Appendix B of Harewood (2011) provide in Appendix A. A total of 29 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the single day reconnaissance survey carried out in August 2011. Observed fauna species included 26 species of birds, one reptile species and two non-volant (non-flying) mammal species. No fauna species of conservation significance (listed on state or federal threatened/migratory species lists or DEC priority species) were positively identified as having used the study area during the Level 1 field reconnaissance survey.

FLORA AND FAUNA ASSESSMENT  
STOVE HILL, KARRATHA

## 5 Discussion

### 5.1 Flora and Vegetation

57 native flora species were recorded within the site within three intact plant communities. None of these species are considered to be of conservation significance. No PEC or TEC's were recorded within the site. However, as the majority of the vegetation within the site is in 'Very Good' to 'Excellent-Pristine' condition, the vegetation has local environmental significance.

Vegetation within the site is representative of the characteristic vegetation communities found within the Pilbara 'PIL4 – Roebourne synopsis' biogeographical subregion. Flats and plains generally support *Acacia stellaticeps*, *A. pyrifolia* and *A. inaequaliter* dominated shrublands whilst uplands are dominated by *Triodia* hummock grasslands (McKenzie *et al.* 2003). Ephemeral drainage lines within the subregion generally support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands (McKenzie *et al.* 2003), as is seen within the site. Thus the plant communities recorded within the site are well represented across the PIL4 - Roebourne subregion. The PIL4 subregion has 9.56% of its surface under some form of conservation tenure; this is above the average for the whole Pilbara bioregion (7.75%) (McKenzie *et al.* 2003).

Plant communities **C1** and **C2** are associated with major and minor flow pathways within the site and contain relatively mesophytic flora. The major flow line running along the south of the site is ephemeral and foreshore vegetation consists of plant community **C1**. The minor flow lines running down from the north containing plant community **C2** are also ephemeral flow paths and provide drainage from the Karratha Hills to the north into the major flow line at the base of the site. From a policy perspective the major flow line will require a foreshore setback from any development in order to protect the quality of the waterways and to limit potential flooding impacts.

Areas of the site in 'Good' and 'Degraded' condition occur to the west and south of the former Drive-In cinema. These areas have been subject to disturbance through clearing and weed invasion from the grass species Buffel Grass, which was introduced by pastoralists as a fodder species. This species has demonstrated allelopathic capacities (releasing chemicals that inhibit the growth of other plants) and is an aggressive and effective competitor with native flora. This perennial grass forms dense tussock grasslands particularly along flow pathways and floodplains (as shown within the site by Plant Community **B**).

### 5.2 Fauna

Of the 155 native animals that are listed as potentially occurring in the area, one (Peregrine Falcon) is considered to be in need of special protection under the WC Act. In addition three migratory bird species may frequent the area at times and three DEC priority species was identified as possibly present.

The anticipated degree of impact on specific species of conservation significance previously recorded in the general area are provided in **Table 6** below, taken from Harewood (2011). Additional information on specific fauna species are provided in Appendix D of Harewood (2011) which is provided in **Appendix A**.

The broadly defined fauna habitats present within the development area were identified as being common and widespread in the wider area and the faunal assemblage identified as potentially present

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

is unlikely to be different to that found in similar habitat located elsewhere in the region. It can therefore be concluded that the project area does not contain habitat of high ecological significance from a faunal perspective or contain faunal assemblages that are ecologically significant.

Table 6: Likelihood of occurrence and degree of potential impact – fauna species of conservation significance

COMMON NAME	GENUS & SPECIES	CONSERVATION STATUS	LIKELIHOOD OF OCCURRENCE	POTENTIAL IMPACT ON HABITAT	DEGREE OF IMPACT	JUSTIFICATION
Lined Soil-Crevise Skink	<i>Notoscincus butleri</i>	P4	Possible	Modification/ loss of a small area of habitat	Low	Habitat, if suitable, very limited in extent
Pilbara Olive Python	<i>Liasis olivaceus barroni</i>	S1 VU	Unlikely	None	Nil	Preferred habitat lacking
Great Egret	<i>Ardea alba</i>	S3 Mig	Unlikely	None	Nil	No suitable habitat
Cattle Egret	<i>Ardea ibis</i>	S3 Mig	Unlikely	None	Nil	No suitable habitat
Peregrine Falcon	<i>Falco peregrinus</i>	S4	Possible	None Likely	Nil/Very Low	Widespread species that can use degraded habitats
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Mig	Unlikely/Flyover Only	None	Nil	No suitable habitat
Osprey	<i>Pandion haliaetus</i>	Mig	Unlikely/Flyover Only	None	Nil	No suitable habitat
Australian Bustard	<i>Ardeotis australis</i>	P4	Possible	Modification/ loss of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats
Eastern Curlew	<i>Numenius madagascariensis</i>	S3, P4, Mig	Unlikely	None	Nil	No suitable habitat
Bush Stone-curlew	<i>Burhinus grallarius</i>	P4	Possible	Modification/ loss of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats
Oriental Plover	<i>Charadis veredus</i>	S3, Mig	Unlikely	None	Nil	No suitable habitat
Oriental Pratincole	<i>Glareola maldivarum</i>	S3, Mig	Unlikely	None	Nil	No suitable very marginal/habitat
Flock Bronzewing	<i>Phaps histrionic</i>	P4	Unlikely	None	Nil	Habitat marginal, probably locally extinct
Fork-tailed Swift	<i>Apus pacificus</i>	S3 Mig	Flyover Only	None	Nil	Aerial Species
Rainbow Bee-eater	<i>Merops ornatus</i>	S3 Mig	Possible	Modification/ loss of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats
Barn Swallow	<i>Hirundo rustica</i>	S3 Mig	Possible	Modification of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats



**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

COMMON NAME	GENUS & SPECIES	CONSERVATION STATUS	LIKELIHOOD OF OCCURRENCE	POTENTIAL IMPACT ON HABITAT	DEGREE OF IMPACT	JUSTIFICATION
Northern Quoll	<i>Dasyurus hallucatus</i>	S1 EN	Unlikely	None	Nil	Preferred habitat lacking, transients only
Western Pebble-mound Mouse	<i>Pseudomys chapmani</i>	P4	Unlikely	None	Nil	Habitat limited in extent, probably locally extinct
Little North-western Mastiff Bat	<i>Mormopterus loriae cobourgiana</i>	P1	Unlikely	None	Nil	Preferred roosting habitat absent
Pilbara Leaf-nosed Bat	<i>Rhinioncteris aurantius p</i>	S1 VU	Unlikely	None	Nil	Preferred roosting habitat absent
Ghost Bat	<i>Macroderma gigas</i>	P4	Unlikely	None	Nil	Preferred roosting habitat absent

### 5.2.1 Commonwealth Environment Protection & Biodiversity Conservation Act 1999

The objective of the EPBC Act is to provide for the protection of the environment, especially those aspects that are of national significance, promote ecologically sustainable development, the conservation of biodiversity and a cooperative approach to the protection and management of the environment.

#### 5.2.1.1 Listed Threatened Species

No listed EPBC Act threatened fauna species are considered likely to be utilising the study area to any substantial degree. It is therefore very unlikely that development of the site at any scale would constitute a potentially significant impact (as defined by SEWPaC) on any EPBC Act listed threatened fauna species.

#### 5.2.1.2 Listed Migratory Species

EPBC Act listed migratory fauna species identified as being present in the general area of the development site at times were:

- *Apus pacificus* Fork-tailed Swift
- *Merops ornatus* Rainbow Bee-eater
- *Hirundo rustica* Barn Swallow

An action has, will have, or is likely to have a significant impact on migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species; or
- result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species; or



**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An area of important habitat is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species;
- habitat that is of critical importance to the species at particular life-cycle stages;
- habitat utilised by a migratory species which is at the limit of the species range; or
- habitat within an area where the species is declining.

To have a significant impact on a migratory species as defined under the SEWPaC Significant Impact Guidelines (DEWHA 2009), any proposed development would need to trigger at least one of the above mentioned significant impact criteria thresholds. Each of these is briefly assessed below.

*Substantially modify, destroy or isolate an area of important habitat of the migratory species*

The study area does not represent important habitat for any of the migratory species listed as potentially utilising the site.

The Fork-tailed Swift is an aerial species that rarely roosts. It would not be specifically attracted to the area and if ever present would only stay temporarily. Rainbow Bee-eaters are seasonally widespread and common in southern WA and utilise both natural and totally degraded habitats. Individuals of this species may frequent the area at times but they would not be specifically attracted to the site. The percentage of the population present at any one time would be very small and insignificant as they rarely congregated in colonies. Barn Swallow also utilise both natural and totally degraded habitats and development of the site will have no effect on the status of this species whatsoever.

This criteria will therefore not be compromised by any development within the site proceeding.

*Result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species*

There is no evidence available to suggest that sections of the study area represents important habitat to any of the migratory species listed as potentially utilising the site. It is extremely unlikely that the proposed development of the land would result in an invasive species that is harmful to migratory species becoming established on the site or in the vicinity.

This criteria will not be compromised by any development within the site proceeding.

*Seriously disrupt the lifecycle of an ecologically significant proportion of the population of the species.*

There is no evidence available to suggest that sections of the study area represents important habitat to any of the migratory species listed as potentially utilising the site. The proposal area or adjoining areas would not support, at any time of the year, a significant proportion of the population of any migratory species.

This criteria will not be compromised by any development within the site proceeding.

In all cases it is considered unlikely that the impact caused by development at the site would trigger any of the abovementioned criteria and therefore no significant impact on EPBC Act listed migratory species can be considered likely.

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

## 6 Conclusions and Recommendations

The flora and fauna assessment undertaken by Emerge and Greg Harewood in August 2011 identified 59 flora species (57 native and 2 introduced) occurring within the site and 155 native fauna species potentially utilizing the site.

Vegetation across the site was found to be within three intact plant communities as well as areas of degraded closed tussock grassland of *\*Cenchrus ciliaris* (B). Woodland of *Eucalyptus victrix* and *Corymbia hamersleyana* over open shrubland of *Santalum lanceolatum*, *Acacia inaequilatera*, *Acacia colei* and *Grevillea pyramidalis* over closed tussock grassland of *\*Cenchrus ciliaris* and *Dichanthium sericeum* subsp. *humilius* (C1) occurred in major flow lines within the site. Open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* with isolated trees of *Corymbia hamersleyana*, over hummock grassland of *Triodia wiseana* and open tussock grassland of *Chrysopogon fallax* and *\*Cenchrus ciliaris* (C2) was recorded in minor flow lines within the site. Areas of open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* and *Acacia ancistrocarpa* over hummock grassland of *Triodia wiseana* and isolated tussock grasses of *Enneapogon caerulescens* and *Aristida contorta* with sparse forbland of *Ptilotus exaltatus*, *Ptilotus helipteroides*, *Stackhousia intermedia* and *Indigofera monophylla* (T1) occurred on flats and hill slopes.

Vegetation condition across much of the site was 'Excellent to Pristine', especially to the west. Closer to Karratha road and surrounding the Drive-In cinema site on Lot 1090, vegetation condition ranged from 'Completely Degraded' along cleared tracks to 'Degraded to Good' and 'Very Good' along the major and minor flow lines. Along the flow lines, various levels of weed invasion by *\*Cenchrus ciliaris* was the primary cause of reduced vegetation condition.

No Threatened or Priority Flora, PEC or TEC's, or other botanical features of high conservation significance were recorded across the site.

With respect to native vertebrate fauna, 18 mammals (includes 9 bats species), 78 bird, 57 reptile and two frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise the proposed development area at times. Based on habitat preferences, a range of previous survey results and currently documented distributions it has been concluded to be unlikely that any threatened (vulnerable, endangered, rare or likely to become extinct) species frequent the study area except possibly as vagrants, on rare occasions.

No significant impact to any EPBC Act Threatened Fauna species is anticipated, principally because none can be considered likely to be using the site to any significant degree. The site also does not appear to contain habitat that could be considered critical for the recovery of any listed threatened species.

Other species of conservation significance that may be present at times include one species considered in need of special protection under state legislation (Peregrine Falcon), three DEC priority species (Lined Soil-crevice Skink, Australian Bustard and the Bush Stone Curlew) and three migratory bird species (Fork-tailed Swift, Rainbow Bee-eater, Barn Swallow). Development at the site may result in the loss/modification of some habitat utilised by these species at times but this is very unlikely to alter their conservation status on a local or regional scale.

The broadly defined plant communities present within the development area were identified as being common and widespread in the wider area and the faunal assemblage identified as potentially present is unlikely to be different to that found in similar habitat located elsewhere in the region. It can

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

therefore be concluded that the site does not contain habitat of high ecological significance from a faunal perspective or contain faunal assemblages that are regionally significant.

Any proposed development within the site will necessarily require the clearing of existing vegetation and fauna habitat, and the Greenvalley Asset site will be almost entirely cleared. Planning for the proposal should take into account the presence of native fauna and flora so that impacts can be minimised and managed. A series of other recommendations aimed at mitigating and minimising potential impacts on fauna and fauna habitat in general are provided in Section 8.2 of Harewood (2011) provided in **Appendix A**. These should be incorporated into required management plans where considered reasonable and practicable.

Whilst no floral or faunal values of regional conservation significance were found, Emerge recommends that within the context of a planning and development framework, consideration is given to:

- Retention of as much vegetation as is reasonable and practical in 'Very Good' to 'Pristine', preferably in a single large area rather than smaller, fragmented and scattered areas (**Figure 3**). From a fauna habitat perspective larger trees and dense vegetation should be retained where possible.
- Control of the weed *Cenchrus ciliaris* adjacent to the creek lines and in degraded areas within the site is recommended.
- Retention of and foreshore setback from the major flow pathway running along the southern edge of the site will be required by local and state planning policy in order to protect water resources. In addition, foreshore setback from the minor flow lines, or alternative water management, is recommended in order to prevent flooding of any developed areas and runoff into larger waterways. A Local Water Management Strategy (Emerge Associates 2011) has been developed to manage hydrological attributes within the site.
- Disruption to surface and sub-surface hydrology should be minimised where possible and levees and drains designed to mimic natural drainage flows where disruptions will occur. See the Local Water Management Strategy (Emerge Associates 2011) for further information.

**FLORA AND FAUNA ASSESSMENT**  
STOVE HILL, KARRATHA

## 7 References

- Beard, JS 1990. Plant Life of Western Australia, Kangaroo Press Pty Ltd.
- Bureau of Meteorology. 2011. "Climate Averages." Retrieved March, 2011, from <http://www.bom.gov.au/climate/data/>.
- Clarke, KR and Gorley, RN 2006. PRIMER v6: User Manual/Tutorial. Plymouth, PRIMER-E.
- DEC 2009. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Perth, Department of Environment and Conservation.
- DEC 2010. Priority Ecological Communities for Western Australia Version 15. Branch, SaC. Perth, Department of Conservation and Environment.
- DEWHA 2009. EPBC Act - Principle Significant Impact Guidelines 1.1, Matters of National Environmental Significance, EPBC Act Policy Statement. Department of the Environment, Water, Heritage and the Arts.
- DoW 2006. Vegetation Buffers to Sensitive Water Resources, Water Quality Protection Note Number 6 (WQPN6). Perth, Government of Western Australia.
- DoW 2010. Pilbara Regional Water Plan 2010-2030. Perth, Government of Western Australia.
- Emerge Associates 2011. Local Water Management Strategy: Karratha Local Structure Plan. Subiaco, Unpublished report prepared for Greenvalley Asset.
- English, V and Blyth, J 1997. Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province, ANCA National Reserves System Cooperative Program, Project Number N702.
- EPA 2004a. Guidance Statement No. 51. Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia. Perth, Environmental Protection Authority.
- EPA 2004b. Guidance Statement No. 56. Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Perth, Environmental Protection Authority.
- Gov. of WA 2003. A State Water Strategy for Western Australia. Perth, Government of Western Australia.
- Harewood, G 2011. Terrestrial Fauna Survey (Level 1) of Unallocated Crown Land Stovehill Karratha. Bunbury, Unpublished report prepared on behalf of Emerge Associates.
- Keighery, B 1994. Bushland Plant Survey: A guide to plant community survey for the community. Nedlands, Wildflower Society of WA (Inc).
- Kent, M and Coker, P 1994. Vegetation description and analysis: A practical approach. Chichester, John Wiley & Sons.
- McKenzie, NL, May, JE and McKenna (ed), S, Eds. 2003. Bioregional Summary of the 2002 Biodiversity Audit for Western Australia. Perth, Department of Conservation and Land Management.
- Thackway, R, Neldner, J and Bolton, M 2006. Chapter 8: Vegetation. The Blue Book: Australian Soil and Land Survey Handbook Guidelines for Conducting Surveys. Canberra, CSIRO.
- WAPC 2005. State Planning Policy 2.9: Water Resources. Gazetted in December 2006. Perth, Western Australian Planning Commission.

FLORA AND FAUNA ASSESSMENT  
STOVE HILL, KARRATHA

WRC 2001a. River Restoration: Determining Foreshore Reserves. Report No. RR16. East Perth, Water and Rivers Commission.

WRC 2001b. Water Note 23: Determining Foreshore Reserves. East Perth, Water and Rivers Commission. **WN23**.

WRC 2002. Foreshore Policy 1: Identifying the Foreshore Area. East Perth, Water and Rivers Commission.



# FIGURES



*Figure 1: Site Locality and Plan*

*Figure 2: Plant Communities*

*Figure 3: Vegetation Condition*



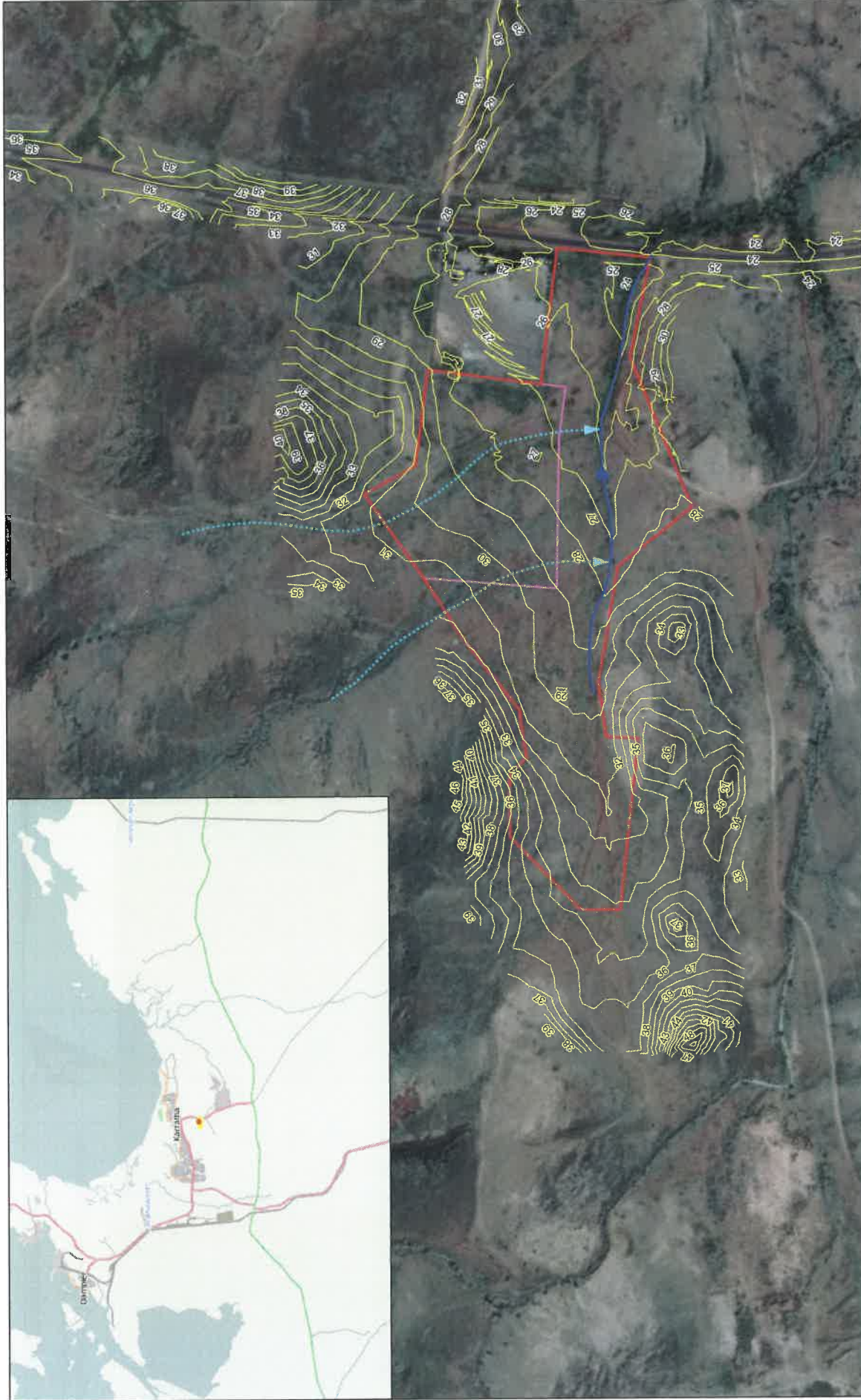
01/09/11 :Date  
1:5,000@A3 :Scale  
EP11-018(003)-F01 :Plan Number  
SKP :Checked  
JDH :Approved  
Notes: This drawing is the property of Emerge Associates and shall not be used without permission.

**Sources**  
The following datasets were used in the production of this map:  
Contours - Whilans (2011)

**Legend**  
Study area  
Contours (mAHD)  
Greenvalley asset site  
Stream line  
Flow pathways



**Title: Figure 1: Locality Plan**  
**Project: Karatha Amendment Support - Flora and Fauna Assessment**  
**Client: Greenvalley Asset Pty Ltd**



0 100 200 300 Meters



- Legend**
- Study area
  - Survey locations
  - Greenvalley asset site
  - B Closed tussock grassland of *Cenchrus ciliaris*
  - C1 Hummock grassland *Triodia wiseana* and isolated tussock grasses of *Enneapogon caerulescens* and *Aristida contorta* within emergent open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* and *Acacia anisocarpa* with sparse formland of *Ptilotus exaltatus*, *Ptilotus helipteroides*, *Stackhousia intermedia* and *Indigofera monophylla* on rocky slopes of Karraatha Hills.
  - T1 Emergent *Eucalyptus victrix* and *Corymbia hamersleyana* over open shrubland of *Santalum lanceolatum*, *Acacia inaequilatera*, *Acacia colei* and *Grevillea pyramidalis* over closed tussock grassland of *Cenchrus ciliaris* and *Dichanthium sericeum* subsp. *humilius* in major flow lines.
  - C2 Open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* with isolated trees of *Corymbia hamersleyana*, over hummock grassland of *Triodia wiseana* and open tussock grassland of *Chrysopogon fallax* and *Cenchrus ciliaris* in minor flow lines.
  - Flow pathways
  - ▶ Stream

Title: Figure 2: Plant Communities

Project: Karraatha Amendment Support - Flora and Fauna Assessment

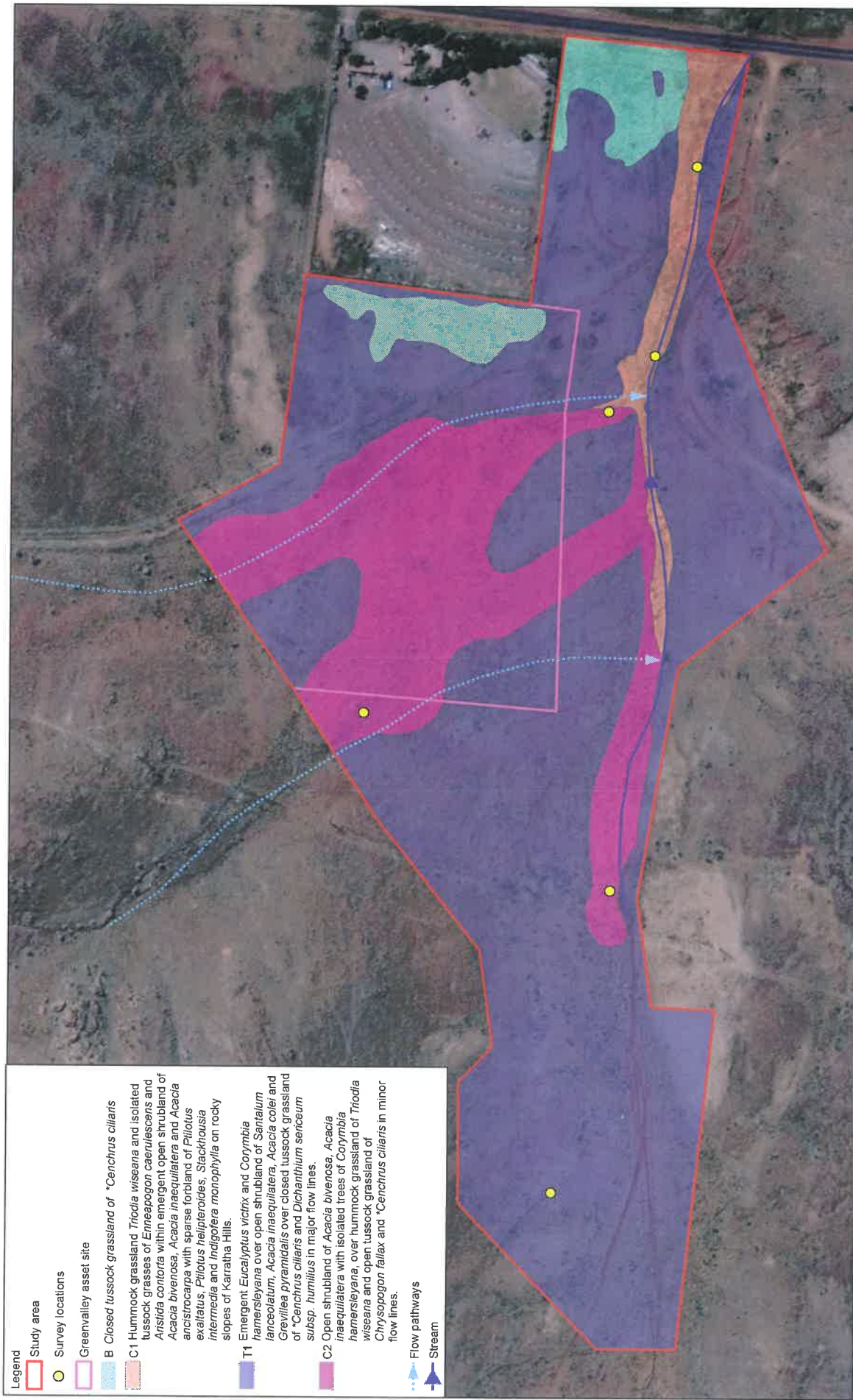
Client: Greenvalley Asset Pty Ltd

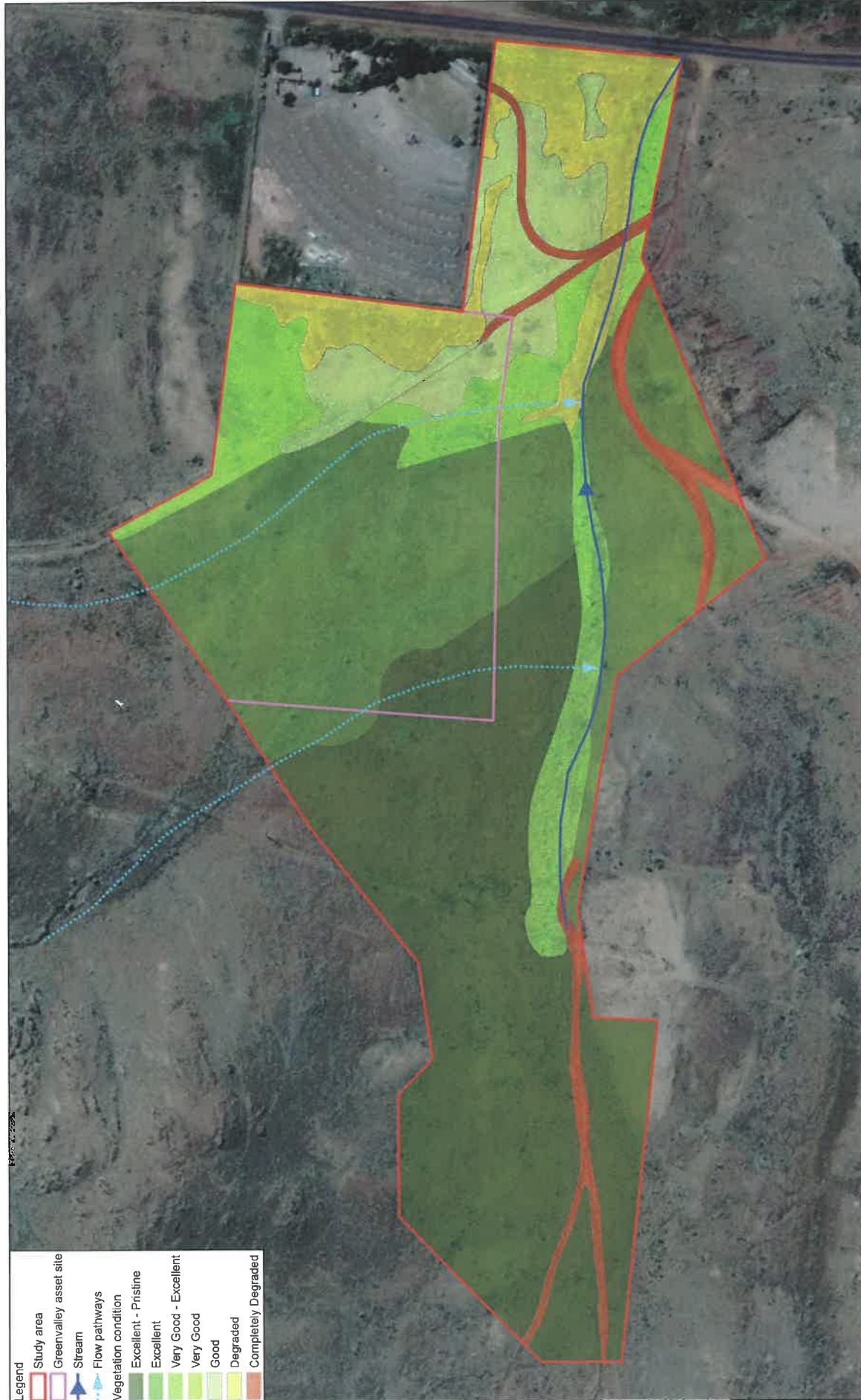


**Sources**  
The following datasets were used in the production of this map:

01/09/11 :Date  
1:2,500@A3 :Scale  
EP11-018(003)-F02 :Plan Number  
SKP :Checked  
JDH :Approved

Notes: This drawing is the property of Emerge Associates and shall not be used without permission.





- Legend**
- Study area
  - Greenvalley asset site
  - Stream
  - Flow pathways
  - Vegetation condition**
  - Excellent - Pristine
  - Excellent
  - Very Good - Excellent
  - Very Good
  - Good
  - Degraded
  - Completely Degraded

<p><b>Title:</b> Figure 3: Vegetation Condition</p> <p><b>Project:</b> Karratha Amendment Support - Flora and Fauna Assessment</p> <p><b>Client:</b> Greenvalley Asset Pty Ltd</p>			<p><b>Sources</b></p> <p>The following datasets were used in the production of this map:</p>	<p><b>01/09/11 :Date</b></p> <p><b>1:2,500@A3 :Scale</b></p> <p><b>EP11-018(003)-F03 :Plan Number</b></p> <p><b>:SKP :Checked</b></p> <p><b>:JDH :Approved</b></p> <p><small>Notes: This drawing is the property of Emerge Associates and shall not be used without permission.</small></p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	--	----------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------





# APPENDIX A



HAREWOOD 2011 TERRESTRIAL FAUNA ASSESSMENT STOVEHILL KARRATHA

**Terrestrial Fauna Survey  
(Level 1)  
of  
Unallocated Crown Land  
Stovehill  
Karratha**



September 2011  
Version 2

*On behalf of:*  
Emerge Associates  
Suite 4, 6 Centro Avenue  
Subiaco WA 6008  
T: (08) 9380 4988

*Prepared by:*  
Greg Harewood B.Sc.  
A.B.N. 95 536 627 336  
PO Box 755  
BUNBURY WA 6231  
M: 0402 141 197  
T/F: (08) 9725 0982  
E: gharewood@iinet.net.au

## TABLE OF CONTENTS

### EXECUTIVE SUMMARY

1.	INTRODUCTION.....	1
3.	BIOGEOGRAPHICAL SETTING .....	1
4.	SCOPE OF WORKS .....	2
5.	METHODOLOGY .....	3
5.1	POTENTIAL FAUNA INVENTORY - DESKTOP STUDY .....	3
5.1.1	Database Searches .....	3
5.1.2	Previous Fauna Surveys in the Area.....	3
5.1.3	Existing Publications.....	4
5.1.4	Fauna of Conservation Significance .....	5
5.1.5	Invertebrates.....	6
5.1.6	Taxonomy and Nomenclature.....	6
5.2	SITE SURVEYS .....	7
5.2.1	Fauna Habitat Assessment.....	7
5.2.2	Opportunistic Fauna Observations.....	7
6.	SURVEY CONSTRAINTS .....	7
7.	RESULTS.....	8
7.1	POTENTIAL FAUNA INVENTORY - DESKTOP STUDY .....	8
7.2	SITE SURVEYS .....	9
7.2.1	Fauna Habitat Assessment.....	9
7.2.2	Opportunistic Fauna Surveys.....	9
7.3	FAUNA INVENTORY – SUMMARY .....	10
7.3.1	Vertebrate Fauna.....	10
7.3.2	Invertebrate Fauna .....	13



8.	ECOLOGICAL IMPACTS AND MANAGEMENT .....	13
8.1	POTENTIAL IMPACTS.....	13
8.2	MINIMISING IMPACTS .....	15
9.	COMMONWEALTH ENVIRONMENT PROTECTION & BIODIVERSITY CONSERVATION ACT 1999.....	16
9.1	LISTED THREATENED SPECIES .....	17
9.2	LISTED MIGRATORY SPECIES.....	17
10.	CONCLUSION .....	19
11.	BIBLIOGRAPHY.....	21

## FIGURES

- FIGURE 1: Study Area & Surrounds
- FIGURE 2: Study Area - Air Photo
- FIGURE 3: Fauna Habitats

## TABLES

- TABLE 1: Summary of Potential Vertebrate Fauna Species
- TABLE 2: Likelihood of Occurrence and Degree of Potential Impact – Fauna Species of Conservation Significance

## **PLATES**

- PLATE 1: Emergent trees over open shrubland over closed tussock grassland in major flow line
- PLATE 2: Open shrubland with isolated trees over hummock grassland and open tussock grassland in minor flow lines
- PLATE 3: Hummock grassland and isolated tussock grasses within emergent open shrubland on rocky slopes
- PLATE 4: Closed tussock grassland (Buffel Grass)

## **APPENDICES**

- APPENDIX A: Conservation Categories
- APPENDIX B: Fauna Observed in Study Area
- APPENDIX C: DEC NatureMap & EPBC Database Search Results
- APPENDIX D: Significant Species Profiles

## **DISCLAIMER**

This fauna assessment report ("the report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Greg Harewood ("the Author"). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints. In accordance with the scope of services, the Author has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

The conclusions are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

Within the limitations imposed by the scope of services, the field assessment and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

In preparing the report, the Author has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise stated in the report, the Author has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. The Author will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to the Author.

The report has been prepared for the benefit of the Client and no other party. The Author assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of the Author or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

The Author will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

## EXECUTIVE SUMMARY

This report details the results of a Level 1 fauna assessment of an area of Unallocated Crown Land situated about 3 km south of Karratha, Western Australia. The study site has an area of approximately 19.9 ha (Figures 1 & 2).

The assessment has included a desktop study, which included a review of available fauna related data for the area and a field reconnaissance survey. Field survey work was carried out by Greg Harewood (B.Sc. Zoology) during a one day period on the 19<sup>th</sup> August, 2011.

The broad scale fauna habitats within the study area are based on vegetation structure as identified during the flora and vegetation survey (Emerge 2011a). The location and approximate extent of each identified unit is shown in Figure 3 with a description below. More detail on the vegetation units present can be found in the flora and vegetation report (Emerge 2011).

- T1 Hummock grassland *Triodia wiseana* and isolated tussock grasses of *Enneapogon caeruleus* and *Aristida contorta* within emergent open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* and *Acacia ancistrocarpa* with sparse forbland of *Ptilotus exaltatus*, *Ptilotus helipteroides*, *Stackhousia intermedia* and *Indigofera monophylla* on rocky slopes of Karratha Hills.
- B Degraded closed tussock grassland of *\*Cenchrus ciliaris* (Buffel grass).
- C1 Emergent *Eucalyptus victrix* and *Corymbia hamersleyana* over open shrubland of *Santalum lanceolatum*, *Acacia inaequilatera*, *Acacia coleii* and *Grevillea pyramidalis* over closed tussock grassland of *\*Cenchrus ciliaris* and *Dichanthium sericeum* in major flow lines.
- C2 Open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* with isolated trees of *Corymbia hamersleyana*, over hummock grassland of *Triodia wiseana* and open tussock grassland of *Chrysopogon fallax* and *\*Cenchrus ciliaris* in minor flow lines.

Note \* = introduced plant species

Plates 1 to 4 illustrate the nature of the main fauna habitats existing within the project area.

A complete list of vertebrate fauna possibly inhabiting or frequenting the study area is held in Appendix B. With respect to native vertebrate fauna, 18 mammals (includes 9 bats species), 78 bird, 57 reptile and two frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise at times, the proposed development area.

A total of 29 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the single day reconnaissance survey carried out in August 2011. No fauna species of conservation significance (listed on state or federal threatened/migratory species lists or Department of Environment and Conservation (DEC) priority species) were positively identified as having used the study area during the Level 1 field reconnaissance survey.

Species of conservation significance that may be present at times include one species considered in need of special protection under state legislation (Peregrine Falcon), four DEC priority species (Lined Soil-Crevise Skink, Australian Bustard and the Bush Stone Curlew) and three migratory bird species (Fork-tailed Swift, Rainbow Bee-eater, Barn Swallow).

The exact extent and nature of development within the study area is not known at this stage however development is likely to result in the loss/modification of some habitat. The anticipated degree of impact on specific species of conservation significance previously recorded in the general area is provided in the table below. Additional information on specific fauna species are provided in Appendix D.

**Likelihood of Occurrence and Degree of Potential Impact – Fauna Species of Conservation Significance (continues on following page).**

Common Name	Genus & Species	Conservation Status	Likelihood of Occurrence	Potential Impact on Habitat	Degree of Impact	Justification
Lined Soil-Crevise Skink	<i>Notoscincus butleri</i>	P4	Possible	Modification/loss of a small area of habitat	Low	Habitat, if suitable, very limited in extent
Pilbara Olive Python	<i>Liasis olivaceus barroni</i>	S1 VU	Unlikely	None	Nil	Preferred habitat lacking
Great Egret	<i>Ardea alba</i>	S3 Mig	Unlikely	None	Nil	No suitable habitat
Cattle Egret	<i>Ardea ibis</i>	S3 Mig	Unlikely	None	Nil	No suitable habitat
Peregrine Falcon	<i>Falco peregrinus</i>	S4	Possible	None Likely	Nil/Very Low	Widespread species that can use degraded habitats
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Mig	Unlikely/Flyover Only	None	Nil	No suitable habitat
Osprey	<i>Pandion haliaetus</i>	Mig	Unlikely/Flyover Only	None	Nil	No suitable habitat
Australian Bustard	<i>Ardeotis australis</i>	P4	Possible	Modification/loss of a small area of habitat	Nil/Very Low	Widespread species, habitat common in area
Eastern Curlew	<i>Numenius madagascariensis</i>	S3, P4, Mig	Unlikely	None	Nil	No suitable habitat
Bush Stone-curlew	<i>Burhinus grallarius</i>	P4	Possible	Modification/loss of a small area of habitat	Nil/Very Low	Widespread species, habitat common in area
Oriental Plover	<i>Charadrius veredus</i>	S3, Mig	Unlikely	None	Nil	No suitable habitat



Common Name	Genus & Species	Conservation Status	Likelihood of Occurrence	Potential Impact on Habitat	Degree of Impact	Justification
Oriental Pratincole	<i>Glareola maldivarum</i>	S3, Mig	Unlikely	None	Nil	No suitable very marginal/habitat
Flock Bronzewing	<i>Phaps histrionic</i>	P4	Unlikely	None	Nil	Habitat marginal, probably locally extinct
Fork-tailed Swift	<i>Apus pacificus</i>	S3 Mig	Flyover Only	None	Nil	Aerial Species
Rainbow Bee-eater	<i>Merops ornatus</i>	S3 Mig	Possible	Modification/loss of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats
Barn Swallow	<i>Hirundo rustica</i>	S3 Mig	Possible	Modification of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats
Northern Quoll	<i>Dasyurus hallucatus</i>	S1 EN	Unlikely	None	Nil	Preferred habitat lacking, transients only
Western Pebble-mound Mouse	<i>Pseudomys chapmani</i>	P4	Unlikely	None	Nil	Habitat limited in extent, probably locally extinct
Little North-western Mastiff Bat	<i>Mormopterus loriae cobourgiana</i>	P1	Unlikely	None	Nil	Preferred roosting habitat absent
Pilbara Leaf-nosed Bat	<i>Rhinonictis aurantius p</i>	S1 VU	Unlikely	None	Nil	Preferred roosting habitat absent
Ghost Bat	<i>Macroderma gigas</i>	P4	Unlikely	None	Nil	Preferred roosting habitat absent

The broadly defined fauna habitats present within the development area were identified as being common and widespread in the wider area and the faunal assemblage identified as potentially present is unlikely to be different to that found in similar habitat located elsewhere in the region. It can therefore be concluded that the project area does not contain habitat of high ecological significance from a faunal perspective or contain faunal assemblages that are ecologically significant.

The assessment results also suggest that no species of conservation significance have the potential to be directly affected to any significant degree by the proposal. Available evidence suggests that a significant proportion of the species discussed are locally extinct or unlikely to use the site due to a lack of suitable habitat. Those species that potentially utilise the site are relatively wide ranging and/or will persist in adjoining unaffected areas.

No listed EPBC Act threatened fauna species are considered by the Author likely to be utilising the study area to any substantial degree. It is therefore the Author's opinion that development of the site at any scale would not constitute a significant impact (as defined by the SEWPaC) on any EPBC Act listed threatened fauna species. The results of the fauna assessment also suggest that significant impact on EPBC Act listed migratory species can also be considered to be highly unlikely.

Any proposed development will necessarily require the clearing of existing fauna habitat. Planning for the proposal should take into account the presence of native fauna so that impacts can be minimised. A series of other recommendations aimed at mitigating and minimising potential impacts on fauna and fauna habitat in general are provided in Section 8.2. These should be incorporated required management plans where considered reasonable and practicable.

## 1. INTRODUCTION

This report details the results of a Level 1 fauna assessment of an area of Unallocated Crown Land situated about 3 km south of Karratha, Western Australia. The study site is centred at approximately 20.752675°S and 116.844812°E and has an area of approximately 19.9 ha (Figures 1 & 2).

## 2. DEVELOPMENT PROPOSAL

It is understood that Greenvalley Asset Pty Ltd (Greenvalley Asset) is in the process of negotiating the acquisition of a 7.14ha parcel of land from the State Government, and that this area is currently Unallocated Crown Land that is reserved under the Shire of Roebourne's Town Planning Scheme No. 8 (TPS 8) for 'Conservation Recreation and Natural Landscapes'.

A scheme amendment initiation report (rezoning request) was prepared by TPG and has been lodged with the Shire of Roebourne, and this covers an area referred to as "DA42" and requests this area be rezoned to 'Urban Development'. This involves a wider area than the 7.14ha parcel of land being acquired by Greenvalley Assets and is 19.861ha in area. Currently Greenvalley Asset has no involvement with the balance of the DA42 area (outside of the 7.14ha parcel). Despite this the fauna assessment report on here includes the larger area to ensure any issues with fauna are identified in the first instance.

Information obtained as part of this fauna assessment report will be used in conjunction with other environmental investigations for development planning and will also be used in the formulation of management plans, both of which will aim to minimise potential environmental impacts. It is anticipated that the information presented will also be used by regulatory authorities to assess the potential impact of the proposal on fauna and fauna habitats at the site once the development plan is finalised and presented for approval.

## 3. BIOGEOGRAPHICAL SETTING

The Stovehill Project falls within the Pilbara biogeographic region as defined by the IBRA (Thackway and Cresswell 1995). The Pilbara bioregion has four main geological components (subregions) with the project area falling within the Roebourne Biogeographical subregion (Pilbara 4 – Roebourne Synopsis – Kendrick and Stanley 2001).

The Roebourne subregion is characterised by:

- Quaternary alluvial and older colluvial coastal and sub-coastal plains with a grass savanna of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia translucens* or *A. pyrifolia* and *A. inequilatera*;

- Uplands, dominated by *Triodia* hummock grasslands;
- Ephemeral drainage lines supporting *Eucalyptus* woodlands;
- Samphire, *Sporobulus* and mangal occurring on marine alluvial flats and river deltas;
- Resistant linear ranges of basalts occurring across the coastal plains; and
- Islands comprising Quaternary sand accumulations, basalt and/or limestone.  
(Kendrick and Stanley 2001)

#### 4. SCOPE OF WORKS

The scope of works was designed to comply with requirements of a Level 1 terrestrial fauna survey as defined in EPA Guidance Statement 56 (EPA 2004):

- Background research or 'desktop' study

The purpose is to gather background information on the target area (usually at the locality scale). This involves a search of all sources for literature, data and map-based information.

- Reconnaissance survey

The purposes are:

- i) to verify the accuracy of the background study;
- ii) to further delineate and characterise the fauna and faunal assemblages present in the target area; and
- iii) to identify potential impacts.

The reconnaissance survey involves a site visit by suitably qualified personnel to undertake selective, low intensity sampling of the fauna and faunal assemblages, and to provide habitat descriptions and habitat maps of the project area (EPA 2004).

## **5. METHODOLOGY**

### **5.1 POTENTIAL FAUNA INVENTORY - DESKTOP STUDY**

#### **5.1.1 Database Searches**

Searches of the following databases were undertaken to aid in the compilation of a list of vertebrate fauna potentially occurring within the study area:

- DEC's NatureMap Database Search (combined data from DEC, Western Australian Museum and Birds Australia) (DEC 2011); and
- Protected matters search tool (Department of Sustainability, Environment, Water, Population and Communities - SEWPaC 2011).

It should be noted that these lists are based on observations from a broader area than the study site and therefore may include species that would only ever occur as vagrants in the actual study area due to a lack of suitable habitat or the presence of only marginal habitat. The databases also often included very old records and in some cases the species in question have become locally or regionally extinct.

Information from these sources should therefore be taken as indicative only and local knowledge and information needs also to be taken into consideration when determining what actual species may be present within the specific area being investigated.

#### **5.1.2 Previous Fauna Surveys in the Area**

Fauna surveys, assessments and reviews have been undertaken in nearby areas in the past, though not all are publically available and could not be referenced. The most significant of those available have been used as the primary reference material for compiling the potential fauna list for the general area. Those reports referred to included, but were not limited to:

- Bamford M.J. & A.R. (2003). Duplication of the Dampier Highway between Karratha and Dampier: assessment of fauna values (revised 10/06/03). Unpublished report for GHD.
- Biota Environmental Sciences (Biota) (2008). Cape Lambert Port B Development Seasonal Fauna Survey. Unpublished report for Pilbara Iron Pty Ltd.
- ENV Australia (2005). Pluto Burrup Proposed Pipeline Corridor (Route 1) Fauna Assessment Survey. Unpublished report for SKM.



- Kendrick, P (2007). The non-volant vertebrate fauna of the Burrup Peninsula, Western Australia. The Western Australian Naturalist, Volume 25 No 4 - February 28, 2007.
- Ninox Wildlife Consulting (2008). A Vertebrate Fauna Survey of the Cape Lambert Iron Ore Project Area, near Karratha, Western Australia. Unpublished Report for Cape Lambert Iron Ore Limited.
- Phoenix Environmental Sciences (2009). Vertebrate Fauna Survey. Anketell Point Rail Alignment and Port Projects. Unpublished Report for API.

As with the databases searches some reports refer to species that would not occur in the study area due to a lack of suitable habitat (extent and/or quality) and this fact was taken into consideration when compiling the potential fauna species list for the study area. It should also be noted that the NatureMap database is likely to include some records from previous fauna surveys in the area including some of those listed above.

### **5.1.3 Existing Publications**

The following represent the main publications used to identify and refine the potential fauna species list for the study area:

- Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). The New Atlas of Australian Birds. Royal Australasian Ornithologists Union, Victoria.
- Churchill, S. (2008). Australian Bats. Second Edition, Allen & Unwin.
- Johnstone, R.E. and Storr, G.M. (1998). Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth Western Australia.
- Johnstone, R.E. and Storr, G.M. (2004). Handbook of Western Australian Birds: Volume 2 – Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth Western Australia.
- Menkhorst, P. and Knight, F. (2011). A Field Guide to the Mammals of Australia. Third Edition, Oxford University Press, Melbourne.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1983). Lizards of Western Australia II: Dragons and Monitors. WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1990). Lizards of Western Australia III: Geckos and Pygopods. WA Museum, Perth.

- Storr, G.M., Smith, L.A. and Johnstone R.E. (1999). Lizards of Western Australia I: Skinks. Revised Edition, WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (2002). Snakes of Western Australia. Revised Edition, WA Museum, Perth.
- Tyler M.J. & Doughty P. (2009). Field Guide to Frogs of Western Australia, Fourth Edition, WA Museum, Perth.
- Van Dyck, S. & Strahan, R. Eds (2008) The Mammals of Australia. Third edition. Queensland Museum.
- Wilson, S. and Swan, G. (2010) A Complete Guide to Reptiles of Australia. Third Edition, Reed, New Holland, Sydney.

#### **5.1.4 Fauna of Conservation Significance**

The conservation significance of fauna species has been assessed using data from the following sources:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Administered by the Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPaC);
- *Wildlife Conservation Act 1950 (WC Act)*. Administered by the Western Australian Department of Environment and Conservation (DEC);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List - the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and the
- DEC Priority Fauna list. A non-legislative list maintained by the DEC for management purposes.

The *EPBC Act* also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA);
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and

- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

(Note - Species listed under JAMBA are also protected under Schedule 3 of the *WC Act*.)

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance (NES) under the *EPBC Act*.

The conservation status of all vertebrate fauna species listed as occurring or possibly occurring in the vicinity of the Project area has been assessed using the most recent lists published in accordance with the above-mentioned instruments and is indicated as such in the fauna listings of this report. A full listing of conservation codes are provided in Appendix A.

#### **5.1.5 Invertebrates**

It can be difficult to identify what may be significant invertebrate species (e.g. Short Range Endemics - SREs) as there is a lack of knowledge on invertebrates and there is a shortage of invertebrate taxonomic expertise. Where invertebrates are collected during surveys, a high percentage are likely to be unknown, or for known species there can be limited knowledge or information on their distribution (Harvey 2002).

For this project, the assessment for conservation significant invertebrates has been limited to those listed by in the DEC and *EPBC Act* database searches (which rely on distribution records and known habitat preferences). Generally very little is known about short range endemic invertebrates in the Pilbara (Kendrick and Stanley 2001) and therefore no assessment of the potential for SREs to be present has been made.

#### **5.1.6 Taxonomy and Nomenclature**

Taxonomy and nomenclature for fauna species used in this report is generally taken from the DEC's WA Fauna Census Database which is assumed to follow Aplin and Smith (2001) for amphibians and reptiles, How *et al.* (2001) for mammals and Johnstone (2001) for birds.

Common names are taken from the Western Australia Museum (WAM) recognised primary common name listings when specified, though where common names are not provided they have been acquired from other publications. Sources include Van Dyck & Strahan (2008), Bush *et al.* (2007), Wilson and Swan (2010), Bush *et al.* (2002), Tyler *et al.* (2000), Christidis and Boles (2008) and Glauret (1961). Not all common names are generally accepted.

## **5.2 SITE SURVEYS**

Field survey work was carried out by Greg Harewood (B.Sc. Zoology) during a one day period on the 19<sup>th</sup> August, 2011.

### **5.2.1 Fauna Habitat Assessment**

Vegetation units identified during the flora and vegetation survey, carried out by Emerge Associates (2011), have been used to define broad fauna habitat types across the site. This information has been supplemented with observations made during the fauna survey.

The main aim of the habitat assessment was to determine if it was likely that any species of conservation significance would be utilising the areas that maybe impacted on as a consequence of development at the site proceeding. The habitat information obtained was also used to aid in finalising the overall potential fauna list.

As part of the desktop literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was researched. During the field survey the habitats within the study area were assessed and specific elements identified, if present, to determine the likelihood of listed threatened species utilising the area and its significance to them.

### **5.2.2 Opportunistic Fauna Observations**

Opportunistic observations of fauna species was made during while traversing the study area on foot. This included searching microhabitats such as logs, rocks, leaf litter and observations of bird species with binoculars.

## **6. SURVEY CONSTRAINTS**

The assessment reported on here has included a desktop analysis and a site reconnaissance survey that included opportunistic fauna observations made during a single daytime period. No seasonal sampling has been conducted. The conclusions presented are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

Some fauna species are reported as potentially occurring within the study area based on there being suitable habitat (quality and extent) within the study area or immediately adjacent. With respect to opportunistic observations, the possibility exists that certain species may not have been detected during field investigations due to:

- seasonal inactivity during field survey;
- species present within micro habitats not surveyed;
- cryptic species able to avoid detection; and
- transient wide-ranging species not present during survey period.

The lack of observational data on some species should therefore not be taken as necessarily indicating that a species is absent from the site.

In recognition of survey limitations a precautionary approach has been adopted for this assessment. Any fauna species that would possibly occur within the study area as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the Author has been assumed to potentially occur in the study area.

The habitat requirements and ecology of many of the species known to occur in the wider area are often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitat or microhabitat within the study area. As a consequence of this limitation the potential fauna list produced is most likely an overestimation of those species that actually utilise the study area for some purpose. Some species may be present in the general area but may only use the study area itself on rare occasions or as vagrants.

## **7. RESULTS**

### **7.1 POTENTIAL FAUNA INVENTORY - DESKTOP STUDY**

A list of expected fauna species that could occur in the study area was compiled from information obtained during the desktop study and is presented in Appendix B. This listing was refined after information gathered during the site reconnaissance survey was assessed. The results of some previous fauna surveys carried out in the general area are summarised in this species listing as are the DEC NatureMap database search results. The raw database search results from NatureMap (DEC 2011) and the Protected Matters Search Tool (SEWPaC 2011) are contained within Appendix C.

The list of potential fauna takes into consideration that firstly the species in question is not known to be locally extinct and secondly that suitable habitat for each species, as identified during the habitat assessment, is present within the study area, though compiling an accurate list has limitations (see Section 4). As a consequence of the various limitations the potential fauna list produced is most likely an overestimation of those species that actually utilise the study area for some purpose.



## 7.2 SITE SURVEYS

### 7.2.1 Fauna Habitat Assessment

The broad scale fauna habitats within the study area are based on vegetation structure as identified during the flora and vegetation survey (Emerge 2011a). The location and approximate extent of each identified unit is shown in Figure 3 with a description below. More detail on the vegetation units present can be found in the flora and vegetation report (Emerge 2011).

- T1 Hummock grassland *Triodia wiseana* and isolated tussock grasses of *Enneapogon caeruleus* and *Aristida contorta* within emergent open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* and *Acacia ancistrocarpa* with sparse forbland of *Ptilotus exaltatus*, *Ptilotus helipteroides*, *Stackhousia intermedia* and *Indigofera monophylla* on rocky slopes of Karratha Hills.
- B Degraded closed tussock grassland of *\*Cenchrus ciliaris* (Buffel grass).
- C1 Emergent *Eucalyptus victrix* and *Corymbia hamersleyana* over open shrubland of *Santalum lanceolatum*, *Acacia inaequilatera*, *Acacia colei* and *Grevillea pyramidalis* over closed tussock grassland of *\*Cenchrus ciliaris* and *Dichanthium sericeum* subsp. *humilius* in major flow lines.
- C2 Open shrubland of *Acacia bivenosa*, *Acacia inaequilatera* with isolated trees of *Corymbia hamersleyana*, over hummock grassland of *Triodia wiseana* and open tussock grassland of *Chrysopogon fallax* and *\*Cenchrus ciliaris* in minor flow lines.

Note \* = introduced plant species

Plates 1 to 4 illustrate the nature of the main fauna habitats existing within the project area.

### 7.2.2 Opportunistic Fauna Surveys

The results of the opportunistic fauna survey are listed in Appendix B and summarised in Table 1. A total of 29 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the single day reconnaissance survey carried out in August 2011. No fauna species of conservation significance (listed on state or federal threatened/migratory species lists or DEC priority species) were positively identified as having used the study area during the Level 1 field reconnaissance survey.

### 7.3 FAUNA INVENTORY – SUMMARY

#### 7.3.1 Vertebrate Fauna

Table 1 summarises the numbers of potential species based on vertebrate class considered likely to be present in the general vicinity of the study area. A complete list of vertebrate fauna most likely to frequent the site or nearby areas is held in Appendix B. The results of the DEC NatureMap fauna database search and the *EPBC Act* database search are held in Appendix C.

Not all species listed in existing databases and publications as potentially occurring within the region (i.e. *EPBC Act*'s Threatened Fauna and Migratory species lists, DEC's NatureMap Fauna Database and various publications) are likely to be present within the Pioneer study area. Some species have been excluded from this list based on the lack of suitable habitat or known/highly likely local extinction even if suitable habitat is present (e.g. Numbat, Bilby).

It should be noted that even if some additional species are omitted from the listing for the specific study area the resulting list would still very likely represent an over estimation of the fauna species utilising the site (either on a regular or infrequent basis) as a result of the precautionary approach adopted for the assessment.

**Table 1: Summary of Potential Vertebrate Fauna Species (as listed in Appendix B)**

Group	Total number of potential species	Potential number of specially protected species	Potential number of migratory species	Potential number of priority species	Number of species observed L1 Survey 2011
Amphibians	2	0	0	0	0
Reptiles	57	0	0	1	1
Birds	78	1	3	2	26
Non-Volant Mammals	14 <sup>5</sup>	0	0	0	2
Volant Mammals (Bats)	9	0	0	0	0
Total	160 <sup>5</sup>	1	3	3	29

Superscript = number of introduced species included in total.

A review of the *EPBC Act*'s threatened fauna list, DEC's Threatened Fauna Database and Priority List, unpublished reports and scientific publications

identified 21 specially protected, priority or migratory vertebrate fauna species as potentially occurring in the general vicinity of the study area. Based on the habitats present and documented distributions it is considered possible that seven (7) of these species may use the study area for some purpose at times. Species have been omitted from the potential list for the site (Appendix B), principally due to lack of suitable habitat on-site or known local extinction.

Additional details on significant species that potentially utilise the study area are given in Appendix E.

As stated no evidence of any conservation significant species utilising the site was found during the field survey and the current status of many species on site and/or in the general area is difficult to determine. However, based on the habitats present and, in some cases, recent nearby records, seven species of conservation significance can be regarded as possibly utilising the study area for some purpose at times, these being:

- *Notoscincus butleri* Lined Soil-Crevice Skink – P4 (DEC Priority Species)  
Status in the study area is difficult to determine. Habitat appears superficially suitable based on published descriptions.
- *Falco peregrinus* Peregrine Falcon - S4 (WC Act)  
The species potentially utilises some sections of the study area as part of a much larger home range. The site contains no suitable nesting habitat.
- *Ardeotis australis* Australian Bustard - P4 (DEC Priority Species)  
May infrequently traverse the area but it would not be specifically attracted to the site and would only ever be present as individuals or very small groups for small periods of time.
- *Burhinus grallarius* Bush Stone Curlew - P4 (DEC Priority Species)  
May infrequently traverse the area but it would not be specifically attracted to the site and would only ever be present as individuals or very small groups for small periods of time.
- *Apus pacificus* Fork-tailed Swift – S3 (WC Act), Migratory (EPBC Act)  
Rare seasonal visitor. It is potentially an occasional summer visitor to the Karratha area but is entirely aerial and largely independent of terrestrial habitats.
- *Merops ornatus* Rainbow Bee-eater – S3 (WC Act), Migratory (EPBC Act)  
Common seasonal visitor to southern Western Australia. May frequent the area at times to forage. Unlikely to breed due to rocky nature of soil.

- *Hirundo rustica* Barn Swallow – S3 (WC Act), Migratory (EPBC Act)  
Seasonal migrant that prefers open, often disturbed habitats. Potentially frequents the Karratha area in low numbers but would not be specifically attracted to the site.

The following species of conservation significance, while possibly present in the general area and/or the wider region are not listed as potential species due to the study area being outside of their currently recognised range, a lack of suitable habitat or known/very likely local or regional extinction (and no subsequent recruitment from adjoining areas):

- *Liasis olivaceus barroni* Pilbara Olive Python – S1 (WC Act), Vulnerable (EPBC Act)  
Preferred rocky habitats and areas such as gorges, caves and rock crevices are not present within the site. This species is therefore unlikely to frequent the study area except on very rare occasions as transient individuals.
- *Ardea alba* Great Egret – S3 (WC Act), Migratory (EPBC Act)  
No suitable habitat.
- *Ardea ibis* Cattle Egret – S3 (WC Act), Migratory (EPBC Act)  
No suitable habitat.
- *Haliaeetus leucogaster* White-bellied Sea-Eagle – S3 (WC Act), Migratory (EPBC Act).  
May flyover occasionally but the site itself contains no suitable habitat for this species to utilise.
- *Pandion haliaetus* Osprey – S3 (WC Act), Migratory (EPBC Act).  
May flyover occasionally but the site itself contains no suitable habitat for this species to utilise.
- *Numenius madagascariensis* Eastern Curlew – S3 (WC Act), Migratory (EPBC Act).  
No suitable habitat.
- *Charadis veredus* Oriental Plover – S3 (WC Act), Migratory (EPBC Act)  
No suitable habitat.
- *Glareola maldivarum* Oriental Pratincole – S3 (WC Act), Migratory (EPBC Act)  
Only very small sections of the study area appear suitable for this species to utilise (degraded, bare areas) and it is only likely to frequent the area on very rare occasions.
- *Phaps histrionic* Flock Bronzewing – P4 (DEC Priority Species)  
Locally extinct. Habitat marginal.

- *Dasyurus hallucatus* Northern Quoll – S1 (WC Act), Endangered (EPBC Act)  
Lack of this species preferred denning habitat within the study area and the limited number of records in the Karratha area suggests it would only ever occur on very rare occasions within the study area, and then only as transient individuals. Not listed as a potential species.
- *Pseudomys chapmani* Western Pebble-mound Mouse – P4 (DEC Priority Species)  
Habitat with the study area suitable for this species to utilise is limited in extent. No evidence of any pebble mounds found. These observations and the fact that this species has not been recorded in the area in recent times suggest it is locally extinct.
- *Mormopterus loriae cobourgiana* Little North-western Mastiff Bat – P1 (DEC Priority Species)  
No mangroves or potential roosting habitat occurs within the site.
- *Rhinonicteris aurantius* Pilbara Leaf-nosed Bat – S1 (WC Act), Vulnerable (EPBC Act)  
There are no suitable dry or wet season roosting sites for this species within the study area and the lack of documented records from the immediate vicinity suggests it is also not present in nearby areas.
- *Macroderma gigas* Ghost Bat – P4 (DEC Priority Species)  
There are no roosting sites for this species within the study area and the lack of documented records from the immediate area suggests it is also not present nearby.

### 7.3.2 Invertebrate Fauna

No listed threatened or priority invertebrate species appeared in the DEC and EPBC Act database searches (DEC 2011, SEWPac 2011).

## 8. ECOLOGICAL IMPACTS AND MANAGEMENT

### 8.1 POTENTIAL IMPACTS

In general the most significant potential impacts to fauna of any development include:

- Loss of vegetation/fauna habitat that is used for foraging, breeding, roosting, or dispersal (includes loss of hollow bearing trees),
- Fragmentation of vegetation/fauna habitat which may restrict the movement of some fauna species,
- Modifications to surface hydrology, siltation of creek lines,



- Changes to fire regimes,
- Pollution (e.g. oil spills),
- Noise/Light/Dust,
- Spread of plant pathogens (e.g. dieback) and weeds,
- Potential increase in the number of predatory feral species (e.g. foxes, cats) and
- Death or injury of fauna during clearing and construction.

The exact extent and nature of development within the study area is not known at this stage however the anticipated degree of impact on specific species of conservation significance previously recorded in the general area are provided in Table 2 below. Additional information on specific fauna species are provided in Appendix D.

**Table 2: Likelihood of Occurrence and Degree of Potential Impact – Fauna Species of Conservation Significance (continues on following page).**

Common Name	Genus & Species	Conservation Status	Likelihood of Occurrence	Potential Impact on Habitat	Degree of Impact	Justification
Lined Soil-Crevise Skink	<i>Notoscincus butleri</i>	P4	Possible	Modification/loss of a small area of habitat	Low	Habitat, if suitable, very limited in extent
Pilbara Olive Python	<i>Liasis olivaceus barroni</i>	S1 VU	Unlikely	None	Nil	Preferred habitat lacking
Great Egret	<i>Ardea alba</i>	S3 Mig	Unlikely	None	Nil	No suitable habitat
Cattle Egret	<i>Ardea ibis</i>	S3 Mig	Unlikely	None	Nil	No suitable habitat
Peregrine Falcon	<i>Falco peregrinus</i>	S4	Possible	None Likely	Nil/Very Low	Widespread species that can use degraded habitats
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Mig	Unlikely/Flyover Only	None	Nil	No suitable habitat
Osprey	<i>Pandion haliaetus</i>	Mig	Unlikely/Flyover Only	None	Nil	No suitable habitat
Australian Bustard	<i>Ardeotis australis</i>	P4	Possible	Modification/loss of a small area of habitat	Nil/Very Low	Widespread species, habitat common in area
Eastern Curlew	<i>Numenius madagascariensis</i>	S3, P4, Mig	Unlikely	None	Nil	No suitable habitat
Bush Stone-curlew	<i>Burhinus grallarius</i>	P4	Possible	Modification/loss of a small area of habitat	Nil/Very Low	Widespread species, habitat common in area
Oriental Plover	<i>Charadis veredus</i>	S3, Mig	Unlikely	None	Nil	No suitable habitat

Common Name	Genus & Species	Conservation Status	Likelihood of Occurrence	Potential Impact on Habitat	Degree of Impact	Justification
Oriental Pratincole	<i>Glareola maldivarum</i>	S3, Mig	Unlikely	None	Nil	No suitable very marginal/habitat
Flock Bronzewing	<i>Phaps histrionic</i>	P4	Unlikely	None	Nil	Habitat marginal, probably locally extinct
Fork-tailed Swift	<i>Apus pacificus</i>	S3 Mig	Flyover Only	None	Nil	Aerial Species
Rainbow Bee-eater	<i>Merops ornatus</i>	S3 Mig	Possible	Modification/loss of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats
Barn Swallow	<i>Hirundo rustica</i>	S3 Mig	Possible	Modification of a small area of habitat	Nil/Very Low	Widespread species that can use degraded habitats
Northern Quoll	<i>Dasyurus hallucatus</i>	S1 EN	Unlikely	None	Nil	Preferred habitat lacking, transients only
Western Pebble-mound Mouse	<i>Pseudomys chapmani</i>	P4	Unlikely	None	Nil	Habitat limited in extent, probably locally extinct
Little North-western Mastiff Bat	<i>Mormopterus loriae cobourgiana</i>	P1	Unlikely	None	Nil	Preferred roosting habitat absent
Pilbara Leaf-nosed Bat	<i>Rhinonictis aurantius p</i>	S1 VU	Unlikely	None	Nil	Preferred roosting habitat absent
Ghost Bat	<i>Macroderma gigas</i>	P4	Unlikely	None	Nil	Preferred roosting habitat absent

## 8.2 MINIMISING IMPACTS

The following recommendations are provided for guidance during ongoing development planning and for the formulation of management plans both of which should aim to reduce the impact on fauna and fauna habitat as much as reasonable and practicable. It is recommended that:

- Planning for development should aim to minimise as much as reasonable and practical the area of remnant vegetation requiring removal. Larger trees and dense vegetation in particular should be avoided (e.g. along the main drainage line).
- During site works, areas requiring clearing should be clearly marked and access to other areas restricted to prevent accidental clearing of areas to be retained.
- Disruption to surface and sub-surface hydrology should be minimised where possible and levees and drains designed to mimic natural drainage flows where disruptions will occur.
- No dead, standing or fallen timber should be removed unnecessarily. Logs (hollow or not) and other debris resulting from land clearing should

be used to enhance fauna habitat in untouched and rehabilitated areas if possible.

- A Construction and Operations Fire Management Plan should be prepared to reduce the risk of unplanned fires and provide contingency measures to minimise any associated impacts. The plan will include a contingency and response plan in the event of any bushfires that commence as a result of the works on site.
- All staff working on site should be made aware that native fauna is protected. Personnel working on the project should not be allowed to bring firearms, other weapons or pets onsite.
- Native fauna injured during clearing or normal site operations should be taken to a designated veterinary clinic or a DEC nominated wildlife carer.
- Fuel storage facilities should be bunded.
- Any holes, pits or trenches required for services should be kept open for only as long as necessary and suitable escape ramps (45° batter) and bridging provided if the site is to be left unattended for extended periods. Significant sized holes, pits or trenches should be inspected for fauna immediately prior to filling.

## **9. COMMONWEALTH ENVIRONMENT PROTECTION & BIODIVERSITY CONSERVATION ACT 1999**

A number of fauna species known to or potentially present within the study area are listed under the federal *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The objective of the *EPBC Act* is to provide for the protection of the environment, especially those aspects that are of national significance, promote ecologically sustainable development, the conservation of biodiversity and a cooperative approach to the protection and management of the environment.

Development proposals (“actions”) that are likely to have a significant impact on any listed species should be referred to the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) for assessment. The aim of a referral is to provide certainty about whether a proposal does or doesn’t need approval under the *EPBC Act*. The proposed action should be considered at its broadest possible scope. This includes all stages and components of the action, all related activities, and all related infrastructure such as roads and powerlines, if applicable.

It is the proponent's responsibility to determine if their proposed action (e.g. clearing and development of an area of native bushland) requires referral. To aid in determining if a proposal is likely to have a significant impact SEWPaC provide a series of Significant Impact Guidelines (DEH 2006). These guidelines outline a 'self-assessment' process, including detailed criteria, to assist persons in deciding whether or not referral may be required.

The criteria are intended to provide general guidance on the types of actions that will require approval and the types of actions that will not require approval. The criteria are not intended to be exhaustive or definitive. If a proponent is unsure whether their proposed action is likely to have a significant impact on a matter of national environmental significance it should be referred to the SEWPaC for a binding decision on whether approval is required (DEH 2006).

## 9.1 LISTED THREATENED SPECIES

No listed *EPBC Act* threatened fauna species are considered by the Author likely to be utilising the study area to any substantial degree. It is therefore the Author's opinion that development of the site at any scale would not constitute a significant impact (as defined by the SEWPaC) on any *EPBC Act* listed threatened fauna species.

## 9.2 LISTED MIGRATORY SPECIES

*EPBC Act* listed migratory fauna species identified as being present in the general area of the development site at times were:

- *Apus pacificus* Fork-tailed Swift – Migratory
- *Merops ornatus* Rainbow Bee-eater – Migratory
- *Hirundo rustica* Barn Swallow – Migratory

An action has, will have, or is likely to have a significant impact on migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species; or
- result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An area of important habitat is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species;
- habitat that is of critical importance to the species at particular life-cycle stages;
- habitat utilised by a migratory species which is at the limit of the species range; or
- habitat within an area where the species is declining.

To have a significant impact on a migratory species as defined under the SEWPaC Significant Impact Guidelines (DEH 2006), any proposed development would need to trigger at least one of the above mentioned significant impact criteria thresholds. Each of these is briefly assessed below.

**Substantially modify, destroy or isolate an area of important habitat of the migratory species**

The study area does not represent important habitat for any of the migratory species listed as potentially utilising the site.

The Fork-tailed Swift is an aerial species that rarely roosts. It would not be specifically attracted to the area and if ever present would only stay temporarily. Rainbow Bee-eaters are seasonally widespread and common in southern WA and utilise both natural and totally degraded habitats. Individuals of this species may frequent the area at times but they would not be specifically attracted to the site. The percentage of the population present at any one time would be very small and insignificant as they rarely congregated in colonies. Barn Swallow also utilise both natural and totally degraded habitats and development of the site will have no effect on the status of this species whatsoever.

This criteria will therefore not be compromised by the development proceeding.

**Result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species**

There is no evidence available to suggest that sections of the study area represents important habitat to any of the migratory species listed as potentially utilising the site. It is extremely unlikely that the proposed development of the land would result in an invasive species that is harmful to migratory species becoming established on the site or in the vicinity.

This criteria will not be compromised by the development proceeding.



**Seriously disrupt the lifecycle of an ecologically significant proportion of the population of the species.**

There is no evidence available to suggest that sections of the study area represents important habitat to any of the migratory species listed as potentially utilising the site. The proposal area or adjoining areas would not support, at any time of the year, a significant proportion of the population of any migratory species.

This criteria will not be compromised by the development proceeding.

In all cases it is considered unlikely that the impact caused by development at the site would trigger any of the abovementioned criteria and therefore no significant impact on *EPBC Act* listed migratory species can be considered likely.

## **10. CONCLUSION**

The Level 1 fauna survey at the proposed Stovehill was undertaken in August 2011 for the purposes of identifying the site specific fauna assemblage and fauna habitats present at the proposed development site.

With respect to native vertebrate fauna, 18 mammals (includes 9 bats species), 78 bird, 57 reptile and two frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise at times, the proposed development area. Based on habitat preferences, a range of previous survey results and currently documented distributions it has been concluded to be unlikely that any threatened (vulnerable, endangered, rare or likely to become extinct) species frequent the study area except possibly as vagrants, on rare occasions.

Other species of conservation significance that may be present at times include one species considered in need of special protection under state legislation (Peregrine Falcon), four DEC priority species (Lined Soil-crevice Skink., Australian Bustard and the Bush Stone Curlew) and three migratory bird species (Fork-tailed Swift, Rainbow Bee-eater, Barn Swallow). Development at the site may result in the loss/modification of some habitat utilised by these species at times but this is very unlikely to alter their conservation status on a local or regional scale.

The broadly defined fauna habitats present within the development area were identified as being common and widespread in the wider area and the faunal assemblage identified as potentially present is unlikely to be different to that found in similar habitat located elsewhere in the region. It can therefore be concluded that the project area does not contain habitat of high ecological

significance from a faunal perspective or contain faunal assemblages that are ecologically significant.

The assessment results also suggest that no species of conservation significance have the potential to be directly affected to any significant degree by the proposal. Available evidence suggests that a significant proportion of the species discussed are locally extinct or unlikely to use the site due to a lack of suitable habitat. Those species that potentially utilise the site are relatively wide ranging and/or will persist in adjoining unaffected areas.

No significant impact on any *EPBC Act* threatened species is anticipated, principally because none can be considered likely to be using the site to any significant degree. The site also does not appear to contain habitat that could be considered critical for the recovery of any listed threatened species.

Any proposed development will necessarily require the clearing of existing fauna habitat. Planning for the proposal should take into account the presence of native fauna so that impacts can be minimised. A series of other recommendations aimed at mitigating and minimising potential impacts on fauna and fauna habitat in general are provided in Section 8.2. These should be incorporated required management plans where considered reasonable and practicable.

## 11. BIBLIOGRAPHY

(not necessarily cited)

Aplin, K.P. and Smith, L.A. (2001). Checklist of the frogs and reptiles of Western Australia, Records of the Western Australian Museum Supplement No. 63, 51-74.

Bamford MJ & AR (2003). Duplication of the Dampier Highway between Karratha and Dampier: assessment of fauna values (revised 10/06/03) prepared by Bamford Consulting Ecologists to GHD, Perth WA.

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). The New Atlas of Australian Birds. Royal Australasian Ornithologists Union, Victoria.

Beard, J.S. (1990). Plant life of Western Australia. Kangaroo Press, NSW.

Biota Environmental Sciences (Biota) (2001). Burrup Liquid Ammonia Plant Targeted Fauna Survey. Unpublished report for SKM on behalf of Burrup Fertilisers Pty Ltd.

Biota Environmental Sciences (Biota) (2008). Cape Lambert Port B Development Seasonal Fauna Survey. Unpublished report for Pilbara Iron Pty Ltd.

Burbidge, A. (2004). Threatened Animals of Western Australia.

Butler, W.H. and Butler, M.A. (1983). Burrup Peninsula Fauna Survey. Unpub.report to Woodside Offshore Petroleum Pty Ltd.

Christidis, I. and Boles, W.E. (1994). The Taxonomy and Species of Birds of Australia and its Territories. RAOU, Monograph 2.

Christidis, L. and Boles, W.E. (2008) Systematics and Taxonomy of Australian Birds. CSIRO Publishing, Melbourne

Churchill, S. (2008). Australian Bats. Second Edition, Allen & Unwin.

Cogger, H.G., (2000). Reptiles and Amphibians of Australia. Reed, Sydney.

Cogger, H.G., Cameron E.E., Sadler R.A. & Eggler, P. (1993). The Action Plan for Australian Reptiles. [Online]. Canberra, ACT: Australian Nature Conservation Agency. Available from: <http://www.environment.gov.au/biodiversity/threatened/action/reptiles/index.html>

Department of Environment and Conservation (DEC) (2011). NatureMap Database Search – “By Circle” Centre 116°50' 43" E, 20°45' 10" S (plus 10km buffer). Accessed 25<sup>th</sup> August 2011.

Department of the Environment and Heritage (2006), EPBC Act - Principal Significant Impact Guidelines 1.1, Matters of National Environmental Significance. EPBC Act Policy Statement.

Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (2011). EPBC Act Protected Matters Report: Coordinates - 20.752 116.84699 (2km Buffer) Available from: <http://www.environment.gov.au>. Accessed 25/08/11 @ 18:04:49.

Duncan, A. & Baker, G. B. & Montgomery, N. & Natural Heritage Trust (Australia) (1999). The action plan for Australian bats / edited by Anne Duncan, G. Barry Baker and Narelle Montgomery; with assistance from Lindy Lumsden et al. Natural Heritage Trust, Canberra.

ENV Australia (2005). Pluto Burrup Proposed Pipeline Corridor (Route 1) Fauna Assessment Survey. Unpublished report for SKM.

Environmental Protection Authority (2002). Terrestrial Biological Surveys As An Element of Biodiversity Protection. Position Statement No. 3. EPA, Perth.

Environmental Protection Authority (2004). Guidance for the Assessment of Environmental Factors - Terrestrial fauna surveys for environmental impact assessment in Western Australia. Guidance Statement No 56 EPA, Perth.

Environmental Protection Authority (EPA) and Department of Environment and Conservation (DEC) (2010), Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessments (eds B.M. Hyder, J. Dell and M.A. Cowan), Perth Western Australia.

Glauret, L. (1961). A Handbook of the Lizards of Western Australia. Handbook 6, Western Australian Naturalists Club, Perth.

Greer, A.E. (2006). Encyclopedia of Australian Reptiles. Australian Museum Online <http://www.amonline.net.au/herpetology/research/encyclopedia.pdf> Version date: 7 August 2006.

Hill B.M. and Ward S.J. (2009). National Recovery Plan for the Northern quoll *Dasyurus hallucatus*. Department of Natural Resources, Environment, The Arts and Sport, Darwin.

How, R., Cooper, N.K. and Bannister, J.L. (2001). Checklist of the mammals of Western Australia, Records of the Western Australian Museum Supplement No. 63, 91-98.

Johnstone, R.E. (2001). Checklist of the birds of Western Australia, Records of the Western Australian Museum Supplement No. 63, 75-90.

Johnstone, R.E. and Storr, G.M. (1998). Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth Western Australia.

Johnstone, R.E. and Storr, G.M. (2004). Handbook of Western Australian Birds: Volume 2 – Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth Western Australia.

Keighery, B.J. (1994). Bushland Plant Survey: a Guide to Plant Community Surveys for the Community. Wildflower Society of Western Australia (Inc.) Nedlands, Western Australia.

Kendrick, P (2007). The non-volant vertebrate fauna of the Burrup Peninsula, Western Australia. The Western Australian Naturalist, Volume 25 No 4 - February 28, 2007.

Kendrick, P, & Stanley, F. (2001). Pilbara 1 (PIL1 – Roebourne Synopsis). In: A Biodiversity Audit of Western Australia. Eds McKenzie, N.L., May, J.E. and McKenna, S. Department of Conservation and Land Management, Perth.

Main Roads Western Australia (MRWA) (2009) Environmental Impact Assessment – Dampier Highway Duplication. December 2009.

Maxwell, S., Burbidge, A.A. and Morris, K. (eds). (1996). The 1996 Action Plan for Australian Marsupials and Monotremes. Wildlife Australia Endangered Species Program Project Number 50. Environment Australia, Canberra.

Menkhorst, P. and Knight, F. (2011). A Field Guide to the Mammals of Australia. Third Edition, Oxford University Press, Melbourne.

Morcombe, M. (2004). Field Guide to Australian Birds. Steve Parish Publishing, Archerfield, Queensland.

Ninox Wildlife Consulting (2008). A Vertebrate Fauna Survey of the Cape Lambert Iron Ore Project Area, near Karratha, Western Australia. Unpublished Report for Cape Lambert Iron Ore Limited.

Pearson, DJ (1993). Distribution, status and conservation of pythons in Western Australia, In: Lunney, D & Ayers, D (Eds) Herpetology in Australia: a Diverse Discipline, pp. 383-395, Royal Zoological Society of NSW, Sydney.

Pearson, D. (2003). Giant Pythons of the Pilbara. Landscape. 19(1).

Phoenix Environmental Sciences (2009). Vertebrate Fauna Survey. Anketel Point Port Project. Unpublished Report for API.

Simpson, K. and Day, N. (2010). Field Guide to the Birds of Australia. Penguin Books, Ringwood.



Storr, G.M., Smith, L.A. and Johnstone R.E. (1983). Lizards of Western Australia II: Dragons and Monitors. WA Museum, Perth.

Storr, G.M., Smith, L.A. and Johnstone R.E. (1990). Lizards of Western Australia III: Geckos and Pygopods. WA Museum, Perth.

Storr, G.M., Smith, L.A. and Johnstone R.E. (1999). Lizards of Western Australia I: Skinks. Revised Edition, WA Museum, Perth.

Storr, G.M., Smith, L.A. and Johnstone R.E. (2002). Snakes of Western Australia. Revised Edition, WA Museum, Perth.

Tutt, M., S. Fekete, S. Mitchell, P. Brace & D. Pearson (2004). Unravelling the mysteries of Pilbara Olive Python ecology. Threatened Species Network Community Grants Final Report- Project WA11/101. Karratha: Nickol Bay Naturalists' Club/WA & CALM.

Tutt, M. S. Mitchell, P. Brace & D. Pearson (2002). Conserving Pilbara olive pythons on the Burrup. Threatened Species Network community grants annual report, Project WA04/100. Karratha: Nickol Bay Naturalists' Club/WA & CALM

Tyler M.J. & Doughty P. (2009). Field Guide to Frogs of Western Australia, Fourth Edition, WA Museum, Perth.

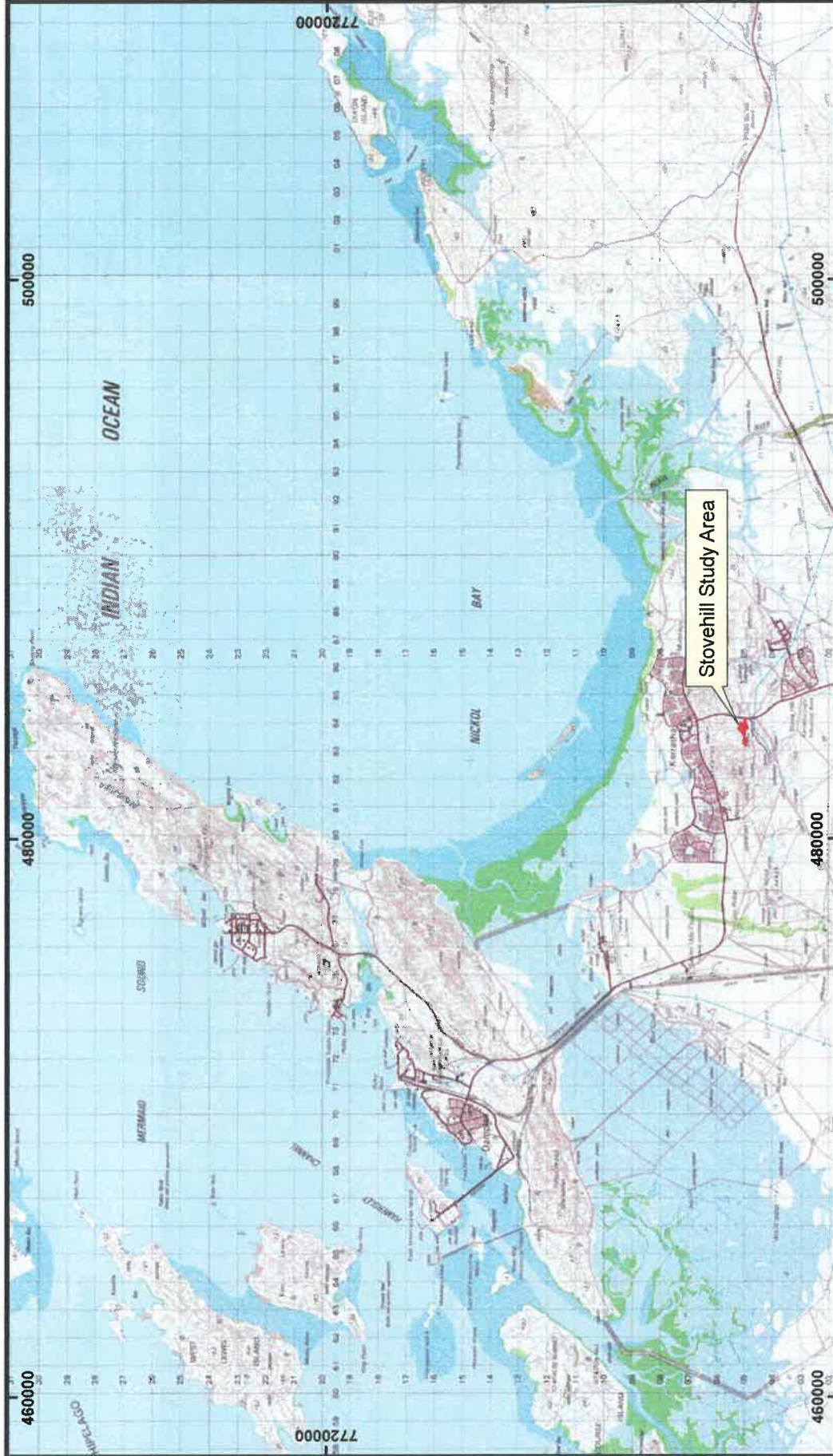
Tyler M.J., Smith L.A. and Johnstone R.E. (2000). Frogs of Western Australia, Revised Edition, WA Museum, Perth.

Thackway, R. and Cresswell, I. D. (1995). An Interim Biogeographic Regionalisation for Australia. Australian Nature Conservation Agency, Canberra.

Van Dyck, S. & Strahan, R. Eds (2008) The Mammals of Australia. Third edition Queensland Museum.

Wilson, S. and Swan, G. (2010) A Complete Guide to Reptiles of Australia. Third Edition, Reed, New Holland, Sydney.

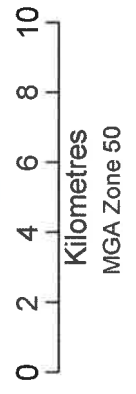
## FIGURES



DRAWING: Harewood  
DATE: August 2011  
SCALE: 1:200,000

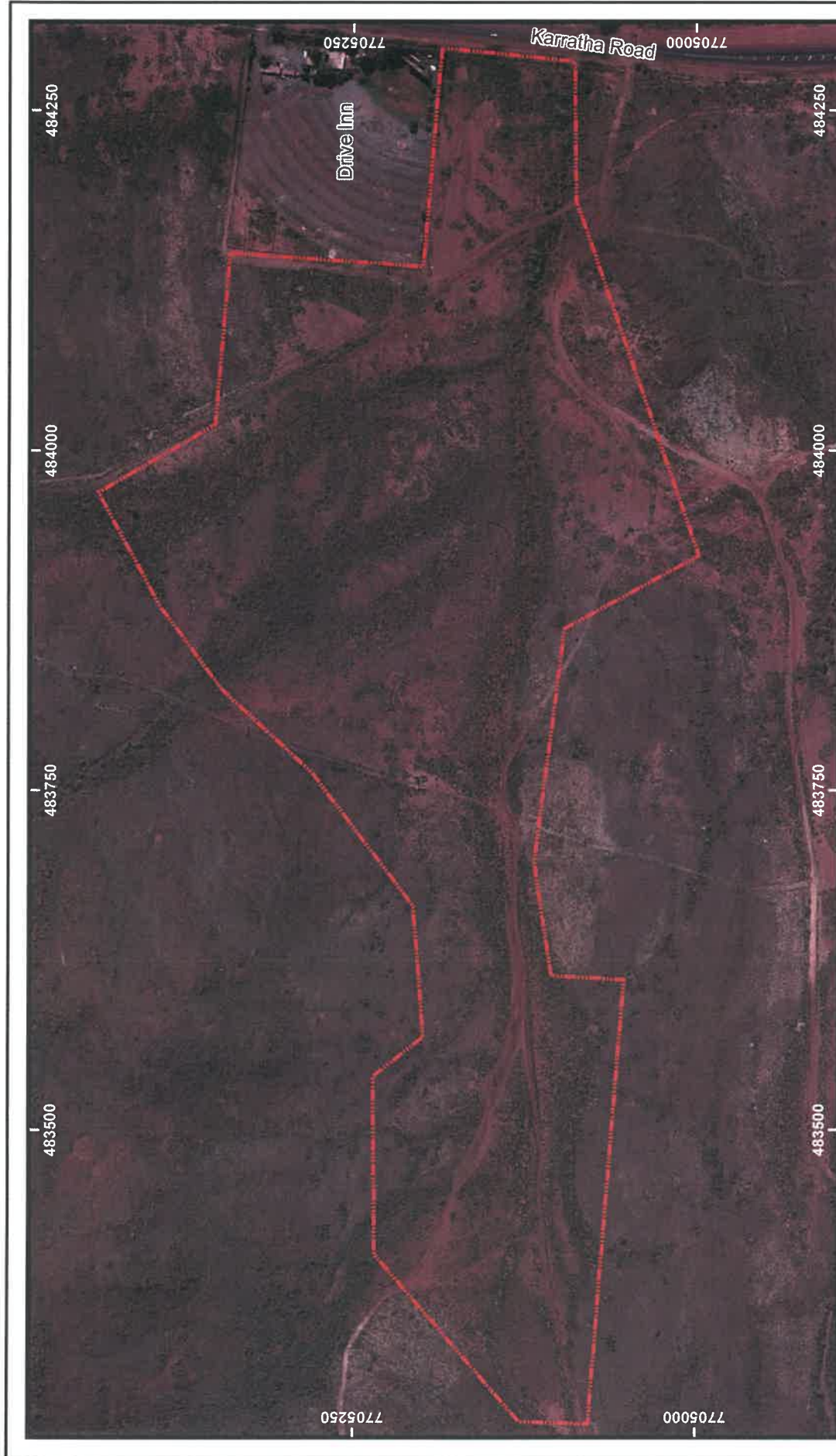
Greenvalley Asset Pty Ltd  
Stovehill

# Study Area and Surrounds



## Legend

Stovehill DA42 Area



# Legend

 Stovehill DA42 Area



0 50 100 150 200  
Metres

MGA Zone 50

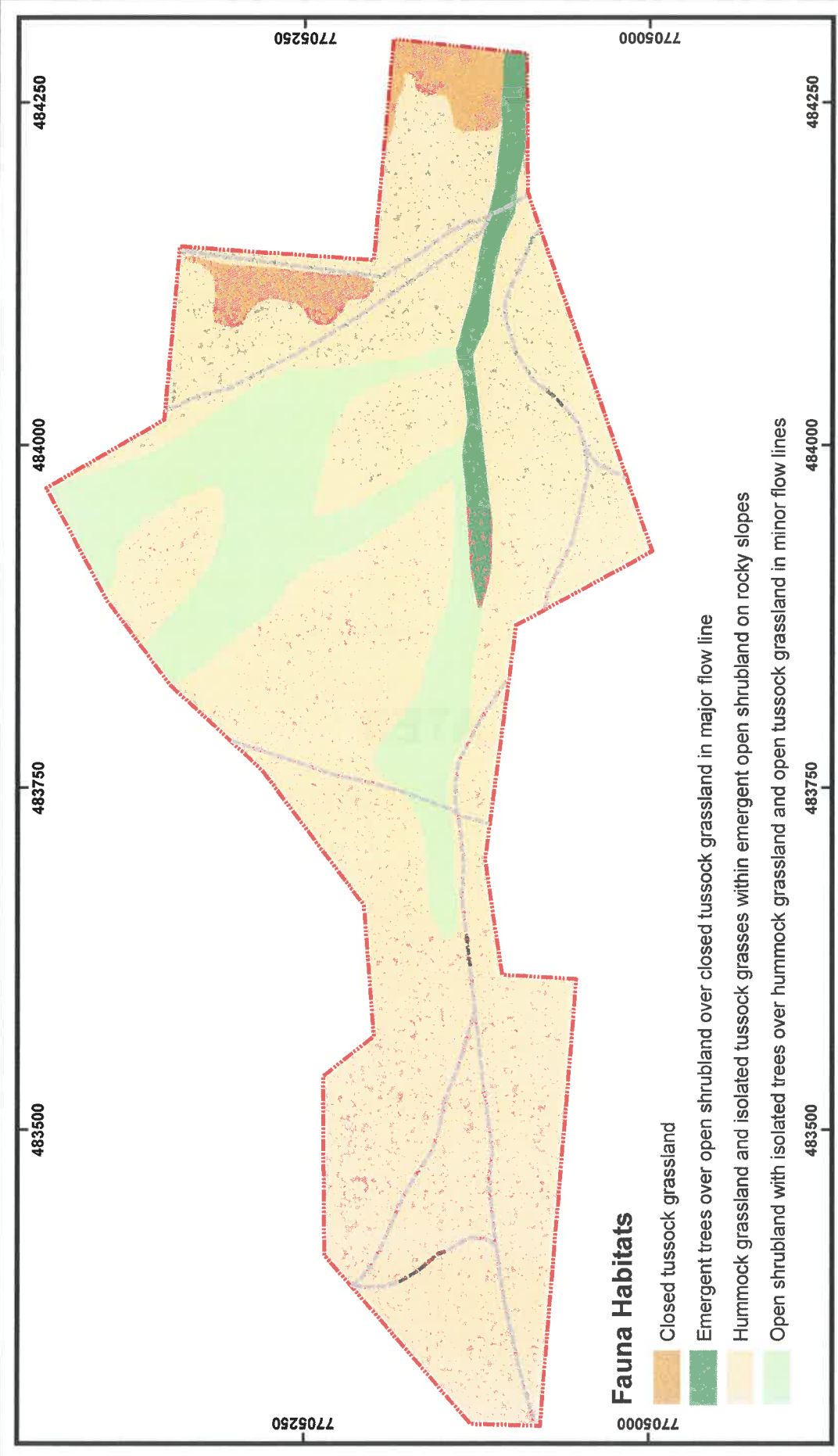


DRAWN: G Harewood  
DATE: August 2011  
SCALE: 1:4 000

Greenvalley Asset Pty Ltd  
Stovehill

## Study Area Air Photo



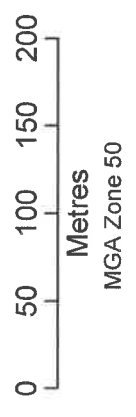


### Fauna Habitats

- Closed tussock grassland
- Emergent trees over closed tussock grassland in major flow line
- Hummock grassland and isolated tussock grasses within emergent open shrubland on rocky slopes
- Open shrubland with isolated trees over hummock grassland and open tussock grassland in minor flow lines

### Legend

- Stovehill DA42 Area
- Tracks



Greenvalley Asset Pty Ltd  
Stovehill

## Fauna Habitats

DRAWING: Harewood  
DATE: August 2011  
SCALE: 1:4 000