



West Erregulla Seismic Survey

Warrego Energy

Environment Plan Summary



Warrego Energy
Environment Plan Summary
West Erregulla 3D Seismic Survey
May 2014

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1 Introduction

1.1 Context

Warrego Energy Pty Ltd (Warrego Energy), the Proponent, is a private oil and gas development and production company established to invest in onshore unconventional gas assets through the application of innovative drilling and production techniques and technologies. Warrego Energy is proposing to conduct a three-dimensional (3D) seismic survey (the project) within exploration permit EP 469, approximately 50 km southeast of Dongara and 300 km north of Perth (Figure 1).

This Environment Plan Summary is required under the *Petroleum and Geothermal Energy Resources Act 1967* and the Petroleum and Geothermal Energy Resources (Environment) Regulations 2012. It has been prepared according to the Guidelines for the Preparation and Submission of an Environment Plan published by the Department of Mines and Petroleum (DMP, 2012) and is intended to summarise the West Erregulla 3D Seismic Survey Environment Plan (Coffey, 2014) in a format suitable for online publication and reference.

1.2 Proponent contact details

The operator for the proposed activities is Warrego Energy. Warrego Energy's contact details are as follows:

Contact: Duncan MacNiven (Director)
Address: 37-39 Hay St, Subiaco WA 6008
Telephone: +61 8 9467 7822
Website: <http://www.warregoenergy.com>
Email: info@warregoenergy.com

2 Project description

2.1 Location and tenure

The project involves conducting a 3D seismic survey within exploration permit (EP) 469, located onshore approximately 50 km southeast of Dongara and 300 km north of Perth, Western Australia (see Figure 1). Warrego Energy is the sole holder of exploration permit EP 469, which was issued on 16 April 2010 and is due to expire on 15 April 2019. Undertaking this project is an obligation under the exploration permit imposed by the regulator.

Land use in the vicinity of the project includes Vacant Crown Land (VCL) and Freehold land (Figure 2), with the nearest residential property located about 570 m to the east (see Figure 2). The closest conservation areas are Wilson Nature Reserve and Yandanogo Nature Reserve, located approximately 20 km southeast and 25 km west of the project area, respectively (see Figure 1).

The project area is bounded by the following points:

- 29° 21' 28" S, 115° 17' 47" E
- 29° 21' 32" S, 115° 22' 07" E
- 29° 25' 21" S, 115° 21' 57" E

- 29° 25' 21" S, 115° 20' 53" E
- 29° 27' 26" S, 115° 20' 51" E
- 29° 27' 25" S, 115° 16' 25" E
- 29° 24' 32" S, 115° 16' 28" E

2.2 Activities

Seismic surveys enable creation of a map of the subsurface landscape, leading to identification of structures that may contain oil and gas accumulations. Vibroseis trucks are used as the source of vibrations (sound waves) that penetrate into the ground and are reflected from subsurface geological structures. The reflected seismic signal is then detected by geophones on the surface, and interpreted to create a 3D geological model from which locations of potential oil and gas accumulations may be identified.

Warrego Energy has committed to disturbing no more than 70 ha within the project area in the development of this project. Figure 2 identifies the nominal position of the seismic survey lines and associated infrastructure. Warrego Energy will undertake final line planning to minimise potential impacts to Threatened species (discussed in Section 3).

The project will comprise three principal activities, summarised below.

2.2.1 Site preparation

Site preparation requires clearing of 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 Vibroseis trucks.

Receivers will be set out along approximately 31 parallel lines, spaced 360 m apart across the project area and perpendicular to the source lines. Warrego Energy has committed to walking in receivers to prevent the need to clear along receiver lines.

Vegetation will be cleared using a raised roller mulching technique. As vegetation is cleared it will be mulched and spread behind the machine.

2.2.2 Operations

Vibroseis trucks travel along source lines generating a seismic signal (vibrations in the range of 5 to 100 Hz). They typically work in small fleets of two to four vehicles, travelling head-to-tail and creating synchronous seismic vibrations.

Geophones to detect the seismic signal are placed by hand at 40 m intervals along the uncleared receiver lines. Depending on local conditions (e.g., soil type and slope), several geophones may be used in the same location. The geophones capture the acoustic signals generated by the Vibroseis trucks as they are reflected by the sub-surface environment. These reflected seismic signals are digitised and subsequently downloaded from the receiver nodes.

2.2.3 Demobilisation and rehabilitation

While some permanent line markers are required to be retained in accordance with the Schedule of Onshore Petroleum Exploration and Production Requirements 1991, all other pegs, markers and equipment will be removed from the project area following completion of the project. Temporary fencing set up by the seismic crew (if any) will be removed, and any pre-existing fencing that was modified will be reinstated, in accordance with landowner requirements.

Warrego Energy will close all project access tracks (i.e., through the placement of brushing at entrances to areas of remnant vegetation) as soon as practicable to prevent unauthorised third party access. Access may be retained in some circumstances (e.g., for access during a subsequent appraisal drilling program or as otherwise requested by local authorities and/or relevant stakeholders). The project access tracks and source lines will then be left to regenerate naturally.

2.2.4 Rehabilitation monitoring

Warrego Energy will monitor rehabilitation of the project area and audit it against the closure criteria developed within a DMP-approved rehabilitation plan. Monitoring will commence one month after completion of the project with a particular focus on third party access issues and the presence of introduced weeds and/or dieback. It is likely that weed monitoring will focus on areas of higher risk (i.e., on private property and along access tracks in the VCL). The program will continue annually between October and December for a minimum of two years and until monitoring has shown all rehabilitation completion criteria have been met.

2.2.5 Supporting infrastructure

Warrego Energy will use an existing residence and groundwater bore located on freehold land within exploration permit EP 469, in agreement with the landholder (Figure 2). Water will be abstracted from the existing bore in accordance with the landholder's existing water licence to meet the project's non-potable water requirements (i.e. hygiene station). The residence will act as the project's site office.

Personnel will be housed outside exploration permit EP 469 at existing facilities in nearby towns or at a temporary accommodation camp at a nearby site depending on contractor selection (Figure 2).

2.3 Schedule

The project is scheduled to be undertaken in a phased approach between July and December 2014 as shown in Table 2.1.

Table 2.1 Indicative project timing

Activity	Approximate duration	Indicative timing
Site preparation	30 days	July/August 2014
Mobilisation/operation	20 days	October/November 2014
Demobilisation and rehabilitation	25 days	November/December 2014
Post rehabilitation monitoring	Two years or until rehabilitation performance criteria have been met	Monitoring to commence one month after the demobilisation and occur annually between October and December

3 Environmental risks and management

3.1 Existing environment

The project is located in the Northern Sandplains Region (Irwin Botanical District) as described by Beard (1990), which features predominantly yellow sands overlaying laterite (Beard, 1990).

The project area is generally devoid of any significant permanent surface water features. However, there are several small ephemeral creeks in the project area, including Sand Plain Creek and several other unnamed watercourses (RPS, 2011).

The Tathra vegetation system (Beard, 1976) in which the project is located is the most extensive vegetation system in the Dongara area and consists of scattered shrubs of 1 to 2 m height and a denser layer of shrubs to 1 m height. Species present include *Nuytsia floribunda*, *Eucalyptus todtiana*, *Banksia attenuata*, *Banksia menziesii* and *Banksia prionotes*. Also within the Tathra vegetation system, but on outcrops of laterite ridges and breakaways, is *Hakea auriculata*, which dominates a low heath cover to 60 cm height.

No state-listed Threatened ecological communities (TEC) or Priority Ecological Communities (PEC) or Commonwealth-listed threatened ecological vegetation communities were identified within the project area. Furthermore, none of the 17 vegetation types mapped and described by Woodman Environmental (2013) were equivalent to any state-listed TECs or PECs or Commonwealth-listed threatened ecological vegetation communities.

The condition of nearly all vegetation mapped was classified as pristine. Remnant vegetation within private property (i.e., on agricultural land) varied in condition from pristine to poor depending on the number of weeds present and the decline in native species diversity relating to clearing and grazing impacts. Twenty-two introduced flora species were recorded within the survey area. None of these weeds are listed as weeds of national significance.

A total of 535 vascular flora taxa and one known hybrid, representing 64 families and 196 genera were recorded from the project area and included three Threatened flora species (*Eucalyptus crispata* and the orchids *Thelymitra stellata* and *Paracaleana dixonii*), 23 confirmed Priority species, one probable Priority species and one hybrid species (Woodman Environmental, 2013). In addition, another Threatened flora species, two priority flora species and a probable priority species have historically been recorded within the survey area.

Coffey (2013) identified five fauna habitat types within the project area, including cleared land, planted eucalyptus, open eucalyptus forest, mixed shrubland with/without woodland species, laterite breakaway and minor drainage lines. With the exception of the cleared land, all other habitats provide habitat (i.e., foraging and roosting) critical to the survival of the Carnaby's Black Cockatoo.

A total of 304 fauna species have previously been recorded in the vicinity of the project, including 11 introduced species and 20 species of conservation significance. While none of these conservation significant species were positively recorded during field investigations, four are considered "likely" to occur (Carnaby's Black Cockatoo, Australian Bustard, Rainbow Bee-eater and Western Carpet Python), and another four were considered as "possibly" occurring within the project area (Peregrine Falcon, Fork-tailed Swift, Western Brush Wallaby and Gilled Slender-Bluetongue).

The closest conservation areas to the project area are Wilson Nature Reserve and Yandanogo Nature Reserve, located 15 km to the southeast and 15 km to the west respectively. There is also an environmentally sensitive area within and in close proximity to the project area (see Figure 1). The nearest indigenous and non-indigenous heritage sites are over 20 km from the project area and the

nearest sensitive receptor (a residence) is located approximately 570 m to the east of the project area (see Figure 2).

3.2 Environmental risk assessment

Potential environmental risks associated with the project were assessed qualitatively based on Warrego Energy's internal environmental risk assessment (ERA) method and the principles of Australian Standard / New Zealand Standard 31000:2009 and Handbook 203:2012.

A summary of the potential impacts, controls and residual risk is provided in Table 3.1. All 34 potential environmental impacts identified have been assessed as having a residual risk of 'low' or 'medium'.

Table 3.1 Potential environmental impacts and controls

Impact	Control
Loss of conservation significant flora	<ul style="list-style-type: none"> • Clearing of native vegetation will not exceed 70 ha within the 8,575 ha project area. • Vegetation will be cleared using roller mulching clearing methods. Raised-blade clearing preserves rootstock and retains seedstock and vegetation cover, increasing the success of natural rehabilitation and revegetation and mitigating impacts to tubers of both <i>Thelymitra stellata</i> and <i>Paracaleana dixonii</i>. • All large trees, open Eucalyptus forest habitat and planted Eucalyptus habitat will be avoided. • Known locations of Threatened flora will be avoided by deviating source lines, receiver points and tracks around sensitive areas and topographic obstructions. • Where possible, known locations of Priority 1 and Priority 2 flora will be avoided by deviating source lines, receiver points and tracks around sensitive areas and topographic obstructions. • ESA 6046 will be avoided. • A Permit To Take has been obtained through Department of Parks and Wildlife (DPaW) prior to native vegetation clearing. No known Threatened flora will be cleared without a Permit To Take. • Education and awareness training will identify conservation significant values within the project area and discuss relevant management measures and personnel/contractor responsibilities. • A permit to clear native vegetation has been obtained prior to clearing. • Clearing of vegetation will be kept to the minimum necessary to conduct the survey. • Initial surveying using a GPS will be undertaken to accurately locate and demarcate all areas of disturbance (i.e. source and receiver lines) and identify areas that need to be avoided. • Vehicle and machinery movements will be restricted to the project footprint and existing disturbance, tracks and firebreaks. • Vehicle movements will be minimised (particularly along source lines) to maximise success of natural regeneration. • All vehicles and machinery will be fitted with rubber tyres. • Incident reporting procedures will be implemented.
Introduction and spread of weeds/dieback	<ul style="list-style-type: none"> • The Vacant Crown Land in the project area will be treated as dieback-free. • A dieback and weed management plan has been developed. • Vehicle and machinery movements will be restricted to the project footprint and existing disturbance, tracks and firebreaks. • Adhere to any biosecurity requirements of landowners as per land access agreements. • All personnel will be instructed on weed/disease risks and correct hygiene procedures. • Vehicle movements will be minimised to maximise success of natural regeneration. • Any soil from the hygiene station will be treated as contaminated and removed from site. • All personnel will be instructed on weed/disease risks and correct hygiene procedures.

Impact	Control
Fauna mortalities/ Disturbance to fauna	<ul style="list-style-type: none"> • Vehicle and machinery movements will be restricted to a speed limit of 20 km/h along new project tracks and as per land access agreements on other non-public tracks. • Vehicle and machinery movements will be restricted to the project footprint and existing disturbance, tracks and firebreaks. • Education and awareness training will identify conservation significant values within the project area and discuss relevant management and personnel/contractor responsibilities. • Project activities will be planned for daylight hours only. • Pets and firearms will be prohibited in the project area. • All putrescible waste will be stored in bins with a tightly secured lid.
Loss of / fragmentation of habitat for conservation significant fauna species	<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 and receiver lines) and identify areas that need to be avoided. • Vegetation will be cleared using roller mulching clearing methods. Raised-blade clearing preserves rootstock and retains seedstock and vegetation cover, increasing the success of natural rehabilitation and revegetation and mitigating impacts to tubers of both <i>Thelymitra stellata</i> and <i>Paracaleana dixonii</i>. • All large trees, open Eucalyptus forest habitat and planted Eucalyptus habitat will be avoided. • Receivers will be walked in, reducing the area to be cleared. • The number of access tracks required along east-west receiver lines will be kept to a minimum. • A permit to clear native vegetation has been obtained prior to clearing. • The project has been referred to the Commonwealth Department of the Environment under the EPBC Act. • Clearing of vegetation will be kept to the minimum necessary to conduct the survey. • An offset for native vegetation and Carnaby's Black Cockatoo feeding and roosting habitat will be developed in accordance with clearing permit and EPBC Act approval conditions. • Education and awareness training will identify conservation significant values within the project area and discuss relevant management measures and personnel/contractor responsibilities.
Fire	<ul style="list-style-type: none"> • The project will not operate during harvest and vehicle movement bans issued by local shires. • 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. • Maintain at least one 'fast-attack' vehicle (with water tank, pump and hose) on-site at all times during operations. • Permit smoking only in designated smoking areas. • Liaise with DFES, DPaW and local councils to ensure that activities are undertaken at times of lower risk, that any local restrictions are adhered to and that any incidence of fire is reported. • 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. • All vehicles and machinery will operate on diesel fuel. • Adhere to emergency response plan (ERP) and stakeholder management plan. • Vehicle and machinery movements will be restricted to the project footprint and existing disturbance, tracks and firebreaks.

Impact	Control
Erosion of soil	<ul style="list-style-type: none"> • Vehicle and machinery movements will be restricted to a speed limit of 20 km/h along new project tracks and as per land access agreements on other non-public tracks. • No clearing will occur within 20 m of Sand Plain Creek. • Vehicle and machinery movements will be restricted to the project footprint and existing disturbance, tracks and firebreaks. • Vegetation will be cleared using a raised roller mulching method. Raised-blade clearing preserves rootstock and retains seed stock and vegetation cover. • Project activities (especially vehicle movements) will be limited during and immediately after high rainfall events.
Soil compaction	<ul style="list-style-type: none"> • On agricultural land, rehabilitation techniques (e.g. shallow ripping) will be as agreed with the landowner. • A rehabilitation plan will be developed in line with industry standards and in consultation with the Department of Mines and Petroleum (DMP) and the DPaW. The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey. • Vehicle movements will be minimised (particularly along source lines) to maximise success of natural regeneration.
Contamination of soil	<ul style="list-style-type: none"> • Use drip trays, spill mats or equivalent while refuelling. • Refuel, service and maintain vehicles and machinery at designated locations only. • Remove and dispose of any contaminated material offsite to a licenced facility using a licenced contractor. • Sewage will be contained and removed and disposed of offsite using an approved contractor in accordance with local requirements. • Spill kits will be available during all refuelling operations. • No smoking will be permitted in vicinity of refuelling operations under any circumstances. • In-field refuelling will be prohibited during total fire ban or harvester and vehicle movement bans. • Refuelling will not be conducted within 100 m of watercourses. • Incident reporting procedures will be implemented. • Vehicles and machinery will be maintained according to the manufacturer's specifications. • Vehicles and machinery will be inspected on a regular basis. • Drums containing oil will be stored in a bund capable of holding 110% of the largest drum's contents. • Vehicles delivering fuel to the project area will have a journey management plan in place. • Vehicles delivering fuel to the project area will carry a spill kit at all times. • Vehicles delivering fuel to the project area will be double banded.
Disturbance to drainage lines or minor watercourses	<ul style="list-style-type: none"> • No clearing will occur within 20 m of Sand Plain Creek. • Existing crossings of watercourses will be used. • Project activities (especially vehicle movements) will be limited during and immediately after high rainfall events. • A rehabilitation plan will be developed in line with industry standards and in consultation with the DMP and the DPaW. The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey.

Impact	Control
Unsuccessful rehabilitation	<ul style="list-style-type: none"> • A rehabilitation plan will be developed in line with industry standards and in consultation with the DMP and theDPaW. The rehabilitation plan will be submitted to the DMP for approval prior to the completion of the seismic survey. • Rehabilitation of seismic lines will commence as soon as practicable. • Minimise visual line of sight along access tracks from intersections with public roads (i.e. dog-leg or meander cleared tracks). • All project tracks will be closed as soon as possible after completion of seismic data acquisition (e.g. through placement of brushing at entrances to remnant vegetation).
Generation of dust	<ul style="list-style-type: none"> • Vehicle and machinery movements will be restricted to a speed limit of 20 km/h along new project tracks and as per land access agreements on other non-public tracks. • Consider dust suppression techniques such as watering if required. • Vehicle and machinery movements will be restricted to the project footprint and existing disturbance, tracks and firebreaks. • Vegetation will be cleared using a raised roller mulching method. Raised-blade clearing preserves rootstock and retains seed stock and vegetation cover.
Greenhouse gas emissions	<ul style="list-style-type: none"> • Ensure vehicles and machinery have standard emission control devices fitted and maintained.
Disruption to landowners/ local community	<ul style="list-style-type: none"> • Ensure landowner access agreements are in place before project commences. • Include landowner requirements and sensitivities in inductions for all personnel/contractors. • Adhere to stakeholder management plan. • Incident reporting procedures will be implemented. • Education and awareness training will identify stakeholder sensitivities within the project area and discuss relevant management measures and personnel/contractor responsibilities. • Implement a traffic management plan (approved by local shire) where required.
Disturbance to indigenous or non-indigenous heritage site	<ul style="list-style-type: none"> • Adhere to agreement with Amangu people. • Education and awareness training will identify heritage values within the project area and discuss relevant management measures and personnel/contractor responsibilities. • There are no registered indigenous or non-indigenous heritage sites within the project area. • Establish protection buffer zone of 20 m around identified heritage sites. • Adhere to requirements of the <i>Aboriginal Heritage Act 1972</i> in the event that a suspected Aboriginal heritage site is discovered.

3.3 Implementation strategy

Warrego Energy and its contractor will have a number of systems, practices and procedures that relate to the implementation of this Environment Plan, specifically in relation to site preparation, dieback and weed management, traffic management, stakeholder management, waste management, traffic management, refuelling and oil spill/emergency response.

3.4 Roles and responsibilities

The Environment Plan defines roles and responsibilities for key Warrego Energy and contractor personnel. These personnel include the Warrego Energy Board, Executive, and Energy Asset & HSE Manager, the Seismic Contractor Manager, Project Manager, and crew, and the Line Preparation Contractor. The roles and the responsibilities relate to the implementation of management measures and the timely monitoring and reporting of key environmental parameters.

4 Stakeholder consultation

Warrego Energy initiated a stakeholder consultation program in 2008 when it acquired exploration rights in EP 469. The aim of the stakeholder consultation program was and is to inform stakeholders of Warrego Energy's proposed activities and to identify any conflicts, concerns, management strategies and benefits.

Warrego Energy has consulted with various government regulators, landowners, local shires and other petroleum explorers and operators in the area.

Warrego will continue to consult with the relevant government authorities, landowners and interested persons regarding project activities prior to the commencement of the project. Records of Warrego's consultation activities will be presented in Warrego's Annual Environmental Report to the DMP and the Department of the Environment for the project.

5 References

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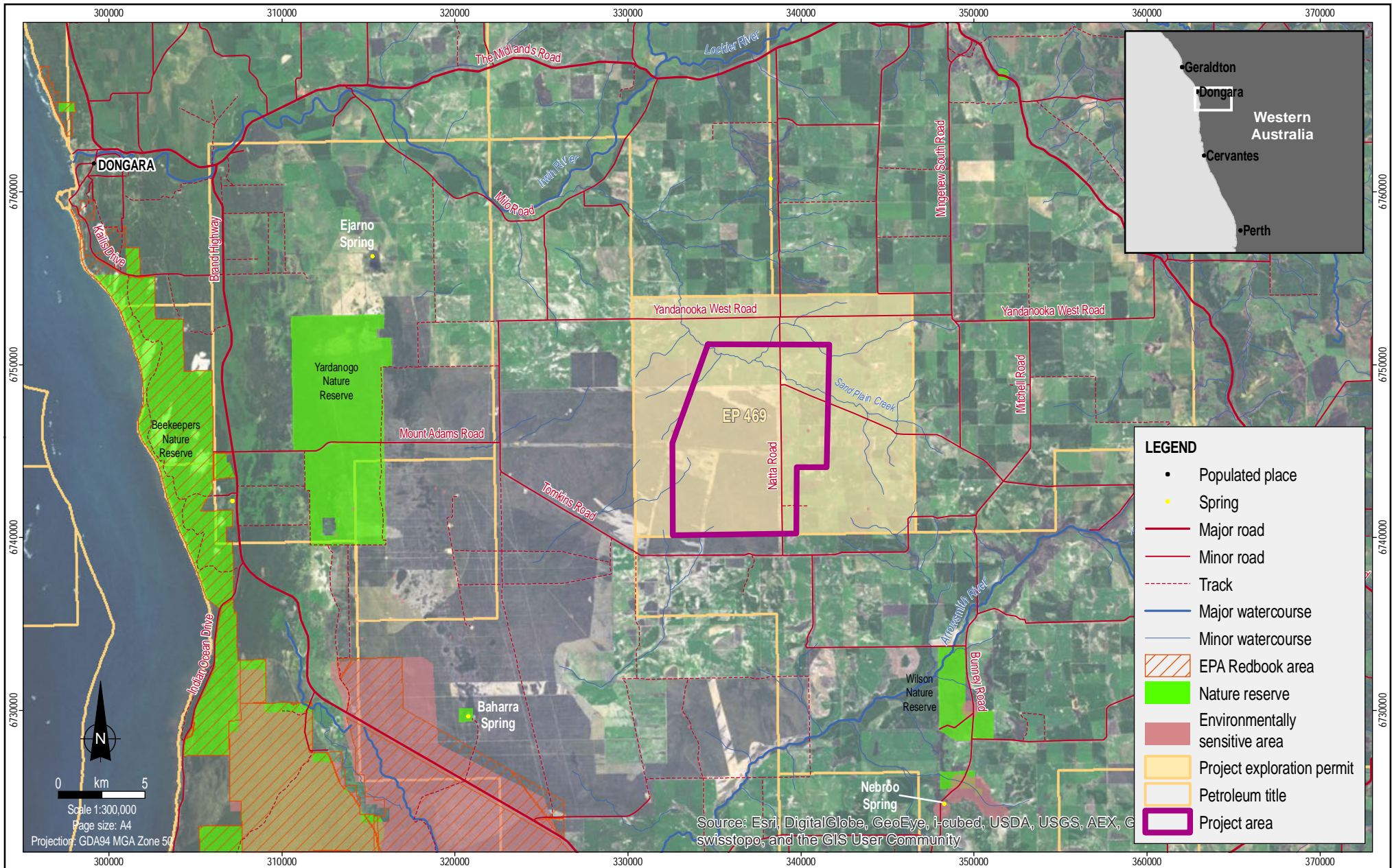
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6 Glossary

Acronyms and abbreviations

3D	three-dimensional
DMP	Department of Mines and Petroleum
DPAW	Department of Parks and Wildlife
EP	Exploration Permit
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
HSE	health, safety, environment
PEC	Priority ecological community
TEC	Threatened ecological community
VCL	Vacant Crown Land
Warrego Energy	Warrego Energy Pty Ltd



Source:
 Project area from Warrego Energy.
 Petroleum titles from DMP.
 Nature reserves and environmentally sensitive areas from DEC.
 EPA Redbook data from DEC (downloaded from SLIP, September 23, 2010).
 Populated places, roads, watercourses and springs from GEODATA250K.
 Imagery from ArcGIS online (capture date unknown).



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Warrego Energy
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**Project location, regional setting,
 and hydrology**

Figure No:
1

