

Appendix H

Native Vegetation Clearing Permit Application (Supporting Information)



WEST ERREGULLA EXPLORATION PROGRAM

Warrego Energy

Native Vegetation Clearing Permit Application



Warrego Energy Pty Ltd
Native Vegetation Clearing Permit Application
West Erregulla Exploration Program
November 2013



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1 Introduction

1.1 Proponent and Proposed Activities

Warrego Energy Pty Ltd (Warrego Energy), is preparing to undertake exploration activities in respect of the West Erregulla Field, approximately 300 km north of Perth and located onshore within the North Perth Basin. The West Erregulla Field was discovered in 1990 following the drilling of the West Erregulla-1 well by Barrack Energy Limited. The field has been independently assessed to contain significant volumes of gas, which Warrego Energy intends to recover through innovative drilling and production techniques.

Warrego Energy's proposed West Erregulla Exploration Program (the project) comprises of a three-dimensional (3D) onshore seismic survey (West Erregulla 3D Seismic Survey) and an appraisal well drilling program (the West Erregulla-2 Appraisal Well Drilling Program) within Exploration Permit (EP) 469 (see Figure 1). The seismic survey will involve traversing the project area in a grid pattern, sending, receiving and processing seismic signals in order to map the underlying geology using Vibroseis trucks. Warrego will utilise innovative seismic technologies to mitigate environmental impacts. The appraisal well involves the drilling and testing of a single gas well (the West Erregulla-2 Appraisal Well).

All project activities will be confined to the project area, which covers an area of approximately 8,575 ha. The project's development footprint is estimated to be a maximum of 92 ha, representing about 1.1% of the project area. The conceptual disturbance footprint is depicted in Figure 2, identifying the nominal position of the seismic survey lines and indicative location of the appraisal well and associated infrastructure.

It is important to note that approximately 28 ha of the conceptual disturbance footprint occurs within already cleared land so only 64 ha of ground disturbance would be required. This area may increase slightly given Warrego's commitment to avoid certain environmental values (e.g. length of a source line may increase slightly where it is diverted to avoid DRF). To allow for this Warrego Energy is applying for and **committing to disturb no more than 70 ha within the project area** (approximately 0.8% of the project area).

1.2 Purpose of this Application

Native vegetation will need to be cleared in order to undertake the proposed exploration activities. Under Part V of the *Environmental Protection Act 1986* (WA) (EP Act), clearing of native vegetation is prohibited unless a clearing permit has been granted or the clearing is exempt under either Schedule 6 of the EP Act or under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

Under Regulation 5, Item 20, Petroleum exploration activities that are deemed to be 'low impact' are exempt from requiring a clearing permit unless the activities are carried out within an environmentally sensitive area (ESA). As the project does not meet the definition of a 'low impact' petroleum activity (defined in Schedule 1 of the Environmental Protection (Clearing of Native Vegetation) Regulations 2004) a clearing permit will be required.

This report supports the application for a **purpose permit** to allow the Project to clear a **maximum of 70 ha** of vegetation within a specified area of 8,575 ha (the project area).

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2 Project Description

This chapter provides a description of the project location, proposed schedule, proposed activities, approval requirements and consultation to date.

2.1 Project Location

The project is located within the Shires of Three Springs and Mingenew, approximately 50 km southeast of Dongara and 300 km north of Perth, Western Australia. To the north of the project area is Yandanooka West Road, to the west is Mount Adams Road and to the south is Tomkins Road. Natta Road traverses the eastern portion of the project area (see Figure 1).

The seismic survey will be entirely within EP 469 (see Figure 3). While the precise location of the appraisal well is yet to be defined, the well and associated infrastructure will also be located within EP 469. Details of EP 469 are provided in Table 1.

Table 1 Exploration Permit Details

Exploration Permit ID	Holder	Status	Issued	Expiry
EP 469	Warrego Energy	Active	16 April 2010	15 April 2019

Land use in the surrounding area is varied and includes a mixture of Vacant Crown Land (VCL), and Freehold land (see Figure 3). The nearest residential property is located approximately 0.57 km to the east of the project area. The closest conservation areas include Wilson Nature Reserve and Yandanogo Nature Reserve, which are located approximately 20 km to the southeast and 25 km west of the project area, respectively (see Figure 1).

2.2 Project Schedule

Warrego Energy intends to commence the project in the first quarter of 2014; with project activities associated with the appraisal well commencing after the successful completion of the seismic survey indicating a commercial accumulation of gas. This timing is subject to the receipt of required approvals.

An indicative timeline for each aspect of the project is detailed in Table 2.

Table 2 Indicative Project Schedule

Activity	Approximate Duration	Indicative Timing
West Erregulla 3D Seismic Survey		
Site preparation (including vegetation clearing)	30 days	February 2014
Mobilisation of Machinery/Equipment	20 days	February/March 2014
Demobilisation	10 days	April 2014
Rehabilitation	15 days	April 2014

Table 2 Indicative Project Schedule (cont'd)

Activity	Approximate Duration	Indicative Timing
West Erregulla-2 Appraisal Well Drilling Program		
Construction	28 days	January/February 2015
Mobilisation (rig up)	12 days	February 2015
Operation (drilling)	30 to 50 days	March 2015
Well testing (flow testing)	20 days	April 2015
Demobilisation	10 days	May 2015
Rehabilitation	5 days	May 2015
West Erregulla Rehabilitation Program		
Post Rehabilitation Monitoring	2-years or until rehabilitation performance criteria have been met.	Monitoring to commence one month after the demobilisation of the seismic survey and annually between October and December

2.3 Proposed Activities

The project consists of the West Erregulla 3D Seismic Survey (seismic survey) and West Erregulla-2 Appraisal Well Drilling Program (appraisal drilling program).

2.3.1 3D Seismic Survey

The 3D seismic survey will consist of the following main activities, which are discussed further below:

- Site preparation, i.e. preparing source lines and constructing an accommodation camp including any necessary vegetation clearing and surveying.
- Operations, i.e. setting out the signal retrieval network along receiver lines, creating sound waves along the source lines and collecting data.
- Demobilisation, i.e. removal of any infrastructure and rehabilitation.

Site Preparation

Warrego Energy plans to run 25 parallel source lines, spaced 360 m apart, lengthways along the project area, approximately north to south. The source lines will have a width of 3.5 m to accommodate the Vibroseis trucks that will travel along them generating seismic signals. The source lines' total disturbance footprint will be approximately 81.8 ha.

Receivers will also be installed along approximately 31 parallel lines, spaced 360 m apart, across the project area perpendicular to the source lines. Warrego Energy has committed to walking in receivers to prevent the need to clear along receiver lines. Warrego Energy's preference is to utilise true cable free nodes (e.g. ZLAND™), however should these be unavailable, Warrego Energy is still committed to walking in receivers and avoiding clearing along these lines.

Clearing of native vegetation will be required to prepare the source lines for the seismic survey. As receivers can be walked in no clearing will be required to support their installation. Warrego Energy

aims to position the development footprint to avoid or minimise the project's potential impact to threatened species. Source lines need not be parallel to each other at all times and an individual source point can be moved perpendicular to its line in order to avoid difficult terrain or known locations of threatened species. Clearing will be undertaken using a raised roller mulching technique. As vegetation is cleared it will be mulched and spread behind the machine, this reduces the interference caused by vegetation when it is only pushed over (i.e. using a raised blade technique), allowing for better data collection, whilst still retaining rootstock.

To allow the Vibroseis trucks to move from one source line to the next and in an endeavour to reduce vehicle movements along source lines and so increase the likelihood of natural regeneration, three access tracks 3.5 m wide (totalling 9.5 ha) running east to west have also been allowed for, as depicted on Figure 2. A dogleg has been designed into each of these tracks, to discourage third party access from Natta Road.

Warrego Energy will construct a temporary accommodation camp to cater for the seismic crew (approximately 50 people). The camp will be approximately 50 by 50 m (0.3 ha) in size and where possible will be located within already disturbed agricultural land within EP 469 to minimise impacts (pending negotiations with landholders). Camp facilities will largely be portable buildings transported to site and will consist of dormitory rooms, showers, toilets, kitchen, a meals area and a recreation area. The camp will also require a diesel-powered generator and a vehicle parking area. Water will be purchased from a local water carter and trucked in to be stored in on-site tanks. Ablutions and kitchens will be connected to a self-contained wastewater and sewage system that will be emptied on a regular basis by a licensed contractor.

The conceptual layout of the seismic survey's source and receiver lines, southern access track and camp is provided in Figure 2. Please note that this figure is for illustrative purposes only and does not represent a final design layout.

Operations

Once the source lines and southern access track are prepared and the camp has been constructed, the seismic crew (consisting of Vibroseis trucks, light vehicles and line personnel) will mobilise to the project area.

The Vibroseis trucks travel along each of the source lines and at each energy source position (approximately every 40 m) lower a vibrator pad to the ground, which is vibrated at a range of low to medium frequencies in the range of 5 to 100 Hz (the seismic signal).

To collect the seismic signal, a receiver (i.e. geophones) will be placed at 40 m intervals along a (uncleared) receiver line. The spacing of these receivers will depend upon local conditions (e.g. soil type and slope). Once a section of the source line is completed, the receivers will be removed and relocated to the next section.

Demobilisation

On completion of the seismic survey, all seismic personnel and equipment will be removed from the project area and all disturbed areas will be rehabilitated, as discussed in Section 4.

2.3.2 Appraisal Drilling Program

The appraisal drilling program will involve the drilling of one appraisal gas well, West Erregulla-2, within EP 469 and will consist of the following main activities, which are discussed further below:

- Construction and mobilisation.
- Operations (drilling).
- Demobilisation.

Construction and Mobilisation

Two borrow pits will be established within the project area, in close proximity to the well site to supply road building and construction material for developing the drill pad and associated access track. Use of pre-disturbed areas within the project area will be maximised to avoid additional clearing. Gravel borrow areas will be approximately 20 x 20 m in size (approximately 0.1 ha in total) and be up to 2 m deep. Borrow pits will have a soft slope (maximum 45° batter angles), thus enabling fauna egress and minimising the risk of water ponding and erosion. The borrow areas will also be designed to be self-draining once rehabilitated. Where appropriate borrow material can be sourced externally, clearing impacts will be mitigated. Warrego Energy will ensure that any borrow material sourced from outside the project area is dieback accredited before it is brought onto site.

The drill pad will be approximately 100 x 100 m and surrounded by a 20 m firebreak, resulting in a footprint of approximately 2 ha. The drill pad will contain a drill rig, site office, turkey's nest dam, diesel generators, diesel fuel storage tanks, refuelling area, lined cuttings and mud sump, flare pit (if required) and chemical storage area.

It is unlikely that flaring will be undertaken however, if flaring is required, a flare pit will be constructed on the drill pad. Construction and operation of the flare pit will occur in accordance with Clause 230 of the Schedule of Onshore Petroleum Exploration and Production Requirements 1991. A large tank will be placed in the flare pit, directly below the flare stack. The tank will collect and contain any material not burnt at the flare stack such as produced liquids (oil and/or mud).

The drill sump, turkey's nest and flare pit will be fenced off to prevent fauna ingress. As the sump and turkey's nest will be lined they will also have fauna egress aids provided, such as ramps or matting/netting installed on the edge of the nest or sump, to assist the safe exit of any animal that may otherwise become trapped.

Existing access tracks and disturbance (i.e. old seismic lines or fire breaks and seismic survey source and receiver lines) will be utilised to provide access to the drill pad where possible to minimise impacts on vegetation, soils and landforms. The use of existing tracks and disturbance is likely to require additional clearing so they can accommodate the transport of equipment to and from the drill pad. Approximately 3.4 ha has been allowed for any additional clearing associated with the access track.

Warrego Energy will utilise the existing accommodation camp constructed during the seismic survey to accommodate appraisal drilling program personnel.

Drilling

The West Erregulla-2 well is proposed to target the potential Permian reservoirs of the Dongara Sandstones, at depths of between 3,000 and 4,000 m. Warrego Energy anticipate it will take between 30 to 50 days to drill the well and an additional 20 days to conduct well testing (Table 2).

The drilling fluids that will be used during the exploration program are relatively benign. Water based muds will be used to drill the entire well, with bentonite (spud mud) used to drill the upper section (0 to 500 m) and potassium chloride-polymer used to drill the remainder of the well. Sized calcium carbonate will be added to the drilling fluids to prevent lost circulation during drilling. Chemicals that may be required during drill operations will be stored within a designated, bunded chemical storage area located on the drill pad.

Drilling muds and cuttings will be disposed of into an earthen sump on the drill pad, which will be lined with a tri-laminate polyethylene liner.

Well testing will be undertaken at various intervals throughout the appraisal drilling program. A flare pit will be constructed on the drill pad to accommodate any well testing that will occur, and the firebreak will provide adequate buffer between the flare pit and any surrounding vegetation. Where flaring is required, it will not be undertaken on days of total fire ban.

Demobilisation

On completion of the seismic survey, all seismic personnel and equipment will be removed from the project area and all disturbed areas will be rehabilitated, as discussed in Section 4.

2.4 Approval Requirements

Warrego Energy has not referred the Project to the Office of the Environmental Protection Authority (OEPA) for formal assessment under Part IV of the Western Australian *Environmental Protection Act 1986* (EP Act), as consultation to date has indicated that the project can be adequately assessed by the DMP under the *Petroleum and Geothermal Energy Resources Act 1967* (PGER Act) and Part V of the EP Act. This Native Vegetation Clearing Permit (NVCP) Application seeks approval from the Department of Mines and Petroleum (DMP) under Part V of the EP Act.

Under the PGER Act, Warrego Energy is required to submit a project specific Environment Plan to the DMP. The PGER Act provides the regulatory framework for all onshore oil and gas exploration in WA and is supported by the PGER (Environment) Regulations 2012, which provides regulatory requirements for the exploration of petroleum resources in an environmentally responsible manner. Warrego Energy is currently drafting an Environment Plan for submission to and assessment by the DMP.

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), an action also requires the approval of the Commonwealth Minister for the Department of Environment (DoE) if the action has, will have, or is likely to have significant impact on any 'matters of national environmental significance'. As the project has the potential to impact a number of matters of national environmental significance (i.e. threatened flora and fauna), the project has been referred to the DoE to provide a determination of whether the project activities and their associated impacts are considered to be a controlled action and require approval under the EPBC Act.

Where impacts to Threatened (Declared Rare) flora are unavoidable, the project may also require a 'Permit to Take Declared Rare Flora' under the *Wildlife Conservation Act 1950* (WC Act).

2.5 Stakeholder Consultation

Warrego Energy has proactively consulted with government and non-government stakeholders throughout the development, design and planning stages of the Project and is committed to ongoing consultation with stakeholders to ensure environmental concerns can be raised and addressed during the life of the Project.

Key stakeholders include:

- DMP Petroleum Branch.
- DMP Native Vegetation Branch.
- OEPA.
- Commonwealth Department of the Environment (DoE)
- Department of Environment and Regulation (DER).
- Department of Parks and Wildlife (DPaW).
- Department of Water (DoW).
- Department of Regional Development/Lands.
- Department of Indigenous Affairs (DIA).
- The Amangu People.
- Yamatji Marlpa Aboriginal Corporation.
- Shire of Mingenew.
- Shire of Three Springs.
- Origin Energy.

- AWE Limited
- UIL Energy.
- Empire Oil and Gas NL.
- Tronox Limited.
- Pipeline operators; DBP Transmission and APA Group.
- Landowners.

Warrego Energy met with the DMP Petroleum Branch (representatives: Laura McCarthy and Stan Bowes) in February 2012 to discuss the Project. Consultation with the DMP Petroleum Branch has indicated that the Project environmental approvals required are an EP and NVCP, along with referral to the DoE, and that the Project is unlikely to trigger referral to the EPA under the Memorandum of Understanding (MoU), as discussed in Section 2.4.

Warrego Energy met with the DMP Native Vegetation Branch (representatives: Adam Buck and Matt Boardman) in June 2012 to discuss the Project. Consultation with the DMP Native Vegetation Branch identified the following:

- The NVCP Application should include the following:
 - Management of significant fauna habitat (e.g. Black-Cockatoos).
 - Appropriate biosecurity measures to mitigate against dieback and the spread of weeds.
 - Proposed rehabilitation measures (helpful but not essential, largely assessed through the EP process).
 - Commitments that will assure the DMP that impacts to Threatened (Declared Rare) flora, priority flora and significant fauna habitat will be kept to ALARP or avoided altogether.
- If impacts to DRF are unavoidable, Warrego Energy will be required to obtain a Permit to Take from the DPaW.

Warrego Energy met with the DMP, Petroleum Branch (representatives: Laura McCarthy and Stan Bowes) and Native Vegetation Branch (representative: Alicia Dudzinska) again on the 31 October 2013. Both branches of the DMP were happy to see that Warrego Energy had taken measures to avoid, mitigate and manage project impacts since the last meeting, confirmed the assessment process and recommended prompt submission of the NVCP Application and EP to facilitate meeting the project schedule.

Warrego Energy met with the OEPA (representatives: Peter Tapsell, Maree Heath and Annaleigh Gunston) in November 2012 to discuss the Project. Consultation with the OEPA confirmed that the OEPA believe the project can be adequately assessed by the DMP and would only require their involvement, where the DMP and or the DER was concerned that the proposed management of flora impacts was not satisfactory and decided to refer the project. The OEPA recommended that management approaches be developed in consultation with the DMP and DER.

Warrego Energy has also had preliminary discussions with the Department of Environment and Conservation (representatives: Kelly Griffiths and Ken Atkins) (now the DER and the DPaW) regarding the potential impacts to Threatened Flora and the Requirement to obtain a 'Permit to Take'.

Warrego Energy also met with the DPaW Environmental Management Branch (representatives: Murray Baker and Grant Lamb) on the 29 October 2013. The DPaW Environmental Management Branch recommended that a 'Permit to Take' would be required and an application should be submitted promptly to the Species and Communities Branch to allow parallel assessment with the NVCP application. The DPaW Environmental Management Branch also encouraged the avoidance of Threatened, Priority 1 and Priority 2 flora, implementation of a weed and dieback management plan, development of a communication procedure with the Moora district office, fire management, avoidance of habitat trees, the design of access tracks to avoid third party access (i.e. doglegging) and rehabilitation monitoring.

Warrego Energy met with the DPaW Species and Communities Branch (representative: Ken Atkins and Anthea Jones, along with Grant Lamb from the Environmental Management Branch for

consistency) on the 6 November 2013 to discuss potential impacts to Threatened flora and confirm the requirements of a 'Permit to Take' application. The DPaW Species and Communities Branch was pleased with the avoidance, mitigation and management measures in place and believed they generally represented best practice. It was recommended that rubber tyres be used and vehicle movements minimised to maximise the success of natural revegetation of disturbed areas. It was also identified that any borrow material not sourced from the project area must be dieback accredited, before it is brought onto site and that air blowing and brushing is likely to be the preferred mechanism for dieback and weed control given project activities will be undertaken in March, with a particular focus on belly plates, rail guards and steps.

Warrego Energy met with the Commonwealth Department of the Environment on the 29 October 2013 to discuss the project. The DoE were happy to see that Warrego Energy has taken measures to avoid, mitigate and manage impacts to Matters of National Environmental Significance and that offset options were already being investigated should they be required. The DoE also confirmed the various assessment processes and recommended a rigorous discussion of project impacts, so should it be determined that the project is a controlled action; the project may be assessed under an Assessment on Referral Information (ARI), level of assessment.

Warrego Energy initiated a landholder consultation program as part of planning for the project. Consultants KD.1 Pty Ltd (KD.1) was engaged by Warrego Energy to assist in this regard. The stakeholder consultation program commenced in October 2010 and will continue for the duration of the project.

Warrego Energy has also been consulting with the local indigenous group, the Amangu People, who have a Native Title claim (WC04/2) over EP-469, and their representatives the Yamatji Marlpa Aboriginal Corporation since 2008 during the acquisition of this permit. Warrego Energy has a Heritage Protection Agreement with the Amangu People for the undertaking of low impact and ground disturbing petroleum operations on the land within EP-469 (previously referred to as EP 25/07-8), and will continue to honour the conditions of this agreement.

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3 Site Overview

This chapter provides a brief description of the regions climate and physical and environmental characteristics of the project area.

3.1 Climate

The climate of the region is described as Mediterranean, with dry warm summers and wet cool winters (BoM, 2012).

Climate data from Eneabba weather station, approximately 43 km south of the project area, indicates the warmest period in the region is between December and March, with average maximum temperatures ranging from 33.3°C to 36.2°C. The lowest minimum average temperature occurs between July and September, with average minimum temperatures ranging from 9.0°C to 9.7°C during these months (BoM, 2012).

Rainfall in the region is highest during the cooler months between May and August. Mean monthly rainfall during these months ranges from 70.7 mm to 101.8 mm. The driest months are between November and March, with rainfall ranging from 7.4 mm to 14.4 mm in this period. The average annual rainfall at Eneabba is 495.5 mm (BoM, 2012).

3.2 Geology and Soils

The project area is located within the Geraldton Sandplains bioregion (Lesueur Sandplain sub-region) under the Interim Biogeographic Regionalisation of Australia (IBRA) (Woodman, 2013). The Lesueur Sandplain subregion (GS3) comprises coastal Aeolian and limestones, Jurassic siltstones and sandstones (often heavily lateritised) of central Perth Basin (Desmond & Chant, 2001).

The project area lies in the Northern Sandplains Region (Irwin Botanical District) as described by Beard (1990). Soils are described as yellow sands inland and leached sandy soils near the coast, which overlay laterite. This region is almost completely underlain by sedimentary rocks of siliceous nature. The principal exception to this is a block of Proterozoic metamorphic rocks with some granite between Greenough and Murchison Rivers (Beard, 1990). The sedimentary rocks form a series of plateaux, including the Dandaragan Plateau, on which the project area is located (Beard, 1990; Woodman, 2013). These plateaux have been eroded by the sea on the west and dissected by rivers, but substantial stretches of the plateau surfaces are still preserved and form extensive monotonous sandplains. Sandy soils are found throughout, except upon Proterozoic rocks where red loams are found (Beard, 1990). The area also contains several isolated lateritic outcrops in addition to the generally flat or undulating sandplains.

3.3 Surface Water

The project area is generally devoid of any significant permanent surface water features (see Figure 1). However, numerous small watercourses dissect the surrounding area, draining either westwards from the Arrowsmith Region onto the Swan Coastal Plain, or north or south towards the two nearest river systems (RPS, 2011). There are also several small ephemeral creeks in the surrounding area, including Sand Plain Creek and several other unnamed watercourses (RPS, 2011).

The most significant surface water features in the vicinity of the proposed exploration well are two regional drainage systems: the Arrowsmith River, to the south of the survey area, and the Irwin and Lockier Rivers to the north of the survey area (see Figure 1) (RPS, 2011).

The Arrowsmith River is the smaller of the two rivers (approximately 82 km in length) and lies approximately 15 km south of the proposed exploration well. The river flows in an east-west direction and has a catchment area of 1,605 km². The Arrowsmith River discharges into wetlands and karstic aquifers approximately 5 km from the coast. The Irwin River is approximately 160 km in length and flows east to west through hilly terrain and agricultural areas before discharging into the ocean. The river has a catchment area of 6,605 km² (RPS, 2011).

Both the Irwin and Arrowsmith Rivers flow intermittently with significant flows predominantly through the winter months; however, some semi-permanent pools persist throughout the summer (RPS, 2011). Across the Arrowsmith Region, the Irwin and Arrowsmith Rivers are known to receive a small contribution of fresh groundwater from minor spring-fed tributaries such as Springy Creek (Irwin River) and at the sites of some semi-permanent pools in the rivers (RPS, 2011).

3.4 Groundwater

The project area overlies the Yarragadee Formation aquifer, which is the largest aquifer in the Perth Basin. The Yarragadee Formation lies over the Cadda Formation and is comprised mainly of sand with minor shale and siltstone interbedded within it. The Cadda Formation may host minor localised permeable horizons but is generally of very low permeability. The Cadda Formation, where present, is a regional aquiclude and acts as a confining bed to the underlying aquifers (RPS, 2011).

The Yarragadee Formation aquifer is a multilayered flow system and due to the layered nature of the formation it becomes confined at depth. Within the area of the proposed exploration well, the upper water table is usually in excess of 100 m below ground level and, given the layered nature of the formation, very little direct rainfall recharge is expected to reach the regional water table. The depth of the water table across the project area is expected to be between 70 and 85 mAHD (RPS, 2011).

Water quality in the Yarragadee Formation aquifer is fresh to brackish, with salinity in the aquifer ranging between 500 to 1,000 mg/L. Total dissolved solids (TDS) concentration in the vicinity of the exploration well ranges from 530 to 700 mg/L. (RPS, 2011). The appraisal well is located within the Arrowsmith Groundwater Management Area, as proclaimed under the Rights In Water and Irrigation Act 1914 (RIWI Act) (RPS, 2011).

3.5 Flora and Vegetation

The project area is located within the Geraldton Sandplains bioregion (Leseur Sandplain sub-region) under the Interim Biogeographic Regionalisation of Australia (IBRA) (Woodman, 2013). The vegetation within the Lesueur Sandplain subregion is comprised of proteaceous scrub-heaths rich in endemics. York Gum and Jam woodland occur on outwash plains and associated drainage. The vegetation of the subregion consists mainly of shrub-heaths rich in endemics on a mosaic of lateritic mesas, sandplains, coastal sands and limestones, with heath on lateritised sandplains along the northeastern margins of the subregion (Desmond & Chant, 2001; Woodman, 2013).

The project area is also located within the Northern Sandplains Region as described by Beard (1990). The vegetation of this region is broadly described as scrub on heath on sandplains near the coast with Acacia-Casuarina thickets further inland, Acacia shrub with scattered trees of Eucalyptus loxophleba on hard-setting loams (Beard, 1990).

A Level 2 survey of flora and vegetation was conducted over the project area by Woodman Environmental Consulting (Woodman), in accordance with the Western Australian Environmental Protection Authority's (EPA) Guidance Statement No. 51 (EPA, 2004a). The survey included a desktop assessment, an initial reconnaissance visit (15 September 2011), a detailed survey over three visits in spring 2011 (26 – 30 September, 24 – 27 October and 20 – 26 November) and another two surveys in spring 2012 (10 – 13 September and 2 – 5 October). The full report (Woodman, 2013)

detailing the outcomes of the Level 2 flora and vegetation survey is provided as Appendix A and is summarised below.

Woodman (2013) described and mapped 17 vegetation types (VTs) across the survey area (see Figure 4). While none of these VTs represent Western Australian or Commonwealth listed Threatened Ecological Communities (TECs), the vast majority (excluding VTs 13b and 14) are considered to be of high local significance for one or more of the following reasons:

- Comprised less than 1% of the survey area.
- Generally occurred on landforms that are restricted and/or uncommon in the survey area.
- Provides habitat for one or more taxa listed as Threatened or is habitat for 1 or more other taxa considered to be of significance by the State (i.e. priority flora) that are completely/predominantly restricted to this VT.

For a full description of each of the VTs and conservation significant flora taxon, refer to the Level 2 flora and vegetation report (Appendix A).

The desktop assessment identified a total of 73 conservation significant flora taxa, including nine Threatened (Declared Rare) Flora taxa within the region, which have the potential to occur within the project area. Of these 73 a total of 30 confirmed and two probable conservation significant flora taxa (including one hybrid) are known from the survey area (Woodman, 2013). Known conservation significant flora from the survey area are listed in Table 3 and their locations are depicted on Figures 5 to 9. Threatened flora taxa are described further in Table 4.

Table 3 Conservation Significant Flora Taxa Known From the Survey Area

Taxon	Total Number of Locations	Total Number of Individuals	VTs/Habitat
Threatened			
<i>Eucalyptus crispata</i>	3 (4)	18	8; 10
<i>Eucalyptus leprophloia</i> *	2*	Unknown	8; C
<i>Paracaleana dixonii</i>	174	263	7a; 7b; 8; 10; 11; 12; 13a
<i>Thelymitra stellata</i>	139 (144)	273	7a, 7b, 8, 11, 13a
Priority 1			
<i>Lasiopetalum ogilvieanum</i>	26	113	7a, 7b, 8, 13a
<i>Malleostemon decipiens</i>	2	300	4, 5
<i>Micromyrtus rogeri</i>	504	17,174	1a, 1b, 3, 7a, 7b, 8, 9, 10, 11, 12, 13b, C
? <i>Stylidium carnosum</i> subsp. Narrow leaves (J.A. Wege 490)	1	1	10
<i>Synaphea oulopha</i>	146 (150)	846	1b, 7a, 7b, 8, 9, 10, 11, 13a, 13b
Priority 2			
<i>Eucalyptus abdita</i>	6 (7)	12	1b, 8 (potentially also in 11)
<i>Persoonia filiformis</i>	88	190	7a, 7b, 10, 13a

Table 3 Conservation Significant Flora Taxa Known From the Survey Area (cont'd)

Taxon	Total Number of Locations	Total Number of Individuals	VTs/Habitat
Priority 2 (cont'd)			
<i>Schoenus badius</i>	7	7 [^]	7a, 10, 13b, 14
<i>Stylidium pseudocaespitosum</i>	1	1	13a
Priority 3			
<i>Acacia isoneura</i> subsp. <i>isoneura</i>	1	1	5
<i>Allocasuarina grevilleoides</i>	37	1,997	7a, 7b, 8, 13a
<i>Banksia fraseri</i> ?var. <i>crebra</i> *	1*	Unknown	7b
<i>Beyeria gardneri</i>	1	2	12
<i>Eucalyptus macrocarpa</i> x <i>pyriformis</i>	3	19	7b, 8, 11
<i>Guichenotia impudica</i> *	1*	Unknown	11
<i>Haemodorum loratum</i>	57	90	3, 7a, 7b, 8, 9, 10, 12, 13a, 13b
<i>Hemiandra</i> sp. <i>Eneabba</i> (H. Demarz 3687)	22	30	7a, 10, 13a, 13b
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	514	21,527	3, 7a, 7b, 8, 9, 10, 11, 12, 13a, 13b
<i>Persoonia rudis</i>	17	18	7a, 7b, 8, 10, 11, 12, 13a
<i>Schoenus griffinianus</i> *	1*	1	13a
<i>Stylidium drummondianum</i>	433	9,294	1a, 1b, 7a, 7b, 8, 8D, 9, 10, 11, 13a, 13b, C
<i>Stylidium torticarpum</i>	59	1,111	1a, 1b, 3, 4, 7b, 8, 9, C
<i>Synaphea aephynsa</i>	157	1,780	7a, 7b, 8, 9, 10, 12, 13a
<i>Thryptomene</i> sp. <i>Mingenew</i> (Diels & Pritzel 332)	8	221	4, 4D, 5, 7a
<i>Verticordia luteola</i> var. <i>luteola</i>	2	21	13a
Priority 4			
<i>Banksia scabrella</i>	463	7,668	7a, 7b, 8, 10, 11, 12, 13a, 13b, 14, C
<i>Calytrix chrysantha</i>	1	30	7a
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	121	1,310	3, 7a, 7b, 8, 10, 11, 12, 13a

Note: () Indicate total, when accounting for a number of collections, which could not be positively identified.

* Desktop record not confirmed to be present by Woodman in 2012 and believed to be erroneous (2013).

[^] This species was not counted at recorded locations, however is an annual species that is likely to be more abundant than indicated

Table 4 Threatened Flora Within the Project Area

Threatened Flora	Description	Presence Within Project Area
<p>Scaly Butt Mallee, <i>Eucalyptus leprophloia</i> (Endangered)</p>	<p><i>E. leprophloia</i> is a mallee that grows to a height of about 8 m and generally occurs on breakaways and hills or valleys associated with such features. There are 27 known records of this species representing 9 populations. One of these populations is located in the Boothendarra Nature Reserve (Woodman, 2013).</p>	<p>While two of these known records occur within the project area, <i>E. leprophloia</i> was not recorded by Woodman in the project area during the detailed and targeted surveys in 2011 and 2012. Woodman (2013) considers that both records represent the same plant, the location data of which are suspected to be erroneous.</p>
<p>Yandanooka Mallee, <i>Eucalyptus crispata</i> (Vulnerable)</p>	<p><i>E. crispata</i> grows to about 7 m in height and generally occurs in isolated clumps on breakaways and hills. There are 29 records of <i>E. crispata</i>, representing approximately 12 populations and spanning an area of approximately 80 km, encompassing conservation areas including Wilson Nature Reserve and Boothendarra Nature Reserve. Existing records of the species indicate that populations of <i>E. crispata</i> generally contain fewer than 20 individuals.</p>	<p>Woodman's Level 2 flora and vegetation survey positively identified 18 individuals of this species across three locations. A fourth potential location was also identified but was unable to be positively identified (<i>E. ?crispata</i>) due to the absence of fruiting material (Woodman, 2013).</p> <p>This species was recorded solely within Vegetation Type (VT) 8, as depicted in Figure 5. Approximately 448.3 ha of habitat for <i>E. crispata</i> is present within the survey area.</p>
<p>Star Sun Orchid, <i>Thelymitra stellata</i> (Endangered)</p>	<p><i>Thelymitra stellata</i> is a tuberous, perennial orchid 0.25 m in height, found in small isolated colonies on lateritic soils, often on breakaways and hills. There are 53 records of <i>Thelymitra stellata</i>, representing approximately 42 populations and occurring over a range of approximately 450 km. A number of these populations (consisting of relatively few individuals) are located within secure conservation estate, including Lesueur National Park and Coomaloo Nature Reserve.</p>	<p>A total of 266 individuals of <i>Thelymitra stellata</i> were recorded at 139 locations, representing a total of 18 subpopulations. A further seven individuals, over five locations and representing another two subpopulations, may also represent this species. However, these could only be identified to <i>Thelymitra ?stellata</i> due to the absence of flowering material. The record of this species within the survey area represents the northernmost known collection of the species, extending its known range by approximately 10 km (Woodman, 2013).</p> <p>This species was predominantly recorded within VT 8, with 129 of the 139 confirmed locations and one of the five potential locations recorded occurring within this VT. This species was also recorded within VT 7a (9 locations), 7b (2 locations), 11 (2 locations) and 13a (1 location), as depicted in Figure 5. Approximately 4,195 ha of habitat for <i>Thelymitra stellata</i> is present within the survey area.</p>

Table 4 Threatened Flora Within the Project Area (cont'd)

Threatened Flora	Description	Presence Within Project Area
Sandplain Duck Orchid, <i>Paracaleana dixonii</i> (Endangered)	<i>Paracaleana dixonii</i> is a tuberous, perennial orchid 0.2 m in height, found in small isolated colonies in sandy soils, occasionally over laterite. There are 38 records of <i>Paracaleana dixonii</i> , representing approximately 21 populations and occurring over a range of approximately 180 km. A number of these populations are located within secure conservation estate, including Lesueur and Moore River National Parks and Coomallo and South Eneabba Nature Reserves.	A total of 263 individuals of <i>Paracaleana dixonii</i> were recorded at 174 locations, representing a total of 30 subpopulations. The record of this species within the survey area represents the northernmost known collection of the species, extending its known range by approximately 10 km (Woodman, 2013). This species was predominantly recorded within VT 13a (70 locations) and was also recorded within VT 7a (13 location), 7b (29 locations), 8 (1 location), 11 (7 locations) and 12 (15 locations) as depicted in Figure 5. Approximately 4,438 ha of habitat for <i>Paracaleana dixonii</i> is present within the survey area.

Woodman (2013) also identified a number of other flora species of interest, which may represent a number of undescribed taxon, but require additional investigation to confirm this is the case. Other flora species of interest include *Eucalyptus* sp., *Cryptandra intermedia* (atypical variant), *Leucopogon* sp. and *Acacia ?idiomorpha*. The locations of these species are depicted on Figure 9.

A total of 3,099.26 ha of cleared land was mapped by Woodman (2013), representing approximately 32.5% of the survey area. Remnant vegetation within private property (i.e. on agricultural land) varied in condition from pristine to poor dependent on the number of weeds present and a decline in native species diversity relating to clearing and grazing impacts. Areas ranked good to poor were generally associated with Sand Plain Creek where these pressures were greatest (Woodman, 2013).

The majority of native vegetation located within Vacant Crown Land was considered to be in 'pristine' condition with no obvious signs of disturbance (Woodman, 2013). However, several of the surveyed quadrats contained introduced species and these were often associated with areas containing *Eucalyptus accedens* (Woodman, 2013). Vegetation condition mapping over the project area is provided in the Level 2 flora and vegetation report, provided as Appendix A.

Woodman (2013) recorded a total of 22 introduced flora within the survey area. None of these weeds are listed as Weeds of National Significance, although one species, *Echium plantagineum* (Pattersons Curse), is a Declared pest under the Biosecurity and Agricultural Management Act 2007, however not for the shires within which the project area occurs. For a full list and description of each of the weed species, refer to the Level 2 flora and vegetation report, provided as Appendix A.

Glevan Consulting (2012) was commissioned by Woodman to conduct an assessment for the presence of Phytophthora Dieback in the project area (report provided as Appendix B). No areas of remnant vegetation within the Vacant Crown Land were observed to be currently impacted or infected by, nor considered to be altered by the previous introduction of, Phytophthora Dieback. This area should be considered as being protectable from the Phytophthora Dieback disease. Areas of remnant vegetation within agricultural land were not examined, as they were unmappable (i.e. sufficiently disturbed that dieback occurrence mapping was not possible at time of inspection).

3.6 Terrestrial Fauna

Coffey Environments Australia (Coffey) undertook a Level 1 fauna assessment in accordance with the Guidance for the Assessment of Environmental Factors No. 56 (EPA, 2004b) Terrestrial Fauna

Surveys for Environmental Impact Assessment (EPA, 2002) and Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA and DEC, 2010). Coffey also undertook a Black Cockatoo habitat assessment in accordance with the EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPac, 2012). The full report (Coffey, 2013) detailing the outcomes of the Level 1 fauna assessment is provided as Appendix C and is summarised below.

Six fauna habitat types were identified and mapped within the survey area, comprising cleared land, mixed shrubland with/without woodland species, laterite breakaway, open Eucalyptus forest, minor drainage lines and planted Eucalypts habitats (Figure 10) (Coffey, 2013).

A total of 302 vertebrate fauna species, 20 of which are conservation significant, have previously been recorded within the region and so have the potential to occur within the survey area. Coffey undertook an assessment to determine the likelihood of these species occurring within the survey area based on the availability of suitable habitat, known distribution of each species and currency of species records (Coffey, 2013). Of the 20 species of conservation significance, only seven were considered 'likely' to occur and another six were considered as 'possibly' occurring within the survey area, as detailed in Table 5.

Table 5 Conservation Significant Fauna Potentially Occurring in the Survey Area

Common Name	WC Act/DEC Status ¹	EPBC Act Status ¹	Potential to Exist Within Survey Area ²
Carnaby's Black Cockatoo (<i>Calyptorhynchus latirostris</i>)	Schedule 1	Endangered	Likely
Peregrine Falcon (<i>Falco peregrinus</i>)	Schedule 4	—	Likely
Australian Bustard (<i>Ardeotis australis</i>)	Priority 4	—	Likely
Rufous Fieldwren (<i>Calamanthus campestris</i> subsp. <i>Montanellis</i>)	Priority 4	—	Likely
White-browed Babbler (<i>Pomatostomus superciliosus</i> subsp. <i>ashbyi</i>)	Priority 4	—	Possible
Rainbow Bee-eater (<i>Merops ornatus</i>)	Schedule 3	Migratory	Likely
Fork-tailed Swift (<i>Apus pacificus</i>)	Schedule 3	Migratory	Possible
Great Egret (<i>Ardea alba</i>)	Schedule 3	Migratory	Possible
Cattle Egret (<i>Ardea ibis</i>)	Schedule 3	Migratory	Possible
Western Brush Wallaby (<i>Macropus irma</i>)	Priority 4	—	Possible
Gilled Slender-Bluetongue (<i>Cyclodomorphus branchialis</i>)	Schedule 1	—	Likely
Woma (<i>Aspidites ramsayi</i>)	Schedule 4, Priority 1	—	Possible
Western Carpet Python (<i>Morelia spilota imbricata</i>)	Schedule 4, Priority 4	—	Likely

1. Definitions for WC Act/DEC Status and EPBC Act categories are provided in Appendix C.

2. Likelihood of Occurrence: Likely – Suitable habitat present, species recently recorded in the region; Possible – Suitable habitat present, limited species records in the region; Unlikely – Absence of suitable habitat, known distribution outside the survey area.

None of the conservation significant fauna species listed in Table 5 were recorded during the Level 1 fauna survey. For a description of each of these species refer to the Level 1 fauna assessment report (Appendix C).

In terms of significant habitat, the project area is recognised as providing habitat critical to the survival of the Carnaby's Black Cockatoo (DEC, 2012), including:

- Foraging habitat: shrubland with/without woodland species, laterite breakaways and minor drainage habitats (Figure 10).
- Roosting habitat: open *Eucalyptus* forest and planted *Eucalyptus* habitats (planted roadside/property trees) (Figure 10).

While no suitable breeding habitat was observed during the field investigation, the open *Eucalyptus* forest and planted *Eucalyptus* habitats contained younger age class trees, which may provide suitable breeding habitat in the future.

Eight introduced fauna species were recorded during Coffey's (2013) site investigations, including:

- Cow (*Bos taurus*)
- Goat (*Capra hircus*).
- Sheep (*Ovis aries*)
- Dingo/dog (*Canis lupus/familiaris*)
- Red fox (*Vulpes vulpes*).
- Rabbit (*Oryctolagus cuniculus*).
- Pig (*Sus scrofa*).

Another three introduced fauna species have previously been recorded in the region and so potentially occur in the project area including the Cat (*Felis catus*), House mouse (*Mus musculus*) and Rat (*Rattus rattus*) (Coffey, 2013).

4 Impact Assessment

As discussed in Section 1.1, **Warrego Energy has committed to clearing no more than 70 ha** within the project area (approximately 0.8% of the project area), taking into consideration existing disturbance and to allow for some flexibility in the location of infrastructure to avoid a number of environmentally sensitive values. This chapter discusses the potential impacts of the project on conservation significant flora and fauna.

4.1 Threatened Flora and Threatened Flora Habitat

Based on the current conceptual disturbance footprint (Figure 11), the project will impact approximately 44.4 ha of vegetation types known to support Threatened flora species present within the project area, as detailed in Table 6. This represents approximately 1% of Threatened flora habitat mapped within the survey area by Woodman (2013).

Table 6 Vegetation Types That Provide Habitat for Threatened Flora

Vegetation Type	Threatened Flora Supported	Total Area Mapped (ha)	Total Area Impacted ¹ (ha)	Mapped Area Impacted ¹
7a	Habitat for <i>Thelymitra stellata</i> (Endangered) and <i>Paracaleana dixonii</i> (Endangered).	799.1	7.8	1.0%
7b	Preferred habitat for <i>Paracaleana dixonii</i> (Endangered). Also provides habitat for <i>Thelymitra stellata</i> (Endangered).	663.7	9.5	1.4%
8	Primary habitat for <i>Eucalyptus crispata</i> (Vulnerable) and preferred habitat for <i>Thelymitra stellata</i> (Endangered). Also provides habitat for <i>Paracaleana dixonii</i> (Endangered).	448.3	5.0	1.1%
11	Habitat for <i>Thelymitra stellata</i> (Endangered) and <i>Paracaleana dixonii</i> (Endangered).	538.4	5.9	1.1%
12	Habitat for <i>Paracaleana dixonii</i> (Endangered).	243.3	2.3	0.9%
13a	Preferred habitat for <i>Paracaleana dixonii</i> (Endangered). Also provides habitat for <i>Thelymitra stellata</i> (Endangered).	1,745.2	13.9	0.8%
Total		4438.0	44.4	1.0%

1. Based on the conceptual disturbance footprint depicted in Figure 11.

The following commitments will assist in reducing the project's impact to Threatened flora habitat:

- Where possible, the drill pad, associated access tracks and borrow pits will be located on previously disturbed land.
- Where possible, the camp will be located on cleared land (pending approval from landowners).

Figure 5 illustrates the location of the conceptual disturbance footprint in relation to known locations of Threatened flora. Approximately 8 of the 139 known locations (5.8%) of *Thelymitra stellata* (Star Sun Orchid) and 16 of the 174 known locations (9.2%) of *Paracaleana dixonii* (Sandplain Duck Orchid)

within the survey area occur within 15 m of the conceptual disturbance footprint and so have the potential to be impacted by the project. None of the known locations of *Eucalyptus crispata* occur within 15 m of the conceptual project footprint. There is also the potential that the project may impact (unknown) locations of Threatened flora, not identified during the flora and vegetation assessment.

It is Warrego Energy's intention to avoid all known locations of Threatened flora and minimise the impacts to any unknown locations of Threatened flora through the implementation of the following commitments:

- Initial surveying using a GPS will be undertaken to accurately locate and demarcate all areas of disturbance (i.e. source lines and access tracks) and identify areas which need to be avoided (i.e. locations of Threatened flora).
- All vegetation clearing will be undertaken outside the growth periods for both *Thelymitra stellata* and *Paracaleana dixonii* (i.e. May to December). As both of these species are present as tubers underground outside their growth periods, impacts from clearing will be mitigated.
- Vegetation clearing will be undertaken using a raised roller mulching technique. As tubers of both *Thelymitra stellata* and *Paracaleana dixonii* are present underground outside their growth periods, impacts from clearing will be mitigated.
- All large trees will be avoided, preventing potential impacts to any unidentified locations of the Threatened flora species *Eucalyptus leprophloia* and *Eucalyptus crispata*.
- Warrego Energy commits to avoiding ESA ID 6046 located within the project area.
- Known locations of Threatened flora will be avoided (i.e. deviations to source lines, receiver points and tracks can be made to avoid sensitive areas and topographical obstructions).
- The drill pad, associated access tracks and borrow pits will be located to avoid known locations of Threatened flora and, where possible, will be located on previously disturbed land.
- Where possible, the camp will be located on cleared land (pending approval from landowners) or otherwise located to avoid known locations of Threatened flora and minimise disturbance.
- Warrego Energy commits to avoiding ESA ID 6046 located within the project area.

While it is not Warrego Energy's intention to impact known Threatened flora, given the project has the potential to impact Threatened flora (known and unknown) both directly and indirectly, Warrego Energy will be applying for a 'Permit To Take' through the Western Australian Department of Parks and Wildlife (DPaW), to allow concurrent assessment with this NVCP application. No known Threatened flora will be cleared without a 'Permit To Take'.

Potential indirect impacts to Threatened flora include:

- Introduction and spread of invasive weed species.
- Indirect loss or degradation of flora and vegetation due to impacts from dust deposition, altered drainage patterns and surface water quality.
- Increased risk of fire due to the increased presence of vehicles and machinery and failure of personnel to follow appropriate fire management practices.
- Failure of vegetation to recover and/or colonisation of disturbed areas by weed species following rehabilitation.

Indirect impacts will be mitigated and managed through the implementation of the following commitments:

- The project area will be treated as dieback-free and a dieback and weed management plan will be developed and implemented (as discussed in Section 5).
- All project vehicles and machinery will be fitted with rubber tyres, and movements will be minimised as much as possible, particularly along source lines, to maximise the success of natural revegetation.

- Project vehicle and machinery movements will be restricted to the project footprint and existing disturbance/tracks and firebreaks.
- Project vehicle and machinery movement will be restricted to a speed limit of 20 km/h or less along project tracks.
- The project will not operate during harvest and vehicle movement bans issued by local shires, when vehicle movements and the operation of machinery may otherwise cause a fire or contribute to the spread of a bushfire.
- Fire fighting equipment will be fitted to all machinery and equipment and all personnel will be appropriately trained in how to prevent and respond to fires. A dedicated fire response vehicle will also be available on site to respond to any incident of fire.
- A communication protocol will be established to include notifying the DPaW Moora District office of operations (arrival and departure from the project area) and immediate notification of any incidence of fire associated with project activities.
- Education and awareness training will identify conservation significant values within the project area and discuss relevant management measures and personnel/contractor responsibilities.
- A rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW). The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey (as discussed in Section 5).

4.2 Priority Flora

Based on the current conceptual disturbance footprint (see Figures 6 to 9) the project will directly impact nine priority flora taxon as detailed in Table 7.

Table 7 Priority Flora Impacted by the Conceptual Disturbance Footprint

Taxon	Total Number of Locations Within Survey area	Number of Locations Impacted	% Impacted	Number of Locations Remaining
Priority 1^				
<i>Micromyrtus rogeri</i>	504	11	2.2	493
<i>Synaphea oulopha</i>	146 (150)	1	0.7	145 (149)
Priority 2				
<i>Persoonia filiformis</i>	88	4	4.5	84
Priority 3				
<i>Banksia fraseri</i> ?var. <i>crebra</i> *	1*	1	100.0	0
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	514	10	1.9	504
<i>Stylidium drummondianum</i>	433	13	3.0	420
<i>Synaphea aephyrsa</i>	157	1	0.7	156

Table 7 Priority Flora Impacted by the Conceptual Disturbance Footprint (cont'd)

Taxon	Total Number of Locations Within Survey area	Number of Locations Impacted	% Impacted	Number of Locations Remaining
Priority 4				
<i>Banksia scabrella</i>	463	8	1.7	455
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	121	1	0.8	120

Note: This impact does not take into consideration the project commitments discussed in Section 5.

() Indicate total, when accounting for a number of collections, which could not be positively identified.

* Desktop record not confirmed to be present by Woodman in 2012 and believed to be erroneous (2013).

The conceptual disturbance footprint will impact less than 5% of all known locations of priority flora, with the exception of *Banksia fraseri* ?var. *crebra*. Woodman recorded *Banksia fraseri* ?var. *crebra* during a survey conducted in 2008 but insufficient material was present to confirm the collection represented the priority 3 species *Banksia fraseri* var. *crebra*. During the 2011 survey Woodman revisited the location and a collection was made that was identified as *Banksia fraseri* ?var. *fraseri*, which again had insufficient material to confirm its identity. It is Woodman's (2013) opinion that given the vast number of *Banksia fraseri* var. *fraseri* recorded within the survey area, that *Banksia fraseri* var. *crebra* is unlikely to be present and that the 2008 record was erroneous.

Direct impacts to priority flora will be managed and mitigated through the implementation of the following commitments:

- Where possible, known locations of Priority 1 and Priority 2 species along source lines, receiver points and tracks will be avoided (i.e. minor deviations can be made to avoid sensitive areas and topographical obstructions).
- The drill pad, associated access tracks and borrow pits will be located to avoid known locations of Threatened flora and Priority 1 species and where possible will be located on previously disturbed land.
- Where possible, the camp will be located on cleared land (pending approval from landowners) or otherwise located to avoid known locations of Threatened flora and Priority 1 and Priority 2 species and minimise disturbance.
- Initial surveying using a GPS will be undertaken to accurately locate and demarcate all areas of disturbance (i.e. source lines and access tracks) and identify areas, which need to be avoided.
- All large trees, open Eucalyptus forest habitat and planted Eucalyptus habitat will be avoided.
- Warrego Energy has committed to avoid clearing within 20 m of Sand Plain Creek and utilising existing crossings to minimise disturbance to minor watercourses.

Indirect impacts to priority flora will be managed and mitigated through the implementation of project commitments, similar to those discussed for Threatened flora in Section 4.1.

4.3 Conservation Significant Fauna

Potential impacts of the Project on terrestrial vertebrate fauna present within the survey area include; loss or degradation of fauna habitat; fauna injuries and mortalities from interactions with project vehicles, machinery and infrastructure; increased predation by introduced fauna; altered fauna behaviour associated with noise, vibration and light emissions and increased risk of fire (Coffey, 2013).

As discussed above, **Warrego Energy has committed to clearing no more than 70 ha** within the project area (approximately 0.8% of the project area), taking into consideration existing disturbance and to allow for some flexibility in the location of infrastructure to avoid a number of environmentally sensitive values. Warrego Energy has also committed to avoid clearing all large trees, open *Eucalyptus* forest habitat and planted *Eucalyptus* habitat.

Based on the current conceptual disturbance footprint (see Figure 12) the project will impact less than 64 ha of habitat within the project area as detailed in Table 8.

Table 8 Habitat Impacted by the Conceptual Disturbance Footprint

Habitat Type	Total Area Mapped	Area Impacted (ha)	% Impacted	Area Remaining (ha)
Mixed shrubland with or without woodland species	6,109.5	61.5	0.9	6,048.0
Laterite breakaway	51.6	0.5	0.9	51.1
Open Eucalyptus forest	94.2	0*	0*	94.2
Minor drainage lines	177.6	1.2^	0.7^	176.4
Planted Eucalypts	9.1	0*	0*	9.1
Total	6,442.0	63.2	1.0	6,378.8

Note: Habitat mapped as cleared has not been included in this table.

* Warrego Energy has committed to avoid clearing within these habitats.

^ Warrego Energy has committed to avoid clearing along Sand Plain Creek and so impacts to minor drainage habitat will be less than depicted.

In consideration of the project commitments in Section 5, and with the exception of the Carnaby's Black Cockatoo, the project is not anticipated to have a significant impact on conservation significant fauna present within the project area, given:

- Scale (i.e. 63.2 ha or 1% of habitat present within the project area) and nature of the proposed clearing (e.g., width of clearing, coarse line spacing and raised roller mulching method).
- None of the species identified as 'likely' or 'possibly' occurring within the project area are likely to be solely reliant on habitat present within the project area.
- Availability of similar habitat in the local and regional area (i.e., to the west of the survey area and as approximately 17.67% of the sub region is held in conservation reserves).

The project area provides habitat critical to the survival of the Carnaby's Black Cockatoo (DEC, 2012), including:

- Foraging habitat: shrubland with/without woodland species, laterite breakaways and minor drainage habitats.
- Roosting habitat: open *Eucalyptus* forest and planted *Eucalyptus* habitats (planted roadside/property trees).

While no suitable breeding habitat was observed during the field investigation, the open *Eucalyptus* forest and planted *Eucalyptus* habitats contained younger age class trees, which may provide suitable breeding habitat in the future.

In determining the significance of project impacts on the Carnaby's Black Cockatoo, Coffey (2013) referred to the EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPAC, 2012) in conjunction with the EPBC Policy Act Statement 1.1 Matters of National Environmental Significance (DEWHA, 2006), which sets out a number of significant impact criteria for

Endangered species. Where an action has a 'real chance or possibility' of triggering any of these criteria the action is considered to have a significant impact. The outcomes of this assessment are provided in Appendix C and have been reconsidered below in light of the current development footprint and Warrego Energy's management and mitigation commitments (Section 5).

1. Lead to a long-term decrease in the size of a population.

It is Coffey's assessment that the project has **no 'real chance or possibility'** of leading to a long-term decrease in the size of a population, given the:

- Absence of breeding habitat within the survey area.
- Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees (e.g. *Banksia* spp.), open *Eucalyptus* forest habitat and planted *Eucalyptus* habitat (roosting and potential breeding habitat).
- Scale (i.e. approximately 63.2 ha, 1% of foraging habitat present within the survey area) and nature of the proposed clearing (e.g., width of clearing, coarse grid spacing and raised roller mulching method). Of particular importance is the method of clearing, raised roller mulching preserves rootstock and retains seedstock, which will increase the success of natural rehabilitation and revegetation on completion of the project.
- Short-term nature of the impact. The seismic survey (which accounts for 52.4 ha, 82% of the current conceptual footprint) will be completed in approximately three weeks and disturbed areas will be closed and allowed to regenerate naturally (with the exception of disturbed areas to be utilised during the drilling program). The drilling program accounts for approximately 6% (5.4 ha) of the project disturbance and will take approximately three months to complete, before the area is rehabilitated.
- The implementation of an approved rehabilitation plan developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW).
- Availability of similar foraging and roosting habitat in the local and regional area (i.e., directly to the west of the survey area and as over 21% of remnant vegetation in vegetation associations Tathra-379 and Tathra-49 which encompass the project area are held in conservation reserves (Government of Western Australia, 2013)).

2. Reduce the area of occupancy of the species.

The project area falls within the modelled distribution of the Carnaby's Black Cockatoo, including the north western extent of the modelled breeding range of the species (DSEWPAC, 2012). To reduce the area of occupancy of this species the project would have to significantly impact habitat on the edges of the species' known (breeding and/or non-breeding) distribution or impact a sufficiently large enough area leading to fragmentation effects (Coffey, 2013).

It is Coffey's assessment that the project has **no 'real chance or possibility'** of reducing the area of occupancy of the species, given the:

- Scale (i.e. approximately 63.2 ha, 1% of foraging habitat present within the survey area) and nature of the proposed clearing (e.g., width of clearing, coarse grid spacing and raised roller mulching method), particularly as most of the project disturbance (approximately 94%) is linear in nature and 3.5 m wide.
- Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees, open *Eucalyptus* forest habitat and planted *Eucalyptus* habitat (roosting and potential breeding habitat).
- Location of the survey area within the non-breeding modelled distribution of the species (which extends all directions from the survey area).

- Availability of similar foraging and roosting habitat in the local and regional area (i.e., directly to the west of the survey area and as over 21% of remnant vegetation in vegetation associations Tathra-379 and Tathra-49 which encompass the project area are held in conservation reserves (Government of Western Australia, 2013)).
 - Absence of breeding habitat within the survey area.
3. Fragment an existing population into two or more populations.

A large portion of habitat present within the survey area, namely the area of habitat within the Vacant Crown Land, was considered to be of Very Good quality with good connectivity to surrounding habitat of a similar condition to the west of the survey area. Areas of remnant vegetation within cleared land had a lower quality than similar habitats within the Vacant Crown Land, associated with their level of disturbance and reduced connectivity (Coffey, 2013).

It is Coffey's assessment that the project has **no 'real chance or possibility'** of fragmenting an existing population into two or more populations, given the:

- Scale (i.e. approximately 63.2 ha, 1% of foraging habitat present within the survey area) and nature of the proposed clearing (e.g., width of clearing, coarse grid spacing and raised roller mulching method). particularly as most of the project disturbance (approximately 82%) is linear in nature and 3.5 m wide.
- Aerial and highly mobile nature of the species. While little is known about the species' home range, animals have previously been recorded traveling up to 1.4 and 2.5 km from their nest (DSEWPAC, 2012 and 2013a).
- Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees, open *Eucalyptus* forest habitat and planted *Eucalyptus* habitat (roosting and potential breeding habitat).
- Short-term nature of the impact. The seismic survey (which accounts for 52.4 ha, 82% of the current conceptual footprint) will be completed in approximately three weeks and disturbed areas will be closed and allowed to regenerate naturally (with the exception of disturbed areas to be utilised during the drilling program). The drilling program accounts for approximately 6% (5.4 ha) of the project disturbance and will take approximately three months to complete, before the area is rehabilitated.
- The implementation of an approved rehabilitation plan developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW).

4. Adversely affect habitat critical to the survival of a species.

The Carnaby's Cockatoo Recovery Plan (DEC, 2012) defines habitat critical for the recovery of the species as any identified breeding and nearby feeding habitat, former breeding habitat that has hollows intact, and vegetation that provides habitat for feeding, watering and regular night roosting.

No breeding habitat and thus known nesting trees, or known roosting trees, are present within the survey area. However, some clearing of critical habitat is unavoidable given all habitats (with the exception of cleared land) within the survey area contain suitable foraging and roosting species (Coffey, 2013).

A large portion of habitat present within the survey area, namely the area of habitat within the Vacant Crown Land, was considered to be of Very Good quality with good connectivity to surrounding habitat of a similar condition to the west of the survey area. Areas of remnant vegetation within cleared land had a lower quality than similar habitats within the Vacant Crown Land, associated with their level of disturbance and reduced connectivity (Coffey, 2013).

Given impacts to critical habitat are unavoidable, the project **will** have an adverse affect on habitat critical to the survival of the species. However, it is Coffey's assessment that these impacts will be of limited significance, given the:

- Availability of similar foraging and roosting habitat in the local and regional area (i.e., directly to the west of the survey area and as over 21% of remnant vegetation in vegetation associations Tathra-379 and Tathra-49 which encompass the project area are held in conservation reserves (Government of Western Australia, 2013)).
- Scale (i.e. approximately 63.2 ha, 1% of foraging habitat present within the survey area) and nature of the proposed clearing (e.g., width of clearing, coarse grid spacing and raised roller mulching method). Of particular importance is the method of clearing, raised roller mulching preserves rootstock and retains seedstock, which will increase the success of natural rehabilitation and revegetation on completion of the project.
- Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees, open *Eucalyptus* forest habitat and planted *Eucalyptus* habitat (roosting and potential breeding habitat).
- Short-term nature of the impact. The seismic survey (which accounts for 52.4 ha, 82% of the current conceptual footprint) will be completed in approximately three weeks and disturbed areas will be closed and allowed to regenerate naturally (with the exception of disturbed areas to be utilised during the drilling program). The drilling program accounts for approximately 6% (5.4 ha) of the project disturbance and will take approximately three months to complete, before the area is rehabilitated.
- The implementation of an approved rehabilitation plan developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW).

5. Disrupt the breeding cycle of a population.

Whilst the survey area occurs within the modelled distribution of this species (both breeding and non-breeding range) no known nesting trees have been recorded within the survey area, nor was suitable breeding habitat observed during the field investigation. It is Coffey's assessment that there is **no 'real chance or possibility'** that the project will disrupt the breeding cycle of a population (Coffey, 2013).

6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Warrego Energy is committed to utilising existing areas of disturbance as much as practicable and to retaining/avoiding clearing all large trees, open *Eucalyptus* forest habitat and planted *Eucalyptus* habitat (roosting and potential breeding habitat). However clearing of some Carnaby's Black Cockatoo foraging habitat for this project is unavoidable given that all habitats in the survey area (with the exception of cleared land) contain suitable foraging species.

However, it is Coffey's assessment that there is **no 'real chance or possibility'** that the project will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, given the:

- Scale (i.e. approximately 63.2 ha, 1% of foraging habitat present within the survey area) and nature of the proposed clearing (e.g., width of clearing, coarse grid spacing and raised roller mulching method). Of particular importance is the method of clearing, raised roller mulching preserves rootstock and retains seedstock, which will increase the success of natural rehabilitation and revegetation on completion of the project.
- Short-term nature of the impact. The seismic survey (which accounts for 52.4 ha, 82% of the current conceptual footprint) will be completed in approximately three weeks and disturbed areas will be closed and allowed to regenerate naturally (with the exception of disturbed areas to be utilised during the drilling program). The drilling program accounts for approximately 6% (5.4 ha) of the project disturbance and will take approximately three months to complete, before the area is rehabilitated.

- The implementation of an approved rehabilitation plan developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW).

7. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.

Competition with, or predation by, invasive species is not recognised by DSEWPAC (2013a) as a key threat to the Carnaby's Black Cockatoo.

The feral cat and fox are already believed to be established within the project area, given they are both known to occur in the region from previous records and as a fox was sighted during the field investigation (Coffey, 2013). While these species may prey on birds foraging in low heath, it is Coffey's assessment that there is **no 'real chance or possibility'** that the project will result in the establishment of any other invasive species that may be harmful to the Carnaby's Black Cockatoo becoming established in the project area.

8. Introduce disease that may cause the species to decline.

The only threat of disease posed by the project that may impact the Carnaby's Black Cockatoo, albeit indirectly (i.e., through habitat loss/degradation), is the introduction of *Phytophthora dieback*. *Phytophthora dieback* feeds on the roots of plants causing root-rot in susceptible species and plant death. The pathogen is spread through the movement of infested soil and mud, especially by vehicles and footwear. It also moves in free water and via root-to-root contact between plants (Coffey, 2013).

Phytophthora dieback is a significant threat to vulnerable plants and plant communities in areas receiving at least 400 mm annual rainfall. Although more prevalent in higher rainfall zones (greater than 800 mm annual rainfall) it also spreads through 'water gaining' sites such as wetlands and rivers, in the 400 to 600 mm rainfall zone (Coffey, 2013).

Given the average annual rainfall at Eneabba (the closest weather station) is 493.3 mm, the survey area may be susceptible to *Phytophthora dieback*. An assessment by Glevan Consulting (2012) found that the remnant vegetation within the crown land was free of *Phytophthora dieback* (Glevan Consulting, 2012)

It is Coffey's assessment that there is **no 'real chance or possibility'** that the project will introduce disease that may cause the Carnaby's Black Cockatoo to decline, given Warrego Energy is committed to developing and implementing a dieback and weed management plan (as discussed in Section 4).

9. Interfere with the recovery of the species.

The objective of the Carnaby's Cockatoo Recovery Plan (DEC, 2012) is to stop further decline in the distribution and abundance of Carnaby's Black Cockatoo by protecting the birds throughout their life stages and enhancing habitat critical for survival throughout their breeding and non-breeding range, ensuring that the reproductive capacity of the species remains stable or increases.

The recovery plan will be deemed to not be successful if, within a ten-year period, any of the following performance criteria occur:

- a. The area of occupancy declines by more than 10% below 60,525 km² using a grid size of 15 x 15 km².
- b. The number of breeding pairs of Carnaby's cockatoos at monitored breeding sites across the breeding range decreases by more than 10% averaged over three consecutive years (or similar change in amended methodology).
- c. The estimated number of adult and proportion of juvenile Carnaby's cockatoos at known night roost sites decreases by more than 10% averaged over three consecutive years.

- d. The extent of nesting habitat (trees with nesting hollows), feeding habitat (as defined by vegetation complexes), and night roosting habitat (as identified through community survey) decreases by more than 10% throughout the species' range.

The project is unlikely to contribute to the recovery plan performance criteria 'a', 'b' and 'c', given:

- The project has no 'real chance or possibility' of reducing the area of occupancy of the species, as discussed against significant impact criteria 2 (above).
- No known nesting trees (i.e., breeding sites) have been recorded within the survey area, nor was suitable breeding habitat observed during the field investigation.
- No known roost sites have been recorded within the survey area and while suitable roosting habitat was present (which may also provide suitable breeding habitat in the future), Warrego Energy has committed to avoid clearing these trees/habitat.

While the project may contribute to performance criteria 'd' given some clearing of critical foraging habitat is unavoidable (see discussion against significant impact criteria 4, above), it is Coffey's assessment that there is **no 'real chance or possibility'** that the project itself will interfere with the recovery of the Carnaby's Black Cockatoo.

In conclusion Coffey has determined that the project only has a 'real chance or possibility' of triggering one of the nine criteria, specifically 'adversely affecting habitat critical to the survival of the species', given that some clearing of foraging habitat is unavoidable. The impact of clearing on this species however, is believed to be of limited significance, given the:

- Scale (i.e. approximately 63.2 ha, 1% of foraging habitat present within the survey area) and nature of the proposed clearing (e.g., width of clearing, coarse grid spacing and raised roller mulching method). Of particular importance is the method of clearing, raised roller mulching preserves rootstock and retains seedstock, which will increase the success of natural rehabilitation and revegetation on completion of the project.
- Short-term nature of the impact. The seismic survey (which accounts for 52.4 ha, 82% of the current conceptual footprint) will be completed in approximately three weeks and disturbed areas will be closed and allowed to regenerate naturally (with the exception of disturbed areas to be utilised during the drilling program). The drilling program accounts for approximately 6% (5.4 ha) of the project disturbance and will take approximately three months to complete, before the area is rehabilitated.
- Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees (e.g. *Banksia* spp.), open *Eucalyptus* forest habitat and planted *Eucalyptus* habitat (roosting and potential breeding habitat).
- The implementation of an approved rehabilitation plan developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW).
- Availability of similar foraging and roosting habitat in the local and regional area (i.e., directly to the west of the survey area and as over 21% of remnant vegetation in vegetation associations Tathra-379 and Tathra-49 which encompass the project area are held in conservation reserves (Government of Western Australia, 2013)).

5 Environmental Management Measures and Rehabilitation Practices

To address project impacts, Warrego Energy have developed and committed to implement the following mitigation and management measures:

- Clearing of native vegetation will not exceed 70 ha within the 8,575 ha project area.
- Initial surveying using a GPS will be undertaken to accurately locate and demarcate all areas of disturbance (i.e. source lines and access tracks) and identify areas which need to be avoided.
- All vegetation clearing will be undertaken outside the growth periods for both *Thelymitra stellata* and *Paracaleana dixonii* (i.e. May to December). As both of these species are present as tubers underground outside their growth periods, impacts from clearing will be mitigated.
- Vegetation clearing will be undertaken using a raised roller mulching technique. As tubers of both *Thelymitra stellata* and *Paracaleana dixonii* are present underground outside their growth periods, impacts from clearing will be mitigated.
- All large trees, open Eucalyptus forest habitat and planted Eucalyptus habitat will be avoided, to prevent impacts to roosting (and potential breeding) habitat for Carnaby's Black Cockatoo and any potential unidentified locations of the Threatened flora species, *Eucalyptus leprophloia* and *Eucalyptus crispata*.
- Known locations of Threatened flora will be avoided (i.e. deviations to source lines, receiver points and tracks can be made to avoid sensitive areas and topographical obstructions).
- Where possible, known locations of Priority 1 and Priority 2 species will also be avoided (i.e. deviations to source lines, receiver points and tracks can be made to avoid sensitive areas and topographical obstructions).
- The drill pad, associated access tracks and borrow pits will be located to avoid known locations of Threatened flora and Priority 1 species and where possible will be located on previously disturbed land.
- Where possible, the camp will be located on cleared land (pending approval from landowners) or otherwise located to avoid known locations of Threatened flora and Priority 1 and Priority 2 species and minimise disturbance.
- Warrego Energy will apply for a 'Permit To Take' through the Western Australian Department of Parks and Wildlife prior to native vegetation clearing. No known Threatened flora will be cleared without a 'Permit To Take'.
- Warrego Energy commits to avoiding ESA ID 6046 located within the project area.
- Warrego Energy has committed to avoid clearing within 20 m of Sand Plain Creek and utilising existing crossings to minimise disturbance to minor watercourses.
- The project area will be treated as dieback-free and a dieback and weed management plan will be developed, which will include the development and implementation of the following management strategies and monitoring programs:
 - Ensure machinery, vehicles and equipment are clean of soil and debris prior to entering and leaving the project area, moving between agricultural land and Vacant Crown Land, and in accordance with landowner hygiene requirements.
 - Ensure any borrow material sourced from outside the project area is dieback accredited before arriving on site.

- As much as possible, minimise vehicle movements within and between the agricultural land and the Vacant Crown Land, to mitigate the potential for the introduction of and/or spread of weeds and disease.
 - Design, construct and operate a suitable hygiene facility for decontamination of vehicles and machinery on arrival to and departure from the project area, and in the instance that a vehicle needs to move between the agricultural land and the Vacant Crown Land.
 - A weed monitoring and management program will be developed, to ensure that any existing and new weed infestations within areas of project disturbance (including areas of rehabilitation) are identified and can be controlled or eradicated.
 - A dieback monitoring and management program will be developed, to prevent the introduction of dieback into Vacant Crown Land and to ensure that if dieback is introduced it is identified and controlled to prevent further spread.
- All project vehicles and machinery will be fitted with rubber tyres, and movements will be minimised as much as possible, particularly along source lines, to maximise the success of natural revegetation.
 - Project vehicle and machinery movements will be restricted to the project footprint and existing disturbance/tracks and firebreaks.
 - Project vehicle and machinery movements will be restricted to a speed limit of 20 km/h or less along project tracks.
 - The project will not operate during harvest and vehicle movement bans issued by local shires, when vehicle movements and the operation of machinery may otherwise cause a fire or contribute to the spread of a bushfire.
 - Fire fighting equipment will be fitted to all machinery and equipment and all personnel will be appropriately trained in how to prevent and respond to fires. A dedicated fire response vehicle will also be available on site to respond to any incident of fire.
 - A communication protocol will be established to include notifying the DPaW Moora District office of operations (arrival and departure from the project area) and immediate notification of any incidence of fire associated with project activities.
 - The drill sump, turkey's nest and flare pit will be fenced off to prevent fauna ingress and constructed to ensure a point of ingress/egress to prevent fauna mortalities.
 - All putrescible waste will be stored appropriately within bins, which have a tightly secured lid to avoid fauna attraction and entry.
 - Education and awareness training will identify conservation significant values within the project area and discuss relevant management measures and personnel/contractor responsibilities.
 - A rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW). The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey.

The project will operate in accordance with an approved Environment Plan (EP) under the Petroleum and *Geothermal Energy Resources Act 1967* (WA). The above commitments will be included within the EP, which will be used to guide environmental management of the project.

Rehabilitation

Once seismic data acquisition is complete, Warrego Energy will close project access tracks (i.e. through the placement of brushing at entrances) as soon as practicable to prevent unauthorised third party access (unless retained for access during the appraisal drilling program or otherwise requested by local authorities and/or relevant stakeholders (e.g., Department of Parks and Wildlife, DPaW)). The project access track and source lines will then be left to regenerate naturally.

Following the completion of the appraisal-drilling program, where the well is unsuccessful the drill hole will be backfilled and plugged, all infrastructure will be removed and excavations backfilled (i.e. borrow pit and sumps) with sheeting material from the pad. Shheeting material and any sediment in the earthen sump will first be tested for contaminants (including hydrocarbons) before it is used as backfill. Any contaminated material will be removed and disposed offsite in accordance with the requirements of local authorities. The drill pad and access track will then be ripped and the access track closed to prevent third party access. The disturbance will be left to regenerate naturally, as per the seismic lines.

Where the well is successful and Warrego Energy decide to progress with field development, a wellhead would be installed and left on the ground to contain the well and the pad and drilling infrastructure would be left in-situ until additional approvals were obtained to progress the project (which would include future rehabilitation requirements).

As committed to above, a rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and DPaW, and will be submitted to the DMP for approval prior to the completion of the seismic survey. This will include the development of rehabilitation/revegetation completion criteria, which will be used as the basis for ongoing monitoring of rehabilitation/revegetation progress and to determine when rehabilitation has been satisfactorily achieved. Examples of rehabilitation completion criteria include:

- There should be no actual or potential erosion sites.
- There should be no permanent markers, spoil or litter.
- There should be no open holes or sumps remaining.
- There should be no introduction or spread of weeds within the Vacant Crown Land.
- There should be not introduction of dieback within the Vacant Crown Land.
- There should be no new access apparent to the Vacant Crown Land, which may be used by third parties and develop into permanent features.
- Disturbance outside the Vacant Crown Land should be returned to a state suitable to its previous land use (i.e. agricultural) and to the satisfaction of the relevant landholder in accordance with landholder agreements.
- Revegetation within the Vacant Crown Land should include foraging species for the Carnaby's Black Cockatoo.
- Threatened flora species, *Thelymitra stellata* and *Paracaleana dixonii* (i.e. those identified within 15 m of the conceptual disturbance footprint) persist within the survey area following project completion.
- Rehabilitation of disturbed areas within Vacant Crown Land should consist of native vegetation similar to undisturbed areas within the project area.

To ensure rehabilitation/revegetation of disturbed areas has been successful Warrego Energy will conduct a series of monitoring programs and audits against these criteria. Monitoring will commence one month after the completion of each project activity (i.e. seismic survey and appraisal drilling program) with a particular focus on third party access issues, the presence of introduced weeds and/or dieback. Rehabilitation monitoring will then continue annually between October and December for a minimum of two years and until monitoring has shown all rehabilitation completion criteria have been met.

Rehabilitation monitoring will also include the monitoring of Threatened flora species *Thelymitra stellata* and *Paracaleana dixonii* (in line with the requirements of the Permit to Take) to assess the persistence of these species and their habitat in proximity to disturbed areas following completion of the project (i.e. those locations identified within 15 m of the conceptual disturbance footprint).

Augmentation of the revegetation process will be investigated with the DPaW and the DMP where lines are not recovering unaided and weed and dieback management controls may be implemented (in accordance with a weed and dieback management plan) to achieve the completion criteria.

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6 Assessment Against the Ten Clearing Principles

Ten clearing principles have been developed under Section 5 of the *Environmental Protection Act 1986* (EP Act) to determine the impact of clearing native vegetation. Table 9 provides an assessment of the proposed clearing (maximum of 70 ha, 0.8% of the project area) against each of the ten clearing principles.

Table 9 Assessment Against the Ten Clearing Principles

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(a) Native Vegetation Should Not be Cleared if it Comprises a High Level of Biological Diversity		
<p>The project is located within a national biodiversity hotspot known as Mount Lesueur – Eneabba (Australian Government 2013). The Mount Lesueur-Eneabba hotspot is described as supporting a large number of distinct, species-rich and endemic communities.</p> <p>As discussed in Section 3.5, the following flora and vegetation biodiversity values have been identified within the project area (Woodman, 2013), a total of:</p> <ul style="list-style-type: none"> • 17 vegetation types (VTs), most of which (excluding VTs 13b and 14) are considered to be of high local significance. • 535 vascular flora taxa and one known hybrid, representing 64 families and 196 genera were identified during the Level 2 survey (Woodman, 2013). • 30 confirmed and two probable conservation significant flora taxa (including one hybrid) (Woodman, 2013), including five Priority 1, four Priority 2, sixteen Priority 3, three Priority 4 species and four Threatened (DRF) flora listed as Vulnerable or Endangered (one of which, <i>E. leprophloia</i>, is believed to be an erroneous record and was not recorded during any of the field investigations). <p>None of the VTs mapped in the project area are equivalent to any Commonwealth listed Threatened Ecological Communities (TECs) or State listed TECS or Priority Ecological Communities (PECs) (Woodman, 2013).</p> <p>As discussed in Section 3.6, the following terrestrial vertebrate fauna biodiversity values have been identified within the project area (Coffey, 2013), a total of:</p> <ul style="list-style-type: none"> • Six fauna habitats. • 302 vertebrate fauna species, including; 168 birds, 29 mammals, 94 reptiles and 11 amphibians. • 20 conservation significant vertebrate fauna species which have previously been recorded within the region and so have the potential to occur within the project area, 12 of which are considered to be 'likely' to occur or 'possibly' occurring within the project area. <p>This level of biodiversity is very high given the relatively small size and low diversity of habitats within the survey area (9,543 ha), when compared to other surveys conducted in the region (Woodman, 2013) and when compared to available regional biodiversity data. A search of FloraBase (DPaW, 2013) and NatureMap (DEC, 2013) databases, identified the following levels of biological biodiversity (excluding weeds):</p> <ul style="list-style-type: none"> • Geraldton Sandplain IBRA bioregion (3,142,149 ha), 3558 flora taxa (diversity of fauna taxa at this level could not be determined). • Lesueur Sandplain IBRA subregion (1,172,152 ha), 2395 flora taxa and 3,385 fauna species. • Shire of Mingenew (193,633 ha), 728 flora taxa and 1,037 fauna species. • Shire of Three Springs (265,328 ha), 959 flora taxa and 1,285 fauna species. 	<p>Given the scale and nature of the proposed clearing the project is not anticipated to impact the level of biodiversity present within the project area.</p>	<p>This project is likely to be at variance to this principle.</p>

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(a) Native Vegetation Should Not be Cleared if it Comprises a High Level of Biological Diversity (cont'd)		
<p>Warrego Energy has committed to clearing no more than 70 ha (0.8%). Based on the current conceptual disturbance footprint (see Figure 2) the project will impact nine priority flora species known from the project area, as detailed in Table 7 and depicted in Figures 6 to 9:</p> <p>The conceptual disturbance footprint will impact less than 5% of all known locations of priority flora, with the exception of <i>Banksia fraseri</i> ?var.crebra. Woodman recorded <i>Banksia fraseri</i> ?var.crebra during a survey conducted in 2008 but insufficient material was present to confirm the collection represented the priority 3 species <i>Banksia fraseri</i> var. crebra. During the 2011 survey Woodman revisited the location and a collection was made that was identified as <i>Banksia fraseri</i> ?var.fraseri, which again had insufficient material to confirm its identity. It is Woodman's (2013) opinion that given the vast number of <i>Banksia fraseri</i> var. fraseri recorded within the survey area, that <i>Banksia fraseri</i> var.crebra is unlikely to be present and that the 2008 record was erroneous.</p> <p>Where possible, conservation significant flora, particularly Threatened flora and Priority 1 and Priority 2 species, along source lines, project tracks and receiver points will be avoided (i.e. deviations can be made to avoid sensitive areas or topographical obstructions).</p> <p>It is Warrego Energy's intention to avoid all known locations of Threatened flora and minimise the impacts to any unknown locations of Threatened flora through the implementation of the project commitments in Section 4. Impacts to Threatened flora (and their habitat) are discussed further under <i>clearing principal (c)</i>. Based on the current conceptual disturbance footprint (see Figure 11) and Warrego Energy's commitment to avoid clearing open <i>Eucalyptus</i> forest habitat and planted <i>Eucalyptus</i> habitat, the project will impact less than 63.2 ha (1%) of habitat present within the project area (see Table 8).</p> <p>With the exception of the Carnaby's Black Cockatoo (see <i>clearing principal (b)</i>), the project is unlikely to have a significant impact on terrestrial fauna biodiversity, given:</p> <ul style="list-style-type: none"> • Scale (i.e. 63.2 ha or 1% of habitat present within the project area) and nature of the proposed clearing (e.g., width of clearing, coarse line spacing and raised roller mulching method). • None of the species identified as 'likely' or 'possibly' occurring within the project area are likely to be solely reliant on habitat present within the project area. • Availability of similar habitat in the local and regional area (i.e., to the west of the survey area and as approximately 17.67% of the sub region is held in conservation reserves). 	<p>See above</p>	<p>See above</p>

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
<p>(b) Native Vegetation Should Not be Cleared if it Comprises the Whole or a Part of, or is Necessary for the Maintenance of, a Significant Habitat for Fauna Indigenous to Western Australia</p>		
<p>As discussed under <i>clearing principal (a)</i>, the project is unlikely to significantly impact any fauna species of conservation significance present in the project area, with the exception of the Carnaby's Black Cockatoo.</p> <p>The project area provides habitat critical to the survival of the Carnaby's Black Cockatoo (DEC, 2012), including:</p> <ul style="list-style-type: none"> • Foraging habitat: shrubland with/without woodland species, laterite breakaways and minor drainage habitats (see Figure 10). • Roosting habitat: open <i>Eucalyptus</i> forest and planted <i>Eucalyptus</i> habitats (planted roadside/property trees) (see Figure 10). <p>While no suitable breeding habitat was observed during the field investigation, the open <i>Eucalyptus</i> forest and planted <i>Eucalyptus</i> habitats contained younger age class trees, which may provide suitable breeding habitat in the future.</p> <p>In determining the significance of project impacts on the Carnaby's Black Cockatoo, Coffey (2013) referred to the EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPAC, 2012) in conjunction with the EPBC Policy Act Statement 1.1 Matters of National Environmental Significance (DEWHA, 2006), which sets out a number of significant impact criteria for Endangered species. Where an action has a 'real chance or possibility' of triggering any of these criteria the action is considered to have a significant impact. The outcomes of this assessment are provided in Appendix C and have been reconsidered in Section 4.3, in light of the current development footprint and Warrego Energy's management and mitigation commitments (see Section 4). Coffey determined that the project only has a 'real chance or possibility' of triggering one of the nine criteria, specifically 'adversely affecting habitat critical to the survival of the species', given that some clearing of foraging habitat is unavoidable (see Figure 12).</p> <p>The impact of clearing on this species however, is believed to be of limited significance, given the:</p> <ul style="list-style-type: none"> • Scale (i.e. approximately 63.2 ha, 1% of foraging habitat present within the survey area) and nature of the proposed clearing (e.g., width of clearing, coarse grid spacing and raised roller mulching method). Of particular importance is the method of clearing, raised roller mulching preserves rootstock and retains seedstock, which will increase the success of natural rehabilitation and revegetation on completion of the project. • Short-term nature of the impact. The seismic survey (which accounts for 52.4 ha, 82% of the current conceptual footprint) will be completed in approximately three weeks and disturbed areas will be closed and allowed to regenerate naturally (with the exception of disturbed areas to be utilised during the drilling program). The drilling program accounts for approximately 6% (5.4 ha) of the project disturbance and will take approximately three months to complete, before the area is rehabilitated. • Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees (e.g. <i>Banksia</i> spp.), open <i>Eucalyptus</i> forest habitat and planted <i>Eucalyptus</i> habitat (roosting and potential breeding habitat). 	<p>The project will impact foraging habitat for the Carnaby's Black Cockatoo, although the impact of which is anticipated to be of limited significance.</p>	<p>This project is likely to be at variance to this principle.</p>

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(b) Native Vegetation Should Not be Cleared if it Comprises the Whole or a Part of, or is Necessary for the Maintenance of, a Significant Habitat for Fauna Indigenous to Western Australia (cont'd)		
<ul style="list-style-type: none"> The implementation of an approved rehabilitation plan developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW). Availability of similar foraging and roosting habitat in the local and regional area (i.e., directly to the west of the survey area and as over 21% of remnant vegetation in vegetation associations Tathra-379 and Tathra-49 which encompass the project area are held in conservation reserves (Government of Western Australia, 2013)). 	See above	See above
(c) Native Vegetation Should Not be Cleared if it Includes, or is Necessary for the Continued Existence of, Rare Flora		
<p>Woodman (2013) recorded three threatened (DRF) flora species within the survey area including, <i>Eucalyptus crispata</i> (Vulnerable) and the orchids <i>Thelymitra stellata</i> (Endangered) and <i>Paracaleana dixonii</i> (Endangered). A description of these three species including total known records and distribution and their presence within the survey area is provided in Table 4.</p> <p>Vegetation types known to provide habitat for these species include VT 7a, VT 7b, VT 8, VT 11, VT 12 and VT 13a. The total area of habitat for Threatened flora within the survey area is 4,438 ha.</p> <p>Potential direct impacts of the project to Threatened flora include:</p> <ul style="list-style-type: none"> Loss of conservation significant flora and habitat at a local scale. Loss of regional representation of conservation significant flora and habitat. <p>Warrego Energy has committed to disturbing no more than 70 ha (0.8%) of native vegetation within the project area. Figure 11 illustrates the location of the current conceptual disturbance footprint over vegetation types present within the project area. Based on the current conceptual disturbance footprint, the project will impact less than 44.4 ha of vegetation types (habitat) known to support Threatened flora present within the project area (refer to Table 6). This represents less than 1.0% of Threatened flora habitat present within the survey area (Woodman, 2013).</p> <p>Figure 5 illustrates the location of the conceptual disturbance footprint in relation to known locations of Threatened flora. Approximately 8 of the 139 known locations (5.8%) of <i>Thelymitra stellata</i> (Star Sun Orchid) and 16 of the 174 known locations (9.2%) of <i>Paracaleana dixonii</i> (Sandplain Duck Orchid) within the survey area occur within 15 m of the conceptual disturbance footprint and so have the potential to be impacted by the project. None of the known locations of <i>Eucalyptus crispata</i> occur within 15 m of the conceptual project footprint and so are unlikely to be impacted.</p> <p>There is also the potential that the project may impact (unknown) locations of Threatened flora, not identified during the flora and vegetation assessment. It is Warrego Energy's intention to avoid all known locations of Threatened flora and minimise the impacts to any unknown locations of Threatened flora through the implementation of the following commitments:</p>	The project is unlikely to impact the continued existence of Threatened flora known to be present within the project area.	This project is likely to be at variance to this principle.

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(c) Native Vegetation Should Not be Cleared if it Includes, or is Necessary for the Continued Existence of, Rare Flora (cont'd)		
<ul style="list-style-type: none"> • Initial surveying using a GPS will be undertaken to accurately locate and demarcate all areas of disturbance (i.e. source lines and access tracks) and identify areas which need to be avoided (i.e. locations of Threatened flora). • All vegetation clearing will be undertaken outside the growth periods for both <i>Thelymitra stellata</i> and <i>Paracaleana dixonii</i> (i.e. May to December). As both of these species are present as tubers underground outside their growth periods, impacts from clearing will be mitigated. • Vegetation clearing will be undertaken using a raised roller mulching technique. As tubers of both <i>Thelymitra stellata</i> and <i>Paracaleana dixonii</i> are present underground outside their growth periods, impacts from clearing will be mitigated. • All large trees will be avoided, preventing potential impacts to any unidentified locations of the Threatened flora species <i>Eucalyptus leprophloia</i> and <i>Eucalyptus crispata</i>. • Warrego Energy commits to avoiding ESA ID 6046 located within the project area. • Known locations of Threatened flora will be avoided (i.e. deviations to source lines, receiver points and tracks can be made to avoid sensitive areas and topographical obstructions). • The drill pad, associated access tracks and borrow pits will be located to avoid known locations of Threatened flora and, where possible, will be located on previously disturbed land. • Where possible, the camp will be located on cleared land (pending approval from landowners) or otherwise located to avoid known locations of Threatened flora and minimise disturbance. • Warrego Energy commits to avoiding ESA ID 6046 located within the project area. • The drill pad, associated access tracks and borrow pits will be located to avoid known locations of Threatened flora and, where possible, will be located on previously disturbed land. • Where possible, the camp will be located on cleared land (pending approval from landowners) or otherwise located to avoid known locations of Threatened flora and minimise disturbance. <p>Potential indirect impacts of the project to Threatened flora include; introduction and spread of invasive weed species; indirect loss or degradation of flora and vegetation due to impacts from dust deposition, altered drainage patterns and surface water quality; increased risk of fire due to the increased presence of vehicles and machinery; failure of personnel to follow appropriate fire management practices; and failure of vegetation to recover and/or colonisation of disturbed areas by weed species following rehabilitation.</p> <p>Indirect impacts will be mitigated and managed through the implementation of the following commitments:</p>	<p>See above</p>	<p>See above</p>

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(c) Native Vegetation Should Not be Cleared if it Includes, or is Necessary for the Continued Existence of, Rare Flora (cont'd)		
<ul style="list-style-type: none"> • The project area will be treated as dieback-free and a dieback and weed management plan will be developed and implemented (as discussed in Section 5). • All project vehicles and machinery will be fitted with rubber tyres, and movements will be minimised as much as possible, particularly along source lines, to maximise the success of natural revegetation. • Project vehicle and machinery movements will be restricted to the project footprint and existing disturbance/tracks and firebreaks. • Project vehicle and machinery movement will be restricted to a speed limit of 20 km/h or less along project tracks. • The project will not operate during harvest and vehicle movement bans issued by local shires, when vehicle movements and the operation of machinery may otherwise cause a fire or contribute to the spread of a bushfire. • Fire fighting equipment will be fitted to all machinery and equipment and all personnel will be appropriately trained in how to prevent and respond to fires. A dedicated fire response vehicle will also be available on site to respond to any incident of fire. • A communication protocol will be established to include notifying the DPaW Moora District office of operations (arrival and departure from the project area) and immediate notification of any incidence of fire associated with project activities. • Education and awareness training will identify conservation significant values within the project area and discuss relevant management measures and personnel/contractor responsibilities. • A rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW). The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey (as discussed in Section 5). <p>While it is not Warrego Energy's intention to impact known Threatened flora, given the project has the potential to impact Threatened flora (known and unknown) both directly and indirectly Warrego Energy has applied for a 'Permit To Take' through the Western Australian Department of Parks and Wildlife (DPaW), which will be assessed concurrently with this NVCP application. No known Threatened flora will be cleared without a 'Permit To Take'.</p>	See above	See above
(d) Native Vegetation Should Not be Cleared if it Comprises the Whole or a Part of, or is Necessary for the Maintenance of a Threatened Ecological Community		
None of the Vegetation Types mapped in the project area are equivalent to any state or nationally listed Threatened Ecological Communities (TECs). The nearest TECs to the project area are the Endangered TEC 'Assemblages of organic mound springs of the Three Springs area' and the Vulnerable TEC 'Ferricrete floristic community (Rocky Springs type)', located approximately 10 km east of the project area.	The project area does not comprise the whole or a part of, or is necessary for the maintenance of a TEC.	This project is not at variance to this principle.

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(e) Native Vegetation Should Not be Cleared if it is Significant as a Remnant of Native Vegetation in an Area that has Been Extensively Cleared		
<p>The project area traverses two vegetation associations known as Tathra-49 and Tathra-379 (Woodman, 2013). On a bioregion level the current extent of vegetation association (Government of Western Australia, 2013):</p> <ul style="list-style-type: none"> • Tathra-49 is approximately 14,446 ha, approximately 36.37% of its pre-European extent, and of which 24.1% is currently reserved or managed within DPaW lands. • Tathra-379 is approximately 130,074 ha, approximately 23.88% of its pre-European extent, and of which 22.2% is currently reserved or managed within DPaW lands. <p>The National Objectives and Targets for Biodiversity Conservation 2001-2005 recognise that the retention of 30 per cent or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected (DEC, 2009). This is the threshold level, below which species loss appears to accelerate exponentially and as such the WA Environmental Protection Authority classifies vegetation complexes with 30% of less of their pre-clearing extent remaining in a bioregion, as critical assets (EPA, 2006).</p> <p>As vegetation association Tathra-379 is already below the 30% retention target this vegetation association is likely to be recognised as significant remnant vegetation in an area that has been extensively cleared.</p> <p>Warrego Energy has committed to disturbing no more than 70 ha of native vegetation within the project area. Based on the current conceptual disturbance footprint (with no account for existing disturbance within the project area) the project will impact 9.3 ha of vegetation association Tathra-49 and 82.4 ha of vegetation association Tathra-379. The project will reduce the pre-European extent of vegetation association Tathra-49 by 0.02% (to 36.35%) and vegetation association Tathra-379 by 0.01% (to 23.86%).</p>	<p>The current extent of vegetation association Tathra-379 is currently below the 30% retention target.</p> <p>The project will remove approximately 82.4 ha and reduce the pre-European extent of vegetation association Tathra-379 by an additional 0.01%.</p>	<p>This project may be at variance to this principle.</p>
(f) Native Vegetation Should Not be Cleared if is Growing in, or in Association with, an Environment Associated with a Watercourse or Wetland		
<p>As discussed in Section 3.3, the project area is generally devoid of any significant permanent surface water features (see Figure 1).</p> <p>Habitat mapping and vegetation type mapping undertaken by Coffey (2013) and Woodman (2013) identified some minor drainage lines and depressions (i.e. minor drainage line habitat and Vegetation Type 5 and 14) in the project area (see Figure 4 and Figure 10).</p> <p>The most significant drainage system in the project area is Sand Plain Creek, which passes through agricultural land in the north of the project area (see Figure 10). Woodman ranked remnant vegetation surrounding Sand Plain Creek as 'Very Good' to 'Good', due to the decline of native species diversity associated with clearing, impacts from grazing stock and increased weed loading. The other areas of minor drainage are within the Vacant Crown Land and so are in 'Pristine' to 'Excellent' condition (Woodman, 2013).</p> <p>The larger river systems outside the project area are known to flow intermittently, flowing predominantly in winter and with some semi permanent pools persisting through summer (RPS, 2011). The same ephemeral nature is likely to be the case for Sand Plain Creek all though given its minor nature it is less likely that standing water persists through summer. The other minor drainage lines and depressions within the Vacant Crown Land are only likely to hold water after heavy rainfall.</p> <p>Warrego Energy has committed to avoid clearing along Sand Plain Creek and utilising existing crossings to minimise disturbance.</p>	<p>The project will not clear vegetation growing in, or in a association with any mapped wetland or watercourse.</p>	<p>This project is not considered to be at variance to this principle.</p>

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(g) Native Vegetation Should Not be Cleared if the Clearing of Vegetation is Likely to Cause Appreciable Land Degradation		
<p>Disturbed areas resulting from clearing may be more susceptible to land degradation (i.e. soil erosion, salinity, nutrient export, acidification, waterlogging and flooding). This project is not likely to cause appreciable land degradation for the following reasons:</p> <ul style="list-style-type: none"> • Scale (i.e. approximately 70 ha or 0.8% of the project area) and nature of the proposed clearing (e.g., width of clearing, coarse line spacing and raised roller mulching method). • Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees, vegetation along Sand Plain Creek, open <i>Eucalyptus</i> forest habitat and planted <i>Eucalyptus</i> habitat (roosting and potential breeding habitat). • A rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW). The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey. 	<p>This project is unlikely to cause appreciable land degradation.</p>	<p>This project is not considered to be at variance to this principle.</p>
(h) Native Vegetation Should Not be Cleared if the Clearing of the Vegetation is Likely to Have an Impact on the Environmental Values of any Adjacent or Nearby Conservation Area.		
<p>The closest conservation areas to the project area are (see Figure 1):</p> <ul style="list-style-type: none"> • Wilson Nature Reserve, located approximately 15 km to the southeast. • Yardanogo Nature Reserve, located approximately 15 km to the west. • Beekeepers Nature Reserve located approximately 40 km to the southwest. <p>The project area does not provide a direct ecological linkage or buffer to any of the above-mentioned conservation areas and so it is unlikely that the project will impact any of these conservation areas.</p> <p>The project is however on the most eastern extent of a fairly contiguous, albeit somewhat fragmented (i.e. linear infrastructure and agricultural land) and unprotected area of remnant vegetation that links up to Yardanogo Nature Reserve (and ultimately Beekeepers Nature Reserve) to the west.</p> <p>Given the scale (i.e. approximately 70 ha or 0.8% of the project area) and nature of the proposed clearing (e.g., width of clearing, coarse line spacing and raised roller mulching method) the project is unlikely to cause any further restriction in fauna movements between these areas.</p>	<p>No conservation areas occur adjacent or nearby to the project area.</p>	<p>This project is not considered to be at variance to this principle.</p>

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(i) Native Vegetation Should Not be Cleared if the Clearing of Vegetation is Likely to Cause Deterioration in the Quality of Surface or Underground Water		
<p>The project area is generally devoid of any significant permanent surface water features (see Section 3.3 and the assessment against Clearing Principle (f) above). The northern and southern limits of the project area are bounded by two regional drainage systems, the Irwin River to the north and the Arrowsmith River to the south (RPS, 2011). The Irwin River has a catchment area of 6,072km² and the Arrowsmith River has a catchment of 1,605km. Both rivers flow intermittently, with significant flows predominantly through the winter months, but with some semi-permanent pools persisting through the summer. Water quality is generally brackish to saline with water quality in the order of 3,500mg/L to 4,500mg/L (RPS, 2011).</p> <p>The project area overlies the Yarragadee Formation aquifer. The upper water table of this aquifer is usually in excess of 100 m below ground level and, given the layered nature of the formation, very little direct rainfall recharge is expected to reach the regional water table. The depth of the water table across the project area is expected to be between 70 and 85 mAHD (RPS, 2011). Water quality in this aquifer is fresh to brackish, with salinity ranging between 500 to 1,000 mg/L and total dissolved solids (TDS) concentrations ranging from 530 to 700 mg/L (RPS, 2011).</p> <p>The Tathra vegetation system on which the project area occurs is largely composed of sandplain with a uniform scrub heath assemblage and occasional outcrops of laterite on ridges and breakaways supporting a low heath (Woodman, 2013).</p> <p>This project is not likely to cause deterioration in the quality of surface or underground water given the nature of the existing environment and given:</p> <ul style="list-style-type: none"> • The scale (i.e. approximately 70 ha or 0.8% of the project area) and nature of the proposed clearing (e.g., width of clearing, coarse line spacing and raised roller mulching method). • Warrego Energy's commitment to avoid clearing within 20 m of Sand Plain Creek and utilising existing crossings and all large trees, open <i>Eucalyptus</i> forest habitat and planted <i>Eucalyptus</i> habitat. • A rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW). The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey. • All chemicals and hydrocarbons will be managed in accordance with a DMP approved Environment Plan. 	<p>This project is unlikely to cause deterioration in the quality of surface or underground water.</p>	<p>This project is not considered to be at variance to this principle.</p>

Table 9 Assessment Against the Ten Clearing Principles (cont'd)

Assessment	Potential Impacts if Cleared	Is the Project at Variance
(j) Native Vegetation Should Not be Cleared if Clearing the Vegetation is Likely to Cause, or Exacerbate, the Incidence or Intensity of Flooding		
<p>The project is unlikely to result in the exacerbation of flooding for the following reasons:</p> <ul style="list-style-type: none"> • Scale (i.e. approximately 70 ha or 0.8% of remnant vegetation in the project area) and nature of the proposed clearing (e.g., width of clearing, coarse line spacing and raised roller mulching method). • Commitment to utilise existing areas of disturbance as much as practicable and to retain/avoid clearing all large trees, vegetation along Sand Plain Creek, open <i>Eucalyptus</i> forest habitat and planted <i>Eucalyptus</i> habitat (roosting and potential breeding habitat). • A rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (DPaW). The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey. 	<p>This project is unlikely to cause or exacerbate the incidence or intensity of flooding.</p>	<p>This project is not considered to be at variance to this principle.</p>

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7 References

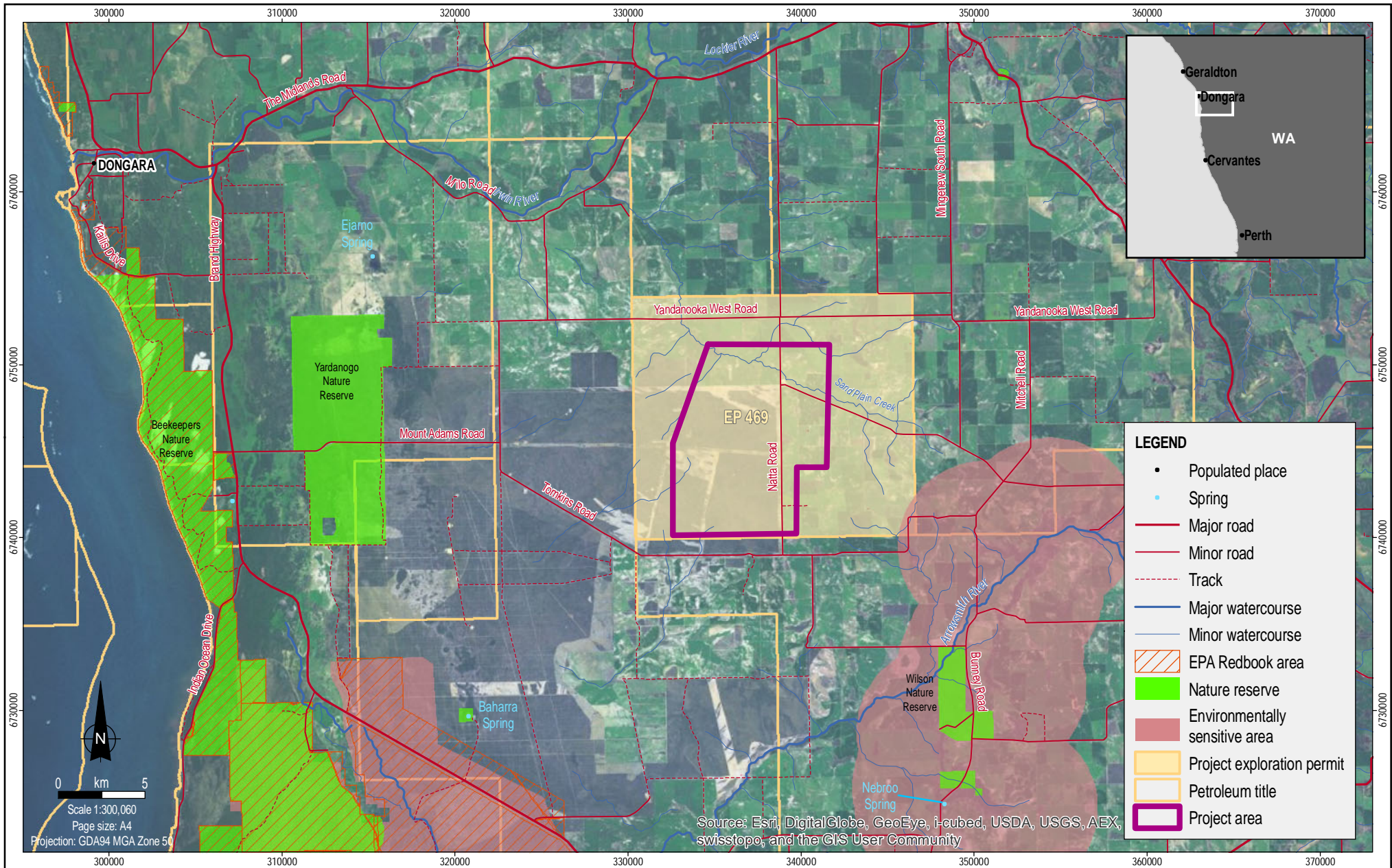
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Figures



- LEGEND**
- Populated place
 - Spring
 - Major road
 - Minor road
 - - - Track
 - Major watercourse
 - Minor watercourse
 - ▨ EPA Redbook area
 - Nature reserve
 - Environmentally sensitive area
 - Project exploration permit
 - Petroleum title
 - Project area

Scale 1:300,060
Page size: A4
Projection: GDA94 MGA Zone 50

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, swisstopo, and the GIS User Community

Source:
Seismic survey area from Warrego Energy; Petroleum title and pipeline from DMP
Crown reserves from Landgate
Nature reserves and environmentally sensitive areas from DEC
EPA Redbook data from DEC (downloaded from SLIP, September 23, 2010)
Roads, railways, powerlines and watercourses from GEODATA250K (optimum scale 1:250,000)
Imagery from ArcGIS online



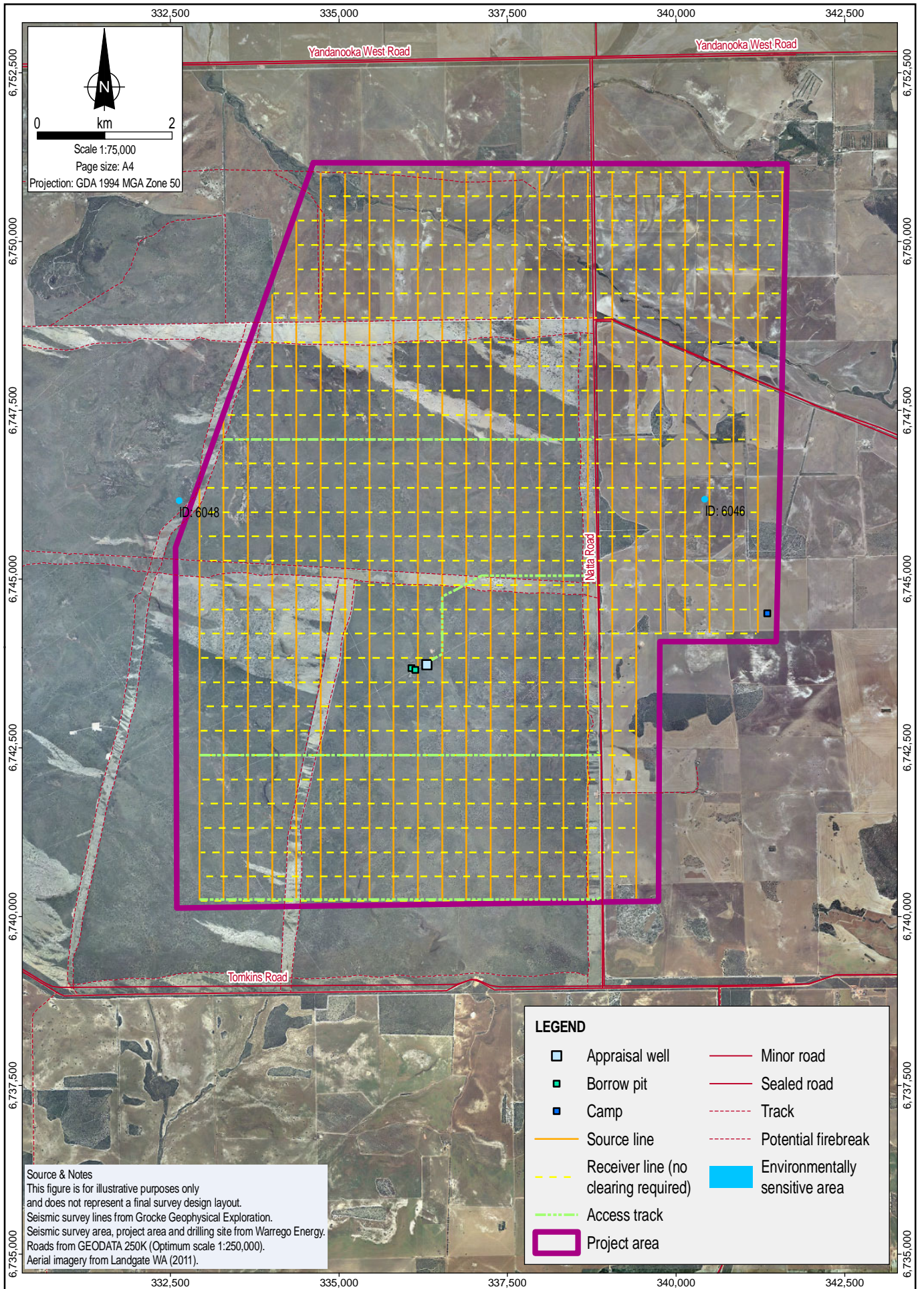
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Warrego Energy
West Erregulla Exploration Program



Project Location and Regional Setting

Figure No:
1



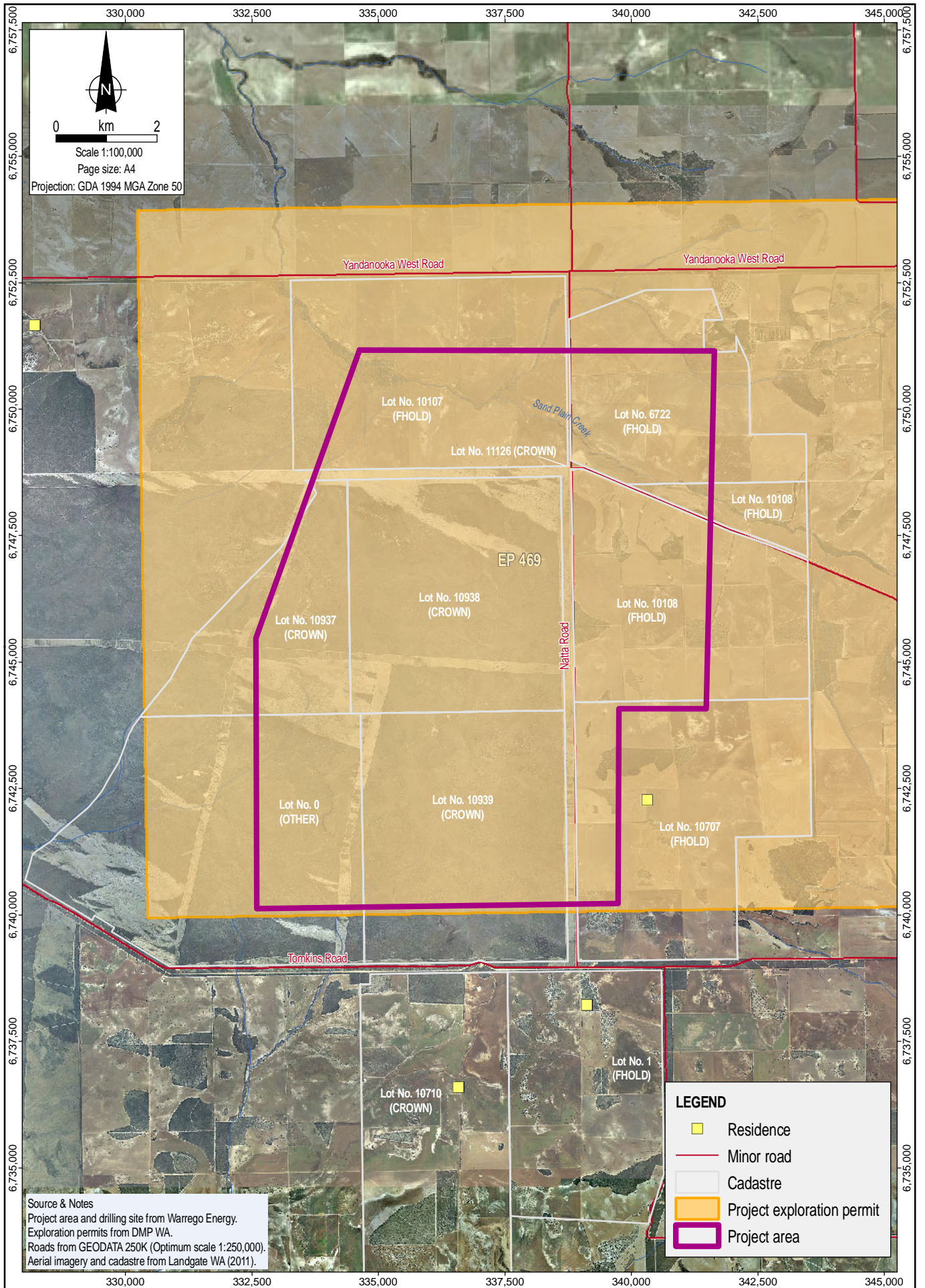
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Source & Notes
 This figure is for illustrative purposes only and does not represent a final survey design layout.
 Seismic survey lines from Grocke Geophysical Exploration.
 Seismic survey area, project area and drilling site from Warrego Energy.
 Roads from GEODATA 250K (Optimum scale 1:250,000).
 Aerial imagery from Landgate WA (2011).

LEGEND

- Appraisal well
- Borrow pit
- Camp
- Source line
- Receiver line (no clearing required)
- Access track
- Project area
- Minor road
- Sealed road
- Track
- Potential firebreak
- Environmentally sensitive area

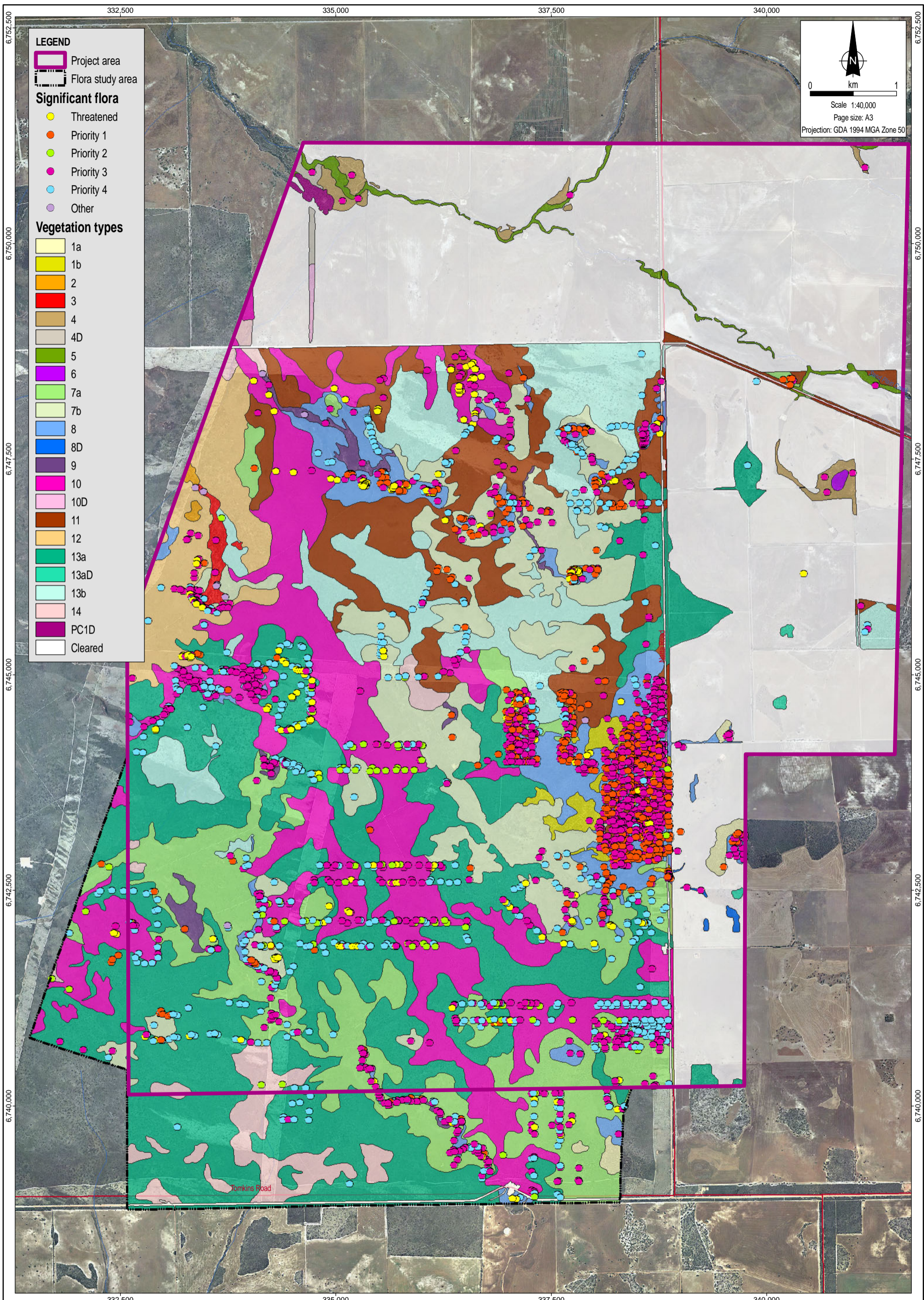


Projection: GDA 1994 MGA Zone 50

Source & Notes
 Project area and drilling site from Warrego Energy.
 Exploration permits from DMP WA.
 Roads from GEODATA 250K (Optimum scale 1:250,000).
 Aerial imagery and cadastre from Landgate WA (2011).

LEGEND

- Residence
- Minor road
- Cadastre
- Project exploration permit
- Project area



Source & Notes
 Significant flora and vegetation types from Woodman Environmental Consulting (2013).
 Roads from GEODATA 250K (Optimum scale 1:250,000).
 Aerial imagery from Landgate WA (2011).



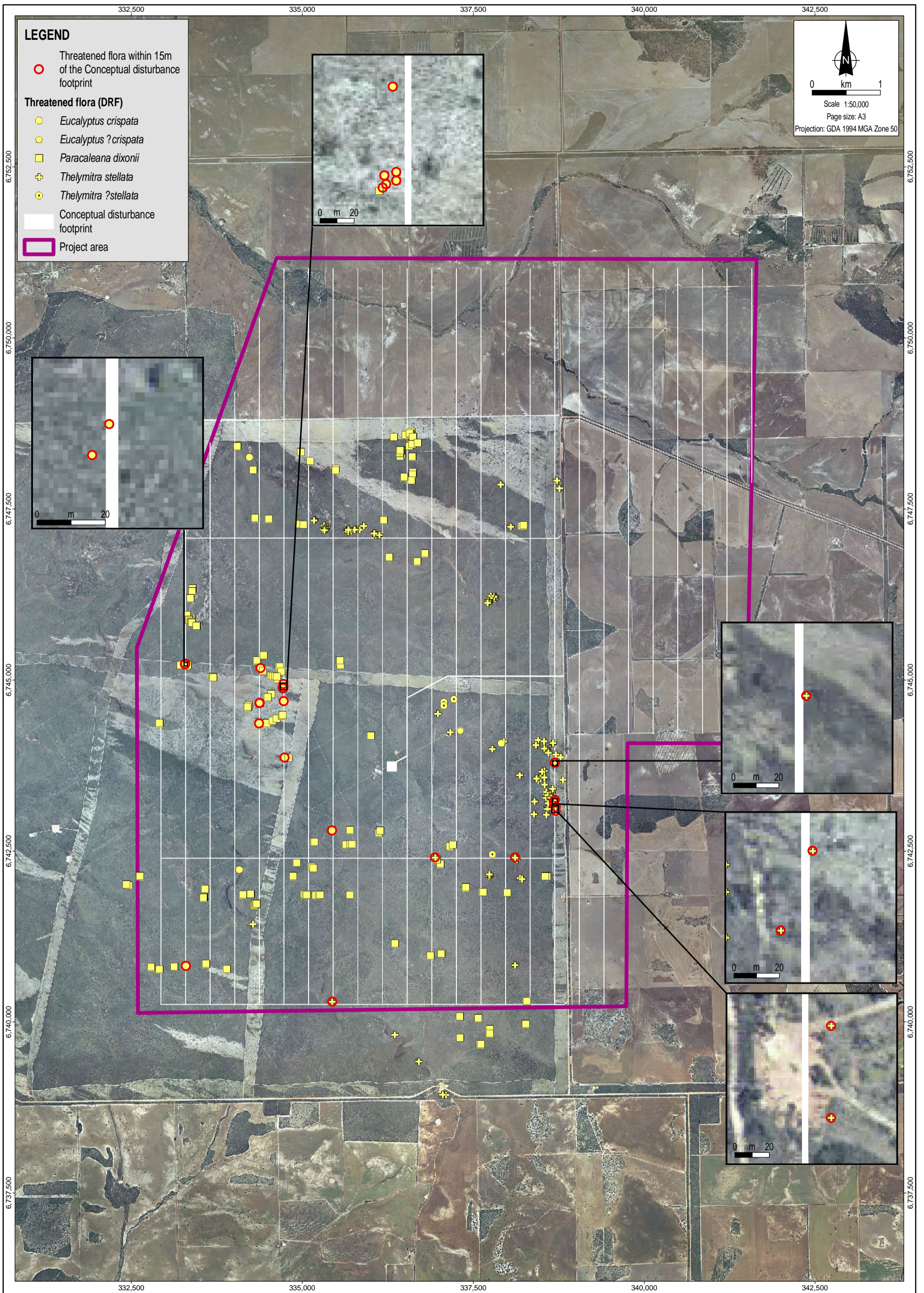
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 MXT: 2034_03_GIS013_v0_2
 File Name: 2034_03_V3_F004_GIS

Warrego Energy
 West Erregulla Exploration Program



Vegetation Types and Locations of
 Conservation Significant Flora
 Within the Project Area

Figure No:
 4



Source & Notes
 This figure is for illustrative purposes only and does not represent a final survey design layout.
 Threatened flora from Woodman Environmental Consulting (2013).
 Seismic survey areas and drilling site from Warrego Energy.
 Roads from GEODATA 250K (Optimum scale 1:250,000).
 Aerial imagery from Landgate WA (2011).

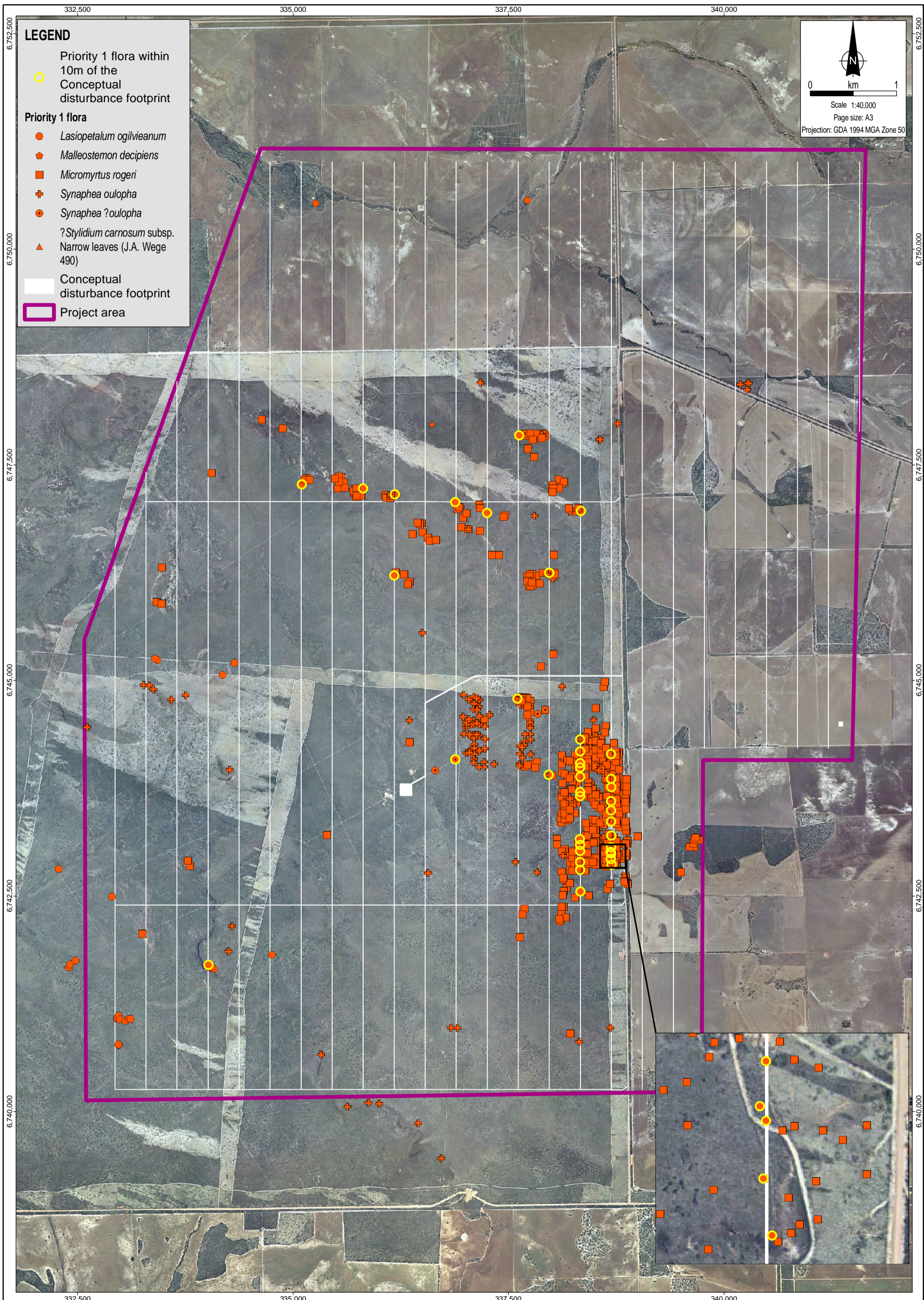


Date: 08.11.2013
 MXT: 2034_03_GIS006_v0_2
 File Name: 2034_03_V3_F005_GIS

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Threatened Flora Potentially Impacted by the Conceptual Disturbance Footprint



Source & Notes
 This figure is for illustrative purposes only and does not represent a final survey design layout.
 Significant flora from Woodman Environmental Consulting (2013).
 Seismic survey areas and drilling site from Warrego Energy.
 Roads from GEODATA 250K (Optimum scale 1:250,000).
 Aerial imagery from Landgate WA (2011).



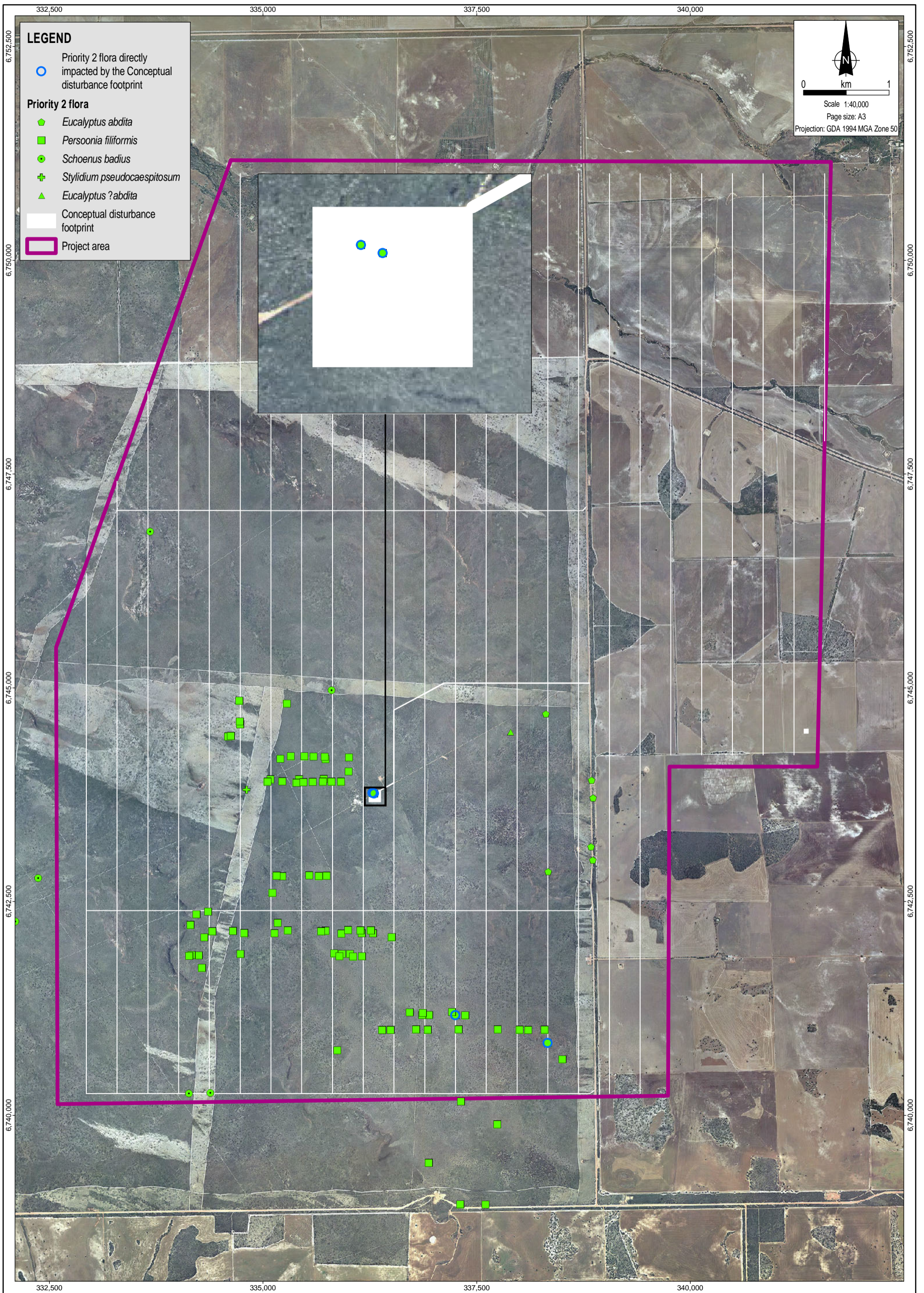
Date: 08.11.2013
 MXT:
 2034_03_GIS007_v0_2
 File Name:
 2034_03_V3_F006_GIS

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Priority 1 Flora Potentially Impacted by the Conceptual Disturbance Footprint

Figure No: **6**



LEGEND

- Priority 2 flora directly impacted by the Conceptual disturbance footprint
- Priority 2 flora**
- ◆ *Eucalyptus abdita*
- *Persoonia filiformis*
- *Schoenus badius*
- + *Stylidium pseudocaespitosum*
- ▲ *Eucalyptus ?abdita*
- Conceptual disturbance footprint
- Project area


 0 km 1
 Scale 1:40,000
 Page size: A3
 Projection: GDA 1994 MGA Zone 50

Source & Notes
 This figure is for illustrative purposes only and does not represent a final survey design layout.
 Significant flora from Woodman Environmental Consulting (2013).
 Seismic survey areas and drilling site from Warrego Energy.
 Roads from GEODATA 250K (Cytinum scale 1:250,000).
 Aerial imagery from Landgate WA (2011).



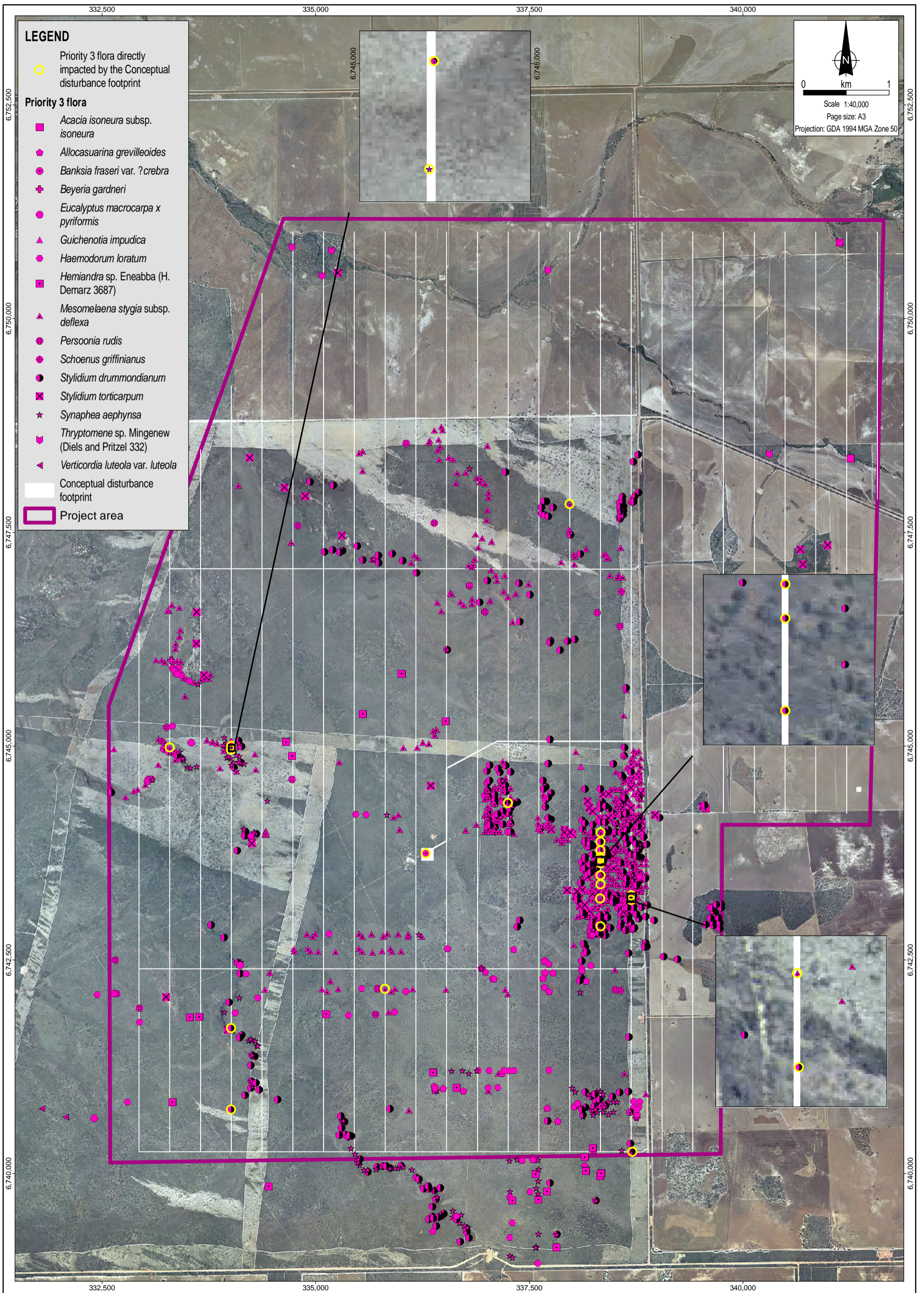
Date: 08.11.2013
 MXT: 2034_03_GIS008_v0_2
 File Name: 2034_03_V3_F007_GIS

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Priority 2 Flora Potentially Impacted by the Conceptual Disturbance Footprint

Figure No: **7**



LEGEND

- Priority 3 flora directly impacted by the Conceptual disturbance footprint
- Priority 3 flora**
- *Acacia isoneura* subsp. *isoneura*
- ◆ *Allocasuarina grevilleoides*
- *Banksia fraseri* var. *?crebra*
- + *Beyeria gardneri*
- *Eucalyptus macrocarpa* x *pyriformis*
- ▲ *Guichenotia impudica*
- *Haemodorum loratum*
- *Hemiandra* sp. Eneabba (H. Demarz 3687)
- ▲ *Mesomelaena stygia* subsp. *deflexa*
- *Persoonia rudis*
- ◆ *Schoenus griffinianus*
- *Stylidium drummondianum*
- ✕ *Stylidium torticarpum*
- ★ *Synaphea aephynsa*
- ◆ *Thryptomene* sp. Mingenew (Diels and Pritzel 332)
- ▲ *Verticordia luteola* var. *luteola*
- Conceptual disturbance footprint
- Project area

0 km 1
 Scale 1:40,000
 Page size: A3
 Projection: GDA 1994 MGA Zone 50

Source & Notes
 This figure is for illustrative purposes only and does not represent a final survey design layout.
 Significant flora from Woodman Environmental Consulting (2013).
 Seismic survey areas and drilling site from Warrego Energy.
 Roads from GEODATA 250K (Optimum scale 1:250,000).
 Aerial imagery from Landgate WA (2011).

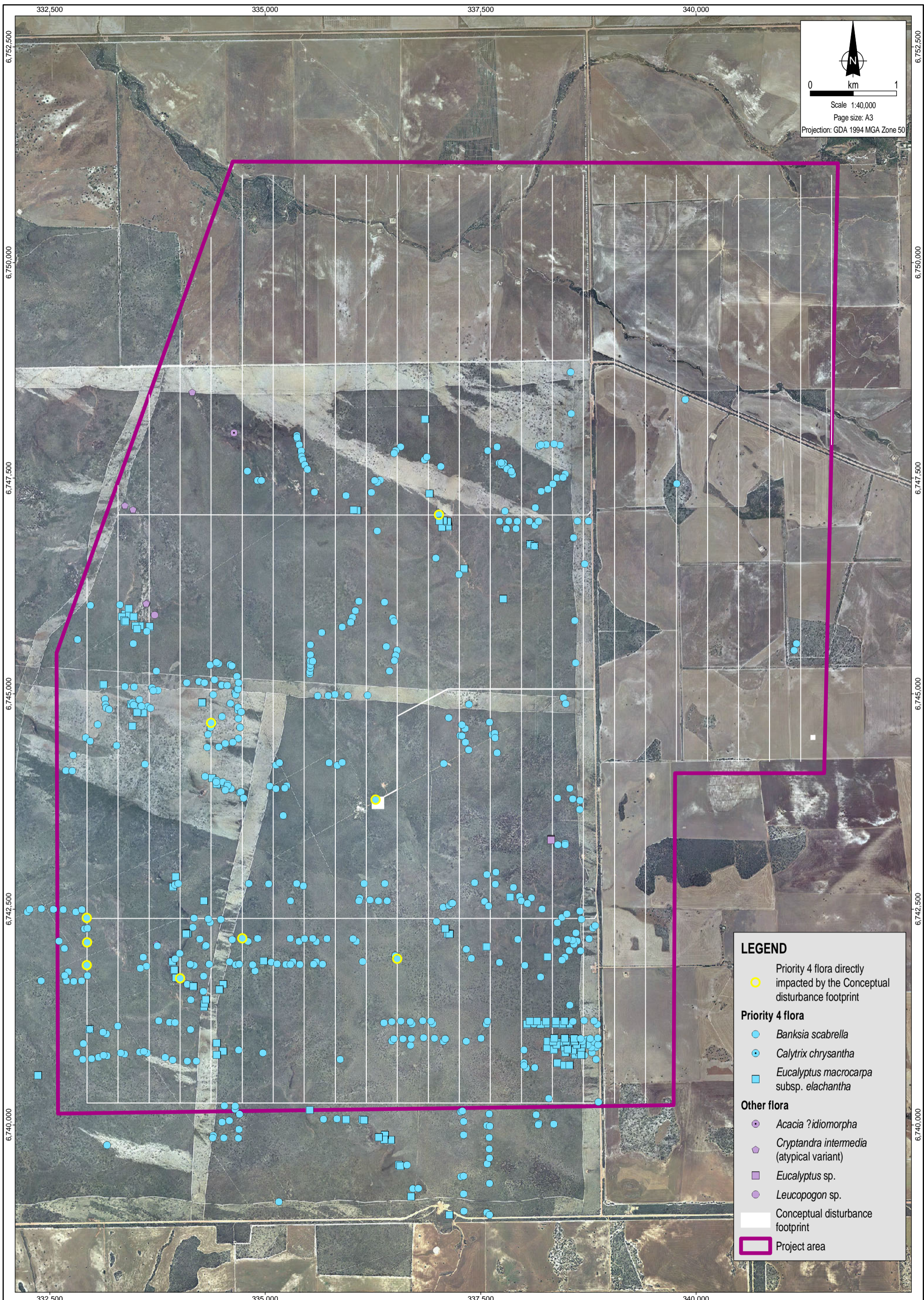


Date: 08.11.2013
 MXT: 2034_03_GIS009_v0_2
 File Name: 2034_03_V3_F008_GIS

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**Priority 3 Flora Potentially Impacted
 by the Conceptual Disturbance Footprint**



LEGEND

- Priority 4 flora directly impacted by the Conceptual disturbance footprint
- Priority 4 flora**
 - *Banksia scabrella*
 - ◐ *Calytrix chrysantha*
 - *Eucalyptus macrocarpa* subsp. *elachantha*
- Other flora**
 - *Acacia ?idiomorpha*
 - ◐ *Cryptandra intermedia* (atypical variant)
 - *Eucalyptus* sp.
 - *Leucopogon* sp.
- Conceptual disturbance footprint
- Project area

Source & Notes
 This figure is for illustrative purposes only and does not represent a final survey design layout.
 Significant flora from Woodman Environmental Consulting (2013).
 Seismic survey areas and drilling site from Warrego Energy.
 Roads from GEODATA_250K (Optimum scale 1:250,000).
 Aerial imagery from Landgate WA (2011).

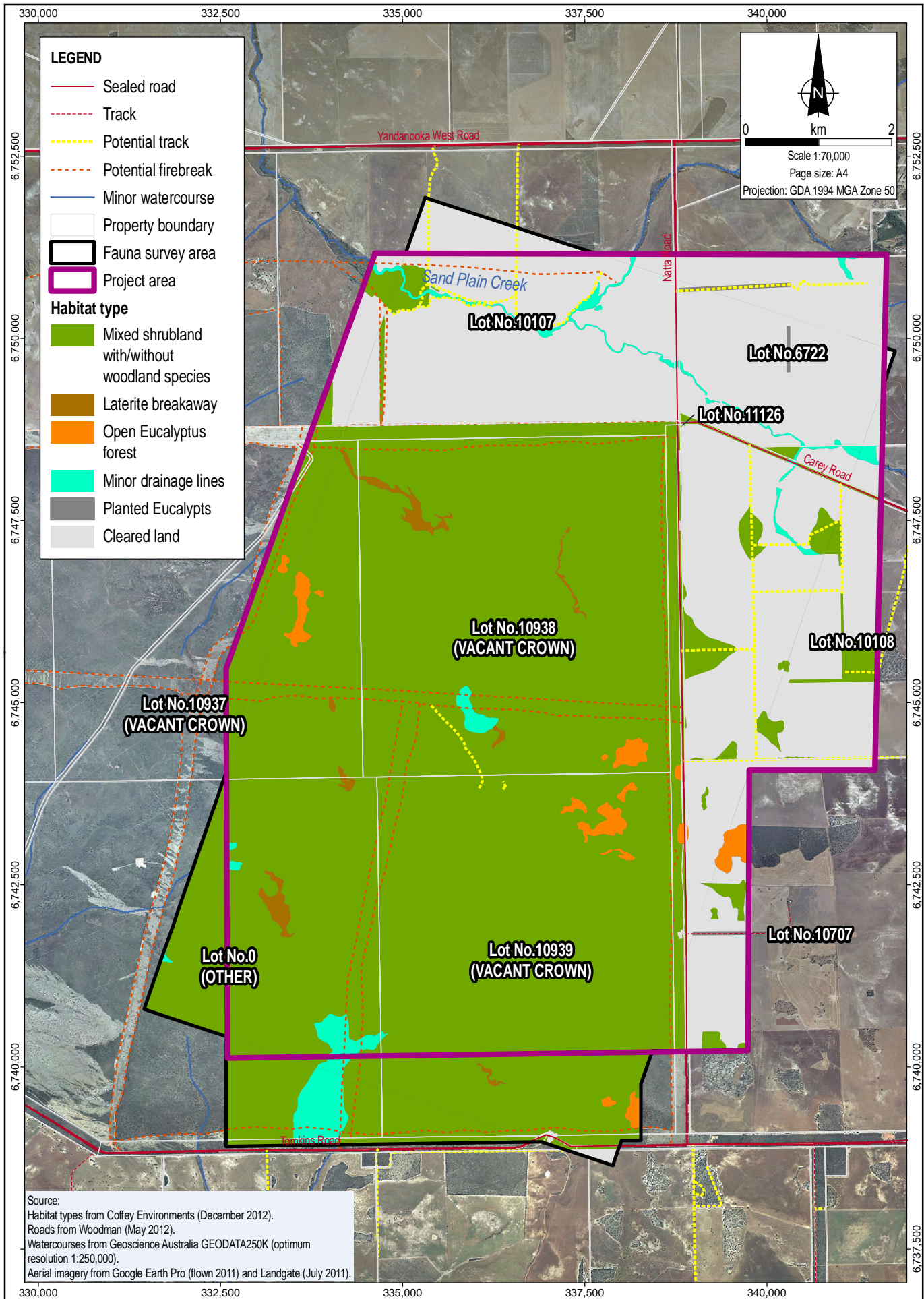


Date: 08.11.2013
 MXT: 2034_03_GIS010_v0_2
 File Name: 2034_03_V3_F009_GIS

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Priority 4 Flora Potentially Impacted by the Conceptual Disturbance Footprint



LEGEND

- Sealed road
- - - Track
- - - Potential track
- - - Potential firebreak
- Minor watercourse
- Property boundary
- Fauna survey area
- Project area

Habitat type

- Mixed shrubland with/without woodland species
- Laterite breakaway
- Open Eucalyptus forest
- Minor drainage lines
- Planted Eucalyptus
- Cleared land

0 km 2

Scale 1:70,000
Page size: A4
Projection: GDA 1994 MGA Zone 50

**Lot No.10937
(VACANT CROWN)**

**Lot No.10938
(VACANT CROWN)**

**Lot No.10939
(VACANT CROWN)**

Lot No.6722

Lot No.11126

Lot No.10108

Lot No.10707

**Lot No.0
(OTHER)**

Source:
Habitat types from Coffey Environments (December 2012).
Roads from Woodman (May 2012).
Watercourses from Geoscience Australia GEODATA250K (optimum resolution 1:250,000).
Aerial imagery from Google Earth Pro (flown 2011) and Landgate (July 2011).



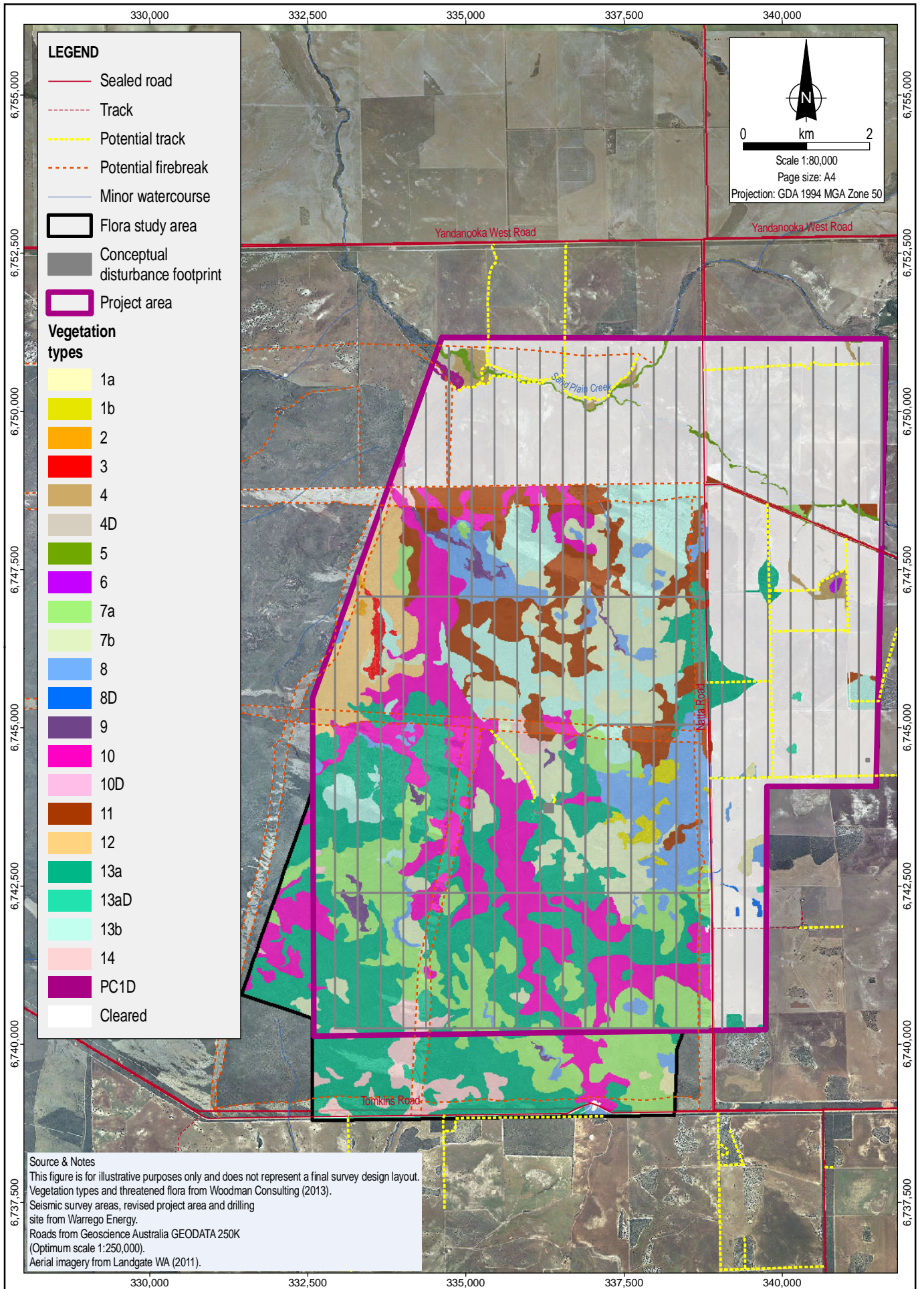
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08.11.2013
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2034_03_GIS011_v0_2
File Name:
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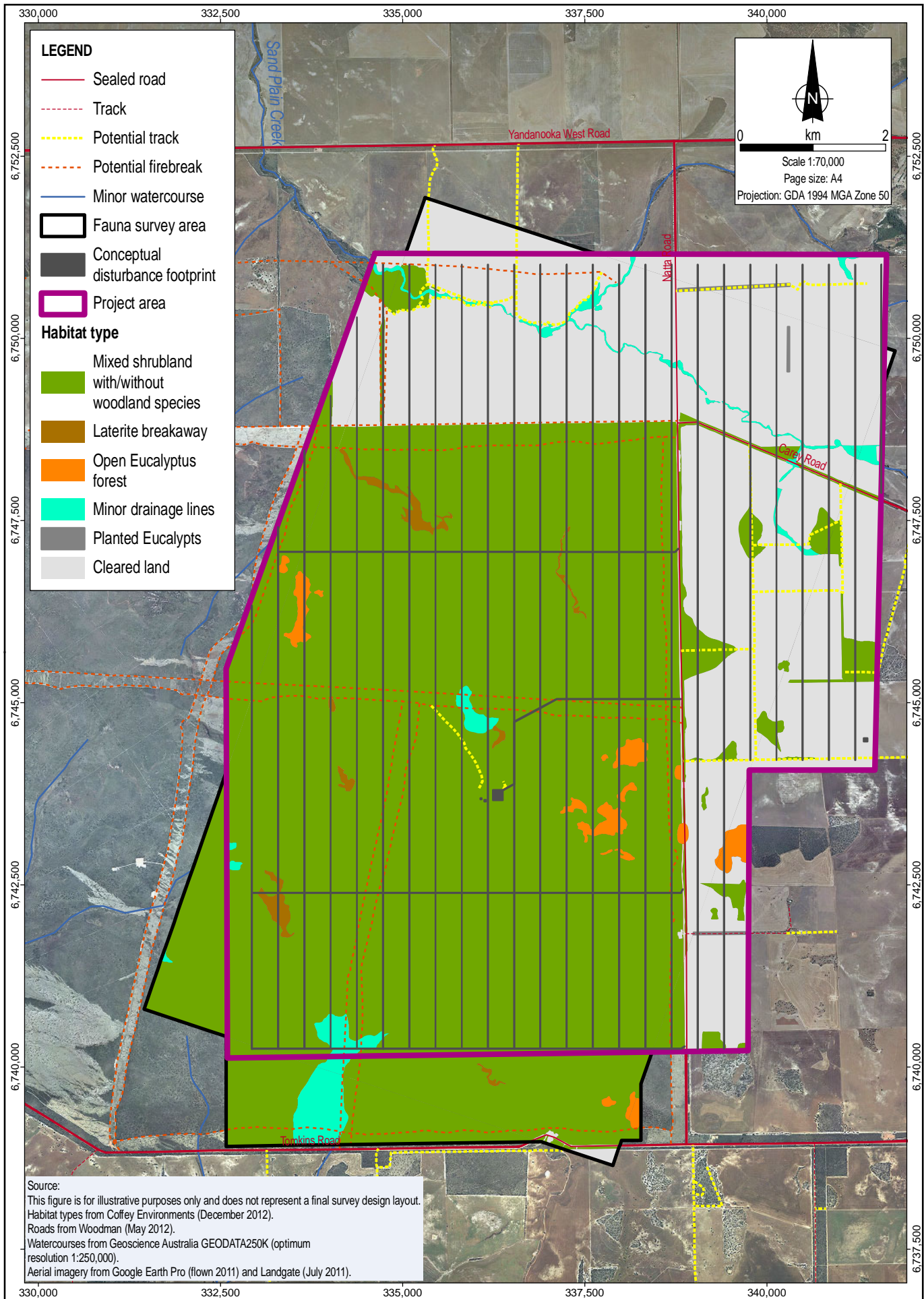
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**Habitat Types Present
Within the Project Area**

Figure No:
10





LEGEND

- Sealed road
- - - Track
- · - · Potential track
- · - · Potential firebreak
- Minor watercourse
- ▭ Fauna survey area
- ▭ Conceptual disturbance footprint
- ▭ Project area

Habitat type

- ▭ Mixed shrubland with/without woodland species
- ▭ Laterite breakaway
- ▭ Open Eucalyptus forest
- ▭ Minor drainage lines
- ▭ Planted Eucalypts
- ▭ Cleared land

0 km 2

Scale 1:70,000
Page size: A4
Projection: GDA 1994 MGA Zone 50

Source:
This figure is for illustrative purposes only and does not represent a final survey design layout.
Habitat types from Coffey Environments (December 2012).
Roads from Woodman (May 2012).
Watercourses from Geoscience Australia GEODATA250K (optimum resolution 1:250,000).
Aerial imagery from Google Earth Pro (flown 2011) and Landgate (July 2011).