

All enquiries to Planning Services on 9526 1131

Our ref: P01495/01:GF:wj

Electronic Ref: OC14/21003



Shire of Serpentine Jarrahdale

Sustainable. Connected. Thriving!

10 December 2014

Environmental Protection Authority
Locked Bag 10
EAST PERTH WA 6892

Dear Sir/Madam

**Proposed Extractive Industry (Sand Mining)
Lot 810 Yangedi Road, Hopeland**

Council is in receipt of an application for approval to commence development of an extractive industry site (sand mining) on the above property (refer attached location plan). The details of the proposal are as follows:

Total area of project site:	72.0 ha
Total area of mining footprint:	18.0 ha
Total disturbance area:	18.0 ha
Timeframe:	Approximately 3 years
Truck movements:	Approx. 100 per day
Hours of operation:	7:00am to 5:00pm Monday – Friday.
Purpose:	Sand extraction
Basic Raw Materials Policy:	Not listed in policy
Site Constraints:	Conservation Category wetland Resource Enhancement wetland Three Multiple Use wetlands Within Dampier to Bunbury Natural Gas Pipeline buffer

The Shire has deemed the proposal to be significant with regard to potential impacts on the environment and accordingly the proposal is referred to the Environmental Protection Authority (EPA) for a decision under Section 38 of the Environmental Protection Act. Please find attached a hard copy report on the proposal submitted by the applicant and an electronic version of the documents (on cd).

The application has been referred to the Western Australian Planning Commission for determination under the Metropolitan Region Scheme in accordance with the Clause 32 resolution relating to extractive industry developments.

If you have any queries with regard to this matter, please contact the undersigned on 9526 1166.

Yours faithfully

**Gillian French
Planning Officer**

Enc. Application for Development Approval
Extractive Industries Licence Application
CD

Office of the Environmental Protection Authority	
File:
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6 Paterson Street, Mundijong WA 6123 t 08 9526 1111 f 08 9525 5441 e info@sjshire.wa.gov.au www.sjshire.wa.gov.au



Form No. 4 Regs. 16(1) and 20(2)
Planning And Development Act 2005 (As Amended)

Submission
Shire Of Serpentine Jarrahdale Town Planning Scheme No. 2

**Lot 801 Yangedi Road, Hopeland
Sand Extraction**

REF: P01495/01

To: Chief Executive Officer – Shire of Serpentine Jarrahdale
Attention: **Gillian French, Planning Officer**

Name:

Postal Address:

Email Address:

Phone Numbers: Hm Wk Mob

Subject Of Submission

(State how your interests are affected. Whether as a private citizen, on behalf of a company or other organisation, or as an owner or occupier of property).

.....

Submission

(Give in full your comments and any arguments supporting your comments – continue on additional sheets if necessary)

.....

.....

.....

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.....

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Signature

Dated

Submission forms can be mailed or delivered in person to:
Shire of Serpentine Jarrahdale - 6 Paterson Street, Mundijong WA 6123
Submissions may also be emailed to info@sishire.wa.gov.au
Submissions must be received by 14 January 2015



All submissions, including names and addresses, received in respect to the proposal will be made publicly available and will form part of the report when the item is presented to Council for determination. Names and addresses will be accessible via the internet and may be put on public record.

253 YANGEDI ROAD HOPELANDS

APPLICATION FOR DEVELOPMENT APPROVAL

Prepared for: SAGH Pty Ltd

Report Date: 19 November 2014

Version: 1

Report No. 2014-178

The logo for PGV Environmental is displayed in white text on a red background. The letters 'PGV' are in a large, bold, sans-serif font, with the 'G' being particularly prominent. Below 'PGV', the word 'ENVIRONMENTAL' is written in a smaller, all-caps, sans-serif font.

PGV
ENVIRONMENTAL

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1 INTRODUCTION

1.1 Background

SAGH Pty Ltd is proposing to extract sand from 253 Yangedi Road, Hopelands (the site). The registered proprietors of the site are Rich Vista of 66 Burke Drive, Attadale and De Evergrace Pty Ltd of 11 Meadow Bank Terrace, South Lake (Appendix 1). SAGH have an option to purchase 253 Yangedi Road, Hopelands from the current landowners.

The site is currently used for pasture cropping and stock grazing and will be returned to this land use post sand extraction.

The topography of the site is characterised by an east west ridgeline extending through the northern part of the site. The site gently slopes away to the south and north of the ridgeline. The soils of the site are largely mapped as belonging to the Bassendean Complex with a small intrusion of the Pinjarra Plain Complex in the south.

The vegetation on the site was historically cleared for agricultural purposes in the early 1970s (Plate 1). Native vegetation has re-established on sections of the north western part of the property since 1995 (Plate 2). The remainder of the site is largely pasture with isolated endemic Paperbark stands and planted eucalypt trees.

The site contains a Conservation Category Wetland in the northwest corner and a Resource Enhancement Wetland along an artificial drain line in a north-south direction and converges with the Punrack Drain to the south of the site. Three Multiple Use wetlands are mapped as occurring in the southern section of the site.

The area available for pasture cropping is currently constrained by the east-west ridgeline that supports some pasture and regrowth native vegetation. SAGH Pty Ltd proposes to develop a sand extraction operation in this location with the outcome of releasing more land for future pasture cropping and grazing.

Plate 1: Historical Aerial Photography from 1974 (Landgate, 2014a)

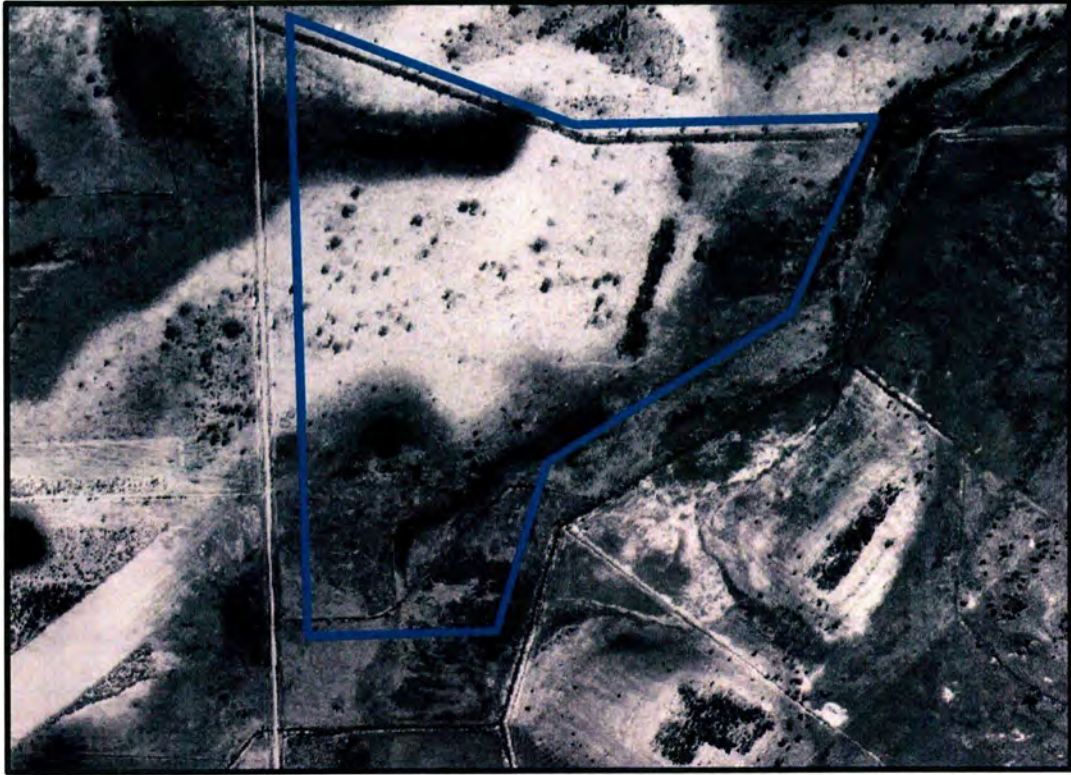


Plate 2: Historical Aerial Photography from 1995 (Landgate, 2014a)



1.2 Site Location

The site is located in the Shire of Serpentine-Jarrahdale (the Shire) and is approximately 50km to the south of the Perth Central Business District and 25km north of Mandurah (Figure 1). The site is bound by Yangedi Road and Serpentine Airfield to the west and private landholdings to the north, east and south (Figure 2). The Dampier Bunbury Natural Gas Pipeline (DBNGP) traverses the north-east section of the site. There are a number of Rural landholdings within a 1km radius of the site with the closest being approximately 500m. The site is located in Special Control - Poultry Farms zone under the Shire's Town Planning Scheme No. 2 (TPS2).

The site is located at 253 Yangedi Road and comprises of 72ha. The legal description of the land is Lot 810 on Deposited Plan 202726:

Lot 253 on Deposited Plan 202726, contained within Certificate of Title Volume 1730 Folio 354.

A copy of the Certificate of Title(s) is submitted as Appendix 1.

1.3 The Proposal

SAGH Pty Ltd proposes to develop an extractive industry (sand) over a portion of their landholding and seek approval under the Serpentine - Jarrahdale Town Planning Scheme No. 2. Planning approval is sought for an 'Industry – Extractive' in order to facilitate the development.

This proposal seeks to secure a portion of the site, being approximately 18ha of the total 72ha area to be extracted over a period of approximately 3 years.

The site will be accessed from Yangedi Road which intersects with Karnup Road to the north providing access to the Kwinana Freeway and South West Highway. The proposal anticipates 100 truck movements per day in the proposed operating hours of 7:00am until 5:00pm Monday to Friday. Infrastructure on the site will be kept to a minimum as existing infrastructure will largely meet the requirements for the sand extraction operation.

This report has been prepared to support an Application for Planning Approval to develop an Extractive Industry. The report addresses the following:

- A description of the site;
- Planning Context;
- Details on the Extractive Industry; and
- Suitability of the site for sand extraction.

An Extractive Industry Licence Application will be submitted to the Shire of Serpentine-Jarrahdale in parallel with this Development Application. The Extractive Licence Application will include an assessment of the potential environmental impacts and their management and a mine closure plan.

2 SITE ANALYSIS

2.1 Access

Yangedi Road runs along the western boundary and provides a sealed access to the site.

Yangedi Road intersects with Karnup Road approximately 2.5km north of the site and allows vehicles to move west to the Kwinana Freeway or east towards the South West Highway.

2.2 Topography

The site is predominantly low lying with a drain running through the eastern portion of the site. A ridgeline to 20m AHD extends through the site in a west to north-east orientation. The site slopes down to 14m AHD to the wetland in the north and down to 12m AHD in the south along the drainage line (Figure 2).

2.3 Soils

The site is largely located on the Bassendean Dune System with the Pinjarra Plain System occurring in the south-east corner of the site (Table 1). There are four soil units mapped on the site as shown in Figure 3 and described in Table 2.

Table 1: Soil Systems mapped on the Site

Soil Systems of the Swan Coastal Plain	Description
Bassendean Dune Soils	These are the oldest of the three dune systems on the Swan Coastal Plain, are thought to be about 800,000 years old and so are the most leached, infertile and acidic. The sands contain little silt or clay, and very low levels of nutrient elements, with any nutrient element content being associated with organic matter. The dunes are low lying hills with poorly drained areas between the hills.
Pinjarra Plain Soils	The soils are complex, and comprise a successive layering of soils formed from erosion of material from the scarp and east of the scarp. Rivers and streams have mostly carried the eroded material, which is deposited from the water as fans of alluvium. Therefore, the plain, is made up of layers of soils of different ages. It occupies about one third of the Swan Coastal Plain, and most of it has been cleared and sown to pasture for the grazing industries, mostly dairy, with some beef.

DAFWA, 2014

Table 2: Mapped Soil Units on the Site

Soil Units	Description
Bassendean B1 (212Bs_B1)	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m. Banksia dominant
Bassendean B3 (212Bs_B3)	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam
Bassendean B6 (212Bs_B6)	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands
Pinjarra P7 (213Pj_P7)	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and grey sandy duplex and effective duplex soils

DAFWA, 2014

The Bassendean B3 soil unit is associated with the dunal ridge that is proposed for the sand extraction operation.

The WA Atlas (Landgate, 2014b) Acid Sulfate Soil (ASS) risk mapping classifies the site largely as having a “moderate to low risk of acid sulphate soils occurring within 3m of natural soil surface” (Figure 4). A small portion of the site adjacent to the northern wetland is mapped as having “high to moderate risk of acid sulphate soils occurring within 3m of natural soil surface”.

This area is not subject to this application and therefore would not be quarried. As there is no prospect of disturbing Acid Sulfate Soil, there is no need to further investigate the sand dunes and quantify acid sulfate properties.

2.4 Groundwater and Surface Water

2.4.1 Groundwater

The site is located in the Serpentine Groundwater Area.

The Department of Water has groundwater monitoring bores adjacent to the western boundary of the site that are monitored on a monthly basis. Groundwater levels range from approximately 1-2m below natural surface level at these locations.

2.4.2 Surface Water

The site is located in the Serpentine River Catchment and contains a number of small largely artificial drainage lines that feed into the Punrack Drain which downstream has its confluence with the Serpentine River.

The surface drains are to the east and south of the area proposed for sand extraction.

2.5 Wetlands

The site contains five wetlands as shown in the *Geomorphic Wetlands of the Swan Coastal Plain Database* (Landgate, 2014b). These are described in Table 3 and shown in Figure 5.

Table 3: The Wetlands Located on the Site

UFI Number	Wetland Classification	Wetland Type	Location
14706	Conservation	Sumpland	Located within the site adjacent to the northern boundary.
14739	Multiple Use	Sumpland	Located in the north west corner of the site
14708	Resource Enhancement	Sumpland	Located in the south east corner of the site within the larger palusplain wetland 15785.
15785	Multiple Use	Palusplain	Located across southern portion of the site
14707	Multiple Use	Sumpland	Located within the larger palusplain wetland 15785.

The Resource Enhancement wetland (UFI 14708) is protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy (EPP) 1992*.

A site visit by PGV Environmental (18 July 2014) determined that the Conservation Category wetland (UFI 14706) had significant wetland values.

The Resource Enhancement wetland (UFI 14708) had reduced wetland values and attributes due to modified drainage, stock grazing and abundance of introduced weed species. The open water however provides habitat for water birds.

The Conservation and Resource Enhancement wetlands and their 50m management buffers are not located in the area proposed for the sand extraction operation.

2.6 Vegetation and Flora

2.6.1 Vegetation

According to historic aerial photography the site was cleared of native vegetation in the early 1970s (Plate 1). The vegetation has regrown on parts of the site, particularly in the north-west corner and the sandy rise which is in the area subject of this development application.

PGV Environmental (2014) undertook a Level 2 Vegetation and Flora Spring Survey on 23 September 2014.

The survey identified 5 separate vegetation types on the site including two woodland vegetation types on the sandy ridge and three wetland vegetation types on low-lying areas as follows (Figure 6):

Dryland vegetation types

EmBi *Eucalyptus marginata/Banksia ilicifolia* Low Open Forest over *Hibbertia hypericoides*
Open Low Heath

BmBaEm *Banksia menziesii*/*B. attenuata*/*Eucalyptus marginata* Low Open Woodland over *Hibbertia hypericoides*/*Allocasuarina humilis* Open Low Heath

Wetland vegetation types

MpAf *Melaleuca preissiana* Low Open Woodland over *Astartea fascicularis* Closed Heath

Kg *Kunzea glabrescens* Tall Open Scrub

ErAf *Eucalyptus rudis* Low Open Forest over *Astartea fascicularis* Shrubland

The vegetation on the ridgeline consisted of pockets of Jarrah woodland among Jarrah/Banksia woodland over low closed native heath dominated by *Hibbertia hypericoides* (Plate 3). *Banksia attenuata* and *B. menziesii* are the dominant Banksia species however the presence of the Holly-leaved Banksia (*B. ilicifolia*) around the margin of the vegetation on the central ridge indicates the presence of groundwater less than 10m deep. The native small tree Woody Pear (*Xylomelum occidentale*) is prevalent on the site.

Parkland cleared native trees occur scattered through the paddocks on the site (Plates 4 and 5).

Plate 3: Jarrah/Banksia woodland over *Hibbertia hypericoides* heath



Plate 4: Parkland Cleared Jarrah and Banksia over Pasture



Plate 5: Parkland Cleared Jarrah and Banksia over Pasture



The Conservation Category wetland in the northern portion of the site contained the best quality wetland vegetation with Paperbark (*Melaleuca preissiana*) and Spearwood (*Kunzea glabrescens*)

over dense *Astartea fascicularis*. A small stand of re-growth Flooded Gum (*Eucalyptus rudis*) occurs near the northwestern boundary.

The vegetation on the site belongs to the Bassendean - Central and South Vegetation Complex. The current extent of the Bassendean - Central and South Vegetation Complex remaining in the Swan Coastal Plain portion of the Perth Metropolitan Region is 10,919ha (24% of the original extent) of which 5,883ha or 13% has some existing or proposed protection. These percentages are above the Bush Forever targets of protecting at least 400ha or 10% of each vegetation complex in the Perth Metropolitan Region.

Within the Shire of Serpentine-Jarrahdale 2707ha of vegetation from the Bassendean - Central and South Vegetation Complex remains which represents 27% of the original extent within the Shire.

The upland vegetation is considered to be representative of Floristic Community Type 23a with some similarities to FCT 21a. The wetland vegetation is considered to be representative of FCT 4 and possibly FCT 5. None of the FCTs is listed as a Threatened or Priority Ecological Community;

The condition of the vegetation was assessed according to the system devised by Keighery and described in Bush Forever (Government of Western Australia, 2000).

The condition of the vegetation on the site was rated as Very Good for most of the Jarrah woodland, some of the *Banksia* woodland and one area of Paperbark woodland. The remaining patches of native vegetation ranged from Good to Degraded where large sections of the understorey and/or the tree canopy has been removed to Degraded and Completely Degraded areas in highly disturbed paddocks (Figure 7).

2.6.2 Flora

A total of 98 plant species was recorded including 80 native and 18 (20%) introduced species. The low species richness overall and in the quadrats reflects the general poor quality of most of the vegetation. None of the species is a Threatened (Declared Rare) or Priority listed species.

2.7 Fauna

From a fauna perspective, the vegetation within the site is considered to be mostly Good to Highly Disturbed Fauna Habitat in areas that have been historically cleared. The fauna assemblage is expected to be highly modified due to the presence of introduced feral predators and grazers.

2.7.1 Fauna Habitat

Fauna habitat can be assessed according to the following categories:

- High quality fauna habitat – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.
- Very good fauna habitat - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.

- Good fauna habitat – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.
- Disturbed fauna habitat – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.
- Highly degraded fauna habitat – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance. (Coffey Environments, 2009)

PGV Environmental identified five fauna habitats on the site as listed in Table 4.

Table 4: Fauna Habitats identified on the Site

Habitat Type	Condition*	Species likely to use the Site
Wetland with <i>Melaleuca raphiophylla</i> and <i>Eucalyptus rudis</i>	The Conservation category wetland is considered to be good fauna habitat.	This wetland is likely to support a number of reptiles, frogs, birds and possibly small mammals including Southern Brown Bandicoot and Rakali.
Wetland with weeds	The drainage lines, resource enhancement wetland and Multiple Use wetland are considered to be highly degraded fauna habitat due to the absence of native vegetation and high cover of weed species.	The open water in the Resource Enhancement wetland may provide habitat for water birds. Frogs are likely in areas of the wetlands where there is some cover to protect them from predators.
Upland Banksia and Jarrah woodland	The upland Banksia and Jarrah woodland is considered to be good fauna habitat as it shows some level of disturbance from grazing and has limited connectivity to surrounding habitat.	This habitat will support a number of reptile, bird species and feral species such as rabbits, foxes, black rats and mice.
Upland Banksia sp. over cleared understorey	Considered to be disturbed fauna habitat as the understorey has been cleared.	This habitat will support largely bird species and some reptiles.

Habitat Type	Condition*	Species likely to use the Site
Cleared paddocks with scattered trees	Considered to be highly degraded fauna habitat.	This habitat is highly degraded and is likely to support a high number of introduced species such as rabbits, mice and black rats. This area may support some reptiles and possibly Western Gray Kangaroos.

Based on Coffey Environments (2009)

2.7.2 Conservation Significant Fauna

A Level 1 Fauna Survey was undertaken by PGV Environmental and a search of the DPaW Fauna Database and the EPBC Act Protected Matters Report identified 19 threatened species of fauna listed as potentially occurring within a 5km radius of the site.

Of the 19 possible threatened species, 3 species of Black Cockatoo may use the site for foraging purposes.

PGV Environmental undertook a Black Cockatoo Assessment in October 2014 and identified the following:

- Approximately 12 ha of foraging habitat is found on the site;
- The site does not contain known breeding habitat and no evidence of breeding was recorded;
- The site contains 28 Jarrah Trees (live and dead) with a diameter at breast height of 500mm or greater. Seven of these trees were recorded as containing hollows or spouts, however only 2 trees contained spouts large enough for breeding by Black Cockatoos; and
- The site does not contain a known roosting site and no evidence was observed that the site has been used as roosting habitat.

Clearing of the site is likely to result in the loss of all of the Black Cockatoo habitat on the site. The surrounding Bush Forever sites provide a large amount of foraging and potential breeding habitat in close vicinity of the site and are likely to lower the impact that clearing of the site would have on Black Cockatoos.

In accordance with the Black Cockatoo Referral Guidelines and on the basis of the extent of clearing of foraging habitat, PGV Environmental consider the impact has a high risk of being a significant impact. Referral to the Department of the Environment under the EPBC Act is recommended.

2.8 Heritage

There are no listed Aboriginal sites located within or adjacent to the site (DAA, 2014).

3 STATUTORY AND STRATEGIES PLANNING CONSIDERATIONS

3.1 Zoning

3.1.1 Metropolitan Region Scheme

The site is zoned 'Rural' under the Metropolitan Region Scheme (MRS).

3.1.2 Shire of Serpentine-Jarrahdale Town Planning Scheme No.2

The site is zoned 'Rural' under the Shire of Serpentine-Jarrahdale Town Planning Scheme No.2 (TPS2) and is in a Poultry Farm Special Control Area. The adjacent land is zoned 'Rural' under the MRS and TPS2.

The scheme statement for the 'Rural' zone under TPS2 is to 'accommodate the full range of rural pursuits and associated activities conducted in the scheme area'.

The proposed use is classified as 'Industry Extractive' which is defined in TPS2 as follows:

- Industry Extractive - means an industry which involves
 - a) the extraction of sand, gravel, clay, soil, rock, stone, minerals, or similar substance from the land, and also includes the management of products from any of those materials when the manufacture is carried out on the land from which any of the materials so used is extracted or on land adjacent thereto, and the storage of such materials or products; and
 - b) the production of salt by the evaporation of salt water.

Table 1 (Zoning Table) of TPS2 states that 'Extractive Industry' is an 'AA' use in a 'Rural' zone which means that the Council have discretion to approve the land use.

3.1.3 Extractive Industry Licence

In addition to planning approval, the Shire of Serpentine- Jarrahdale requires a licence to be issued for all extractive industry operations under the Council's By-Laws Relating to Extractive Industries. A licence period is determined by the Council and may be held for a maximum of 21 years.

The Council's Extractive Industry By-Laws implement additional requirements in relation to the clearing of vegetation and erection of structures within proximity to property boundaries, prohibitions on blasting activities, drainage requirements, and requirements for safety notices/ signage.

An extractive industry licence is also sought.

3.2 Strategic Documents and Policies

The development of the site is consistent with the State's strategic planning framework for the region and the Shire of Serpentine-Jarrahdale longer term strategic objectives for the locality. The following strategic and statutory documents were relevant in the formulation of the development proposal.

3.2.1 State Planning Policy 2.1 – Peel Harvey Coastal Plain Catchment

The purpose of the policy is to establish a statutory framework to control land uses in the Peel-Harvey catchment to achieve a series of objectives:

- Improve the ecological, social, economic and recreational role of the Peel-Harvey catchment;
- Minimise the impact to the environment of changes in land uses;
- Increase re-vegetation in the catchment; and
- Prevent land uses that result in excessive nutrient export into the drainage system.

3.2.2 State Planning Policy 2.4 – Basic Raw Materials

State Planning Policy 2.4 (SPP 2.4), gazetted in July 2000 states that:

‘The availability of basic raw material resources close to Perth is declining as the City expands. Many sites which would otherwise be suitable occur in locations where planning and environmental impacts preclude or severely constrain extraction.’

The importance of the Priority Sand resource is currently being investigated in revisions to Statement of Planning Policy 2.4 being undertaken by the Western Australian Planning Commission, supported by the Department of Mines and Petroleum.

Approval of the proposed sand extraction operation will assist in meeting the immediate and much needed demand for sand by the construction and development industry.

This proposal complies with the objectives of Statement of Planning Policy No 2.4, as approval to the proposal for 253 Yangedi Road Hopelands would make available a much needed sand resource by permitting the sand resource to be extracted.

3.2.3 Shire of Serpentine- Jarrahdale Rural Strategy Review 2013

The Rural Strategy and 2013 Review serves as the Council’s vision for land use within the area. Under the Rural Strategy the subject site is classified as ‘Rural’. Given that the TPS 2 allows extractive industry the proposed development application is consistent with the range of contemplated land uses for the Shire’s Rural Strategy and 2013 Review.

4 PROPOSED EXTRACTIVE INDUSTRY

4.1 Mine Operation

The site is 72ha and the proposed footprint for the sand extraction operation is 18ha which will support the mining of sand for 2-3 years dependent on market demand. The excavation will be staged and where practical returned to pasture cropping upon the completion of mining in each stage. Excavation will be undertaken by a Front End Loader and hauled to a central screening plant.

The following is a summary of the proposed sand mining activities for the site (Table 5).

Table 5: Project Summary

Project Component	Proposal Characteristic
Excavation	
Total area of project site	72 ha
Total area of mine footprint	18 ha
Total disturbance area	18 ha
Life of the project	Approximately 3 years
Dewatering requirements	Nil
Maximum depth of excavation	6 metres AHD
Processing	
Sand	765 000 tonnes
Water	30 000 KI per annum
Infrastructure	
Fuel Storage	12 000 Litre Above Ground (self banded) tank
Transport	
Truck Movements	Variable but approximately 100 per day
Workforce	
Hours of Operation	7:00am to 5:00pm Mon-Fri

4.1.1 Pre-Excavation Works

The Conservation and Resource Enhancement wetlands will be fenced along the 50m buffer taken from the DPaW mapped boundary as shown in Figure 5. This will ensure that mining vehicles and stock cannot enter the wetland areas and will also allow for natural regeneration. The Resource Enhancement wetland will be fenced along the northern extent only as the southern portion of the site will continue to be used for stock grazing and water points occur along the drainage line.

Native vegetation clearing will be undertaken where possible outside of the spring season to minimise disrupting nesting birds. Clearing will be done in a staged manner as the excavation progresses. It is anticipated that 6 ha will be cleared initially with 6 ha annually thereafter depending on the demand for the sand resource.

All clearing will be undertaken using a Traxcavator. Top soil will be removed from the cleared areas and stockpiled appropriately. Direct top soil spreading in the 30m setback to Yangedi Road and the outer areas of the 50m buffer to the Conservation wetland will assist with vegetation screening. The remaining top soil and overburden will be separately stockpiled for future re-use in post extraction activities.

4.1.2 Excavation Method

Sand will be mined from the excavation area in a staged program with mining proposed to commence in 2015 (Appendix 3 Staging Plan). The excavation process will be undertaken on a staged basis with rehabilitation commencing post completion of each stage which reduces the exposed areas and minimises any areas where water may potentially pond. Following extraction in one stage, the next mined stage will be cleared and the previous cell returned to pasture cropping.

The sequence in the extraction of sand from the site is outlined below:

- Excavation will commence on the western edge of the ridge and move eastward on a staged basis.
- Prior to excavation, vegetation will be cleared, topsoil will be removed and stored for use in rehabilitation.
- Overburden will be removed and stored for future land rehabilitation through backfill and placement.
- The sand resource is typically screened using a portable screening plant to remove any organic material and stockpiled prior to tipping directly into road trucks for transportation to stockpile areas.
- Reforming of the land is normally carried out using a bulldozer or loader to push the topsoil and overburden.
- On completion, the land surface will be graded to ensure the final slopes will not exceed 1 in 3 horizontal to vertical in accordance with Shire of Serpentine–Jarrahdale Extractive Industries Local Law 1999.
- Return to pasture cropping will progressively follow excavation wherever possible.

4.1.3 Buffers and Setbacks

To ensure no impact to the Conservation and Resource Enhancement Wetlands a 50m buffer will separate the extraction area and wetlands (Appendix 3). The wetlands will be fenced to prevent access.

The Dampier Bunbury Natural Gas Pipeline (DBNGP) traverses the east of the site. The extraction area will be setback 30m from the DBNGP (Appendix 2). The sand extraction area will not extend east of the DBNGP.

The extraction area will be set back 40m from the eastern road reserve along Yangedi Road (Appendix 2). Existing vegetation will be retained to provide some visual amenity from Yangedi Road. Additional screening planting will be carried out through the buffer zones to improve the screening of the site from the road.

The extraction area will meet the provisions of the Shire for a 20m minimum mining buffer from the boundary of the site.

4.1.4 Noise and Vibration

Development will comply with the *Environmental Protection (Noise) Regulations 1997* (although it should be noted that these do not cover traffic noise). To ensure that the regulations are complied

with, suitable vegetated buffers are proposed. These will use retained vegetation between the proposed extraction area and Yangedi Road.

Vibration disturbance is expected to be minimal as the proposal does not involve blasting.

4.1.5 Dust

Dust management strategies will be implemented as part of the extractive industry licence and overall management of the extraction area therefore risk of wind erosion and dust will be minimised.

4.1.6 Finished Levels

The extraction depth is proposed to be a maximum depth of 14.1m AHD. Excavation shall not occur below the maximum groundwater level.

4.1.7 Hours of Operation/Duration

The hours of operation will be 7:00am to 5:00pm Monday to Friday.

4.1.8 Visual Impact Management

Intermittent views of the extraction area will be visible from Yangedi Road as the remnant vegetation is partially cleared. SAGH Pty Ltd will retain the existing vegetation in the 40m setback along Yangedi Road and supplement this with spread of topsoil to establish native vegetation where it is currently absent. Supplementary planting will be carried out to improve the screening of the site from the road.

The following management actions will be implemented where possible to minimise the visual impact of the extraction area:

- Stage workings and progressive return to pasture to provide visual protection of later excavations;
- Minimise the amount of open ground at any one time;
- Position overburden dumps so they form screening barriers; and
- Maintain a minimum 40 m vegetation buffer from Yangedi Road to the west of the excavation area.

4.2 Infrastructure and Access

Site infrastructure will be kept in a compound area located in the central west section of the site. Infrastructure will include the following:

- Site Office (transportable);
- Refuelling Tank;
- Vehicle/equipment compound; and
- Chemical Toilet.

Vehicles left on site will be locked in the compound. The above ground fuel tank will meet the requirements of the Department Minerals and Petroleum and relevant Australian standards.

4.2.1 Access

Authorised vehicles only will access the site via Yangedi Road through property gates that will be locked outside of operating hours. Perimeter fencing will be maintained along the boundaries of the site.

4.2.2 Haulage

The main haulage route will be north along Yangedi Road to Karnup Road which provides access to the Kwinana Freeway or South Western Highway. It is anticipated that there will be up to 100 truck movements per day during hours of operation.

Traffic noise received at noise-sensitive sites will comply with the *Environmental Protection (Noise) Regulations 1997*.

4.3 Decommissioning and Rehabilitation

Rehabilitation will commence following the establishment of topographic contours. The final contours are anticipated to be visually compatible with other parts of the local landscape. The proposed excavation has been designed to return the landform to pasture cropping and grazing. Topsoil will be respread to a depth best suited for shallow rooted perennial pasture species.

The buffer zones around the site will be extensively planted but it is intended to improve the quality of the pasture on the site and increase grazing levels once excavation is completed.

Screening native vegetation along Yangedi Road will be retained.

5 ENVIRONMENTAL IMPACT ASSESSMENT

The key environmental issues and potential impacts related to the proposal are:

- Vegetation clearing;
- Loss of fauna habitat;
- Surface, groundwater and wetland protection;
- Dust Management;
- Noise Management; and
- Visual Amenity

The Extraction Licence Application contains an environmental impact assessment and addresses the possible impacts and proposed management strategies.

A summary of the potential impacts and management strategies is provided below in Table 6.

Table 6: Summary of Possible Impacts and Proposed Management Strategies

Issue	Potential Impact	Further Investigation	Proposed Management
Vegetation Clearing	<ul style="list-style-type: none"> • Loss of biodiversity; • Sedimentation and increased turbidity of local wetlands; • Soil erosion; • Weed control; • Reduced habitat for fauna 	Non Required	<ul style="list-style-type: none"> • Provision of a 50m buffer from the extraction area to the Conservation and Resource Enhancement Wetlands in accordance with EPA Guidance Statement No. 33; • Staged clearing of the site to allow for fauna movement away from proposed mining operations; • Avoid disturbance of native vegetation outside of the sand extraction area; • Stockpiling of topsoil from areas of good vegetation for rehabilitation works; • Retain and rehabilitate native vegetation in 40m setback along Yangedi Road; • Weed control during sand mining in the conservation wetland and 40m setback along Yangedi Road.
Loss of Fauna Habitat	<ul style="list-style-type: none"> • Clearing of native vegetation; and • Loss of fauna habitat. 	None Required	<ul style="list-style-type: none"> • Staged clearing of the site to allow for fauna movement away from the proposed mining operations • Avoid disturbance of native vegetation outside of the sand extraction area • Provision of a buffer to the conservation and Resource Enhancement Wetlands to maintain environmental values of the wetlands • Establish of CBC habitat in 40m setback to Yangedi Road using topsoil.
Surface Groundwater and Wetland Protection	<ul style="list-style-type: none"> • Increased groundwater recharge leading to water logging or increased discharge into wetlands or drainage channel • Erosion and sedimentation associated with loss of riparian vegetation • Contamination from point sources 	Ongoing groundwater monitoring	<ul style="list-style-type: none"> • Provision of a 50m buffer to the Conservation and Resource Enhancement Wetlands to maintain environmental values of the wetlands; • Construct a fence around the boundary of the 50m management buffer to the Conservation and Resource Enhancement wetlands; • Commence pasture cropping works at the completion of each mining stage where possible; • Monitoring of ground water levels at the site for the duration of the clearing program\; and • Maintain all plant in good condition.
Dust Emissions	<p>Natural environment</p> <p>Human health and amenity</p>	None Required	<ul style="list-style-type: none"> • Implement best practice protocols to reduce dust form traffic in the operational area; • Prepare a and implement a dust management and monitoring program; • Push overburden into positions where they can form screening barriers; and • Establish 40m setback to Yangedi Road with native vegetation screening.

Issue	Potential Impact	Further Investigation	Proposed Management
Noise Emissions	Natural environment Human health and amenity	None Required	<ul style="list-style-type: none"> • Shut down equipment when not in use; • Retain and establish vegetation between the sand extraction area and Yangedi Road to provide a physical separation barrier; • Operate machines within the designated hours of operation; • Record and follow up any complaints received regarding noise disturbance immediately to minimise the cause.
Visual Amenity	Loss of visual amenity and natural environment	None Required	<ul style="list-style-type: none"> • Retain and establish native vegetation in the 40m setback to Yangedi Road • Minimise the amount of open ground at any one time • Stage workings and progressive return to pasture cropping to provide visual protection of later excavations. • If necessary position overburden dumps to form screening barriers.

6 SUMMARY

The proposed extractive industry at 253 Yangedi Road, Hopelands will provide a basic raw material that is in high demand and will be utilised in the SJP and surrounding areas. It is expected that the site will operate for approximately 3 years. On completion of each stage the site will be restored for pasture cropping.

Setbacks to Yangedi Road (30m), Conservation Category Wetland (50m) and Resource Enhancement Wetland (50m) will be put in place. Fencing and rehabilitation through topsoil spread will be applied in these areas to establish native vegetation.

Development of the site for extractive industry is considered an appropriate use as it allows for the removal of an important resource that is vital to the construction industry. This proposal is generally consistent with existing strategic planning and development in the area. On this basis, it is requested that the Shire give its approval to this proposal.

7 REFERENCES

Coffey Environments (2009) Rockingham Industry Zone Fauna Risk Assessment East Rockingham Industrial Park (IP14 Area) Report No. 2005/55. Perth, Western Australia.

Department of Aboriginal Affairs (DAA) (2014) Aboriginal Heritage Inquiry System. Accessed July 2014 <http://www.dia.wa.gov.au/AHIS/default.aspx> Government of Western Australia, Perth.

Department of Agriculture and Food Western Australia (DAFWA) (2014) Natural Resource Management Shared Land Information Platform. Accessed July 2014 <http://maps.agric.wa.gov.au/nrminfo/framesetup.asp> Government of Western Australia, Perth.

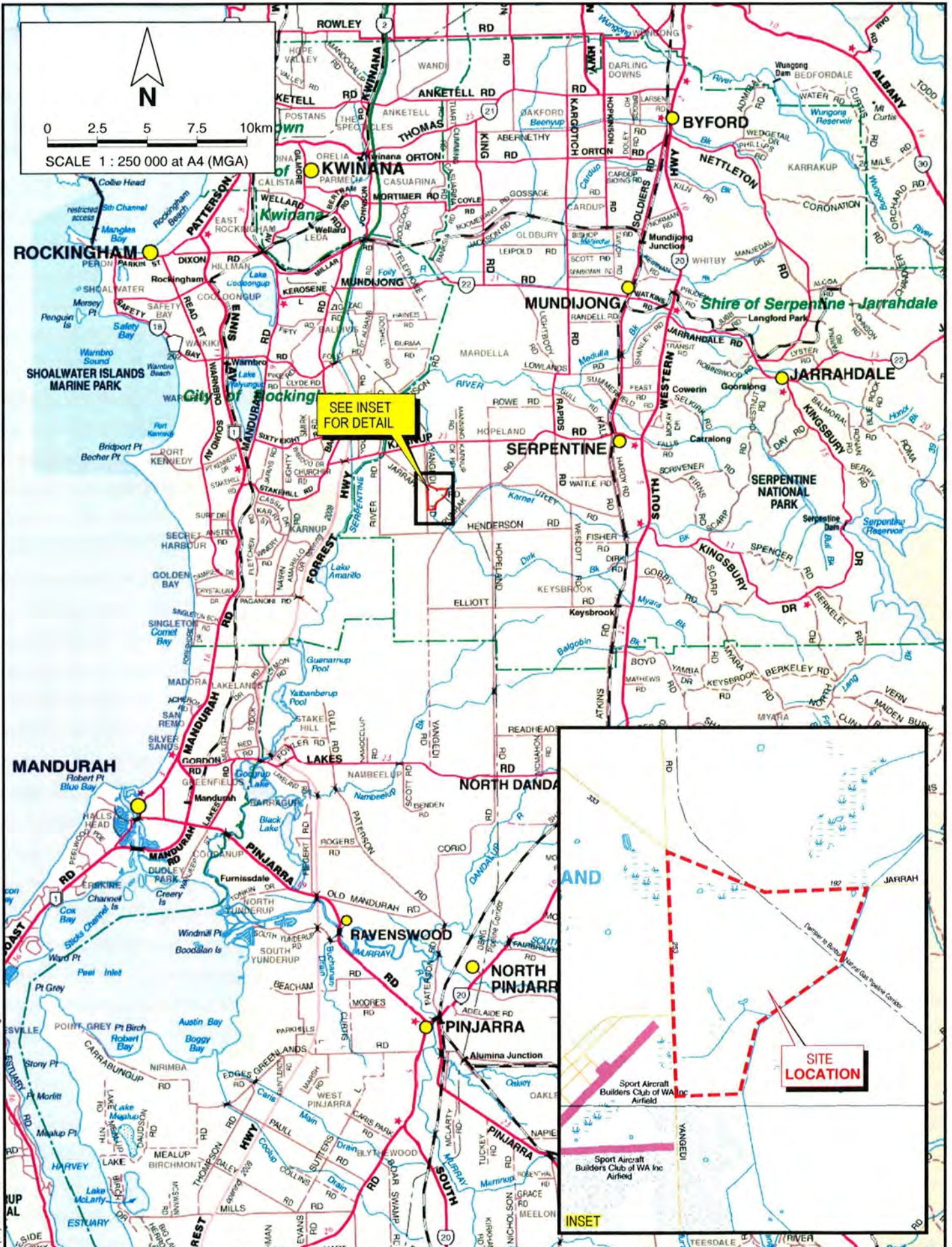
Government of Western Australia (2000) *Bush Forever - Keeping the Bush in the City. Volume 2: Directory of Bush Forever Sites.* Perth, Western Australia.

Landgate (2014a) Historical Aerial Photography. Accessed July 2014 <https://www.landgate.wa.gov.au/bmvf/app/mapviewer/> Government of Western Australia, Perth.


Landgate (2014b) WA Atlas Shared Land Information Platform. Accessed July 2014 <https://www2.landgate.wa.gov.au/bmvf/app/waatlas/> Government of Western Australia, Perth.

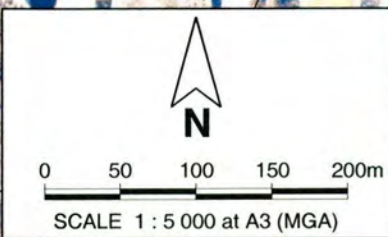
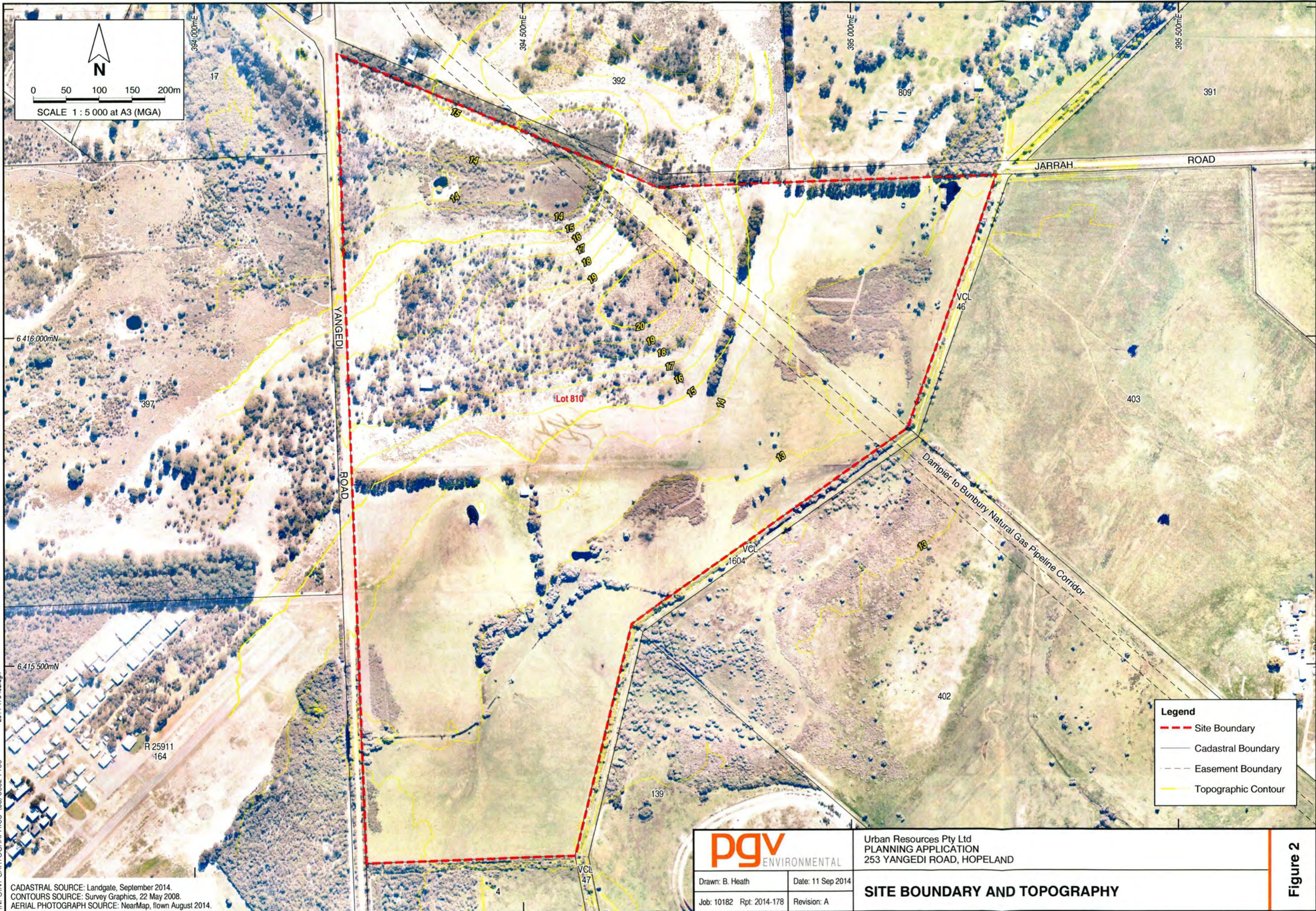
PGV Environmental (2014) *253 Yangedi Road, Hopelands Flora and Vegetation Survey.* Prepared for Urban Resources. Perth, Western Australia.

FIGURES



2014-178-01.dgn
 PINPOINT CARTOGRAPHICS (08) 9552 7136

		Urban Resources Pty Ltd PLANNING APPLICATION 253 YANGEDI ROAD, HOPELAND	Figure 1
Drawn: B. Heath	Date: 11 Sep 2014	SITE LOCATION	
Job: 10182 Rpt: 2014-178	Revision: A		



Legend

- - - Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Topographic Contour

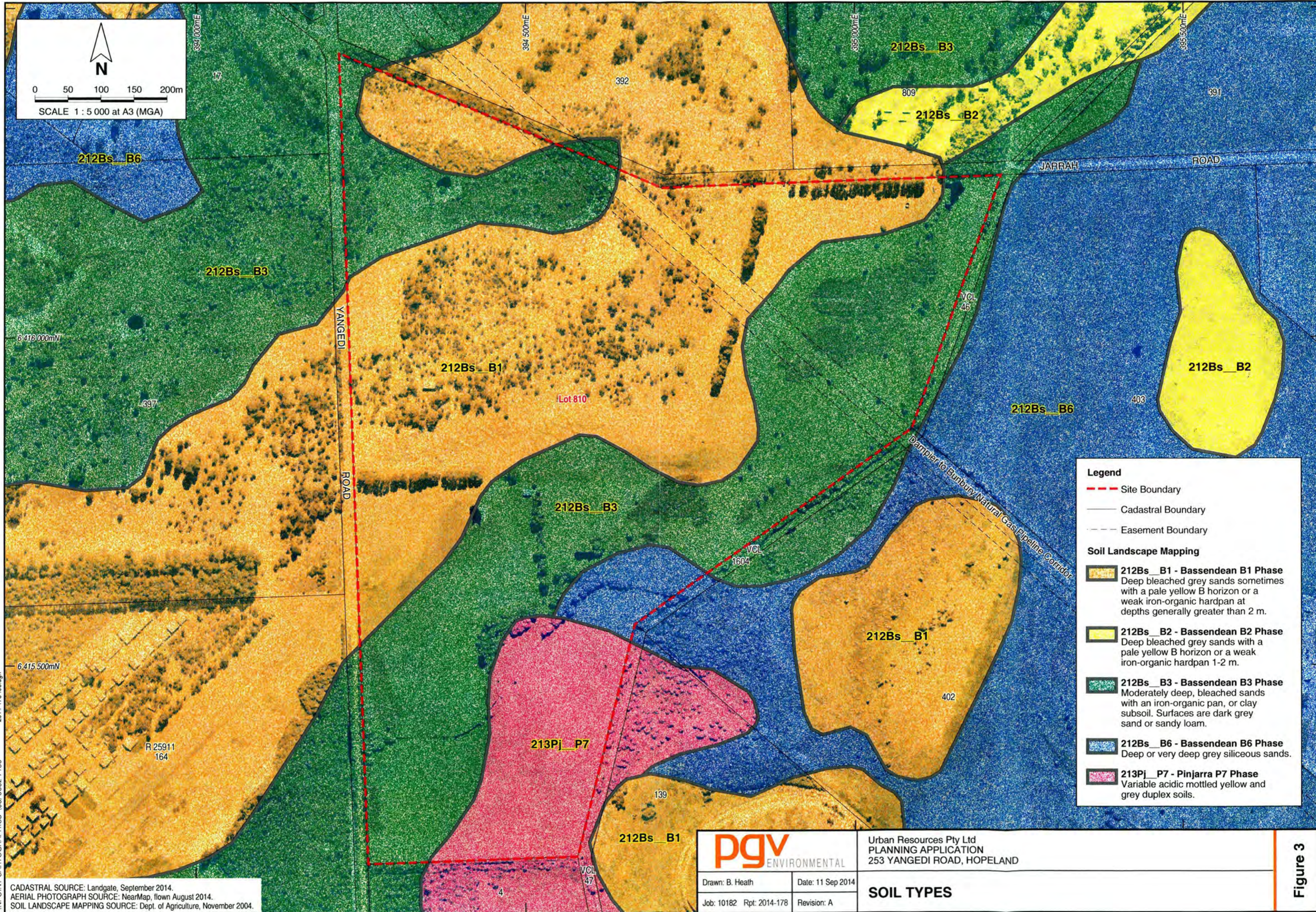
pgv ENVIRONMENTAL	
Urban Resources Pty Ltd PLANNING APPLICATION 253 YANGEDI ROAD, HOPELAND	
Drawn: B. Heath	Date: 11 Sep 2014
Job: 10182 Rpt: 2014-178	Revision: A

SITE BOUNDARY AND TOPOGRAPHY

Figure 2

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-178-102.dgn

CADASTRAL SOURCE: Landgate, September 2014.
 CONTOURS SOURCE: Survey Graphics, 22 May 2008.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.



SCALE 1 : 5 000 at A3 (MGA)

Legend

- - - Site Boundary
- Cadastral Boundary
- Easement Boundary

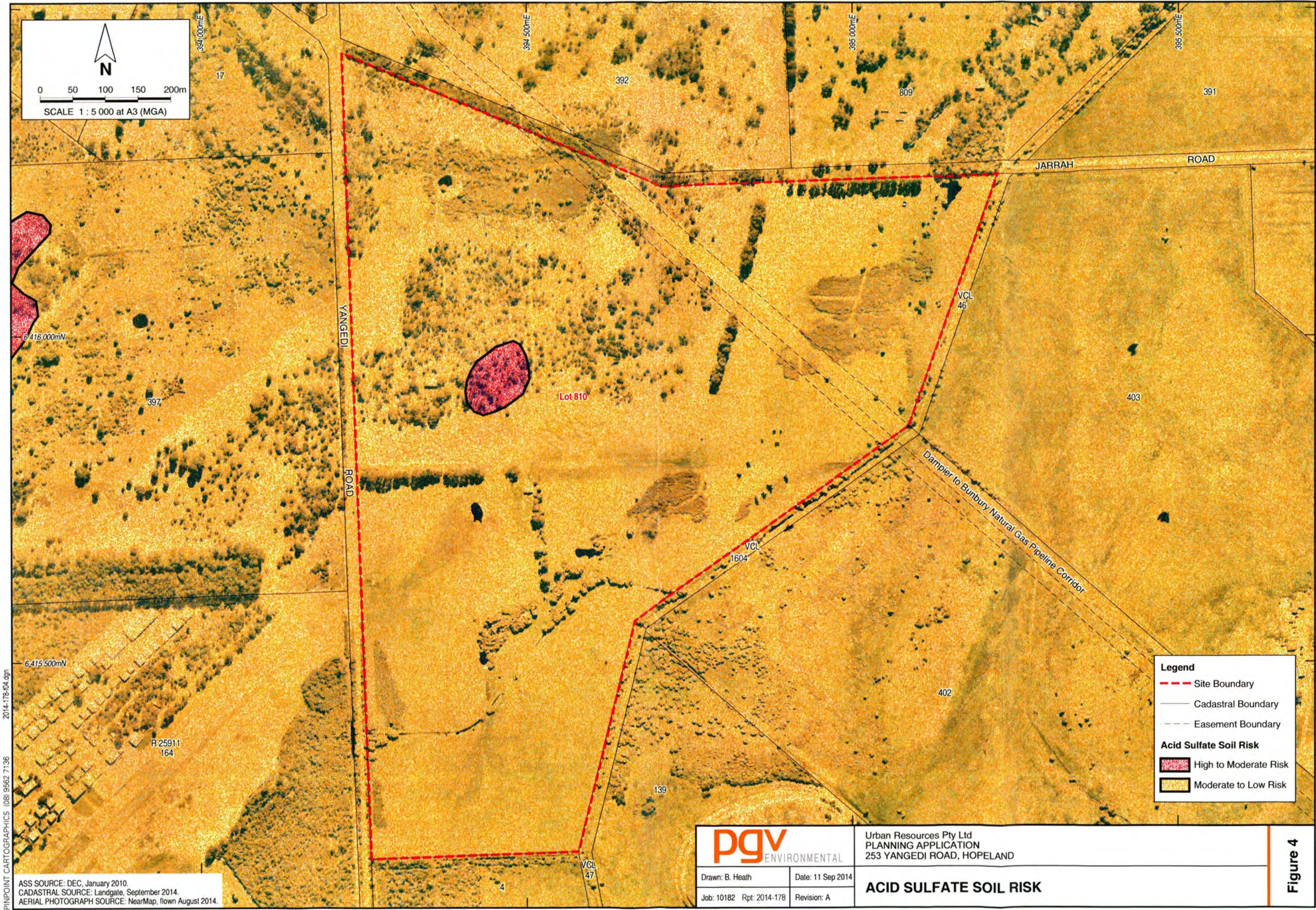
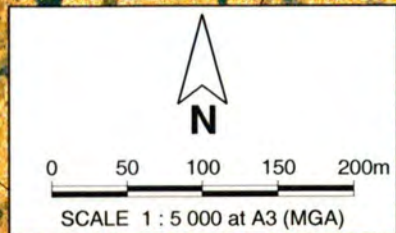
Soil Landscape Mapping

- 212Bs_B1 - Bassendean B1 Phase**
 Deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m.
- 212Bs_B2 - Bassendean B2 Phase**
 Deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.
- 212Bs_B3 - Bassendean B3 Phase**
 Moderately deep, bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.
- 212Bs_B6 - Bassendean B6 Phase**
 Deep or very deep grey siliceous sands.
- 213Pj_P7 - Pinjarra P7 Phase**
 Variable acidic mottled yellow and grey duplex soils.

pgv ENVIRONMENTAL		Urban Resources Pty Ltd PLANNING APPLICATION 253 YANGEDI ROAD, HOPELAND
Drawn: B. Heath	Date: 11 Sep 2014	SOIL TYPES
Job: 10182 Rpt: 2014-178	Revision: A	

CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.
 SOIL LANDSCAPE MAPPING SOURCE: Dept. of Agriculture, November 2004.

Figure 3



Legend

- - - Site Boundary
- Cadastral Boundary
- - - Easement Boundary

Acid Sulfate Soil Risk

- High to Moderate Risk
- Moderate to Low Risk

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-178-104.dgn

ASS SOURCE: DEC, January 2010.
 CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

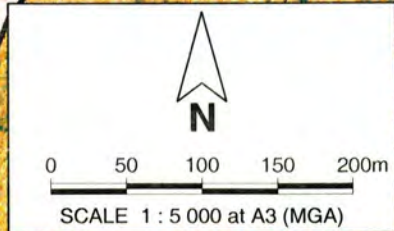
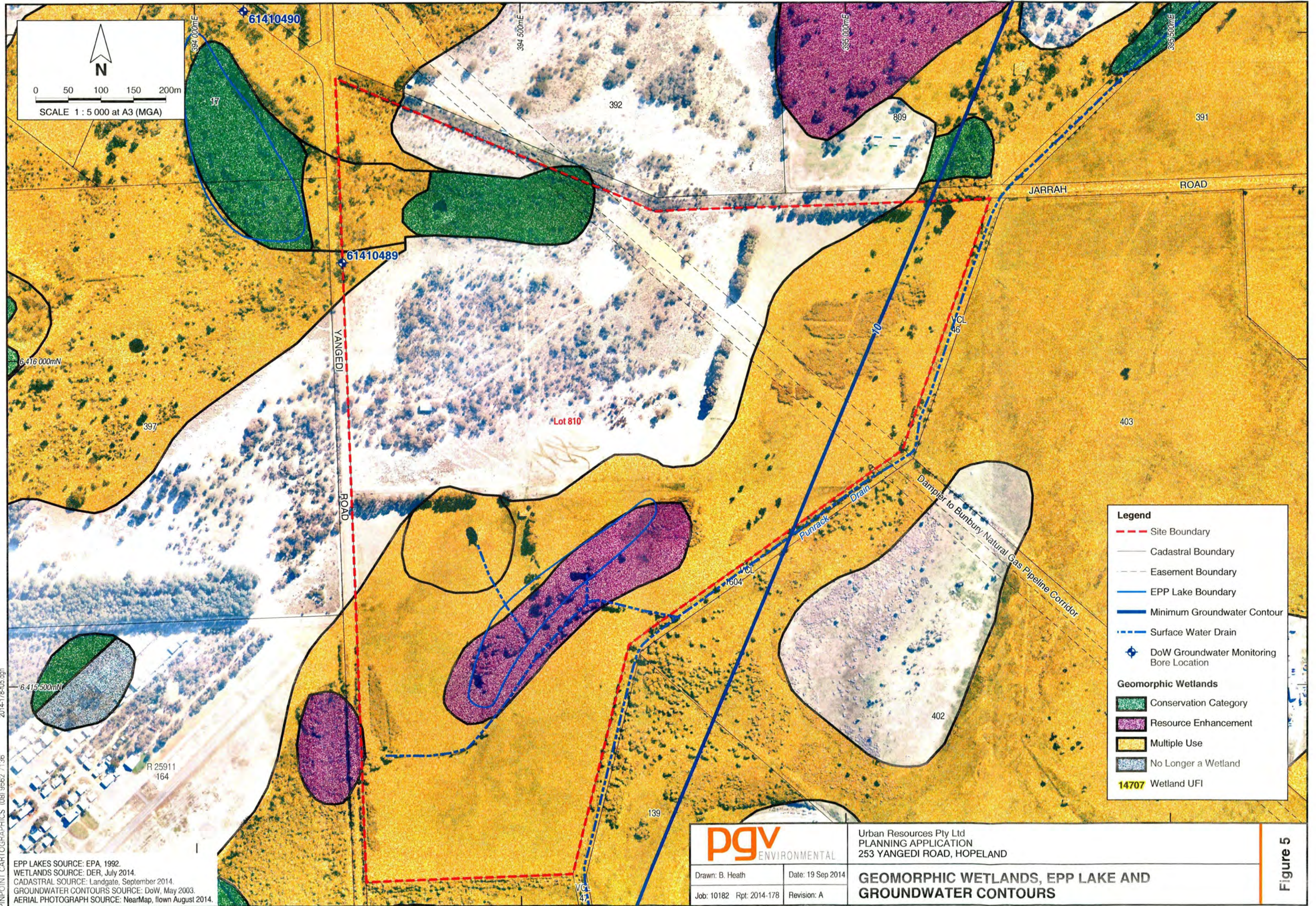
pgv ENVIRONMENTAL

Drawn: B. Heath	Date: 11 Sep 2014
Job: 10182 Rpt: 2014-178	Revision: A

Urban Resources Pty Ltd
 PLANNING APPLICATION
 253 YANGEDI ROAD, HOPELAND

ACID SULFATE SOIL RISK

Figure 4



Legend

- - - Site Boundary
- Cadastral Boundary
- Easement Boundary
- EPP Lake Boundary
- Minimum Groundwater Contour
- Surface Water Drain
- ◆ DoW Groundwater Monitoring Bore Location

Geomorphic Wetlands

- Conservation Category
- Resource Enhancement
- Multiple Use
- No Longer a Wetland
- 14707 Wetland UFI

PINPOINT CARTOGRAPHICS (08) 9562 7136

EPP LAKES SOURCE: EPA, 1992.
 WETLANDS SOURCE: DER, July 2014.
 CADASTRAL SOURCE: Landgate, September 2014.
 GROUNDWATER CONTOURS SOURCE: DoW, May 2003.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

pgv ENVIRONMENTAL

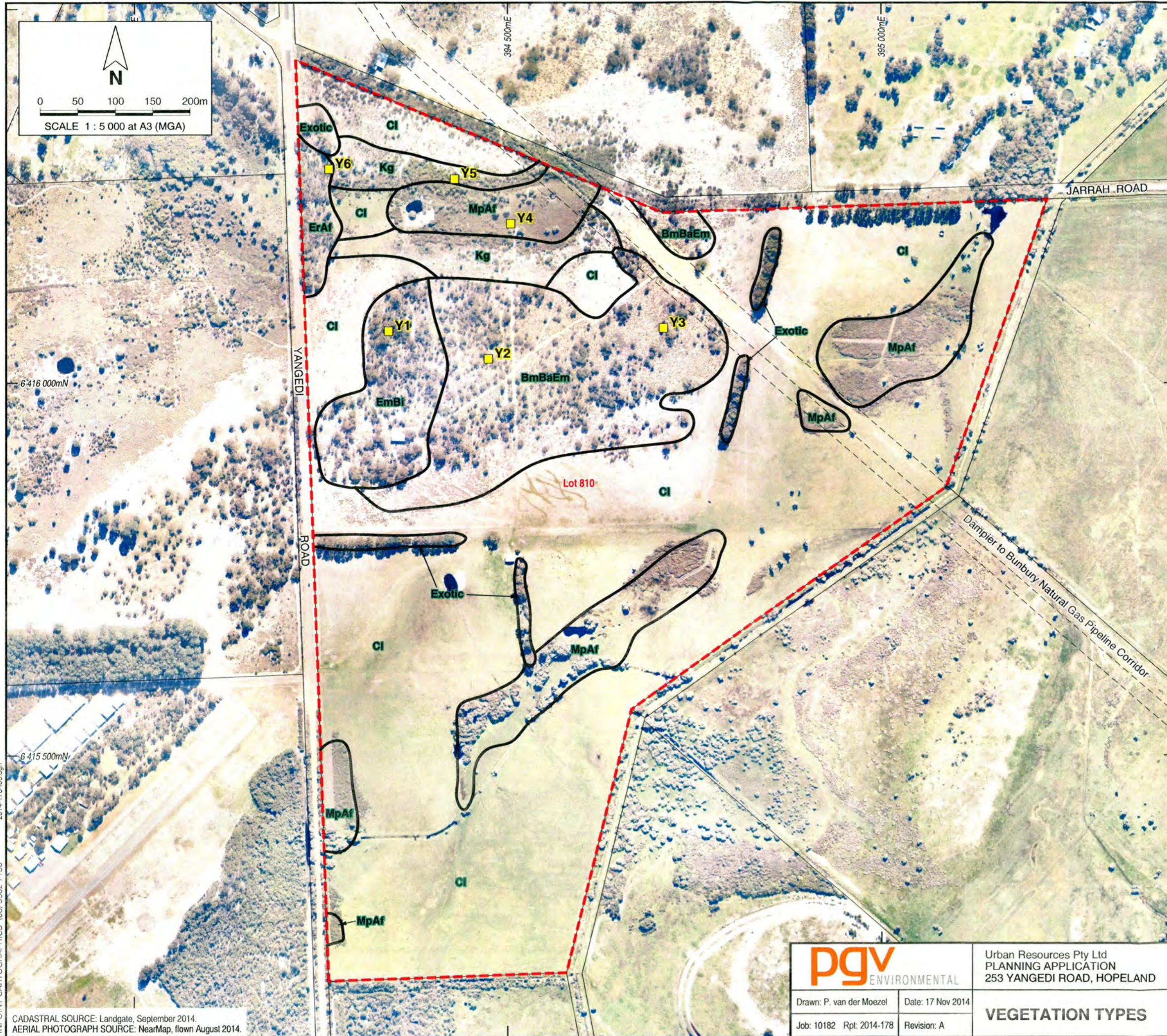
Drawn: B. Heath Date: 19 Sep 2014

Job: 10182 Rpt: 2014-178 Revision: A

Urban Resources Pty Ltd
 PLANNING APPLICATION
 253 YANGEDI ROAD, HOPELAND

**GEOMORPHIC WETLANDS, EPP LAKE AND
 GROUNDWATER CONTOURS**

Figure 5



Legend

- - - Site Boundary
- Cadastral Boundary
- Easement Boundary
- Quadrat Location
- Vegetation Type Boundary
- Mp Vegetation Type

Vegetation Types

EmBi
Eucalyptus marginata/Banksia ilicifolia Low Open Forest over *Hibbertia hypericoides* Open Low Heath

BmBaEm
Banksia menziesii/B. attenuata/Eucalyptus marginata Low Open Woodland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath

MpAf
Melaleuca preissiana Low Open Woodland over *Astartea fascicularis* Closed Heath

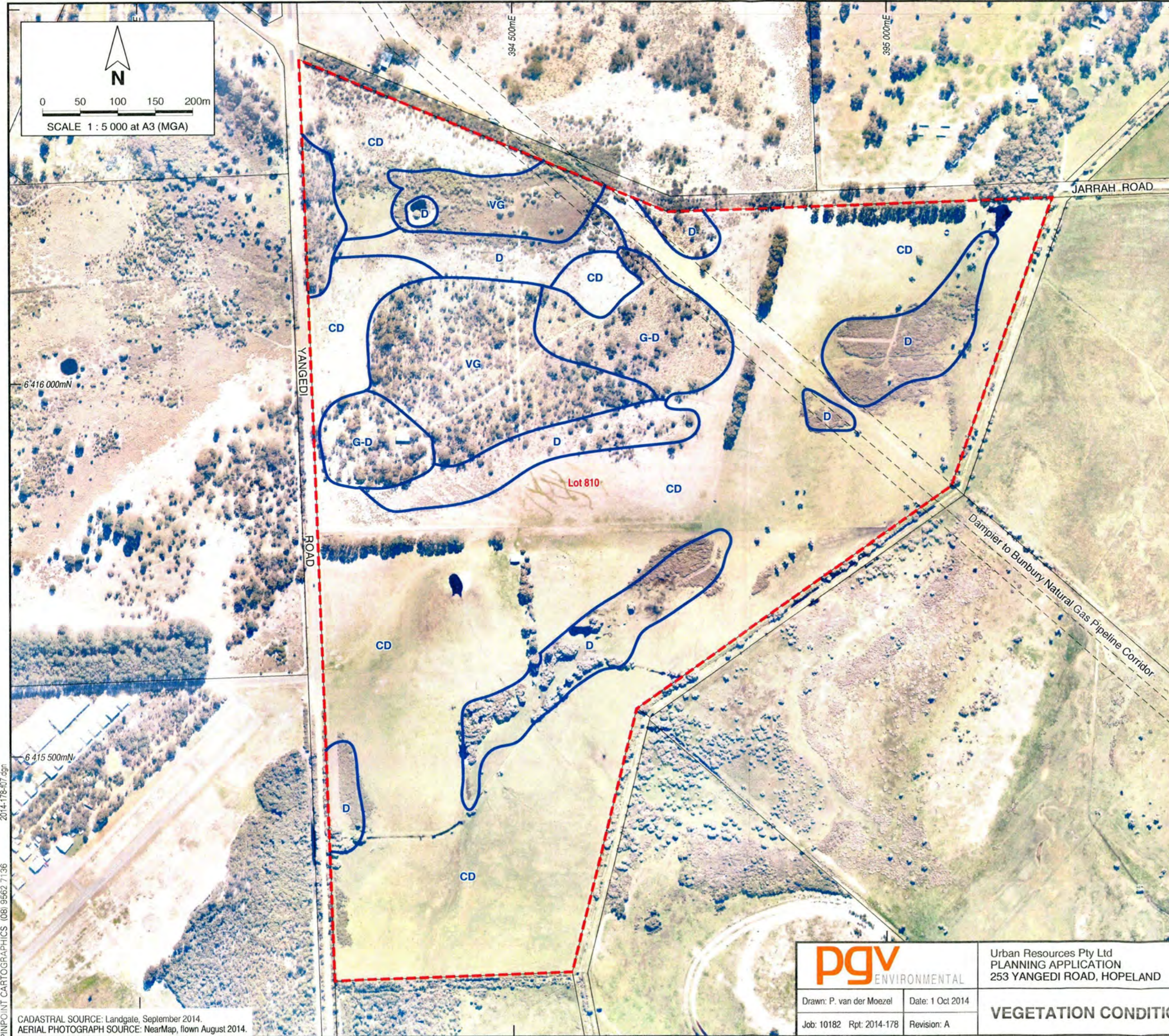
ErAf
Eucalyptus rudis Low Open Forest over *Astartea fascicularis* Shrubland

Kg
Kunzea glabrescens Tall Open Scrub over bare ground

CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

pgv ENVIRONMENTAL		Urban Resources Pty Ltd PLANNING APPLICATION 253 YANGEDI ROAD, HOPELAND
Drawn: P. van der Moezel	Date: 17 Nov 2014	VEGETATION TYPES
Job: 10182 Rpt: 2014-178	Revision: A	

Figure 6



Legend

- - - Site Boundary
- Cadastral Boundary
- Easement Boundary
- Quadrat Location
- Vegetation Condition Boundary
- VG Vegetation Condition

Vegetation Condition

(SOURCE: Bush Forever, Govt. of W.A., 2000)

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

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-178-07.dgn

CADASTRAL SOURCE: Landgate, September 2014.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.



Urban Resources Pty Ltd
PLANNING APPLICATION
253 YANGEDI ROAD, HOPELAND

Drawn: P. van der Moezel Date: 1 Oct 2014
Job: 10182 Rpt: 2014-178 Revision: A

VEGETATION CONDITION

Figure 7

APPENDIX 1
CERTIFICATE OF TITLE

WESTERN



AUSTRALIA

REGISTER NUMBER	
810/DP202726	
Duplicate Certificate	Date Duplicate Issued
2	24/1/2011

RECORD OF CERTIFICATE OF TITLE
 UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1730 FOLIO 354

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.


 REGISTRAR OF TITLES 

LAND DESCRIPTION:

LOT 810 ON DEPOSITED PLAN 202726

REGISTERED PROPRIETOR:
 (FIRST SCHEDULE)

RICH VISTA PTY LTD OF 66 BURKE DRIVE, ATTADALE
 IN 23/25 SHARE
 DE EVERGRACE PTY LTD OF 11 MEADOWBANK TERRACE, SOUTH LAKE
 IN 2/25 SHARE
 AS TENANTS IN COMMON

(T L528642) REGISTERED 12 JANUARY 2011

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
 (SECOND SCHEDULE)

- 1 C518071 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE INSTRUMENT C518071. REGISTERED 22.3.1983.
 H632795 SUNDRY. THE GRANTEE OF TRANSFER C518071 IS NOW THE DBNGP LAND ACCESS MINISTER PURSUANT TO THE DAMPIER TO BUNBURY PIPELINE ACT 1997. REGISTERED 27.12.2000.
- 2. H632795 SUNDRY. PORTION OF THE LAND HEREIN IS WITHIN THE DBNGP CORRIDOR PURSUANT TO THE DAMPIER TO BUNBURY PIPELINE ACT 1997. SEE LAND ADMINISTRATION PLAN 15582. REGISTERED 27.12.2000.
- 3. K830535 SUNDRY. PORTION OF THE LAND HEREIN IS WITHIN THE DBNGP CORRIDOR PURSUANT TO THE DAMPIER TO BUNBURY PIPELINE ACT 1997. SEE DEPOSITED PLAN 39027 REGISTERED 20.1.2009
- 4 *K830536 TAKING ORDER. THE DESIGNATED PURPOSE OF THE INTEREST TAKEN IS STATE CORRIDOR RIGHTS TO THE DBNGP LAND ACCESS MINISTER UNDER THE PROVISIONS OF THE DAMPIER TO BUNBURY PIPELINE ACT 1997. AS TO THE PORTION SHOWN ON DEPOSITED PLAN 39027 ONLY. REGISTERED 20.1.2009.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
 * Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title
 Lot as described in the land description may be a lot or location

-----END OF CERTIFICATE OF TITLE-----

END OF PAGE 1 - CONTINUED OVER

RECORD OF CERTIFICATE OF TITLE

REGISTER NUMBER: 810/DP202726

VOLUME/FOLIO: 1730-354

PAGE 2

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1730-354 (810/DP202726).
PREVIOUS TITLE: 1199-650.
PROPERTY STREET ADDRESS: 253 YANGEDI RD, HOPELAND.
LOCAL GOVERNMENT AREA: SHIRE OF SERPENTINE-JARRAHDALE.

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF PEEL ESTATE LOT 810 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 810 ON DEPOSITED PLAN 202726 ON 06-MAY-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 2: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.



Transfer 0259036

WESTERN



AUSTRALIA

Volume 1199 Folio 650

1730 354

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.

Dated 3rd June 1986

A. J. Smyth
REGISTRAR OF TITLES



ESTATE AND LAND REFERRED TO

State in fee simple in Peel Estate Lot 810, delineated on the map in the Third Schedule hereto, limited however to the natural surface and therefrom to a depth of 60.96 metres.

FIRST SCHEDULE (continued overleaf)

John Raymond Deane, Plant Hirer and June Vivian Deane, Home Duties, both of Lot 23 Clifford Road, Orange Grove, as joint tenants.

SECOND SCHEDULE (continued overleaf)

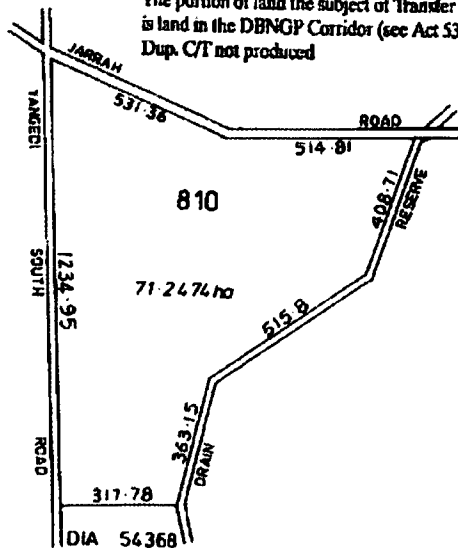
TRANSFER C518071. The right to enter upon the portion of the within land comprised in Plan 14030 to construct use and maintain a pipeline for the carriage of natural or other gas as set out in the said Transfer is granted to the State Energy Commission of Western Australia. Registered 22.3.83 at 3.34 o.c.

~~MORTGAGE 0259037 to Westpac Banking Corporation. Registered 3.6.86 at 9.10 o.c.
Discharged E571611 22.3.91~~

A. J. Smyth
REGISTRAR OF TITLES

THIRD SCHEDULE

The portion of land the subject of Transfer C518071 is land in the DBNGP Corridor (see Act 53 of 1997) Dup. C/T not produced



NOT TO SCALE
INDEX PLAN PEEL 10000 34

Superseded - Copy for Sketch Only

Page 1 (of 2 pages) 1730 VOL. 354 FOL.

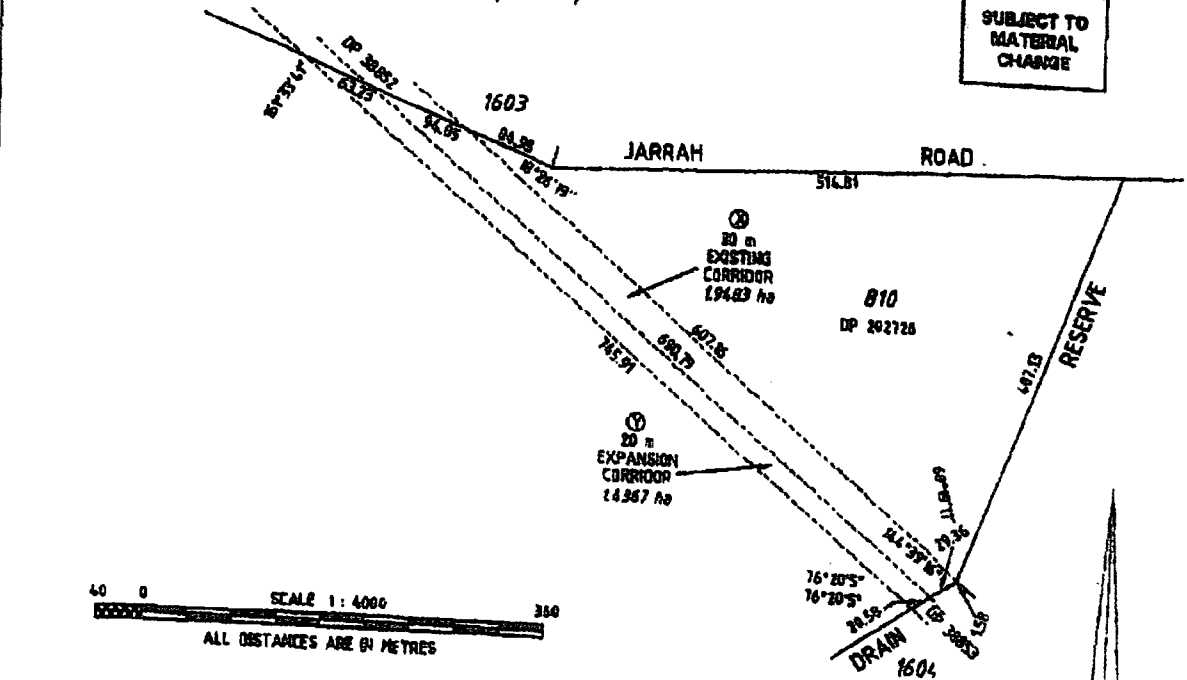
PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

73003/12/77-4348 J/1788

NO/VER	AMENDMENT	BY	DATE
1/1	CHANGE OF EXPANSION CORRIDOR POSITION TO THE WEST OF EXISTING CORRIDOR	CCPL	30/6/07

SUBJECT TO MATERIAL CHANGE



SCALE 1:4000
 ALL DISTANCES ARE IN METRES

TYPE CROWN	
PURPOSE ACQUISITION	BSA - NO
PLAN OF DBNGP CORRIDOR THROUGH LOT 810 ON DP 202726	
DISTRICT COCKBURN SOUND	FILE 1307/2002
TOWNSHIP HOPELAND	LOCAL AUTHORITY SHIRE OF SERPENTINE-JARRAHDALE
FORMER TENURE ON	FIELD BOOK
INDEX 8533 (10) 3.4	

HELD BY DJL
 IN ORIGINAL FORM ONLY.

SCALE 1:4000
 JBA: 4781
 CC: 21933

SURVEYOR'S CERTIFICATE - Reg 84
 G A Lockhart
 I'm a surveyor in a correct representation of the survey and/or calculations in the instruments recorded in the field book signed for the purposes of this plan and that it complies with the relevant section 16(1) of the Act.

LOGGED	TYPE OF VALIDATION	John Ballack and Associates 200 Poplar Ave, Subur West VIC 3089 (03) 9488 1333 Fax (03) 9488 1339
DATE 4-Mar-04	REAL ESTATE	
FILE NO 9127	LOCAL GOVERNMENT	APPROVED BY WESTERN AUSTRALIAN PLANNING COMMISSION
ADDRESS NO 41163	REGISTERED PLANNING	FILE
	DATE	DATE

SUBJECT	PURPOSE	STATUTORY REFERENCE	ORIGIN	LAND BURDENED	DEBERT TO	COMMENTS
⊗	CORRIDOR	DAMPIER TO BLINBURY PIPELINE ACT 1997	DP 215582 GOC 102998	LOT 810	THE DBNGP LAND ACCESS MINISTER	
⊙	CORRIDOR	DAMPIER TO BLINBURY PIPELINE ACT 1997	THIS PLAN	LOT 810	THE DBNGP LAND ACCESS MINISTER	

Total Area = 3.3850 ha

Drawn by:
Cadastral Cartographics
 PO Box 1501, South Perth, WA 6150
 Ph 9368 0282 Fax 9368 8159

Surveyed in accordance with Survey Practice Guidelines for the Damper to Blinbury Natural Gas Pipeline (DBNGP) under Regulation 84A of the Land and Surveyors (Statute of Surveyors Regulation) 1964

Calculations have been made on the OMS4 and distances reduced to Mean Sea Level.

All dimensions derived from the SDO to 5th August 2008

IN ORDER FOR DEALINGS	DATE
SUBJECT TO	
FOR DIRECTOR OF PLANNING & SURVEY (APPROVED LAND OFFICER)	DATE
APPROVED Reg 16A	
DIRECTOR OF PLANNING & SURVEY (APPROVED LAND OFFICER)	DATE

DEPOSITED PLAN 39027
SHEET 1 OF 1 COVER 2 VERSION 1

APPENDIX 2
BULK EARTH WORKS PLAN

APPENDIX 3
STAGING PLAN

253 YANGEDI ROAD HOPELANDS

EXTRACTIVE INDUSTRIES LICENCE APPLICATION

Prepared for: SAGH Pty Ltd

Report Date: 19 November 2014

Version: 1

Report No. 2014-179

SHIRE OF

3 DEC 2014

SERPENTINE JARRAHDALF

PGV
ENVIRONMENTAL

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1 INTRODUCTION

1.1 Site Location

SAGH Pty Ltd (SAGH) is proposing to extract sand from their landholding at 253 Yangedi Road, Hopelands (the site). The site comprises of 72ha of which 18ha is proposed for sand extraction. The site is currently used for pasture cropping and stock grazing and will be returned to this land use post sand extraction.

The site is located in the Shire of Serpentine-Jarrahdale (the Shire) and is approximately 50km from the Perth Central Business District and 25km north of Mandurah (Figure 1). The site is bound by Yangedi Road and Serpentine Airfield to the west and private landholdings to the north, east and south (Figure 2). The Dampier Bunbury Natural Gas Pipeline (DBNGP) traverses the north-east section of the site. There are a number of Rural landholdings within a 1km radius of the site with the closest being approximately 500m. The site is located in Special Control - Poultry Farms zone under the Shire's Town Planning Scheme No. 2 (TPS2).

1.2 Applicant and Site Owner

The registered proprietors of the site are Rich Vista of 66 Burke Drive, Attadale and De Evergrace Pty Ltd of 11 Meadow Bank Terrace, South Lake (Appendix 1).

SAGH is the proponent for this Extractive Industries Licence (EIL) Application. SAGH have an option to purchase 253 Yangedi Road, Hopelands from the current landowners.

The establishment of this sand extraction operation will provide valuable basic resource to the construction and development industries in the region. The key contact for SAGH is detailed below:

Contact Person:	Stephen Elliott
Position:	Manager
Phone:	(+61) 08 9368 1299
Fax:	(+61) 08 9368 1399

1.3 Proposed Operation

SAGH propose to develop an extractive industry (sand) over a portion of the site (18ha). The sand extraction operation will occur on a staged basis dependent on the demand for the product the mine life is anticipated to be 3 years (Appendix 2 and 3).

The site will be accessed from the north south running Yangedi Road which intersects with Karnup Road to the north providing access to the Kwinana Freeway and South West Highway. The proposal anticipates 100 truck movements per day in the proposed operating hours of 7:00am until 5:00pm Monday to Friday. Infrastructure on the site will be kept to a minimum.

1.4 Significance of the Site

The site has been cleared historically in the early 1970s for agricultural purposes and currently supports pasture cropping and stock grazing (Plate 1). A portion of the site contains native vegetation re-growth on an east west ridgeline which is the area proposed for the sand extraction operation. The site contains substantial deposits of medium to fine grain silica sand, with physical characteristics suitable for a wide range of uses including concrete production and engineering fill.

The site is well located and is accessed by a sealed road that connects to Karnup Road providing east and west links to construction and development projects in the region.

Good sand resources in the Perth Metropolitan area are not common and this site provides an opportunity sand extraction on a site that has been previously cleared of native vegetation and has good accessibility to surrounding areas. The site will be returned to pasture cropping and stock grazing post extraction which meets it Rural zoning under the Shire's Town Planning Scheme No. 2 (TPS 2).

2 PLANNING CONTEXT

2.1.1 Metropolitan Region Scheme

The site is zoned 'Rural' under the Metropolitan Region Scheme (MRS).

2.1.2 Shire of Serpentine-Jarrahdale Town Planning Scheme No.2

The site is zoned 'Rural' under the Shire of Serpentine-Jarrahdale Town Planning Scheme No.2 (TPS2) and is in a Poultry Farm Special Control Area. The adjacent land is zoned 'Rural' under the MRS and TPS2.

The scheme statement for the 'Rural' zone under TPS2 is to 'accommodate the full range of rural pursuits and associated activities conducted in the scheme area'.

The proposed use is classified as 'Industry Extractive' which is defined in TPS2 as follows:

- Industry Extractive - means an industry which involves
 - a) the extraction of sand, gravel, clay, soil, rock, stone, minerals, or similar substance from the land, and also includes the management of products from any of those materials when the manufacture is carried out on the land from which any of the materials so used is extracted or on land adjacent thereto, and the storage of such materials or products; and
 - b) the production of salt by the evaporation of salt water.

Table 1 (Zoning Table) of TPS2 states that 'Extractive Industry' is an 'AA' use in a 'Rural' zone which means that the Council have discretion to approve the land use.

In addition to planning approval, the Shire requires a licence to be issued for all extractive industry operations under the Council's By-Laws Relating to Extractive Industries. A licence period is determined by the Council and may be held for a maximum of 21 years.

The Shire's Extractive Industry By-Laws implement additional requirements in relation to the clearing of vegetation and erection of structures within proximity to property boundaries, prohibitions on blasting activities, drainage requirements, and requirements for safety notices/ signage.

2.2 Strategic Documents and Policies

The development of the site is consistent with the State's strategic planning framework for the region and the Shire of Serpentine-Jarrahdale longer term strategic objectives for the locality. The following strategic and statutory documents were relevant in the formulation of the development proposal.

2.2.1 State Planning Policy 2.1 – Peel Harvey Coastal Plain Catchment

The purpose of the policy is to establish a statutory framework to control land uses in the Peel-Harvey catchment to achieve a series of objectives:

- Improve the ecological, social, economic and recreational role of the Peel-Harvey catchment;
- Minimise the impact to the environment of changes in land uses;
- Increase re-vegetation in the catchment; and
- Prevent land uses that result in excessive nutrient export into the drainage system.

2.2.2 State Planning Policy 2.4 – Basic Raw Materials

State Planning Policy 2.4 (SPP 2.4), gazetted in July 2000 states that:

‘The availability of basic raw material resources close to Perth is declining as the City expands. Many sites which would otherwise be suitable occur in locations where planning and environmental impacts preclude or severely constrain extraction.’

The importance of the Priority Sand resource is currently being investigated in revisions to Statement of Planning Policy 2.4 being undertaken by the Western Australian Planning Commission, supported by the Department of Mines and Petroleum.

Approval of the proposed sand extraction operation will assist in meeting the immediate and much needed demand for sand by the construction and development industry.

This proposal complies with the objectives of Statement of Planning Policy No 2.4, as approval to the proposal for 253 Yangedi Road Hopelands would make available a much needed sand resource by permitting the sand resource to be extracted.

2.2.3 State Planning Policy No. 2.5 Agriculture and Rural Land Use Planning

State Planning Policy No. 2.5 (SPP2.5) Agriculture and Land Use Planning (WAPC, 2005) establishes the provision for the extraction of basic raw materials in particular Appendix 2 ‘Identification and Planning of Rural Settlements’ Point 9 states the following:

‘...the location of rural residential and rural landholdings should avoid impacts on, or sterilisation of natural primary resources including prospective areas for mineralisation and basic raw materials...’

2.2.4 Shire of Serpentine- Jarrahdale Rural Strategy Review 2013

The Rural Strategy and 2013 Review serves as the Council’s vision for land use within the area. Under the Rural Strategy the subject site is classified as ‘Rural’. Given that the TPS 2 allows extractive industry the proposed development application is consistent with the range of contemplated land uses for the Shire’s Rural Strategy and 2013 Review.

2.2.5 Environmental Assessment

PGV Environmental undertook a Preliminary Environmental Assessment of the site in June 2014 and identified the following environmental issues:

- Clearing of re-growth native vegetation;
- Loss of fauna habitat;
- Wetland Management;
- Groundwater Contamination; and
- Noise and Dust Management.

As part of the assessment process the following investigations were undertaken by PGV Environmental in October 2014:

- Level 2 Flora and Vegetation Survey; and a
- Black Cockatoo Habitat Assessment.

3 EXISTING ENVIRONMENT

3.1 Access

Yangedi Road runs along the western boundary and provides a sealed access to the site.

Yangedi Road intersects with Karnup Road approximately 2.5km north of the site and allows vehicles to move west to the Kwinana Freeway or east towards the South Western Highway.

3.2 Topography

The site is predominantly low lying with a drain running through the eastern portion of the site. A ridgeline to 20m AHD extends through the site in a west to north-east orientation. The site slopes down to 14m AHD in the wetland to the north and down to 12m AHD in the south along the drainage line and then gently rises up again (Figure 2).

3.3 Soils

The site is largely located on the Bassendean Dune System with the Pinjarra Plain System occurring in the south east corner of the site (Table 1). There are four soil units mapped on the site as shown in Figure 3 and described in Table 2.

Table 1: Soil Systems mapped on the Site

Soil Systems of the Swan Coastal Plain	Description
Bassendean Dune Soils	These are the oldest of the three dune systems on the Swan Coastal Plain, are thought to be about 800,000 years old and so are the most leached, infertile and acidic. The sands contain little silt or clay, and very low levels of nutrient elements, with any nutrient element content being associated with organic matter. The dunes are low lying hills with poorly drained areas between the hills.
Pinjarra Plain Soils	The soils are complex, and comprise a successive layering of soils formed from erosion of material from the scarp and east of the scarp. Rivers and streams have mostly carried the eroded material, which is deposited from the water as fans of alluvium. Therefore, the plain, is made up of layers of soils of different ages. It occupies about one third of the Swan Coastal Plain, and most of it has been cleared and sown to pasture for the grazing industries, mostly dairy, with some beef.

DAFWA, 2014

Table 2: Mapped Soil Units on the Site

Soil Units	Description
Bassendean B1 (212Bs_B1)	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m. Banksia dominant
Bassendean B3 (212Bs_B3)	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam
Bassendean B6 (212Bs_B6)	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands
Pinjarra P7 (213Pj_P7)	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and grey sandy duplex and effective duplex soils

DAFWA, 2014

The Bassendean B3 soil unit is associated with the dunal ridge that is proposed for the sand extraction operation.

3.4 Acid Sulfate Soils

Acid Sulfate Soils (ASS) are formed naturally under waterlogged, iron and sulphate rich conditions. These soils contain iron sulphide minerals (most commonly pyrite) or their oxidation products. They remain stable under anaerobic conditions but exposure to air can lead to their oxidation resulting in the formation of sulphuric acid and the release of iron, aluminium and other heavy metals and nutrients from soils into surface water bodies and ground water.

The WA Atlas (Landgate, 2014b) ASS risk mapping classifies the site largely as having a “moderate to low risk of acid sulphate soils occurring within 3m of natural soil surface” (Figure 4). A small portion of the site adjacent to the northern wetland is mapped as having “high to moderate risk of acid sulphate soils occurring within 3m of natural soil surface”.

The wetland area is not subject to this application and therefore would not be quarried. As there is no prospect of disturbing Acid Sulfate Soil, there is no need to further investigate the sand dunes and quantify acid sulfate properties.

3.5 Groundwater and Surface Water

3.5.1 Groundwater

The site is located in the Serpentine Groundwater Area.

The Department of Water has ground water monitoring bores adjacent to the western boundary of the site that are monitored on a monthly basis. Groundwater levels range from approximately 1-2m below natural surface level at these locations.

3.5.2 Surface Water

The site is located in the Serpentine River Catchment and contains a number of small largely artificial drainage lines that feed into the Punrack Drain which downstream has its confluence with the Serpentine River.

The surface drains are to the east and south of the area proposed for sand extraction.

3.6 Wetlands

The site contains five wetlands as shown in the *Geomorphic Wetlands of the Swan Coastal Plain Database* (Landgate, 2014b). These are described in Table 3 and shown in Figure 5.

Table 3: The Wetlands Located on the Site

UFI Number	Wetland Classification	Wetland Type	Location
14706	Conservation	Sumpland	Located within the site adjacent to the northern boundary.
14739	Multiple Use	Sumpland	Located in the north west corner of the site
14708	Resource Enhancement	Sumpland	Located in the south east corner of the site within the larger palusplain wetland 15785.
15785	Multiple Use	Palusplain	Located across southern portion of the site
14707	Multiple Use	Sumpland	Located within the larger palusplain wetland 15785.

The Resource Enhancement wetland (UFI 14708) is protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy (EPP) 1992*.

A site visit by PGV Environmental (18 July 2014) determined that the Conservation Category wetland (UFI 14706) had significant wetland values.

The Resource Enhancement wetland (UFI 14708) had reduced wetland values and attributes due to modified drainage, stock grazing and abundance of introduced weed species. The open water however provides habitat for water birds.

The conservation and resource enhancement wetlands and their 50m management buffers are not located in the area proposed for the sand extraction operation.

3.7 Vegetation

3.7.1 Vegetation

According to historic aerial photography the site was cleared of native vegetation in the early 1970s (Plate 1). The vegetation has regrown on parts of the site since 1995, particularly in the north-west corner and the sandy rise which is in the area subject of this development application (Plate 2).

Plate 1: Historical Aerial Photography from 1974 (Landgate, 2014a)

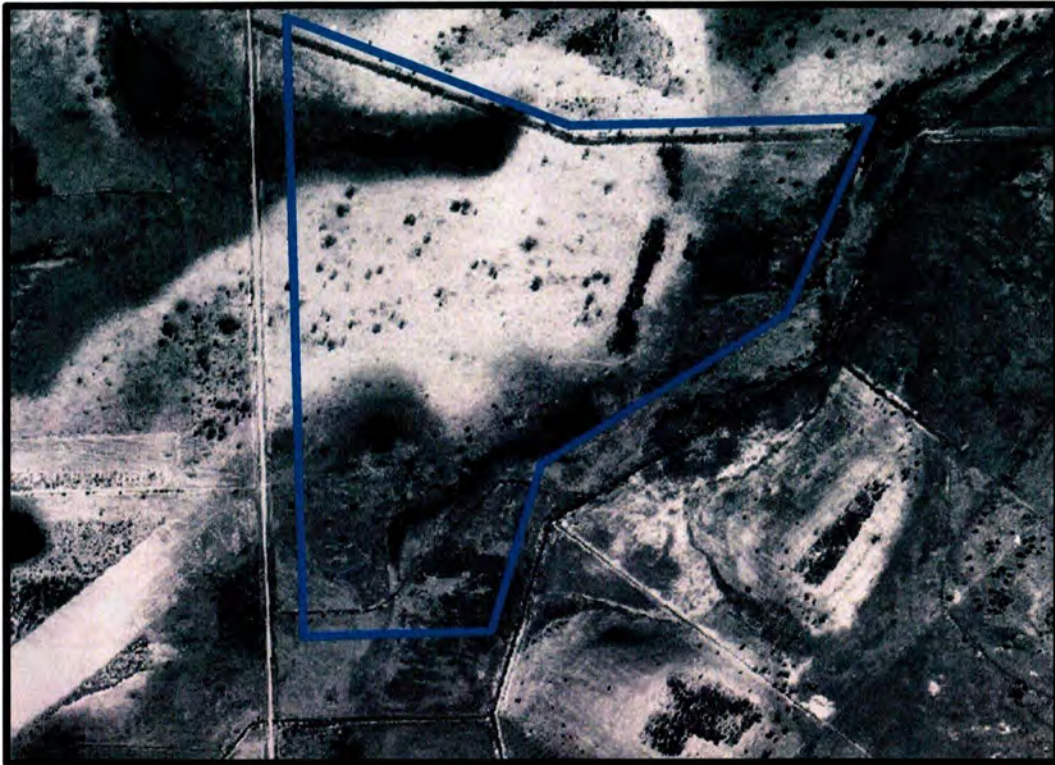


Plate 2: Historical Aerial Photography from 1995 (Landgate, 2014a)



PGV Environmental (2014) undertook a Level 2 Flora and Vegetation Survey on 23 September 2014 (Appendix 4).

The survey identified 5 separate vegetation types on the site including two woodland vegetation types on the sandy ridge and three wetland vegetation types on low-lying areas as follows (Figure 6):

Dryland vegetation types

EmBi *Eucalyptus marginata/Banksia ilicifolia* Low Open Forest over *Hibbertia hypericoides*
Open Low Heath

BmBaEm *Banksia menziesii/B. attenuata/Eucalyptus marginata* Low Open Woodland over
Hibbertia hypericoides/Allocasuarina humilis Open Low Heath

Wetland vegetation types

MpAf *Melaleuca preissiana* Low Open Woodland over *Astartea fascicularis* Closed Heath

Kg *Kunzea glabrescens* Tall Open Scrub

ErAf *Eucalyptus rudis* Low Open Forest over *Astartea fascicularis* Shrubland

The vegetation on the ridgeline consisted of pockets of Jarrah woodland among Jarrah/Banksia woodland (Plate 3) over low closed native heath dominated by *Hibbertia hypericoides*. *Banksia attenuata* and *B. menziesii* are the dominant Banksia species however the presence of the Holly-leaved Banksia (*B. ilicifolia*) around the margin of the vegetation on the central ridge indicates the presence of groundwater less than 10m deep. The native small tree Woody Pear (*Xylomelum occidentale*) is prevalent on the site. Parkland cleared native trees occur scattered through the paddocks on the site (Plates 4 and 5).

Plate 3: Jarrah/Banksia woodland over *Hibbertia hypericoides* heath



Plate 4: Parkland Cleared Jarrah and Banksia over Pasture



Plate 5: Parkland Cleared Jarrah and Banksia over Pasture



The Conservation Category wetland in the northern portion of the site contained the best quality wetland vegetation with Paperbark (*Melaleuca preissiana*) and Spearwood (*Kunzea glabrescens*) over dense *Astartea fascicularis*. A small stand of re-growth Flooded Gum (*Eucalyptus rudis*) occurs near the northwestern boundary.

The vegetation on the site belongs to the Bassendean - Central and South Vegetation Complex. The current extent of the Bassendean - Central and South Vegetation Complex remaining in the Swan Coastal Plain portion of the Perth Metropolitan Region is 10,919ha (24% of the original extent) of which 5,883ha or 13% has some existing or proposed protection. These percentages are above the

Bush Forever targets of protecting at least 400ha or 10% of each vegetation complex in the Perth Metropolitan Region.

Within the Shire of Serpentine-Jarrahdale 2707ha of vegetation from the Bassendean - Central and South Vegetation Complex remains which represents 27% of the original extent within the Shire.

The upland vegetation is considered to be representative of Floristic Community Type 23a with some similarities to FCT 21a. The wetland vegetation is considered to be representative of FCT 4 and possibly FCT 5. None of the FCTs is listed as a Threatened or Priority Ecological Community;

The condition of the vegetation was assessed according to the system devised by Keighery and described in Bush Forever (Government of Western Australia, 2000).

The condition of the vegetation on the site was rated as Very Good for most of the Jarrah woodland, some of the *Banksia* woodland and one area of Paperbark woodland. The remaining patches of native vegetation ranged from Good to Degraded where large sections of the understorey and/or the tree canopy has been removed to Degraded and Completely Degraded areas in highly disturbed paddocks (Figure 7).

3.7.2 Flora

A total of 98 plant species was recorded including 80 native and 18 (20%) introduced species. The low species richness overall and in the quadrats reflects the general poor quality of most of the vegetation. None of the species is a Threatened (Declared Rare) or Priority listed species.

3.8 Fauna

From a fauna perspective, the vegetation within the site is considered to be Good to Highly Disturbed Fauna Habitat in areas that have been historically cleared. The fauna assemblage on the site is expected to be modified due to the presence of introduced feral predators and grazers.

3.8.1 Fauna Habitat

Fauna habitat can be assessed according to the following categories:

- High quality fauna habitat – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.
- Very good fauna habitat - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.
- Good fauna habitat – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.
- Disturbed fauna habitat – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited

connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.

- Highly degraded fauna habitat – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance. (Coffey Environments, 2009)

PGV Environmental identified five fauna habitats on the site as listed in Table 4.

Table 4: Fauna Habitats identified on the Site

Habitat Type	Condition*	Species likely to use the Site
Wetland with <i>Melaleuca raphiophylla</i> and <i>Eucalyptus rudis</i>	The Conservation category wetland is considered to be good fauna habitat.	This wetland is likely to support a number of reptiles, frogs, birds and possibly small mammals including Southern Brown Bandicoot and Rakali.
Wetland with weeds	The drainage lines, resource enhancement wetland and Multiple Use wetland are considered to be highly degraded fauna habitat due to the absence of native vegetation and high cover of weed species.	The open water in the Resource Enhancement wetland may provide habitat for water birds. Frogs are likely in areas of the wetlands where there is some cover to protect them from predators.
Upland Banksia and Jarrah woodland	The upland Banksia and Jarrah woodland is considered to be good fauna habitat as it shows some level of disturbance from grazing and has limited connectivity to surrounding habitat.	This habitat will support a number of reptile, bird species and feral species such as rabbits, foxes, black rats and mice.
Upland Banksia sp. over cleared understorey	Considered to be disturbed fauna habitat as the understorey has been cleared.	This habitat will support largely bird species and some reptiles.
Cleared paddocks with scattered trees	Considered to be highly degraded fauna habitat.	This habitat is highly degraded and is likely to support a high number of introduced species such as rabbits, mice and black rats. This area may support some reptiles and possibly Western Gray Kangaroos.

Based on Coffey Environments (2009)

3.8.2 Conservation Significant Fauna

A Level 1 Fauna Survey was undertaken by PGV Environmental and a search of the DPaw Fauna Database and the EPBC Act Protected Matters Report identified 19 threatened species of fauna listed as potentially occurring within a 5km radius of the site.

Of the 19 possible threatened species, 3 species of Black Cockatoo may use the site for foraging purposes.

PGV Environmental undertook a Black Cockatoo Habitat Assessment in October 2014 and identified the following (Appendix 5):

- Approximately 12 ha of foraging habitat is found on the site;
- The site does not contain known breeding habitat and no evidence of breeding was recorded;
- The site contains 28 Jarrah Trees (live and dead) with a diameter at breast height of 500mm or greater. Seven of these trees were recorded as containing hollows or spouts, however only 2 trees contained spouts large enough for breeding by Black Cockatoos; and
- The site does not contain a known roosting site and no evidence was observed that the site has been used as roosting habitat.

Clearing of the site is likely to result in the loss of all of the Black Cockatoo habitat on the site. The surrounding Bush Forever sites provide a large amount of foraging and potential breeding habitat in close vicinity of the site and are likely to lower the impact that clearing of the site would have on Black Cockatoos.

In accordance with the Black Cockatoo Referral Guidelines and on the basis of the extent of clearing of foraging habitat, PGV Environmental consider the impact has a high risk of being a significant impact. Referral to the Department of the Environment under the EPBC Act is recommended.

3.9 Heritage

There is no listed Aboriginal or European Cultural Heritage Sites located within or adjacent to the site (DAA, 2014; Landgate 2014b).

4 EXCAVATION MANAGEMENT

4.1 General

The site contains deposits of Bassendean Sand which is suitable for use as construction and fill. This extraction operation will provide construction and development industries with sand for concrete products and engineering fill for projects in the region. It is estimated that there is approximately 765 000 tonnes of sand available for extraction within the 18ha excavation area (Appendix 2). The life of the mine is estimated to be three years. The excavation will be staged and where practical returned to pasture cropping upon the completion of mining stage (Appendix 3). Excavation will be undertaken by a Front End Loader and hauled to a central screening plant.

The following is a summary of the proposed sand mining activities for the site (Table 5).

Table 5: Project Summary

Project Component	Proposal Characteristic
Excavation	
Total area of project site	72 ha
Total area of mine footprint	18 ha
Total disturbance area	18 ha
Life of the project	Approximately 3 years
Dewatering requirements	Nil
Maximum depth of excavation	6m AHD
Processing	
Sand	765 000 tonnes
Water	30 000 KI per annum
Infrastructure	
Fuel Storage	12 000 Litre Above Ground (self banded) tank
Transport	
Truck Movements	Variable but approximately 100 per day
Workforce	
Hours of Operation	7:00am to 5:00pm Mon-Fri

4.2 Pre-Excavation Works

The Conservation and Resource Enhancement wetlands will be fenced along the 50m buffer taken from the DPaw mapped boundary as shown in Figure 5. This will ensure that mining vehicles and stock cannot enter the wetland areas and will also allow for natural regeneration. The Resource Enhancement wetland will be fenced along the northern extent only as the southern portion of the site will continue to be used for stock grazing and water points occur along the drainage line.

Native vegetation clearing will be undertaken where possible outside of the spring season to minimise disrupting nesting birds. Clearing will be done in a staged manner as the excavation progresses. It is anticipated that 6ha will be cleared initially with 6ha annually thereafter depending on the demand for the sand resource.

All clearing will be undertaken using a Traxcavator. Top soil will be removed from the cleared areas and stockpiled appropriately. Direct top soil spreading in the 40m setback to Yangedi Road and the

outer areas of the 50m buffer to the Conservation wetland will assist with vegetation screening. The remaining top soil and overburden will be separately stockpiled for future re-use in post extraction activities.

4.3 Excavation Method

Sand will be mined from the excavation area in a staged program with mining proposed to commence in 2015 (Appendix 3). The excavation process will be undertaken on a staged basis with rehabilitation commencing post completion of each stage which reduces the exposed areas and minimises any areas where water may potentially pond. Following extraction in one stage, the next mined stage will be cleared and the previous cell returned to pasture cropping.

The sequence in the extraction of sand from the site is outlined below:

- Excavation will commence on the western edge of the ridge and move eastward on a staged basis.
- Prior to excavation, vegetation will be cleared, topsoil will be removed and stored for use in rehabilitation.
- Overburden will be removed and stored for future land rehabilitation through backfill and placement.
- The sand resource is typically screened using a portable screening plant to remove any organic material and stockpiled prior to tipping directly into road trucks for transportation to stockpile areas.
- Reforming of the land is normally carried out using a bulldozer or loader to push the topsoil and overburden.
- On completion, the land surface will be graded to ensure the final slopes will not exceed 1 in 3 horizontal to vertical in accordance with *Shire of Serpentine-Jarrahdale Extractive Industries Local Law 1999*.
- Return to pasture cropping will progressively follow excavation wherever possible.

4.3.1 Buffers and Setbacks

To ensure no impact to the Conservation and Resource Enhancement Wetlands a 50m buffer will separate the extraction area and wetlands (Appendix 3). The wetlands will be fenced to prevent access.

The Dampier Bunbury Natural Gas Pipeline (DBNGP) traverses the east of the site. The extraction area will be setback 30m from the DBNGP (Appendix 2). The sand extraction area will not extend east of the DBNGP.

The extraction area will be set back 40m from the eastern road reserve along Yangedi Road (Appendix 2). Existing vegetation will be retained to provide some visual amenity from Yangedi Road. Additional screening planting will be carried out through the buffer zones to improve the screening of the site from the road.

The extraction area will meet the provisions of the Shire for a 20m minimum mining buffer from the boundary of the site.

4.3.2 Noise and Vibration

Development will comply with the *Environmental Protection (Noise) Regulations 1997* (although it should be noted that these do not cover traffic noise). To ensure that the regulations are complied with, suitable vegetated buffers are proposed. These will use retained vegetation between the proposed extraction area and Yangedi Road.

Vibration disturbance is expected to be minimal as the proposal does not involve blasting.

4.3.3 Dust

Dust management strategies will be implemented as part of the extractive industry licence and overall management of the extraction area therefore risk of wind erosion and dust will be minimised.

4.3.4 Finished Levels

The extraction depth is proposed to be a maximum depth of 14.1m AHD. Excavation shall not occur below the maximum groundwater level.

4.3.5 Decommissioning and Rehabilitation

Rehabilitation will commence with the establishment of topographic contours. The final contours are anticipated to be visually compatible with other parts of the local landscape. The proposed excavation has been designed to return the landform to pasture cropping and grazing. Topsoil will be respread to a depth best suited for shallow rooted perennial pasture species.

Screening native vegetation along Yangedi Road will be retained.

4.3.6 Hours of Operation/Duration

The hours of operation will be 7:00am to 5:00pm Monday to Friday

4.4 Visual Impact Management

Intermittent views of the extraction area will be visible from Yangedi Road as the remnant vegetation is partially cleared. SAGH Pty Ltd will retain the existing vegetation in the 40m setback along Yangedi Road and supplement this with spread of topsoil to establish native vegetation where it is currently absent. Supplementary planting will be carried out to improve the screening of the site from the road.

The following management actions will be implemented where possible to minimise the visual impact of the extraction area:

- Stage workings and progressive return to pasture to provide visual protection of later excavations;
- Minimise the amount of open ground at any one time ;
- Position overburden dumps so they form screening barriers; and
- Maintain a minimum 40 m vegetation buffer from Yangedi Road to the west of the excavation area.

4.5 Infrastructure and Access

4.5.1 Access

Authorised vehicles only will access the site via Yangedi Road through property gates that will be locked outside of operating hours. Perimeter fencing will be maintained along the boundaries of the site.

4.5.2 Site Infrastructure

Site infrastructure will be kept in a compound area in located in the central west section of the site. Infrastructure will include the following:

- Site Office (transportable);
- Refuelling Tank;
- Vehicle/equipment compound; and
- Chemical Toilet.

Vehicles left on site will be locked in the compound. The above ground fuel tank will meet the requirements of the Department Minerals and Petroleum and relevant Australian standards.

4.5.3 Haulage

The main haulage route will be north along Yangedi Road to Karnup Road which provides access to the Kwinana Freeway or South Western Highway. It is anticipated that there will be 100 truck movements per day during hours of operation.

Traffic noise received at noise-sensitive sites will comply with the *Environmental Protection (Noise) Regulations 1997*.

4.5.4 Signage

In accordance with Provision 6.2 of the *Shire of Serpentine – Jarrahdale Extractive Industry Local Law 1999*, SAGH will place a sign not less than 1.8m high and not less than 1m wide which states 'Danger Excavation Keep Out'.

The signs will also indicate operation hours and contact details for the site manager.

4.6 Safety

All excavation, mining practices and operations procedures will comply with the following legislation:

- *Mines Safety and Inspection Act 1994*;
- *Mines Safety and Inspection Regulations 1995*;
- *Occupational Health and Safety Act 1984*;
- *Occupational Health and Safety Regulations 1996*
- *Shire of Serpentine – Jarrahdale Extractive Industry Local Law 1999*

SAGH has developed procedures and work practices to manage safety, environmental impact, site management and restoration. All personnel are trained to industry standards and are provided with

site inductions, safety and environmental awareness training. All workers are required to wear protective safety and high visibility work wear when on site.

5 POTENTIAL ENVIRONMENTAL IMPACT AND MANAGEMENT

The environmental impact assessment has been completed using the results of the desktop assessment of the site, the Level 2 Flora and Vegetation survey, Level 1 Fauna survey and Black Cockatoo Habitat Assessment. The impact assessment is based on the proposed bulk earthworks plan shown at Appendix 2.

The key environmental issues and potential impacts related to the sand extraction proposal are:

- Vegetation clearing;
- Loss of fauna habitat;
- Surface, groundwater and wetland protection;
- Dust Management;
- Noise Management; and
- Visual Amenity.

A summary of the potential impacts and management strategies is provided in Table 6.

5.1 Current Land Use

The sand extraction area was completely cleared for agricultural purposes in the early 1970's (see Plate 1). Some native vegetation has re-established overtime however the site has continued to be used for pasture cropping and grazing purposes.

The mine footprint does not extend into the Conservation and Resource Enhancement Wetlands or their associated 50m management buffer.

The surrounding land use is Rural and the Serpentine Airfield is directly west of the site.

The current land use on site and in the vicinity of the site does not pose an impediment to the proposed sand extraction operation.

5.2 Topography

The topography of the site does not contain significant ridgelines that have regional or local importance.

The topography of the site is not an impediment to the proposed sand extraction operation on the site.

5.3 Geology and Soils

The proposed sand extraction is located on Bassendean Sands. The site is mapped as having low to moderate risk of ASS however these areas are associated with the low lying wetland areas which are outside of the sand extraction area. Should ASS become an issue it can be managed through an ASS Management and De-watering Management Plan.

Therefore the soils on the site are not an impediment to the proposed sand extraction activity.

5.4 Vegetation Clearing

A total area of 18ha is proposed to be mined, of this area 12ha has native vegetation re-growth.

The PGV Environmental Spring Flora and Vegetation Survey identified five vegetation units in the sand extraction area. The condition of the vegetation ranges from Completely Degraded to Very Good.

A Clearing Permit under Section V of the Environmental Protection Act 1986 may be required prior to development of the site. The Department of Environmental Regulation (DER) is responsible for approving the clearing permit for the proposed sand extraction area. SAGH will consult with DER on prior to clearing the site.

5.4.1 Potential Impacts

The potential impacts associated with the clearing of native vegetation include:

- Loss of biodiversity;
- Sedimentation and increased turbidity of local wetlands;
- Soil erosion;
- Weed control; and
- Reduced habitat for fauna.

5.4.2 Management Response

SAGH will implement the following measures to protect and restore native vegetation and flora:

- Provision of a 50m buffer from the extraction area to the Conservation and Resource Enhancement Wetlands in accordance with *EPA Guidance Statement No. 33*;
- Staged clearing of the site to allow for fauna movement away from proposed mining operations;
- Avoid disturbance of native vegetation outside of the sand extraction area;
- Stockpiling of topsoil from areas of good vegetation for rehabilitation works;
- Retain and rehabilitate native vegetation in 40m setback along Yangedi Road;
- Weed control during sand mining in the conservation wetland and 40m setback along Yangedi Road.

5.5 Loss of Fauna Habitat

The sand extraction area contains fauna habitat in Completely Degraded to Good condition. The fauna assemblage in the sand extraction area is expected to be modified as historic clearing has removed both the overstorey and understorey. The sand extraction area that has re-growth native vegetation in Good condition is likely to support mainly birds, amphibians and reptiles. The Completely Degraded areas of vegetation do not have an intact under or overstorey and provide little or no habitat for fauna. Therefore the mining of this area is anticipated to have minimal impact on the fauna in the area.

Thirteen conservation significant species were identified in the database searches that could possibly be present on the site. Eight of these species are water birds and are associated with the wetlands on the site and are unlikely to be impacted by the sand extraction proposal. Four of the

species may occur in the proposed sand extraction area and therefore could be impacted by the proposed mining. These are:

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo);
- *Calyptorhynchus baudinii* (Baudin's Black-Cockatoo);
- *Calyptorhynchus banksii naso* (Forest Red-tailed Black-Cockatoo); and
- *Merops ornatus* (Rainbow Bee-eater).

The habitat for these species is mostly in a Degraded to Good condition. Clearing of the habitat is unlikely to have a significant impact on the avifauna as they would not be reliant on the habitat for their survival.

The three species of Black Cockatoo are subject to the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the significance of the impact would need to be assessed to determine if a Commonwealth Referral is required.

5.5.1 Potential Impacts

The potential impact to fauna as a result of the sand extraction operation is:

- Loss of fauna habitat.

5.5.2 Management Strategies

It is not anticipated that the sand extraction operation will have a significant impact on fauna species as the habitat has been highly modified. The following management strategies are proposed:

- Staged clearing of the site to allow for fauna movement away from the proposed mining operations;
- Avoid disturbance of native vegetation outside of the sand extraction area;
- Provision of a buffer to the conservation and Resource Enhancement Wetlands to maintain environmental values of the wetlands; and
- Establish CBC habitat in 40m setback to Yangedi Road using topsoil.

5.6 Surface, Groundwater and Wetland Protection

Groundwater is at significant depth to the site and mining cut-off will need to be determined to ensure groundwater quality is protected. The Department of Water is likely to require some groundwater level and quality monitoring pre, during and post mining.

Due to the high porosity of the sandy soils in the extraction area, run off from the excavation areas is not anticipated and infiltration will remain the predominant drainage process. The excavation will not extend below the maximum ground water level therefore de-watering is unlikely to be required.

The Conservation and Resource Enhancement wetlands and their associated 50m management buffer are outside of the proposed sand extraction area. The Conservation wetland will be fenced to reduce impacts from grazing stock which will allow the native vegetation to re-establish.

Water entering the quarry will be from direct runoff from rainfall and it is not expected to contain any potential contaminants. Vehicle refuelling will be conducted at the vehicle compound and the fuel tank will be self bunded and be lined to prevent any contamination in the likely event of a spill.

5.6.1 Potential Impacts

The potential impacts on groundwater and surface water as a result of the sand extraction include:

- Clearing of native vegetation in the sand extraction area has the potential to increase the amount of groundwater recharge resulting in rising groundwater levels which in turn can lead to waterlogging and discharge to the adjacent conservation and resource enhancement wetlands.
- Erosion and sedimentation can occur when fringing native vegetation is removed from surface water areas. Native vegetation will not be removed from the wetland areas therefore sedimentation and or erosion are unlikely to occur.
- The surface water flows on the site may be impacted by mining as the contours are modified. The management of surface water will need to be addressed in the mining proposal to ensure the wetlands and surface drains are not impacted by run-off.
- Contamination from point sources such as a fuel spill has the potential to impact on surface and groundwater.

5.6.2 Proposed Management

It is not anticipated that the sand extraction operation will have any impacts on surface water, groundwater or wetlands. SAGH will implement the following management strategies to minimise the potential for impacts to occur:

- Provision of a 50m buffer to the Conservation and Resource Enhancement Wetlands to maintain environmental values of the wetlands;
- Construct a fence around the boundary of the 50m management buffer to the Conservation and Resource Enhancement wetlands;
- Commence pasture cropping works at the completion of each mining stage where possible;
- Monitoring of ground water levels at the site for the duration of the clearing program\; and
- Maintain all plant in good condition.

5.7 Dust Emissions

Dust can be generated when the wind velocity and frequency is sufficiently strong enough to lift sand particles from the ground surface. The susceptibility of the soil particles to lift is a function of how exposed the ground surface is which includes whether there is vegetation cover, level of compaction and the moisture content of the soil.

The potential for dust may occur during topsoil stripping, sand extraction, stockpiling and sand transport.

5.7.1 Potential impacts

Dust resulting from the sand extraction has the potential to affect:

- Human Health and amenity; and
- Natural Environment.

5.7.2 Proposed Management

There are a number of management actions that can be undertaken to minimise dust generation.

- Implement best practice protocols to reduce dust from traffic in the operational area;
- Prepare and implement a dust management and monitoring program;
- Push overburden into positions where they can form screening barriers; and
- Establish 40m setback to Yangedi Road with native vegetation screening.

5.8 Noise Emissions

Noise can originate from a number of operations and impact on external sensitive premises. The closest noise sensitive premises are the dwellings located approximately 500m to the north and south of the site.

5.8.1 Potential Impacts

Excessive exposure to noise can negatively impact upon people's health, amenity and the natural environment particularly native fauna.

5.8.2 Proposed Management

The sand extraction operations are far enough away from the noise sensitive receivers to achieve compliance with the *Environmental Protection (Noise) Regulations 1997*.

- Shut down equipment when not in use;
- Retain and establish vegetation between the sand extraction area and Yangedi Road to provide a physical separation barrier;
- Operate machines within the designated hours of operation; and
- Record and follow up any complaints received regarding noise disturbance immediately to minimise the cause;

5.9 Visual Amenity

The topography of the site is relatively flat and the surrounding land is used for small farming, rural residential and the Serpentine Airfield. The flatter plain areas have largely been cleared for agricultural uses. There are a number of wetlands and pockets of remnant vegetation both on and off the site.

The pit design and the 40m separation to Yangedi Road minimises the visual effects of the sand mining operation. Additional screening planting will be carried out through the buffer zones to improve the screening of the site from the road. The screening vegetation along Yangedi Road will be established during the first year of operation using topsoil and seed broadcast methods.

5.9.1 Potential Impacts

The staged mining areas will commence in the west and move eastward along with the construction of temporary access routes internally may produce short term visual impacts.

5.9.2 Proposed Management

The management actions proposed to be used across the site to minimise the visual impact of the sand extraction operation are listed below.

- Retain and establish native vegetation in the 40m setback to Yangedi Road;
- Minimise the amount of open ground at any one time;
- Stage workings and progressive return to pasture cropping to provide visual protection of later excavations; and
- If necessary position overburden dumps to form screening barriers.

Table 6: Summary of Possible Impacts and Proposed Management Strategies

Issue	Potential Impact	Further Investigation	Proposed Management
Vegetation Clearing	<ul style="list-style-type: none"> Loss of biodiversity; Sedimentation and increased turbidity of local wetlands; Soil erosion; Weed control; Reduced habitat for fauna 	Non Required	<ul style="list-style-type: none"> Provision of a 50m buffer from the extraction area to the Conservation and Resource Enhancement Wetlands in accordance with EPA Guidance Statement No. 33; Staged clearing of the site to allow for fauna movement away from proposed mining operations; Avoid disturbance of native vegetation outside of the sand extraction area; Stockpiling of topsoil from areas of good vegetation for rehabilitation works; Retain and rehabilitate native vegetation in 40m setback along Yangedi Road; Weed control during sand mining in the conservation wetland and 40m setback along Yangedi Road.
Loss of Fauna Habitat	<ul style="list-style-type: none"> Clearing of native vegetation; and Loss of fauna habitat. 	None Required	<ul style="list-style-type: none"> Staged clearing of the site to allow for fauna movement away from the proposed mining operations Avoid disturbance of native vegetation outside of the sand extraction area Provision of a buffer to the conservation and Resource Enhancement Wetlands to maintain environmental values of the wetlands Establish of CBC habitat in 40m setback to Yangedi Road using topsoil.
Surface Groundwater and Wetland Protection	<ul style="list-style-type: none"> Increased groundwater recharge leading to water logging or increased discharge into wetlands or drainage channel Erosion and sedimentation associated with loss of riparian vegetation Contamination from point sources 	Ongoing groundwater monitoring	<ul style="list-style-type: none"> Provision of a 50m buffer to the Conservation and Resource Enhancement Wetlands to maintain environmental values of the wetlands; Construct a fence around the boundary of the 50m management buffer to the Conservation and Resource Enhancement wetlands; Commence pasture cropping works at the completion of each mining stage where possible; Monitoring of ground water levels at the site for the duration of the clearing program\; and Maintain all plant in good condition.
Dust Emissions	<p>Natural environment</p> <p>Human health and amenity</p>	None Required	<ul style="list-style-type: none"> Implement best practice protocols to reduce dust form traffic in the operational area; Prepare a and implement a dust management and monitoring program; Push overburden into positions where they can form screening barriers; and Establish 40m setback to Yangedi Road with native vegetation screening.

Issue	Potential Impact	Further Investigation	Proposed Management
Noise Emissions	Natural environment Human health and amenity	None Required	<ul style="list-style-type: none"> • Shut down equipment when not in use; • Retain and establish vegetation between the sand extraction area and Yangedi Road to provide a physical separation barrier; • Operate machines within the designated hours of operation; • Record and follow up any complaints received regarding noise disturbance immediately to minimise the cause.
Visual Amenity	Loss of visual amenity and natural environment	None Required	<ul style="list-style-type: none"> • Retain and establish native vegetation in the 40m setback to Yangedi Road • Minimise the amount of open ground at any one time • Stage workings and progressive return to pasture cropping to provide visual protection of later excavations. • If necessary position overburden dumps to form screening barriers.

6 REHABILITATION AND DECOMMISSIONING

SAGH will return the sand extraction area to pasture cropping and stock grazing subject to the land use zoning remaining 'Rural' under the Shire's TPS 2. The screening vegetation in the setback to Yangedi Road will be retained providing a link between the Conservation Wetland and Bush Forever Site No. 378 to the west.

6.1 Decommissioning

Upon completion of the final stage of sand extraction all site facilities and equipment will be removed from the site.

Removal of the fuel tank will adhere to safety practices to minimise the risk of contamination or spills. Remaining fuel will be emptied prior to moving the tank.

Access tracks removal will be dependent on if they will be useful future use of the site. Some areas may require retention others may need to be removed.

6.2 Rehabilitation

The site will be re-contoured post sand extraction to be visibly compatible with the surrounding landscape. The final slopes will be similar to those in the local area and will conform to the *Mines and Safety and Inspection Act 1994*.

The proposed excavation has been designed to comply with the objectives of the zoning and to return the landform to pasture cropping and stock grazing. The buffer zones around the site will be extensively planted but it is intended to improve the quality of the pasture on the site and increase grazing levels once excavation is completed.

7 SUMMARY

The proposed extractive industry at 253 Yangedi Road, Hopelands will provide a basic raw material that is in high demand and will be utilised in the SJP and surrounding areas. It is expected that the site will operate for approximately 3 years. On completion of each stage the site will be restored for pasture cropping.

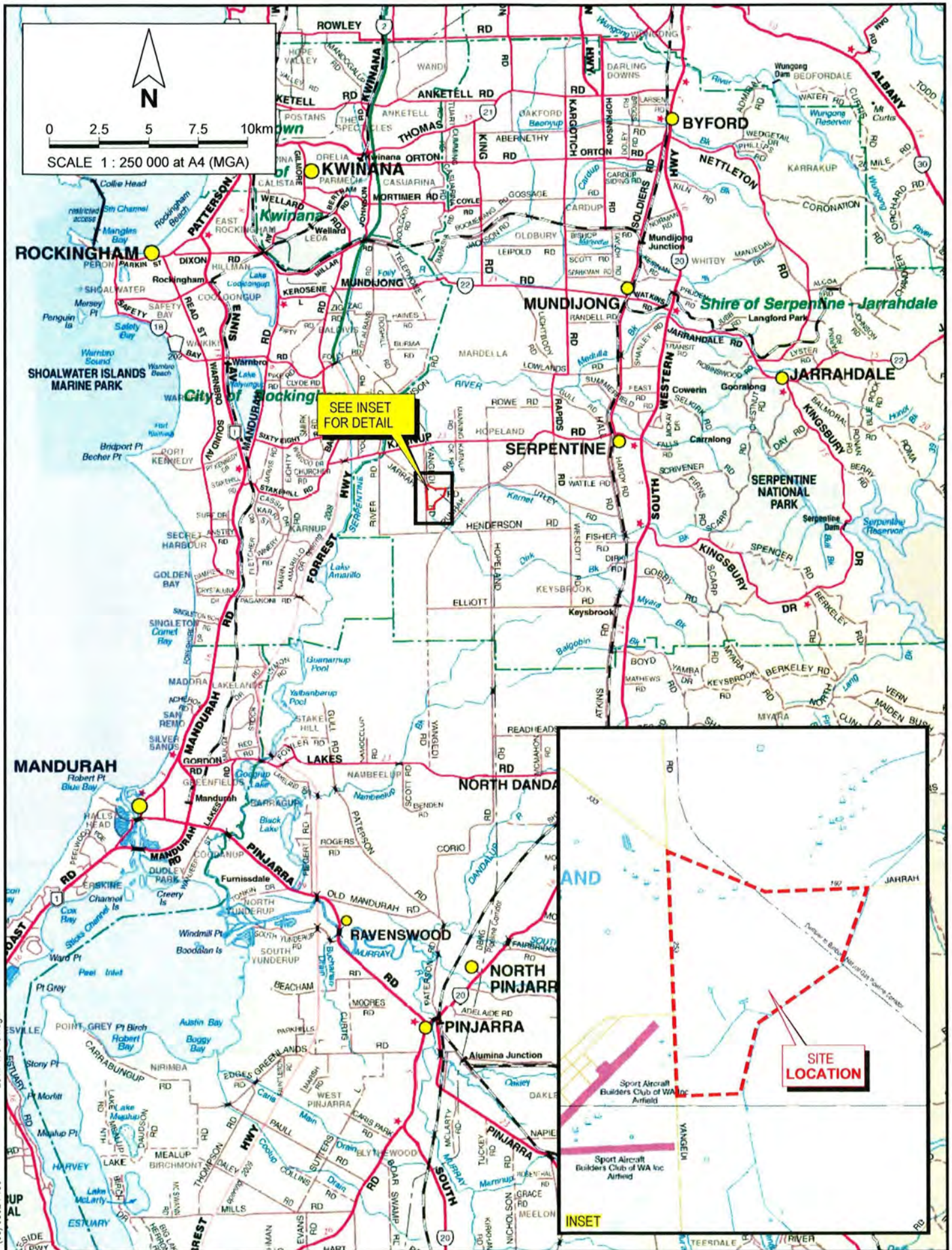
Setbacks to Yangedi Road (40m), Conservation Wetland (50m) and the Resource Enhancement Wetland (50m) will be put in place. Fencing and rehabilitation through topsoil spread will be applied in the 40m setback to Yangedi Road to establish native vegetation.

Development of the site for extractive industry is considered an appropriate use as it allows for the removal of an important resource that is vital to the construction industry. This proposal is generally consistent with existing strategic planning and development in the area. On this basis, it is requested that the Shire give its approval to this proposal.

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FIGURES



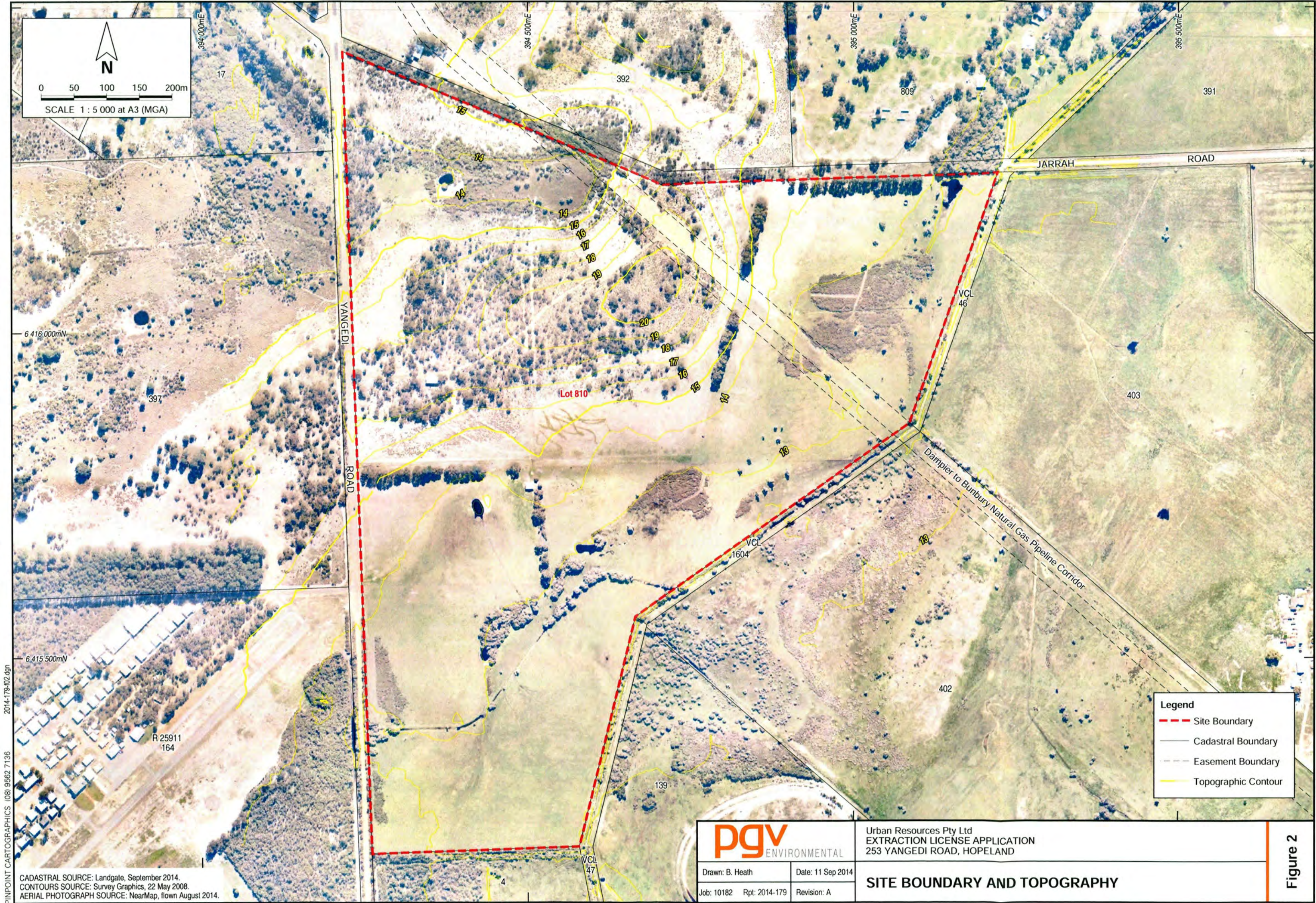
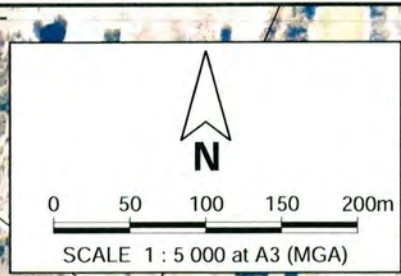
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Drawn: B. Heath	Date: 11 Sep 2014
Job: 10182 Rpt: 2014-179	Revision: A

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 EXTRACTION LICENSE APPLICATION
 253 YANGEDI ROAD, HOPELAND

SITE LOCATION

Figure 1



Legend

- - - Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Topographic Contour

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-179-102.dgn

CADASTRAL SOURCE: Landgate, September 2014.
 CONTOURS SOURCE: Survey Graphics, 22 May 2008.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

pgv ENVIRONMENTAL

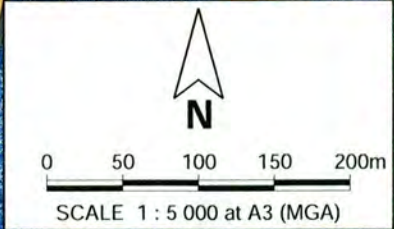
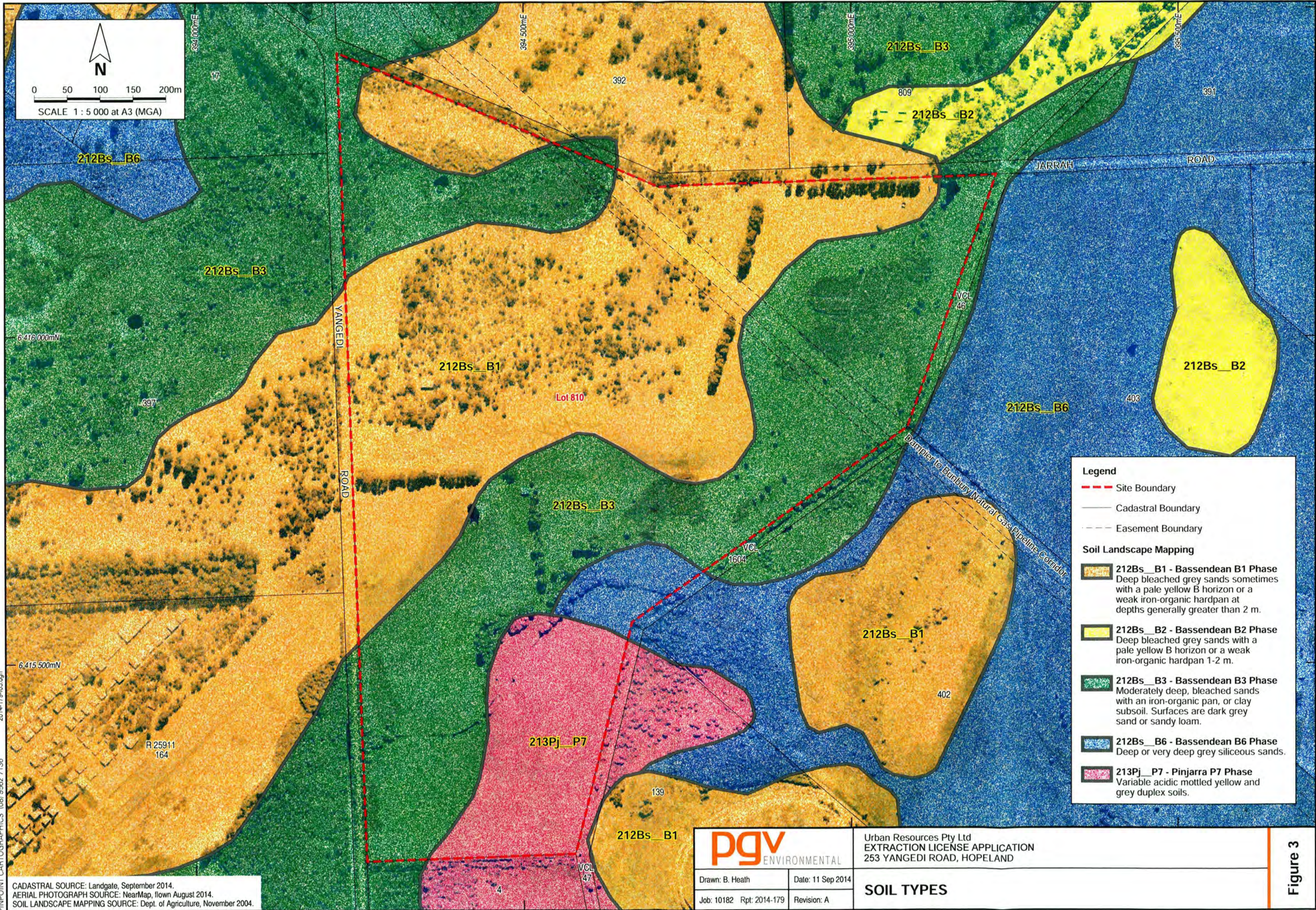
Drawn: B. Heath Date: 11 Sep 2014

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SITE BOUNDARY AND TOPOGRAPHY

Figure 2



Legend

- Site Boundary
- Cadastral Boundary
- - - Easement Boundary

Soil Landscape Mapping

- 212Bs_B1 - Bassendean B1 Phase
Deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m.
- 212Bs_B2 - Bassendean B2 Phase
Deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.
- 212Bs_B3 - Bassendean B3 Phase
Moderately deep, bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.
- 212Bs_B6 - Bassendean B6 Phase
Deep or very deep grey siliceous sands.
- 213Pj_P7 - Pinjarra P7 Phase
Variable acidic mottled yellow and grey duplex soils.

2014-179-f03.dgn
 PINPOINT CARTOGRAPHICS (08) 9562 7136
 CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.
 SOIL LANDSCAPE MAPPING SOURCE: Dept. of Agriculture, November 2004.

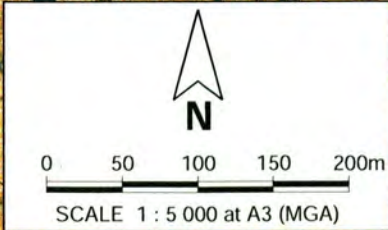
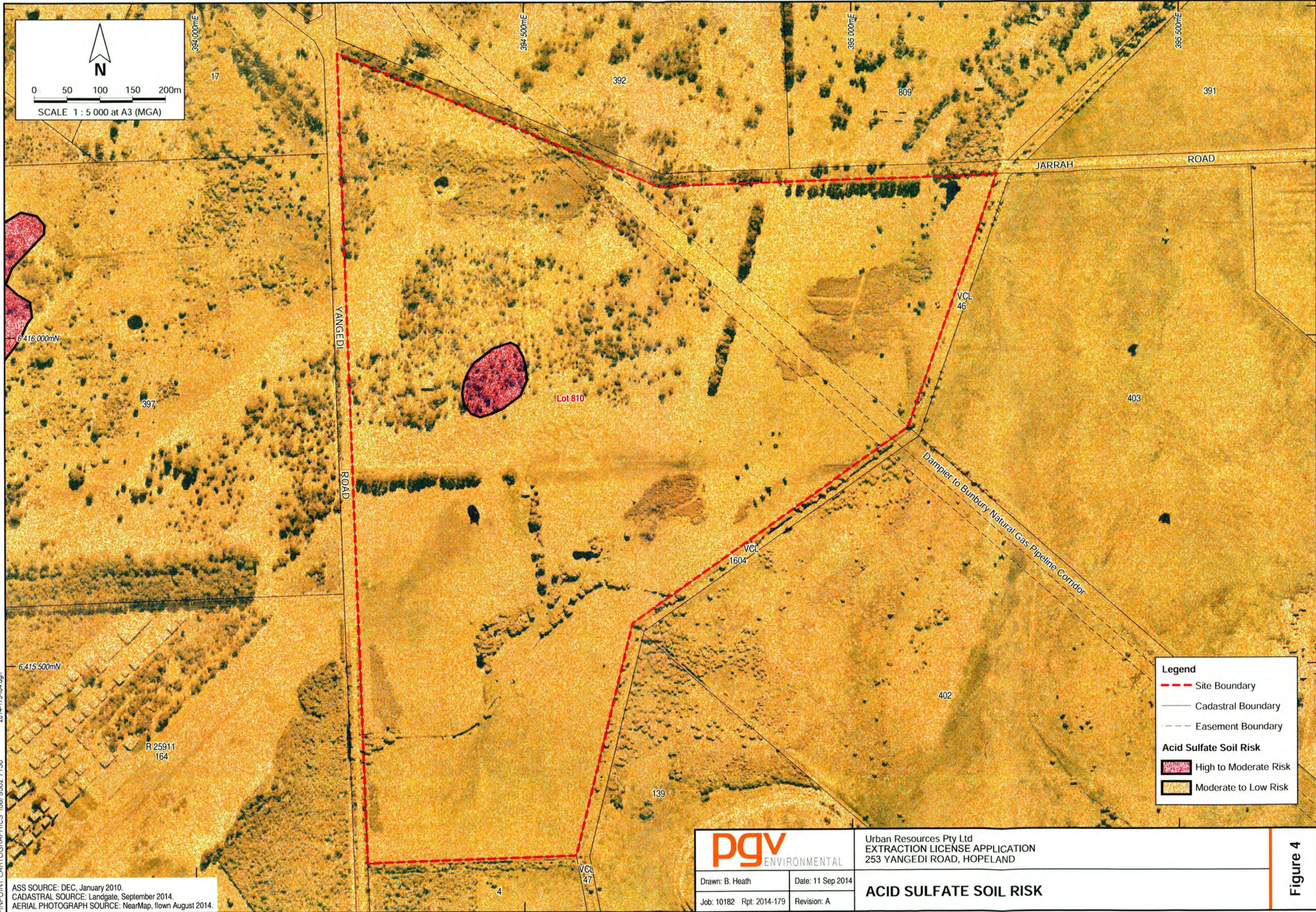
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SOIL TYPES

Figure 3



Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary

Acid Sulfate Soil Risk

- High to Moderate Risk
- Moderate to Low Risk

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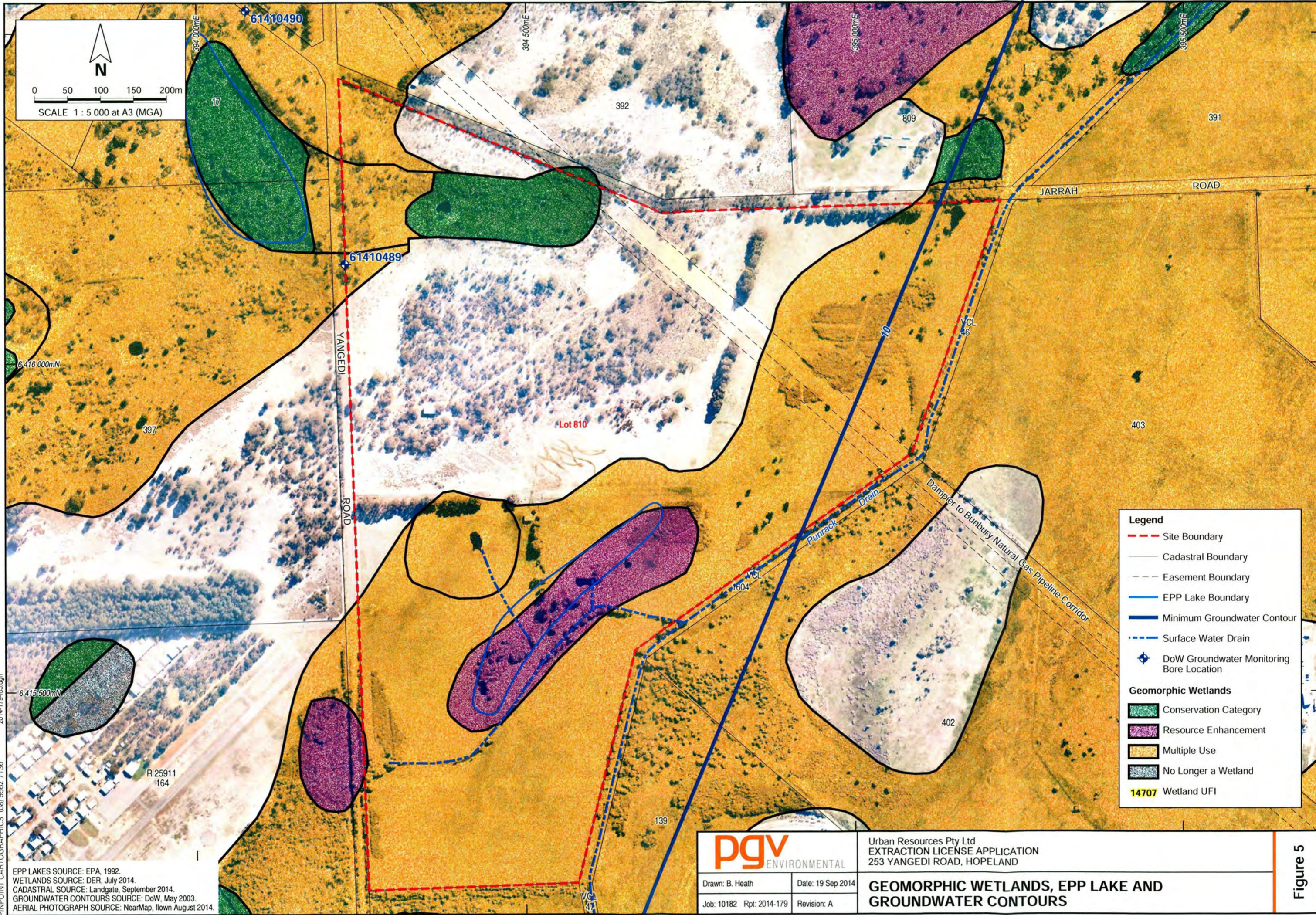
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ACID SULFATE SOIL RISK

Figure 4

ASS SOURCE: DEC, January 2010.
 CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-179-f04.dgn



Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- EPP Lake Boundary
- Minimum Groundwater Contour
- - - Surface Water Drain
- ◆ DoW Groundwater Monitoring Bore Location

Geomorphic Wetlands

- Conservation Category
- Resource Enhancement
- Multiple Use
- No Longer a Wetland
- 14707 Wetland UFI

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-179-f05.dgn

EPP LAKES SOURCE: EPA, 1992.
 WETLANDS SOURCE: DER, July 2014.
 CADASTRAL SOURCE: Landgate, September 2014.
 GROUNDWATER CONTOURS SOURCE: DoW, May 2003.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

pgv ENVIRONMENTAL

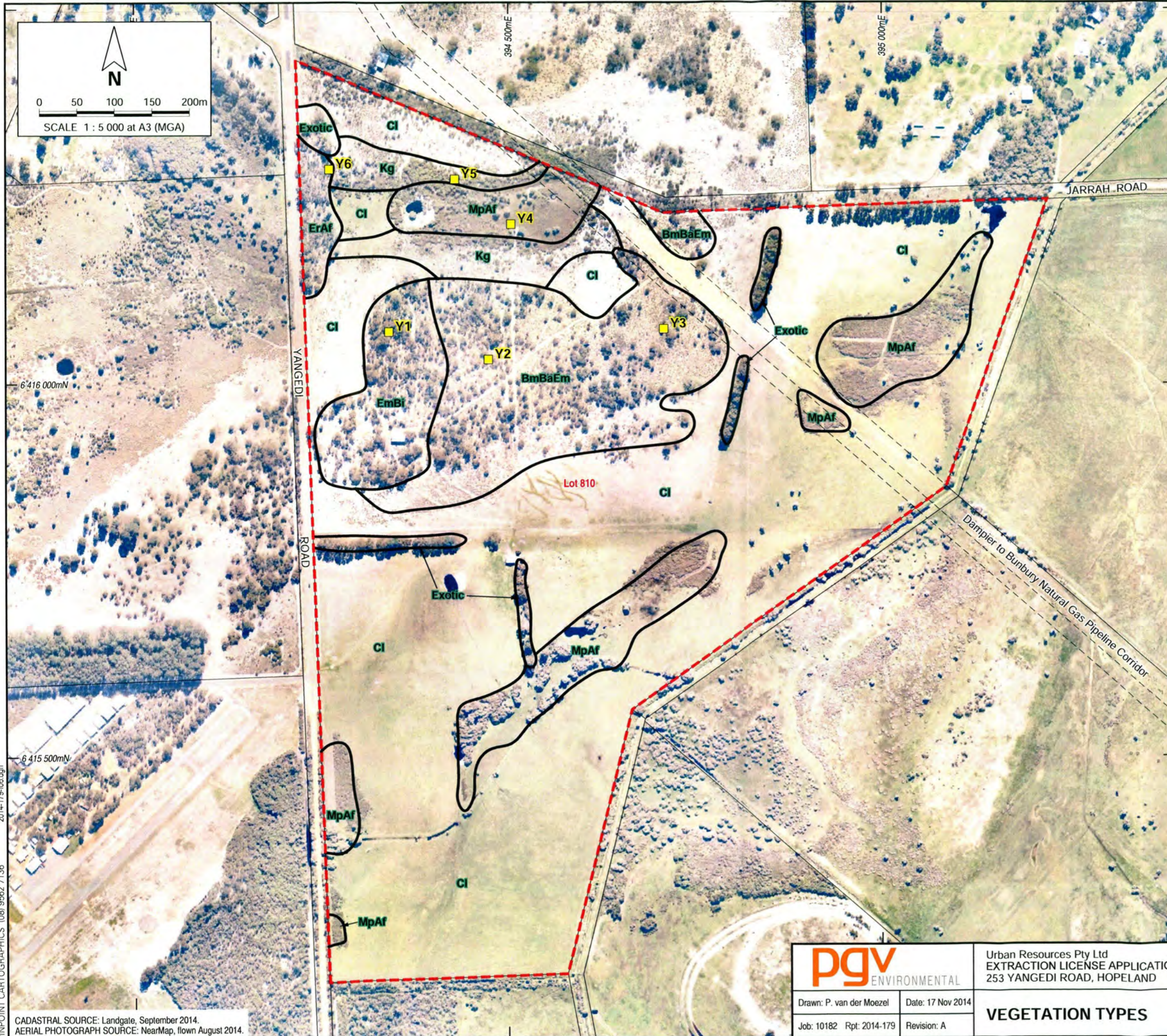
Drawn: B. Heath Date: 19 Sep 2014

Job: 10182 Rpt: 2014-179 Revision: A

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 EXTRACTION LICENSE APPLICATION
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**GEOMORPHIC WETLANDS, EPP LAKE AND
 GROUNDWATER CONTOURS**

Figure 5



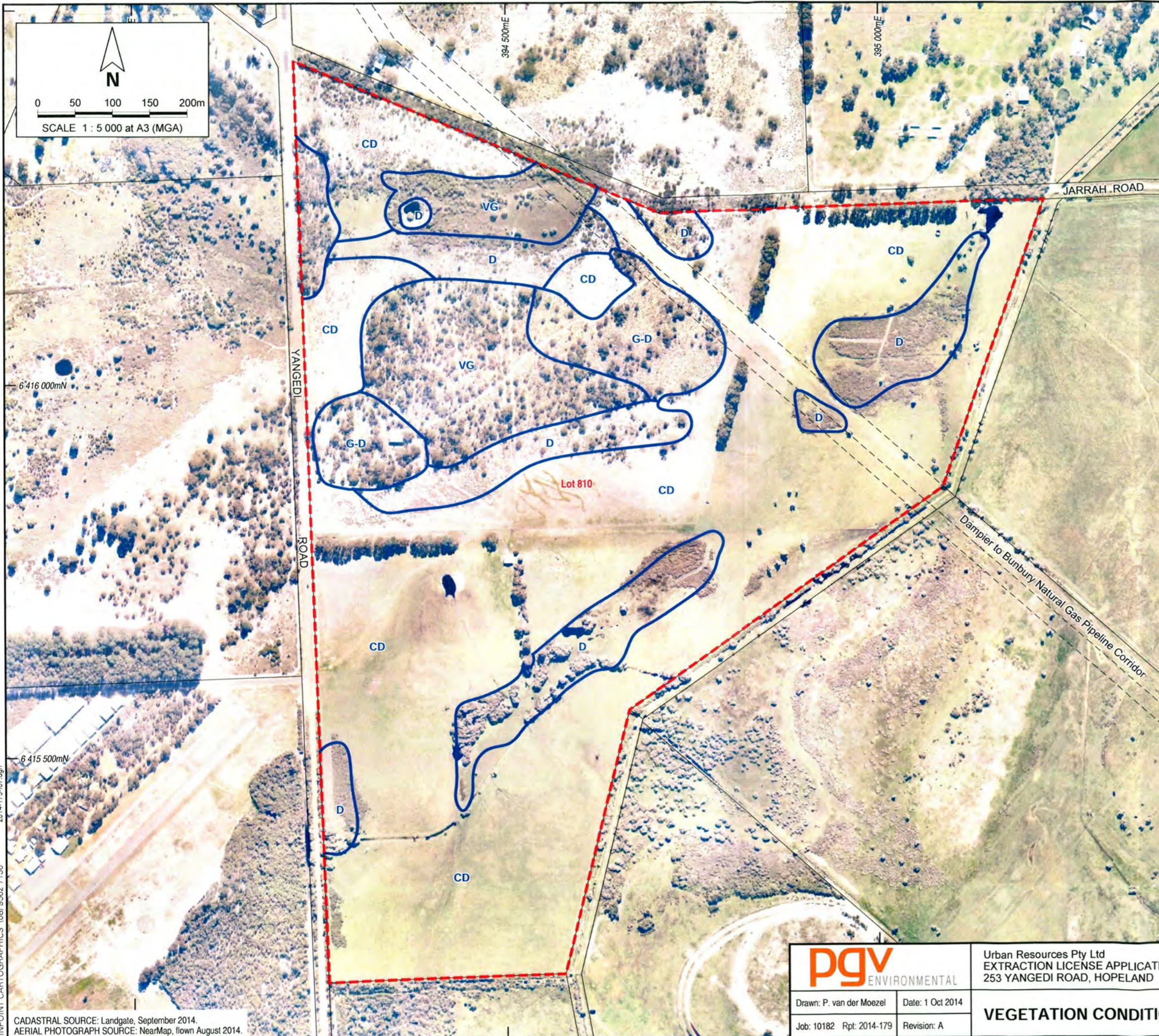
- Legend**
- - - Site Boundary
 - Cadastral Boundary
 - Easement Boundary
 - Quadrat Location
 - Vegetation Type Boundary
 - Mp** Vegetation Type
- Vegetation Types**
- EmBi**
Eucalyptus marginata/Banksia ilicifolia Low Open Forest over *Hibbertia hypericoides* Open Low Heath
- BmBaEm**
Banksia menziesii/B. attenuata/Eucalyptus marginata Low Open Woodland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath
- MpAf**
Melaleuca preissiana Low Open Woodland over *Astartea fascicularis* Closed Heath
- ErAf**
Eucalyptus rudis Low Open Forest over *Astartea fascicularis* Shrubland
- Kg**
Kunzea glabrescens Tall Open Scrub over bare ground

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-179-06.dgn

CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

		Urban Resources Pty Ltd EXTRACTION LICENSE APPLICATION 253 YANGEDI ROAD, HOPELAND
		VEGETATION TYPES
Drawn: P. van der Moezel	Date: 17 Nov 2014	
Job: 10182 Rpt: 2014-179	Revision: A	

Figure 6



Legend

- - - Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Quadrat Location
- Vegetation Condition Boundary
- VG Vegetation Condition

Vegetation Condition
(SOURCE: Bush Forever, Govt. of W.A., 2000)

P - Pristine
Pristine or nearly so, no obvious signs of disturbance.

Ex - Excellent
Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species.

VG - Very Good
Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

G - Good
Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

D - Degraded
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

CD - Completely Degraded
The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

Cl - Cleared
No native vegetation remaining.

CADASTRAL SOURCE: Landgate, September 2014.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

		Urban Resources Pty Ltd EXTRACTION LICENSE APPLICATION 253 YANGEDI ROAD, HOPELAND	
		VEGETATION CONDITION	
Drawn: P. van der Moezel	Date: 1 Oct 2014		
Job: 10182 Rpt: 2014-179	Revision: A		

Figure 7

APPENDIX 1
CERTIFICATE OF TITLE

WESTERN



AUSTRALIA

REGISTER NUMBER 810/DP202726	
DUPLICATE NUMBER 2	DATE DUPLICATE ISSUED 24/1/2011

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **1730** FOLIO **354**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.



REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 810 ON DEPOSITED PLAN 202726

**REGISTERED PROPRIETOR:
(FIRST SCHEDULE)**

RICH VISTA PTY LTD OF 66 BURKE DRIVE, ATTADALE
IN 23/25 SHARE
DE EVERGRACE PTY LTD OF 11 MEADOWBANK TERRACE, SOUTH LAKE
IN 2/25 SHARE
AS TENANTS IN COMMON

(L528642) REGISTERED 12 JANUARY 2011

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)**

- 1. C518071 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE INSTRUMENT C518071. REGISTERED 22.3.1983.
11632795 SUNDRY. THE GRANTEE OF TRANSFER C518071 IS NOW THE DBNGP LAND ACCESS MINISTER PURSUANT TO THE DAMPIER TO BUNBURY PIPELINE ACT 1997. REGISTERED 27.12.2000.
- 2. 11632795 SUNDRY. PORTION OF THE LAND HEREIN IS WITHIN THE DBNGP CORRIDOR PURSUANT TO THE DAMPIER TO BUNBURY PIPELINE ACT 1997. SEE LAND ADMINISTRATION PLAN 15582. REGISTERED 27.12.2000.
- 3. K830535 SUNDRY. PORTION OF THE LAND HEREIN IS WITHIN THE DBNGP CORRIDOR PURSUANT TO THE DAMPIER TO BUNBURY PIPELINE ACT 1997. SEE DEPOSITED PLAN 39027. REGISTERED 20.1.2009.
- 4. *K830536 TAKING ORDER. THE DESIGNATED PURPOSE OF THE INTEREST TAKEN IS STATE CORRIDOR RIGHTS TO THE DBNGP LAND ACCESS MINISTER UNDER THE PROVISIONS OF THE DAMPIER TO BUNBURY PIPELINE ACT 1997. AS TO THE PORTION SHOWN ON DEPOSITED PLAN 39027 ONLY. REGISTERED 20.1.2009.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title
Lot as described in the land description may be a lot or location

-----END OF CERTIFICATE OF TITLE-----

END OF PAGE 1 - CONTINUED OVER

RECORD OF CERTIFICATE OF TITLE

REGISTER NUMBER: 810/DP202726

VOLUME/FOI.I.O: 1730-354

PAGE 2

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1730-354 (810/DP202726).
PREVIOUS TITLE: 1199-650.
PROPERTY STREET ADDRESS: 253 YANGEDI RD, HOPELAND.
LOCAL GOVERNMENT AREA: SHIRE OF SERPENTINE-JARRAHDALE.

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF PEEL ESTATE LOT 810 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 810 ON DEPOSITED PLAN 202726 ON 06-MAY-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 2: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.



Transfer D259036

WESTERN



AUSTRALIA

Volume 1199 Folio 650

1730 354

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.

Dated 3rd June 1986

D. J. Smyth
REGISTRAR OF TITLES



ESTATE AND LAND REFERRED TO

State in fee simple in Peel Estate Lot 810, delineated on the map in the Third Schedule hereto, limited however to the natural surface and therefrom to a depth of 60.96 metres.

FIRST SCHEDULE (continued overleaf)

John Raymond Deane, Plant Hirer and June Vivian Deane, Home Duties, both of Lot 23 Clifford Road, Orange Grove, as joint tenants.

SECOND SCHEDULE (continued overleaf)

TRANSFER C518071. The right to enter upon the portion of the within land comprised in Plan 14030 to construct use and maintain a pipeline for the carriage of natural or other gas as set out in the said Transfer is granted to the State Energy Commission of Western Australia. Registered 22.3.83 at 3.34 o/c.

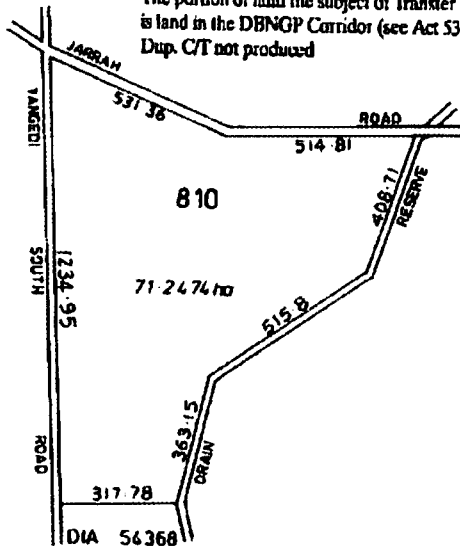
~~MORTGAGE D259037 to Westpac Banking Corporation. Registered 3.6.86 at 9.10 o/c.
Discharged E571611 22.3.91~~

D. J. Smyth
REGISTRAR OF TITLES



THIRD SCHEDULE

The portion of land the subject of Transfer C518071 is land in the DBNGP Corridor (see Act 53 of 1997) Dup. C/T not produced



NOT TO SCALE
INDEX PLAN PEEL 10000 3:4

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

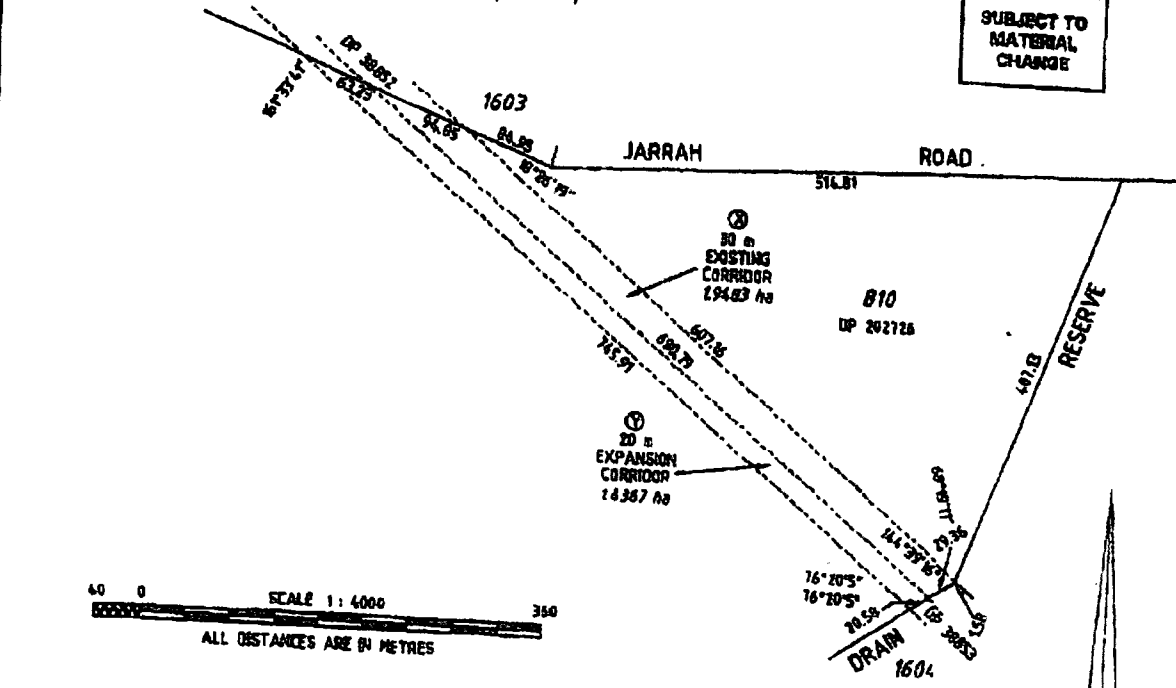
72009/12/77-4100-5/1986

Superseded - Copy for Sketch Only

Page 1 (of 2 pages) 1730 VOL. 354 FOL.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

NO/VER	AMENDMENT	BY	DATE
2/1	CHANGE OF EXPANSION CORRIDOR POSITION TO THE WEST OF EXISTING CORRIDOR	CCPL	20/6/07



TYPE CROWN	
PURPOSE ACQUISITION	BSA - NO
PLAN OF DBNGP CORRIDOR THROUGH LOT 810 ON DP 202726	
DISTRICT COCKBURN SOUND	FILE 1307/2002
TOWNSHIP HOPELAND	LOCAL AUTHORITY SHIRE OF SERPENTINE-JARRAHDALE
FORMER TENURE QJ	INDEX 6533 (10) 3.1
FIELD BOOK	

HELD BY DJI
 BY SERIAL FORM ONLY

SCALE 1:4000
ALL DISTANCES ARE IN METRES

JBA: 4781
CC: 21303

SURVEYOR'S CERTIFICATE - Reg 94
 G A Lodhant
 Surveyor General

This plan of survey is a correct representation of the survey and/or calculations from measurements recorded in the field book referred to for the purposes of this plan and that it complies with the relevant section headed in relation to which it is lodged.

LOGGED	TYPE OF VALIDATION
DATE 4-Mar-04	SCALE CHECK
FOR PLAN 9127	LEGAL COMMENTARY
ADDRESS NO. 41163	PROPERTY PLANNING
	REGISTERED CORRECTLY
	DATE

JBA John Ballack and Associates
 20 Ryper St, Perth WA 6000
 REGISTERED 1998

APPROVED BY
 WESTERN AUSTRALIAN
 PLANNING COMMISSION

DATE

IN ORDER FOR DEALINGS

SUBJECT TO

Department of
 Land Information

APPROVED Reg 26A

DATE

DEPOSITED PLAN
39027

SHEET 1 OF 1
 COVER 2 VERSION 1

INTERESTS AND NOTIFICATIONS

SUBJECT	PURPOSE	STATUTORY REFERENCE	ORIGIN	LAND BURDENED	BENEFIT TO	COMMENTS
⊗	CORRIDOR	DAMPIER TO SUNBURY PIPELINE ACT 1997	DP 215502 GRC 1632795	LOT 810	THE DBNGP LAND ACCESS MINISTER	
⊙	CORRIDOR	DAMPIER TO SUNBURY PIPELINE ACT 1997	THIS PLAN	LOT 810	THE DBNGP LAND ACCESS MINISTER	

Created by:
Cadastral Cartographics
 PO Box 1541, South Perth, 6861
 Ph 08348 0301 Fax 08348 0305

Surveyed in accordance with Survey Practice Guidelines for the Cadastral to Brokers (airmail) Gas Pipelines (DBNGP) under Regulation 26A of the Land and Surveyors (Code of Surveyors Regulations) 1981.

Calculations have been made on the GRADE and distances reduced to Mean Ground Level.

Total Area = 3.3850 ha

All dimensions derived from the SABS on 9 Feb August 2005

APPENDIX 2
BULK EARTH WORKS PLAN

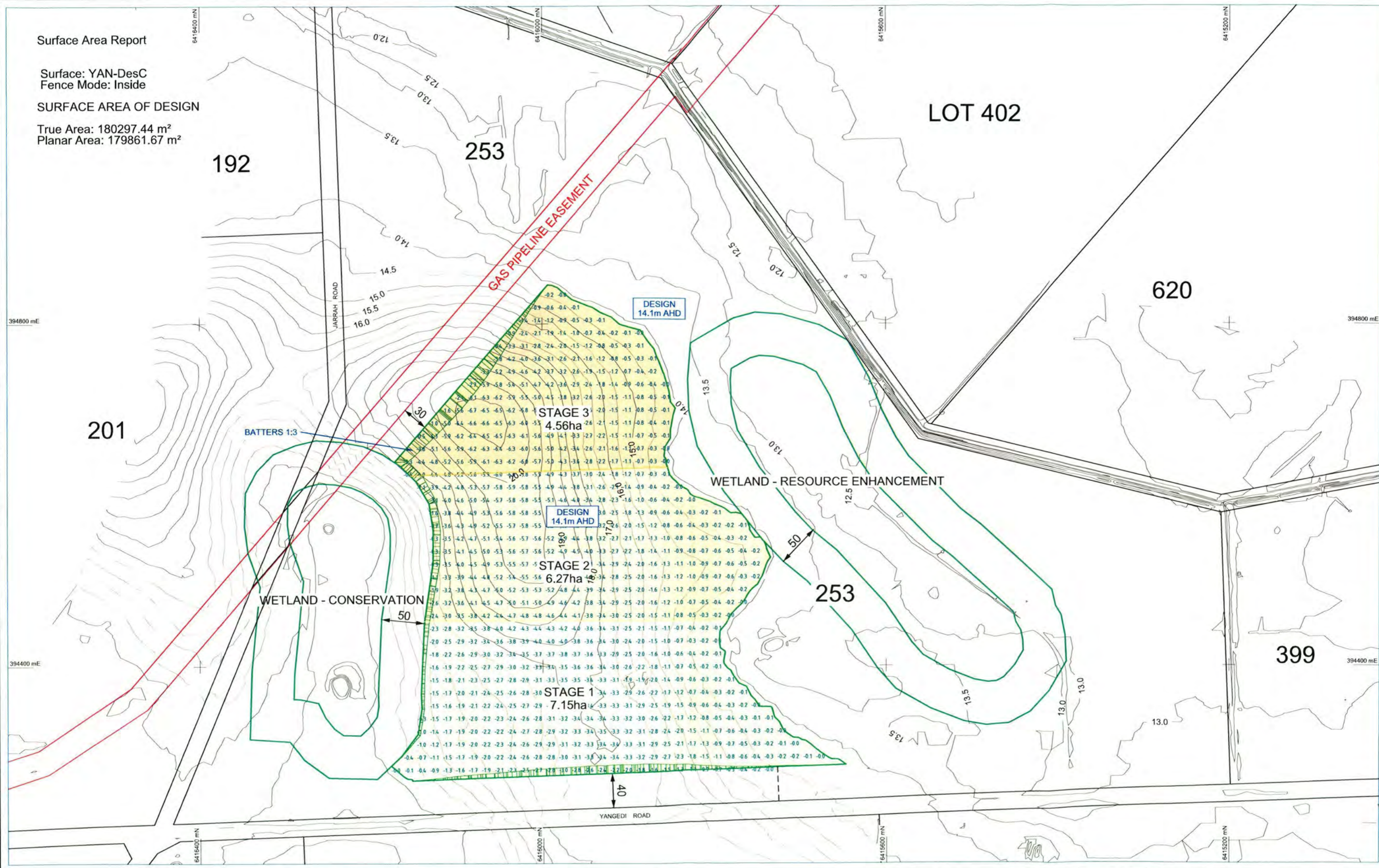
APPENDIX 3
STAGING PLAN

Surface Area Report

Surface: YAN-DesC
Fence Mode: Inside

SURFACE AREA OF DESIGN

True Area: 180297.44 m²
Planar Area: 179861.67 m²



REV	DATE	AMENDMENT	DRN	CKD
A	18/11/14	INITIAL ISSUE	GKB	
REV	DATE	AMENDMENT	DRN	CKD
ORIG SIZE	ARCHIVE	UR143_18-02-01A		

NOTES

1. THE VOLUMES ON THIS PLAN HAVE BEEN CALCULATED USING INFORMATION SUPPLIED BY THE CLIENT. THE ACCURACY OF THESE VOLUMES DEPENDS ON THE QUALITY OF THE DATA SUPPLIED.
2. THE VALUES ON THIS PLAN HAVE BEEN CALCULATED USING GRIDDED DATA INTERPOLATED FROM THE ORIGINAL SURVEYS
3. FILL VALUES SHOWN 3 IN METRES
CUT VALUES SHOWN -3 IN METRES

SCALE 1 : 2000

DATUM
VERTICAL AHD
HORIZONTAL GDA 94

Urban Resources

BebbCart
Marine, Cadastral & Topographic Mapping, Civil Drafting.
Level 3, 20 Parkland Road, Osborne Park, WA
Phone (08) 6163 4990 Fax (08) 6163 4979
Email admin@bebbcart.com.au

URBAN RESOURCES
HOPELANDS - 253 YANGEDI ROAD
PROPOSED EXCAVATION STAGING PLAN

DRAWING NUMBER **UR 143.18 - 02 - 01** REV **A**

APPENDIX 4
FLORA AND VEGETATION SURVEY

253 YANGEDI ROAD, HOPELANDS

FLORA AND VEGETATION SURVEY

Prepared for: Urban Resources

Report Date: 17 November 2014

Version: V1

Report No. 2014-167

PGV
ENVIRONMENTAL

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- Table 1: Soil Systems Mapped on the Site
- Table 2: Mapped Soil Units on the Site
- Table 3: Wetlands Located on the Site
- Table 4: Conservation Significant Flora likely to occur within 5km of the Site
- Table 5: Likelihood of Conservation Significant Flora Species Occurring on the Site
- Table 6: Threatened and Priority Ecological Communities likely to occur within 5km of the Site
- Table 7: Statement of Botanical Survey Conditions
- Table 8: Vegetation Condition Rating Scale

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- Figure 1: Regional Location
- Figure 2: Location
- Figure 3: Vegetation Types
- Figure 4: Vegetation Condition

Appendices

- Appendix 1: Species List
- Appendix 2: Quadrat Data

1. INTRODUCTION

1.1 Purpose

Urban Resources Pty Ltd is proposing to construct a sand extraction pit at Lot 253 Yangedi Road, Hopelands (the site). The site, which is approximately 72ha in size, is currently used for cattle grazing and contains a mixture of cleared paddocks, parkland cleared paddocks with native trees and remnant native vegetation in a range of condition. Extraction of sand from the site will removed native vegetation from the more elevated portions of the site.

PGV Environmental was commissioned by Urban Resources Pty Ltd to undertake a Level 2 flora and vegetation survey of the site.

1.2 Site Location

The site is located in the Shire of Serpentine-Jarrahdale and is approximately 50km from the Perth Central Business District and 25km north of Mandurah (Figure 1). The site is bound by Yangedi Road and Serpentine Airfield to the west and private landholdings to the north, east and south (Figure 2).

The Dampier Bunbury Natural Gas Pipeline (DBNGP) traverses the north-east section of the site.

1.3 Scope of Works

The Level 2 flora and vegetation survey was undertaken in accordance with Guidance Statement 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004) and included the following:

- Desktop search and review of the Department of Parks and Wildlife's (DPaW's) Declared Rare and Priority Flora database and Threatened Ecological Communities database;
- Examination of recent aerial photography and contour maps to provisionally identify vegetation types and condition;
- Field survey in spring using quadrats to record native and introduced species as well as a thorough site walkover of any areas of native vegetation;
- Recording of any significant plant species using a hand-held GPS;
- Description and mapping of vegetation types and vegetation condition; and
- Compilation of a flora list.

2. EXISTING ENVIRONMENT

2.1 Land Use

The site is currently used for grazing purposes and has been for many decades. A house and sheds associated with the rural activities is located close to Yangedi Road.

The Dampier to Bunbury Natural Gas Pipeline (DBNGP) traverses the north-east of the site.

2.2 Topography

The site is generally flat and low-lying with a low sand ridge that runs from south-west to north-east through the northern part of the site (Figure 2). The ridge has a maximum elevation of around 20m AHD and rises 6-7m above the low-lying land to the north-west and south.

2.3 Geology and Soils

The site is largely located on the Bassendean Dune System with the Pinjarra Plain System occurring in the south east corner of the site (Table 1). There are four soil units mapped on the site as shown in Figure 3 and described in Table 2 (Churchward and McArthur (1978).

Table 1: Soil Systems mapped on the Site

Soil Systems of the Swan Coastal Plain	Description
Bassendean Dune Soils	These are the oldest of the three dune systems on the Swan Coastal Plain, are thought to be about 800,000 years old and so are the most leached, infertile and acidic. The sands contain little silt or clay, and very low levels of nutrient elements, with any nutrient element content being associated with organic matter. The dunes are low lying hills with poorly drained areas between the hills.
Pinjarra Plain Soils	The soils are complex, and comprise a successive layering of soils formed from erosion of material from the scarp and east of the scarp. Rivers and streams have mostly carried the eroded material, which is deposited from the water as fans of alluvium. Therefore, the plain is made up of layers of soils of different ages. It occupies about one third of the Swan Coastal Plain, and most of it has been cleared and sown to pasture for the grazing industries, mostly dairy, with some beef.

DAFWA, 2014

Table 2: Mapped Soil Units on the Site

Soil Units	Description
Bassendean B1 (212Bs_B1)	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m. Banksia dominant
Bassendean B3 (212Bs_B3)	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam
Bassendean B6 (212Bs_B6)	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands
Pinjarra P7 (213Pj_P7)	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and grey sandy duplex and effective duplex soils

The Bassendean B3 soil unit is associated with the dunal ridge that extends through the site and Bassendean B1 and B6 map units are associated with the lower lying areas. The Pinjarra P7 soil unit is located in the south east corner.

2.4 Hydrology

2.4.1 Surface Water

The site is located in the Serpentine River Catchment and contains a number of small drainage lines that feed into the Punrack Drain which downstream feeds into the Serpentine River.

2.4.2 Wetlands

The site contains five wetlands as shown in the *Geomorphic Wetlands of the Swan Coastal Plain* Database (Landgate, 2014). These are described in Table 3.

Table 3: Wetlands Located on the Site

UFI Number	Wetland Classification	Wetland Type	Location
14706	Conservation	Sumpland	Located within the site adjacent to the northern boundary.
14739	Multiple Use	Sumpland	Located in the north west corner of the site
14708	Resource Enhancement	Sumpland	Located in the south east corner of the site within the larger palusplain wetland 15785.
15785	Multiple Use	Palusplain	Located across southern portion of the site
14707	Multiple Use	Sumpland	Located within the larger palusplain wetland 15785.

3. FLORA AND VEGETATION

3.1 Methodology

A flora and vegetation survey of the site was conducted by Dr Paul van der Moezel on 22 September 2014.

The survey included sampling from six 10m x 10m non-permanent quadrats as well as a thorough walk over the area. The low number of quadrats was considered suitable given the small size of the site. Site coverage through most of the vegetation was very high due to the ease of access through the open understorey and the small size of the area surveyed. Access was more difficult through the dense vegetation in a part of the wetland in the north-western part of the site. Degraded vegetation was not intensively surveyed using quadrats.

3.2 Desktop Searches

A search of the Department of Parks and Wildlife (DPaW) Threatened Flora Database, the WA Herbarium database (WAHerb), the Declared Rare and Priority Flora Species List and the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Report indicates that a number of species that are listed as Endangered, Threatened or Priority are likely to be located within a 5km radius of the site. The results from these database searches and the likelihood of the Significant Flora species occurring on the site are shown in Tables 4 and 5.

Table 4: Conservation Significant Flora likely to occur within 5km of the Site

Family	Taxa	Status under Wildlife Conservation Act	Status under EPBC Act
Apiaceae	<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459) PN	P3	
Apocynaceae	<i>Parsonsia diaphanophleba</i>	P4	
Centrolepidaceae	<i>Centrolepis caespitosa</i>		E
Cyperaceae	<i>Schoenus capillifolius</i>	P3	
Cyperaceae	<i>Tetraria australiensis</i>	T	
Ericaceae	<i>Andersonia gracilis</i>		E
Euphorbiaceae	<i>Stachystemon</i> sp. <i>Keysbrook</i> (R. Archer 17/11/99)	P1	
Fabaceae	<i>Acacia horridula</i>	P3	
Fabaceae	<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)	P1	
Fabaceae	<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	P3	
Fabaceae	<i>Dillwynia dillwynioides</i>	P3	
Hemerocallidaceae	<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>	P2	
Malvaceae	<i>Lasiopetalum pterocarpum</i>	T	
Myrtaceae	<i>Darwinia foetida</i>		CE
Myrtaceae	<i>Eucalyptus balanites</i>		E
Myrtaceae	<i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>	P4	
Myrtaceae	<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	
Myrtaceae	<i>Verticordia plumosa</i> var. <i>ananeotes</i>	T	
Orchidaceae	<i>Caladenia huegelii</i>	T	E
Orchidaceae	<i>Diuris micrantha</i>		V

Family	Taxa	Status under Wildlife Conservation Act	Status under EPBC Act
Orchidaceae	<i>Diuris purdiei</i>		E
Orchidaceae	<i>Drakaea elastica</i>	T	E
Orchidaceae	<i>Drakaea micrantha</i>		V
Orchidaceae	<i>Thelymitra variegata</i>	P3	
Proteaceae	<i>Synaphea odocoileops</i>	P1	
Proteaceae	<i>Synaphea stenoloba</i>		E
Proteaceae	<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)	T	CE
Proteaceae	<i>Synaphea</i> sp. Pinjarra Plain (A.S. George 17182)	T	
Proteaceae	<i>Synaphea</i> sp. Serpentine (G.R. Brand 103)	T	
Sapindaceae	<i>Dodonaea hackettiana</i>	P4	
Stylidiaceae	<i>Stylidium ireneae</i>	P4	
Stylidiaceae	<i>Stylidium longitubum</i>	P3	

Table 5: Likelihood of Conservation Significant Flora Species Occurring on the Site

Taxa	Preferred Habitat*	Likelihood to be Present on Site
<i>Acacia horridula</i>	Gravelly soils over granite, sand. Rocky hillsides	Highly Unlikely
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)	Grey or black sand over clay. Swampy areas, winter wet lowlands	Possible
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	Granitic Soils	Unlikely
<i>Andersonia gracilis</i>	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps	Possible
<i>Caladenia huegelii</i>	Grey or brown sand, clay loam.	Possible
<i>Centrolepis caespitosa</i>	White sand, clay. Salt flats, wet areas.	Possible
<i>Darwinia foetida</i>	Grey-white sand on swampy, seasonally wet sites	Possible
<i>Dillwynia dillwynioides</i>	Sandy soils. Winter-wet depressions.	Possible
<i>Diuris micrantha</i>	Brown loamy clay. Winter-wet swamps, in shallow water.	Possible
<i>Diuris purdiei</i>	Grey-black sand, moist. Winter-wet swamps.	Possible
<i>Dodonaea hackettiana</i>	Sand. Outcropping limestone.	Unlikely
<i>Drakaea elastica</i>	White or grey sand. Low-lying situations adjoining winter-wet swamps	Possible
<i>Drakaea micrantha</i>	White- grey sand	Possible
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459) PN	Clay, sandy clay. Claypans, seasonally wet flats.	Possible
<i>Eucalyptus balanites</i>	Sandy soils with lateritic gravel.	No

Taxa	Preferred Habitat*	Likelihood to be Present on Site
<i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>	Loam. Flats, hillsides	No
<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>	Grey-white-yellow sand. Flats, seasonally-wet sites	Possible
<i>Lasiopetalum pterocarpum</i>	Dark red-brown loam or clayey sand over granite. On sloping banks near creeklines.	Unlikely
<i>Parsonsia diaphanophleba</i>	Alluvial soils. Along rivers.	No
<i>Schoenus capillifolius</i>	Brown mud. Claypans	No
<i>Stachystemon</i> sp. Keysbrook (R. Archer 17/11/99)	Sandy soils	Possible
<i>Stylidium ireneae</i>	Sandy loam. Valleys near creek lines, woodland, often with Agonis	Unlikely
<i>Stylidium longitubum</i>	Sandy clay, clay. Seasonal wetlands	Possible
<i>Synaphea odocoileops</i>	Brown-orange loam & sandy clay, granite. Swamps, winter-wet areas.	Possible
<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)	Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Possible
<i>Synaphea</i> sp. Pinjarra Plain (A.S. George 17182)	Grey sandy loam or clay, grey-brown clayey sand, brown clayey loam, laterite. Flats, seasonally wet areas, railroad reserves often with wet depressions or drains	Possible
<i>Synaphea</i> sp. Serpentine (G.R. Brand 103)	Loamy soils in low lying areas that are occasionally inundated.	Possible
<i>Synaphea stenoloba</i>	Sandy or sandy clay soils. Winter-wet flats, granite.	Possible
<i>Tetraria australiensis</i>	Grey sand over clay; sandy or clayey lateritic soils. Winter-wet swampy depressions	Possible
<i>Thelymitra variegata</i>	Sandy clay, sand, laterite	No
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	Sand, sandy clay. Winter-wet depressions.	Possible
<i>Verticordia plumosa</i> var. <i>ananeotes</i>	Sandy loam. Seasonally inundated plains	Possible

*sourced from Florabase, DoE SPRAT Database as well as the DPaW database searches

A large number of the significant flora species listed in Table 5 have the potential to occur on the site given the diversity of habitat that includes winter wet swamps and dry sandy upland soils. While the site has been cleared in the past, parts of the northern conservation category wetland and the central ridge have revegetated in Good to Very Good condition.

A search of the DPaW Threatened (TEC) and Priority Ecological Communities (PEC) database and the EPBC Act Protected Matters Report conducted for the site indicated that 3 TECs and one PEC may be present within a 5km radius of the site (Table 6).

Table 6: Threatened and Priority Ecological Communities likely to occur within 5km of the Site

Ecological Community	Description	Status under the Wildlife Conservation Act	Status under the EPBC Act
SCP07	Herb rich saline shrublands in clay pans	TEC (Vulnerable)	TEC (Critically Endangered)
SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain	TEC (Vulnerable)	Not Listed
SCP3c	<i>Corymbia calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, Swan Coastal Plain	TEC (Critically Endangered)	TEC (Endangered)
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	PEC (Priority 3)	Not Listed

3.3 Survey Conditions

The conditions that the survey was undertaken in are presented in Table 7. In summary, there were no constraints to the survey.

Table 7: Statement of Botanical Survey Conditions

ISSUE	CONSTRAINTS (YES/NO); SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No constraints	Dr Paul van der Moezel has extensive survey experience on the Swan Coastal Plain.
Proportion of the flora identified	No constraints	The timing of the survey in late September should have identified most of the native species on the site.
Sources of information (historic/recent or new data)	No constraints	The flora of the Swan Coastal Plain is relatively well documented.
Proportion of the task achieved and further work that may need to be undertaken	No constraints	No follow-up survey required.
Timing/weather/season/cycle	No constraints	Generally slightly below average rainfall in winter 2014. Late September survey ideal for identifying rare orchids and maximising flowering of most species.
Intensity of survey (e.g. In retrospect was the intensity adequate)	No constraints	The small size and open understorey made access and coverage easy.
Completeness (e.g. was relevant area fully surveyed)	No constraints	Approximately 5.5 hours spent on the site.
Resources (e.g. degree of expertise available for plant identification)	No constraints	Experienced botanist undertook plant identifications mostly on site with some identification off-site using standard reference material
Remoteness and/or access problems	No constraints	Easily accessible site traversed entirely on foot.
Availability of contextual (e.g. bioregional) information for the study area.	No constraints	Hedde <i>et al.</i> (1980), Government of Western Australia (2000), Gibson <i>et al.</i> (1994).

Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey.

3.4 Results

3.4.1 Flora

A total of 98 species were recorded during the flora survey (Appendix 1). This total consisted of 80 native species and 18 introduced species (20%). Pasture species in the paddocks were not included. The plant families most represented were the Myrtaceae (myrtle family - 12 species, all native), the Fabaceae (Wattle and Pea family - 10 species including 8 native and 2 introduced) and the Asteraceae (Daisy family - 8 species including 3 native and 5 introduced).

The total number of species recorded in the six quadrats sampled ranged from 5-36 (Appendix 2). The highest species richness was recorded in the upland woodland vegetation types while the wetland vegetation types were very species poor which is typical of the particular wetland types sampled.

None of the species recorded on the site is a Threatened (Declared Rare) flora or Priority species.

3.4.2 Vegetation

Vegetation Complexes

Vegetation Complexes are a broad level of vegetation description which is based on the underlying geomorphology and rainfall (Heddle *et al.*, 1980). The vegetation on the site is part of the Bassendean – Central and South Vegetation Complex (Heddle *et al.*, 1980).

Vegetation Types

Vegetation Types are a finer level of vegetation mapping than the Vegetation Complex and are defined by the composition and structure of the dominant vegetation.

Four vegetation types are mapped on the site (Figures 3) and are described below.

- **EmBi *Eucalyptus marginata/Banksia ilicifolia* Low Open Forest over *Hibbertia hypericoides* Open Low Heath**

This vegetation type occurs on the western end and upper slopes of the remnant vegetation on the central rise. Jarrah (*Eucalyptus marginata*) up to 6m high is the dominant tree species with the presence of Holly-leaved Banksia (*Banksia ilicifolia*) and Woody Pear (*Xylomelum occidentale*) common smaller trees. The presence of *Banksia ilicifolia* and *Melaleuca thymoides* indicate groundwater within a few metres of the surface during winter. *Hibbertia hypericoides* was the dominant shrub species with *Drosera porrecta* and *Desmocladius flexuosus* common herb species. The soils were greyish-brown sand. Quadrat Y1 is representative of this vegetation type.

- **BmBaEm *Banksia menziesii/B. attenuata/Eucalyptus marginata* Low Open Woodland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath**

This is the dominant vegetation type on the central rise occurring on dry sandy soil. *Banksia menziesii* and *B. attenuata* are the main tree species, up to 3-4m high with Jarrah present in patches. Common understorey shrubs include *Hibbertia hypericoides*, *Allocasuarina humilis*, *Acacia sessilis*, *Daviesia triflora* and typical sub-shrubs and herbs include *Burchardia congesta*, *Lomandra*

hermaphrodita, *Trachymene pilosa* and *Desmocladius flexuosus*. *Briza maxima* and *Ursinia anthemoides* are common weeds. Quadrats Y2 and Y3 are representative of this vegetation type.

- **MpAf** ***Melaleuca preissiana* Low Open Woodland over *Astartea fascicularis* Closed Heath**

This vegetation type occurs in low-lying parts of the site on waterlogged black sands. One stand in very good condition occurs near the north-west corner of the site while several other stands in poor quality occur in the broad paddocks on the eastern and southern parts of the property. The stand in very good condition contains Paperbark (*Melaleuca preissiana*) and occasional Spearwood (*Kunzea glabrescens*) up to 4m high in varying density over a dense closed heath of *Astartea fascicularis*. Due to the high density of *Astartea* very few other species occur in this vegetation type. *Lepidosperma longitudinale* and the climber *Cassytha racemosa* were the only other common species recorded. Quadrat Y4 is representative of this vegetation type.

- **Kg** ***Kunzea glabrescens* Tall Open Scrub over bare ground**

Two small stands of this vegetation type occur bordering the MpAf vegetation in the north-west of the site. The Spearwood (*Kunzea glabrescens*) is dense and up to 4m high. As is typical of Spearwood-dominated vegetation the understorey is mostly fine leaf litter and bare sand with very few native species. The soil is black sand and would be slightly more elevated above the watertable than the MpAf vegetation. Quadrat Y5 is representative of this vegetation type

- **ErAf** ***Eucalyptus rudis* Low Open Forest over *Astartea fascicularis* Shrubland**

A small stand of Flooded Gum (*Eucalyptus rudis*) occurs in the north-west corner of the site abutting Yangedi Road. The trees are quite young, 6-9m high, indicating they are all re-growth from a previously cleared event. The understorey is sparse and species poor with *Astartea fascicularis* the dominant native shrub. Most other species were introduced herbs. The soil is grey sand and not waterlogged. Quadrat Y6 is representative of this vegetation type

Floristic Community Types

Floristic Community Types (FCT) are based on the whole floristic composition of the vegetation rather than being determined by soil type and geomorphology (Vegetation Complexes) or the nature of the dominant species (Vegetation Association). The FCT level of vegetation is required to identify whether any of the vegetation on the site is a Threatened or Priority Ecological Community.

Analysis of the FCT was undertaken by comparing the species in each quadrat to the species-Community type table 12 in Gibson *et al.* (1994). The analysis produced a strong correlation for the upland Banksia/Jarrah woodland vegetation types with FCT 28 'Spearwood *Banksia attenuata* woodlands or *Banksia attenuata* – *Eucalyptus* woodland' however this FCT normally occurs on Spearwood sands. Of the FCTs that occur on Bassendean Sands the vegetation is most similar to FCT 23a 'Central *Banksia attenuata* – *B. menziesii* woodlands'. The Jarrah/*Banksia ilicifolia* vegetation type also had strong similarities to FCT 21a 'Central *Banksia attenuata* – *Eucalyptus marginata* woodlands'.

The low species richness in the wetland vegetation types makes it difficult to assign a FCT with any confidence. Twenty-three FCTs occur in wetland soils on the southern Swan Coastal Plain. The MpAf and Kg vegetation types are most likely to be representative of FCT 4 '*Melaleuca preissiana*

damplands' while the Flooded Gum ErAf vegetation type could be FCT 5 'Mixed Shrub damplands' which occasionally contains Flooded Gum.

3.4.3 Vegetation Condition

The vegetation condition over the site was assessed using the condition scale adopted in Bush Forever (Table 4).

The condition of the dryland vegetation on the central raised area was rated as Very Good for the central portion and Good-Degraded for the western and eastern ends. The western Good-Degraded area had a low rating due to the highly disturbed understorey in close proximity to the farm infrastructure. The eastern Good-Degraded area had a low rating due to the past clearing of trees from this area. Parkland cleared dryland areas were rated as Degraded or Completely Degraded.

Most of the remnant wetland vegetated areas were rated as Degraded due to the dominance of weeds among the wetland shrubs. The best condition wetland vegetation was the dense MpAf vegetation in the north-western part of the site.

Table 8: Vegetation Condition Rating Scale.

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

Source: Government of Western Australia, 2000.

3.4.4 Conservation Significance of Flora and Vegetation

Flora

None of the plant species recorded is a Threatened (Declared Rare) or Priority listed flora under the State *Wildlife Conservation Act 1950* or the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*.

Vegetation

The vegetation on the site is not listed as regionally significant in Bush Forever (Government of Western Australia, 2000). Bush Forever Site No. 378 'Henderson Road Bushland, Peel Estate' is located adjacent to the southwestern boundary of the site. Bush Forever Site 378 contains 116.5ha of bushland and includes upland *Banksia* woodlands with Jarrah and *Banksia ilicifolia* and wetland Paperbark and Spearwood damplands from both the Bassendean – Central and South and the Southern River vegetation complexes. The vegetation types on 253 Yangedi Road (this report) therefore could be considered protected in the local area.

The vegetation on the site belongs to the Bassendean - Central and South Vegetation Complex. The current extent of the Bassendean - Central and South Vegetation Complex remaining in the Swan Coastal Plain portion of the Perth Metropolitan Region is 10,919ha (24% of the original extent) of which 5,883ha or 13% has some existing or proposed protection. These percentages are above the Bush Forever targets of protecting at least 400ha or 10% of each vegetation complex in the Perth Metropolitan Region.

The upland vegetation is considered most likely to be representative of FCT 23a with some similarities of the Jarrah/*Banksia ilicifolia* vegetation to FCT 21a. The wetland vegetation was more difficult to assign but is most likely to represent FCT 4 and possibly FCT 5.

Within the Shire of Serpentine-Jarrahdale 2707ha of vegetation from the Bassendean - Central and South Vegetation Complex remains which represents 27% of the original extent within the Shire.

Vegetation from the Bassendean-Central and South Vegetation Complex including dryland and wetland Floristic Community Types similar to those that are on the site are protected in good condition within the adjoining Bush Forever Site 378.

The very good condition wetland vegetation in the north-west corner of the site is identified as a Conservation Category wetland. As such the area is an Environmentally Sensitive Area and has a high degree of environmental values.

Linkages

According to the Shire of Serpentine-Jarrahdale Local Biodiversity Strategy the vegetation on the site is located just outside one of the Regional Linkages identified in the Strategy (Ironbark Environmental, 2008). The adjacent Regional Linkage connects many small, fragmented parcels on private land with larger Bush Forever sites to the south and drainage lines to the north-east and south-east which connect into the eastern parts of the Swan Coastal Plain.

4. CONCLUSIONS AND SUMMARY

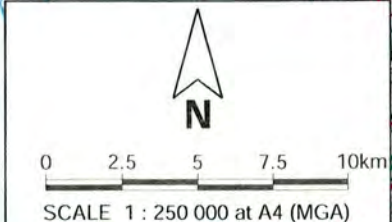
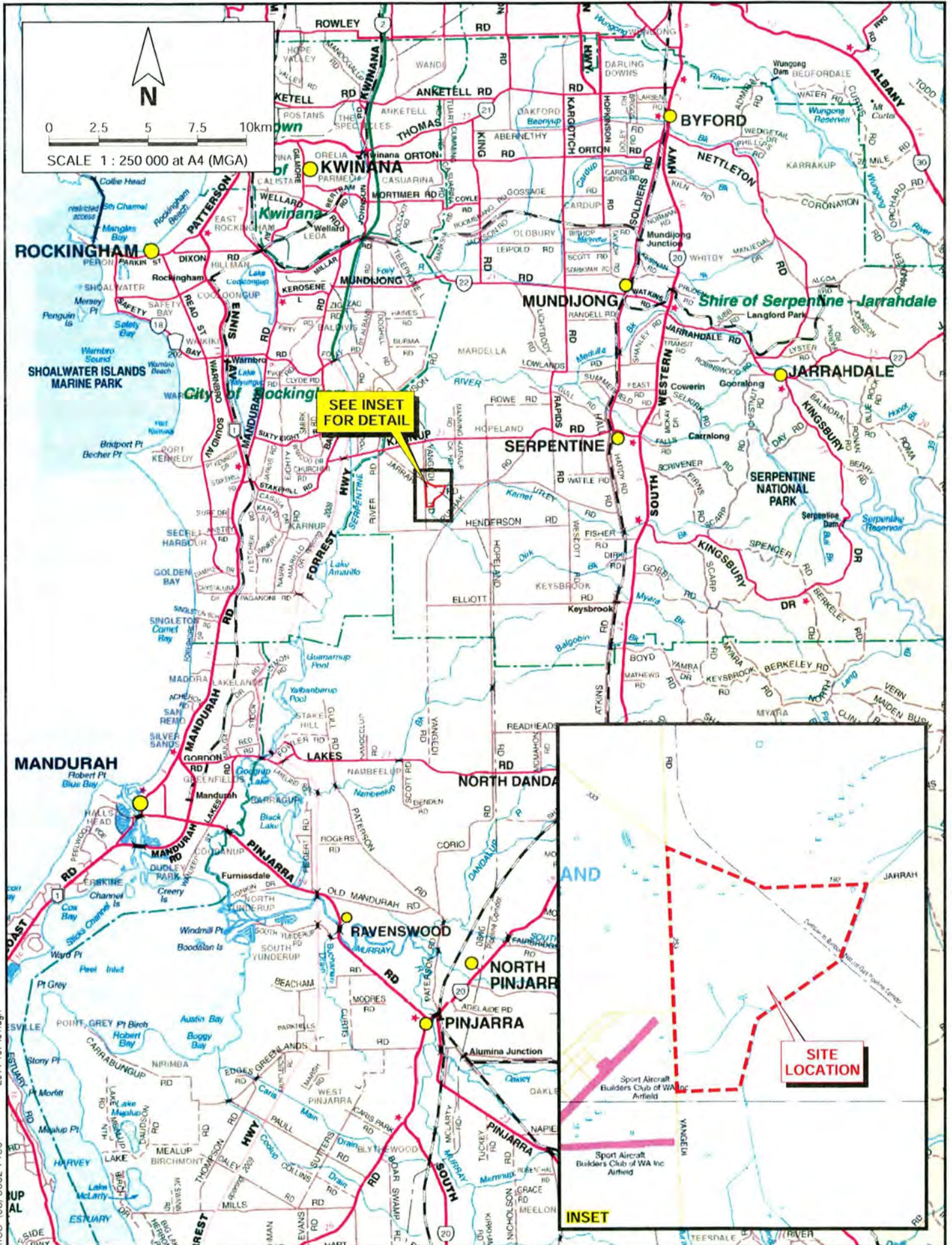
The flora and vegetation survey of 253 Yangedi Road, Hopelands resulted in the following findings:

- A total of 98 plant species was recorded including 80 native and 18 (20%) introduced species. The low species richness overall and in the six quadrats reflects the general poor quality of most of the vegetation;
- None of the species is a Threatened (Declared Rare) or Priority listed species;
- Five vegetation types were described and mapped for the site including two upland woodland types - Jarrah/*Banksia ilicifolia* woodland and *Banksia attenuata*-*B. menziesii* woodland; and three wetland vegetation types - Paperbark (*Melaleuca preissiana*) woodlands, Spearwood (*Kunzea glabrescens*) Scrub and a Flooded Gum (*Eucalyptus rudis*) woodland;
- The condition of the vegetation on the site was rated as Very Good for most of the Jarrah woodland, some of the *Banksia* woodland and one area of Paperbark woodland. The remaining patches of native vegetation ranged from Good to Degraded where large sections of the understorey and/or the tree canopy has been removed to Degraded and Completely Degraded areas in highly disturbed paddocks;
- The vegetation belongs to the Bassendean-Central and South vegetation complex which has approximately 29.5% of its original extent remaining on the Southern Swan Coastal Plain. The amount remaining is above the EPA's target for retaining at least 10% of each vegetation complex. The site was not identified in Bush Forever as being regionally significant;
- The upland vegetation is considered to be representative of Floristic Community Type 23a with some similarities to FCT 21a. The wetland vegetation is considered to be representative of FCT 4 and possibly FCT 5. None of the FCTs is listed as a Threatened or Priority Ecological Community;
- Vegetation from the Bassendean-Central and South vegetation complex with similar vegetation types are represented in the adjoining Bush Forever Site No. 378 'Henderson Road Bushland, Peel Estate';
- The very good condition wetland vegetation in the north-west part of the site is within a Conservation Category Wetland and therefore has important conservation values; and
- The vegetation on the site is adjacent to, but not within, one of the Regional Linkages identified in the Shire of Serpentine-Jarrahdale Local Biodiversity Strategy.

5. REFERENCES

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- Landgate (2014). WA Atlas website <https://www2.landgate.wa.gov.au/bmvf/app/waatlas/>.

FIGURES



SEE INSET FOR DETAIL

SITE LOCATION

INSET

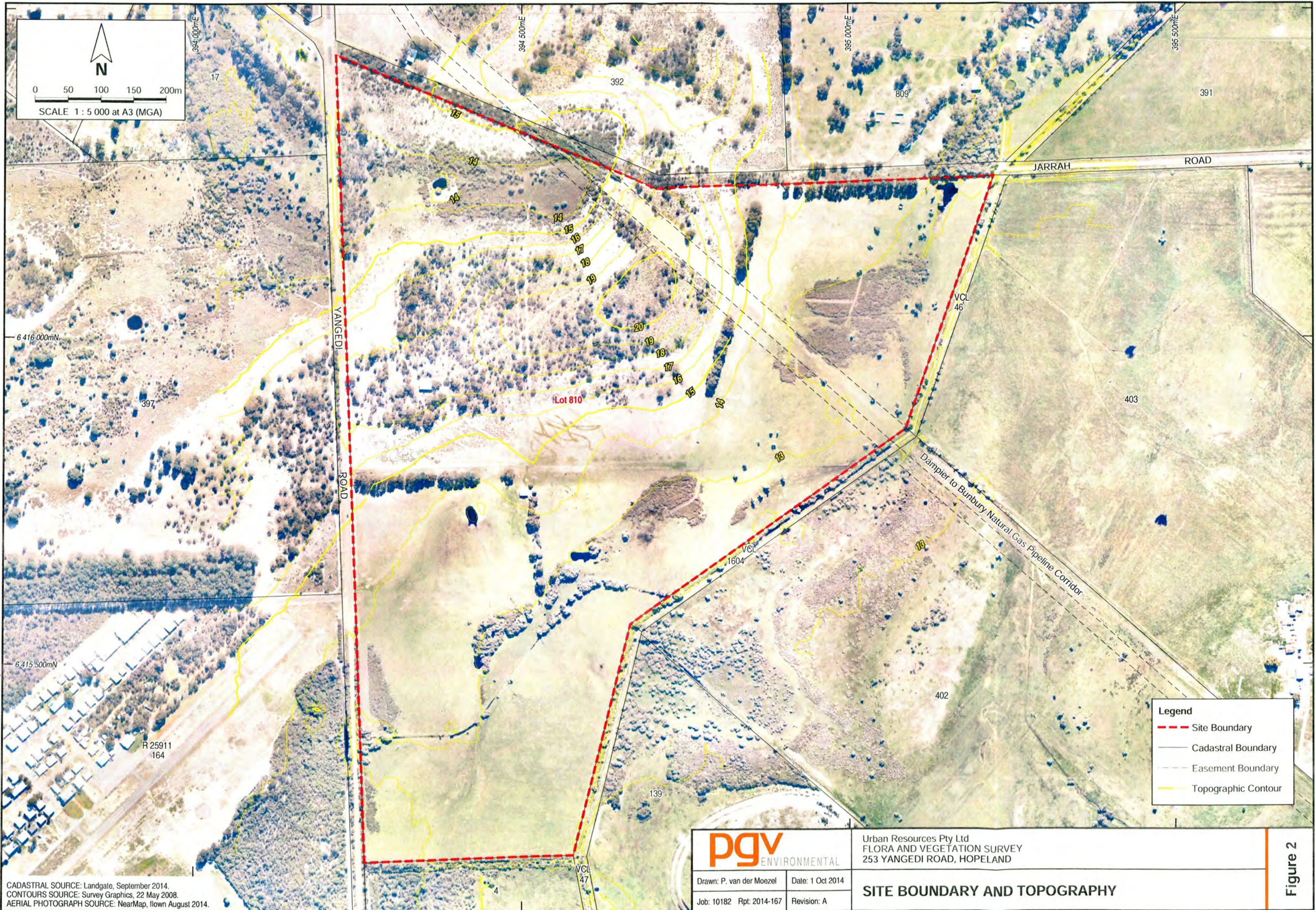
PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-167-101.dgn

Drawn: P. van der Moezel Job: 10182 Rpt: 2014-167	Date: 1 Oct 2014 Revision: A

Urban Resources Pty Ltd
 FLORA AND VEGETATION SURVEY
 253 YANGEDI ROAD, HOPELAND

SITE LOCATION

Figure 1



0 50 100 150 200m

 SCALE 1 : 5 000 at A3 (MGA)

Legend

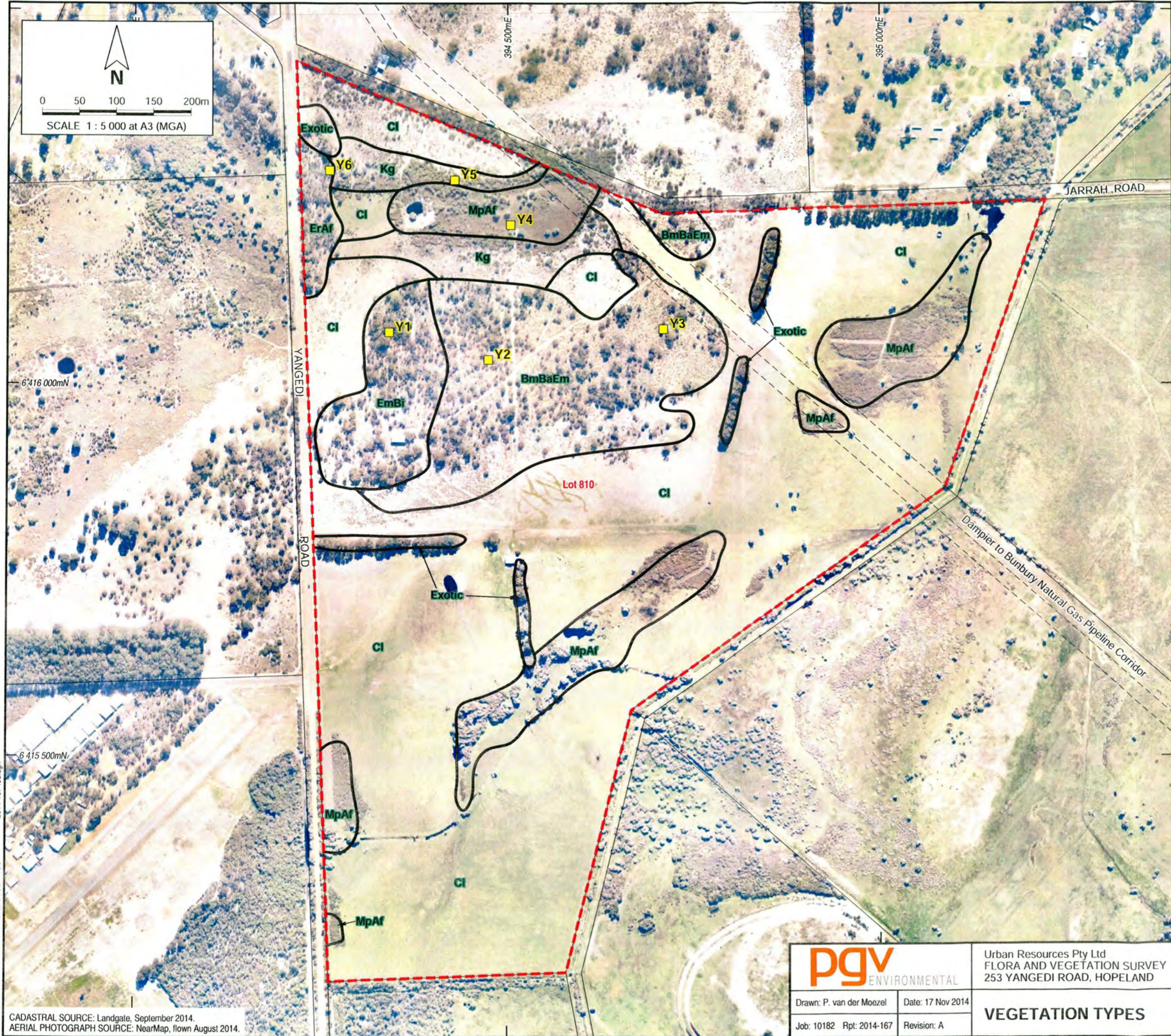
- - - Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Topographic Contour

		Urban Resources Pty Ltd FLORA AND VEGETATION SURVEY 253 YANGEDI ROAD, HOPELAND
Drawn: P. van der Moesel	Date: 1 Oct 2014	SITE BOUNDARY AND TOPOGRAPHY
Job: 10182 Rpt: 2014-167	Revision: A	

PINPOINT CARTOGRAPHICS (08) 9562 7136
 2014-167-02.dgn

CADASTRAL SOURCE: Landgate, September 2014.
 CONTOURS SOURCE: Survey Graphics, 22 May 2008.
 AERIAL PHOTOGRAPH SOURCE: NearMap, fIown August 2014.

Figure 2



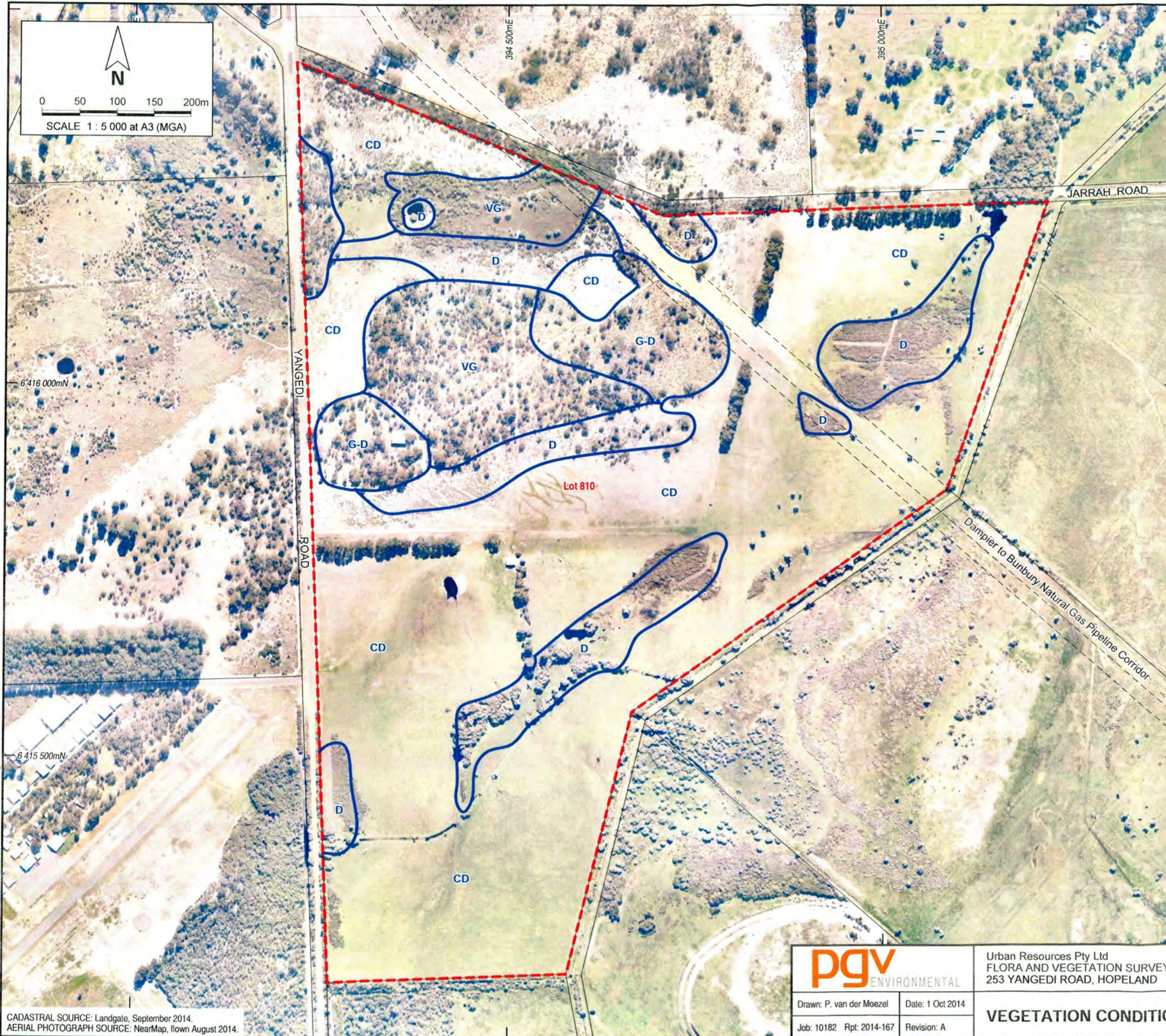
- Legend**
- - - Site Boundary
 - Cadastral Boundary
 - Easement Boundary
 - Quadrat Location
 - Vegetation Type Boundary
 - Mp Vegetation Type
- Vegetation Types**
- EmBi**
Eucalyptus marginata/Banksia ilicifolia Low Open Forest over *Hibbertia hypericoides* Open Low Heath
- BmBaEm**
Banksia menziesii/B. attenuata/Eucalyptus marginata Low Open Woodland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath
- MpAf**
Melaleuca preissiana Low Open Woodland over *Astartea fascicularis* Closed Heath
- ErAf**
Eucalyptus rudis Low Open Forest over *Astartea fascicularis* Shrubland
- Kg**
Kunzea glabrescens Tall Open Scrub over bare ground

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-167-003.dgn

CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

pgv ENVIRONMENTAL		Urban Resources Pty Ltd FLORA AND VEGETATION SURVEY 253 YANGEDI ROAD, HOPELAND
Drawn: P. van der Moezel	Date: 17 Nov 2014	VEGETATION TYPES
Job: 10182 Rpt: 2014-167	Revision: A	

Figure 3



Legend

- - - Site Boundary
- Cadastral Boundary
- Easement Boundary
- Quadrat Location
- Vegetation Condition Boundary
- VG Vegetation Condition

Vegetation Condition
(SOURCE: Bush Forever, Govt. of W.A., 2000)

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

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-167-04.dgn

CADASTRAL SOURCE: Landgate, September 2014.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

pgv ENVIRONMENTAL

Drawn: P. van der Moezel Date: 1 Oct 2014

Job: 10182 Rpt: 2014-167 Revision: A

Urban Resources Pty Ltd
FLORA AND VEGETATION SURVEY
253 YANGEDI ROAD, HOPELAND

VEGETATION CONDITION

Figure 4

APPENDIX 1

Species List

SPECIES LIST – Lot 253 Yangedi Road

MONOCOTYLEDONS

ASPARAGACEAE

Chamaescilla corymbosa
Laxmannia squarrosa
Lomandra hermaphrodita
Lomandra preissii
Thysanotus patersonii

COLCHICACEAE

Burchardia congesta

CYPERACEAE

Lepidosperma longitudinale
Mesomelaena pseudostygia
Schoenus curvifolius

DASYPOGONACEAE

Calectasia narragara
Dasypogon bromeliifolius

HAEMODORACEAE

Anigozanthos humilis
Anigozanthos manglesii
Conostylis aculeata subsp. *aculeata*
Conostylis setigera subsp. *setigera*
Haemodorum sp. (young seedling)

IRIDACEAE

**Gladiolus caryophyllaceus*
Patersonia juncea
Patersonia occidentalis
**Romulea rosea*

ORCHIDACEAE

Caladenia discoidea
Caladenia flava
**Disa bracteata*
Pterostylis vittata
Pterostylis sp. aff. *nana*
Pyrorchis nigricans

POACEAE

Amphipogon turbinatus
**Briza maxima*
**Bromus diandrus*
**Ehrharta calycina*
**Ehrharta longiflora*
Neurachne alopecuroidea

RESTIONACEAE

Desmocladus fasciculatus
Desmocladus flexuosus

XANTHORRHOEACEAE

Xanthorrhoea preissii

DICOTYLEDONS

APIACEAE

Trachymene pilosa
Xanthosia huegelii

ASTERACEAE

**Arctotheca calendula*
**Hypochaeris glabra*
Lagenophora huegelii
**Podotheca angustifolia*
Siloxerus humifusus
**Taraxacum officinale*
**Ursinia anthemoides*
Quinetia urvillei

CARYOPHYLLACEAE

**Petrorhagia dubia*

CASUARINACEAE

Allocasuarina fraseriana
Allocasuarina humilis

CRASSULACEAE

Crassula colorata

DILLENIACEAE

Hibbertia hypericoides

DROSERACEAE

Drosera erythrorhiza
Drosera glanduligera
Drosera menziesii subsp. *penicillaris*
Drosera porrecta

ELAEOCARPACEAE

Tetralochea hirsuta

ERICACEAE

Astroloma macrocalyx
Leucopogon polymorphus

EUPHORBIACEAE

Monotaxis grandiflora var. *grandiflora*

FABACEAE

Acacia sessilis
Acacia willdenowiana
Bossiaea eriocarpa
Daviesia triflora
Gompholobium tomentosum
Hovea trisperma var. *trisperma*
Jacksonia furcellata
Kennedia prostrata
**Lotus subbiflorus*
**Vicia sativa*

GERANIACEAE

**Erodium cicutarium*

GOODENIACEAE

Dampiera linearis

LAMIACEAE

Hemiandra pungens

LAURACEAE

Cassytha racemosa

MYRTACEAE

Astartea fascicularis
Calytrix leschenaultii
Eremaea ebracteata
Eucalyptus marginata

Eucalyptus rudis

Hypocalymma angustifolium

Kunzea glabrescens

Melaleuca preissiana

Melaleuca raphiophylla

Melaleuca thymoides

Regelia inops

Scholtzia involucrata

OROBANCHACEAE

**Orobanche minor*

PHYLLANTHACEAE

Poranthera microphylla

PITTOSPORACEAE

Billardiera heterophylla

PROTEACEAE

Adenanthos cygnorum
Banksia attenuata
Banksia ilicifolia
Banksia menziesii
Petrophile linearis
Xylomelum occidentale

RUTACEAE

Philothea spicata

SCROPHULARIACEAE

**Dischisma capitatum*

STYLIDIACEAE

Stylidium brunonianum
Stylidium piliferum
Stylidium repens

APPENDIX 2

Quadrat Data

QUADRAT Y1

50 394341 E 6416069 N

Vegetation: *Eucalyptus marginata*/*Banksia ilicifolia* Low Open Forest over
Hibbertia hypericoides Open Low Heath

Condition: Very Good

Soil Type: Greyish-brown sand

Landform: Upper slopes of low rise



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
<i>Eucalyptus marginata</i>	6	10
<i>Banksia ilicifolia</i>	4	20
<i>Melaleuca thymoides</i>	2	2
<i>Banksia menziesii</i>	1	1
* <i>Ehrharta calycina</i>	0.6	1
<i>Lomandra preissii</i>	0.6	<1
<i>Hibbertia hypericoides</i>	0.5	30
<i>Burchardia congesta</i>	0.4	<1
* <i>Briza maxima</i>	0.3	5
<i>Drosera porrecta</i>	0.3	4
<i>Patersonia occidentalis</i>	0.3	<1
<i>Acacia willdenowiana</i>	0.3	<1
<i>Gompholobium tomentosum</i>	0.3	<1
<i>Allocasuarina fraseriana</i> (seedling)	0.3	<1
<i>Mesomelaena pseudostygia</i>	0.3	<1
* <i>Vicia sativa</i>	0.2	2
<i>Dampiera linearis</i>	0.2	1
* <i>Lotus subbiflorus</i>	0.2	<1

SPECIES	HEIGHT (m)	COVER (%)
<i>Lomandra hermaphrodita</i>	0.2	<1
* <i>Romulea rosea</i>	0.2	<1
<i>Desmodium flexuosus</i>	0.1	2
<i>Kennedia prostrata</i>	0.1	<1
<i>Caladenia flava</i>	0.1	<1
<i>Xanthosia huegelii</i>	0.1	<1
<i>Chamaescilla corymbosa</i>	0.1	<1
<i>Trachymene pilosa</i>	0.1	<1
<i>Lagenophora huegelii</i>	Flat	<1
<i>Stylidium piliferum</i>	Flat	1
* <i>Taraxacum officinale</i>	Flat	<1
* <i>Hypochaeris glabra</i>	Flat	<1
<i>Billardiera heterophylla</i>	Climber	<1

* introduced species

QUADRAT Y2

50 394474 E 6416032 N

Vegetation: *Banksia menziesii* Low Open Woodland over *Hibbertia hypericoides*/*Allocasuarina humilis* Open Low Heath
Condition: Good to Very Good
Soil Type: Grey sand over orange-grey sand
Landform: Top of low rise



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
<i>Banksia menziesii</i>	3-4	20
<i>Allocasuarina humilis</i>	1.2	5
<i>Acacia sessilis</i>	0.8	<1
<i>Hibbertia hypericoides</i>	0.5	40
<i>Anigozanthos manglesii</i>	0.4	<1
<i>Hovea trisperma</i>	0.4	<1
<i>Patersonia occidentalis</i>	0.4	<1
<i>Burchardia congesta</i>	0.4	<1
<i>Gompholobium tomentosum</i>	0.4	<1
<i>Eremaea ebracteata</i>	0.3	1
<i>Bossiaea eriocarpa</i>	0.3	1
<i>Kunzea glabrescens</i>	0.3	1
<i>Daviesia triflora</i>	0.3	<1
<i>Mesomelaena pseudostygia</i>	0.3	<1
<i>Schoenus curvifolius</i>	0.3	<1
<i>Drosera porrecta</i>	0.2	1
<i>Lomandra hermaphrodita</i>	0.2	<1

SPECIES	HEIGHT (m)	COVER (%)
<i>Anigozanthos humilis</i>	0.2	<1
<i>Trachymene pilosa</i>	0.1	1
* <i>Ursinia anthemoides</i>	0.1	1
<i>Leucopogon polymorphus</i>	0.1	<1
<i>Stylidium repens</i>	0.1	<1
<i>Chamaescilla corymbosa</i>	0.1	<1
<i>Desmodcladus flexuosus</i>	0.1	<1
<i>Laxmannia squarrosa</i>	0.1	<1
* <i>Briza maxima</i>	0.1	<1
<i>Conostylis setigera</i>	0.1	<1
<i>Patersonia juncea</i>	0.1	<1
<i>Quinetia urvillei</i>	0.1	<1
* <i>Lotus subbiflorus</i>	0.1	<1
<i>Calytrix leschenaultii</i>	0.1	<1
<i>Acacia willdenowiana</i>	0.1	<1
<i>Xanthosia huegelii</i>	0.1	<1
<i>Siloxerus humifusus</i>	<0.1	<1
<i>Stylidium piliferum</i>	Flat	<1
<i>Thysanotus patersonii</i>	Climber	<1

* introduced species

QUADRAT Y3

50 394708 E 6416073 N

Vegetation: *Banksia menziesii*/*Eucalyptus marginata* Low Open Woodland over
Hibbertia hypericoides/*Allocasuarina humilis* Open Low Heath

Condition: Good-Degraded

Soil Type: Light yellow sand

Landform: Top of low rise



Quadrat (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
<i>Eucalyptus marginata</i>	6	5
<i>Banksia menziesii</i>	3	5
<i>Allocasuarina humilis</i>	1.2	5
* <i>Ehrharta longiflora</i>	0.6	1
<i>Acacia sessilis</i>	0.5	1
* <i>Gladiolus caryophyllaceus</i>	0.5	<1
<i>Hibbertia hypericoides</i>	0.4	40
* <i>Romulea rosea</i>	0.4	4
<i>Burchardia congesta</i>	0.4	<1
<i>Astroloma macrocalyx</i>	0.4	<1
<i>Daviesia triflora</i>	0.3	1
<i>Lomandra hermaphrodita</i>	0.3	<1
<i>Mesomelaena pseudostygia</i>	0.3	<1
<i>Xanthorrhoea preissii</i>	0.3	<1
* <i>Ursinia anthemoides</i>	0.2	5
<i>Neurachne alopecuroidea</i>	0.2	1
<i>Desmocladius flexuosus</i>	0.2	1
* <i>Briza maxima</i>	0.2	1
<i>Caladenia flava</i>	0.2	<1

<i>Conostylis setigera</i>	0.2	<1
* <i>Bromus diandrus</i>	0.2	<1
<i>Petrophile linearis</i>	0.2	<1
* <i>Lotus subbiflorus</i>	0.2	<1
<i>Poranthera microphylla</i>	0.1	1
<i>Laxmannia squarrosa</i>	0.1	<1
<i>Xanthosia huegelii</i>	0.1	<1
<i>Trachymene pilosa</i>	<0.1	<1
* <i>Hypochaeris glabra</i>	Flat	1
* <i>Taraxacum officinale</i>	Flat	<1
<i>Drosera menziesii</i>	Climber	<1

* introduced species

QUADRAT Y4

50 394504 E 6416213 N

Vegetation: *Melaleuca preissiana* Low Open Woodland over *Astartea fascicularis*
Closed Heath
Condition: Very Good
Soil Type: Greyish black sand
Landform: Flat



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
<i>Melaleuca preissiana</i>	4	10
<i>Astartea fascicularis</i>	1.2	90
<i>Lepidosperma longitudinale</i>	0.6	5
<i>Kunzea glabrescens</i>	0.6	2
* <i>Hypochoeris glabra</i>	Flat	5
<i>Cassytha racemosa</i>	Climber	5

* introduced species

QUADRAT Y5

50 394429 E 6416273 N

Vegetation: *Kunzea glabrescens* Tall Open Scrub over bare ground
Condition: Good
Soil Type: Dark brownish black sand
Landform: Flat



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
<i>Kunzea glabrescens</i>	4	70
<i>Pterostylis</i> sp. aff. <i>nana</i>	0.3	<1
<i>Caladenia flava</i>	0.1	<1
* <i>Ursinia anthemoides</i>	0.1	<1
* <i>Hypochaeris glabra</i>	Flat	1

* introduced species

QUADRAT Y6

50 394261 E 6416286 N

Vegetation: *Eucalyptus rudis* Low Open Forest over *Astartea fascicularis*
Shrubland

Condition: Good

Soil Type: Dark brownish grey sand

Landform: Flat



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
<i>Eucalyptus rudis</i>	6-9	40
<i>Astartea fascicularis</i>	1.8	20
* <i>Romulea rosea</i>	0.4	2
* <i>Vicia sativa</i>	0.2	<1
* <i>Ursinia anthemoides</i>	0.1	<1
* <i>Disa bracteata</i>	0.1	<1
<i>Cassytha racemosa</i>	Climber	<1

* introduced species

APPENDIX 5
BLACK COCKATOO HABITAT
ASSESSMENT

253 YANGEDI ROAD, HOPELANDS

BLACK COCKATOO HABITAT ASSESSMENT

Prepared for: Urban Resources Pty Ltd

Report Date: 16 October 2014

Version: 1

Report No. 2014-166

PGV
ENVIRONMENTAL

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1 INTRODUCTION

1.1 Background

Urban Resources Pty Ltd is proposing to construct a sand extraction pit at 253 Yangedi Road, Hopelands (the site). The site is 72ha in size and is approximately 50km from the Perth Central Business District and 25km north of Mandurah (Figure 1). The site is located in the Shire of Serpentine-Jarrahdale and is bound by Yangedi Road and Serpentine Airfield to the west and private landholdings to the north, east and south (Figure 1). The Dampier Bunbury Natural Gas Pipeline (DBNGP) traverses the north-east section of the site.

The site is zoned 'Rural' under the Metropolitan Region Scheme (MRS) and under the Shire of Serpentine-Jarrahdale Town Planning Scheme 2 (TPS2) it is zoned 'Rural' and in a special control area for poultry farms. The adjacent land is zoned 'Rural' under the MRS and TPS2.

The site has been identified as possibly supporting habitat for Black Cockatoo species that are listed under the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (PGV Environmental, 2014).

The three listed species of Black Cockatoo are:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (Endangered);
- Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) (Vulnerable); and
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable).

PGV Environmental was commissioned by Urban Resources Pty Ltd to undertake a Black Cockatoo Habitat Assessment of the site (this report).

1.2 Scope of Works

The Black Cockatoo Habitat Assessment has been prepared by PGV Environmental to:

- Describe the Black Cockatoo habitat on the site;
- Assess the impact of the proposed sand extraction pit on the Black Cockatoos; and
- Ascertain whether referral of the proposed sand extraction pit is required under the EPBC Act.

2 BLACK COCKATOOS

2.1 Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Black Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of *Banksia*, *Dryandra*, *Hakea*, *Eucalyptus*, *Grevillea*, *Pinus* and *Allocasuarina* spp. It is nomadic, often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 – 12m above the ground and have an entrance of 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell). Eggs are laid from July to October, with incubation lasting 29 days (DoE, 2014).

The site is within the modelled distribution and breeding range for this species (SEWPaC, 2012).

2.2 Baudin's Black Cockatoo (*Calyptorhynchus baudinii*)

Baudin's Black Cockatoo is most common in the far south-west of Western Australia. It is known to breed from the southern forests north to Collie and east to near Kojonup. Baudin's Black Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) woodlands where it feeds mainly on Marri seeds and various Proteaceous species (Johnstone and Kirkby, 2011).

The site is within the modelled distribution for Baudin's Black Cockatoos, however it is outside of the predicted breeding range (SEWPaC, 2012).

2.3 Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

Forest Red-tailed Black Cockatoos are endemic to the humid to sub-humid south-west of Western Australia (SEWPaC, 2012). The range of Forest Red-tailed Black Cockatoos is bound by Gingin in the north to Mt Helena, Christmas Tree Well, West Dale, North Bannister, Mt Saddleback, Kojonup, Rocky Gully, upper King River and Green Range (east of Albany) (SEWPaC, 2012; DoE, 2014). It nests in tree hollows with a depth of 1-5m, that are predominately Marri, Jarrah and Karri (*E. diversicolor*) and it feeds primarily on the seeds of Marri and Jarrah (Johnstone and Kirkby, 2011).

The site is within the modelled distribution for this species (SEWPaC, 2012).

3 METHODOLOGY

PGV Environmental undertook the Black Cockatoo Habitat Assessment in accordance with the *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) and the methodology that is outlined in the SPRAT Database for each of the Black Cockatoo species for Black Cockatoo Habitat Assessments.

A site visit was undertaken by PGV Environmental on 25 September 2014. The site was traversed on foot and information on Black Cockatoo foraging, roosting and breeding habitat was assessed.

The extent, type and quality of the vegetation present, including the presence and extent of plants known to be used by Black Cockatoos, was investigated for this assessment using flora and vegetation studies conducted on the site by PGV Environmental on 22 September 2014.

The quality of the vegetation was determined in the context of foraging habitat for Black Cockatoos. During the site visit a search for feeding signs or feeding debris such as 'chewed' *Banksia* cones and Jarrah nuts was undertaken.

The site was also searched for evidence of roosting including areas of droppings, moulted feathers, feather down or clippings from branches under trees.

Breeding habitat is defined in the Black Cockatoo Referral Guidelines as trees of species known to support breeding within the range of the Black Cockatoo species which either have a suitable nest hollow OR are of a suitable diameter at breast height (DBH) to develop a nest hollow. For most tree species the suitable DBH is 500mm. A Significant Tree Survey assessment was undertaken to identify trees within the site that have a DBH of 500mm or greater. The location, species, tree trunk DBH and any other important descriptive information about each suitable tree located within the site was recorded. The presence of hollows or spouts was also recorded. Any hollows or spouts found were assessed from the ground and therefore those deemed suitable for breeding by Black Cockatoos may not be suitable upon closer inspection.

4 BLACK COCKATOO HABITAT

4.1 Habitat definitions

'Foraging habitat' for Black Cockatoos is determined from the plant species that are present on the site and evidence of feeding such as direct observation of birds or by chewed nuts and cones. 'Roosting habitat' is usually evident due to the presence of Black Cockatoos on the site in the evening and early morning and of scat under the roosting area. 'Breeding habitat' is defined as trees of species known to support breeding within the range of the species which either have a suitable nest hollow OR have a DBH of 500mm or greater.

4.2 Foraging

A survey of the flora and vegetation present on the site was undertaken by Dr Paul van der Moezel from PGV Environmental on 22 September 2014. There are six native species recorded on the site that are recognised as foraging habitat for Black Cockatoos (Valentine and Stock, 2008; Groom, 2011). These are listed in Table 1.

Table 1: Foraging Species for Black Cockatoos Recorded on the Site

Species	Common Name
<i>Eucalyptus marginata</i>	Jarrah
<i>Allocasuarina fraseriana</i>	Sheoak
<i>Banksia attenuata</i>	Candlestick Banksia
<i>Banksia ilicifolia</i>	Holly-leaf Banksia
<i>Banksia menziesii</i>	Firewood Banksia
<i>Xanthorrhoea preissii</i>	Grass Tree

PGV Environmental mapped four vegetation types on the site (Figure 2). These are described in Table 2.

Table 2: The Vegetation Types Mapped on the Site

Vegetation Type	Description
EmBi	<i>Eucalyptus marginata</i> / <i>Banksia ilicifolia</i> Low Open Forest over <i>Hibbertia hypericoides</i> Open Low Heath
BmBaEm	<i>Banksia menziesii</i> / <i>B. attenuata</i> / <i>Eucalyptus marginata</i> Low Open Woodland over <i>Hibbertia hypericoides</i> / <i>Allocasuarina humilis</i> Open Low Heath
MpAf	<i>Melaleuca preissiana</i> Low Open Woodland over <i>Astartea fascicularis</i> Closed Heath
ErAf	<i>Eucalyptus rudis</i> Low Open Forest over <i>Astartea fascicularis</i> Shrubland

Two of the vegetation types have foraging species as one of the main components in the vegetation. The vegetation consisting of foraging species are shown in Plates 1 and 2.

Plate 1: Banksia Woodland on the Site



Plate 2: Jarrah Trees on the Site



The condition of the vegetation on the site was assessed by PGV Environmental on 22 September 2014 according to the Bush Forever rating scale shown in Table 3.

Table 3: Vegetation Condition Rating Scale

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

Source: Government of Western Australia, 2000.

The majority of the site consisted of paddocks in Completely Degraded condition due to grazing by cows. The site contained areas of *Melaleuca* woodlands in Degraded Condition with one area in the north in Very Good Condition. The vegetation types consisting of foraging species contained an area in the centre of the site with vegetation in Very Good Condition (Figure 3). To the east and west of this area were two areas in Good-Degraded Condition with an area to the south and to the north-east in Degraded Condition.

There was no evidence found of foraging by Black Cockatoos on *Banksia* cones on the site during the site visit by PGV Environmental. There was an abundance of fresh *Banksia* cones scattered on the ground within the *Banksia* Woodlands, however none were observed to display chew marks characteristic of Black Cockatoos (Plate 3). There was evidence observed of Black Cockatoos foraging on Jarrah nuts underneath one Jarrah tree on the site (Tree Number 24; Plate 4, Figure 4). The Forest Red-tailed Black Cockatoos are likely to forage predominantly in the Jarrah Woodland while Carnaby's Black Cockatoos forage in *Eucalyptus* and *Banksia* Woodland areas. Baudin's Black Cockatoos prefer Marri nuts, which were not present on the site, however also forage on *Banksia* cones. The extent of foraging habitat on the site was calculated as approximately 12.58ha and is shown in Figure 4.

Plate 3: A Banksia Cone on the Site Showing no Evidence of Foraging



Plate 4: Evidence of Foraging by Black Cockatoos on Jarrah Nuts on the Site



The Black Cockatoo Referral Guidelines refer to the quality of the foraging habitat as an important characteristic in determining the significance of the impact. However, there is no guidance as to how the quality is determined in the Black Cockatoo Referral Guidelines other than specifying that 'quality' foraging habitat refers to the use of the habitat by Black Cockatoos rather than the overall quality of the vegetation which would normally be described using understorey as well as tree canopy. In the absence of any guidance on determining foraging habitat quality PGV Environmental developed a foraging habitat matrix that rates the quality on the basis of the energy resource of the vegetation types, the condition of the vegetation and whether or not foraging has been observed in each vegetation type on the site (Table 4). PGV Environmental has used the matrix in several assessments previously and in referrals under the EPBC Act.

Table 4: Foraging Value Rating Matrix

Vegetation Type	Vegetation Condition	Foraging Observed	Foraging Value
High Resource eg. Banksia woodland Marri Woodland mixed Jarrah/Banksia mixed Jarrah/Marri	VG-E	Y	Excellent
		N	Very Good
	G	Y	Very Good
		N	Good
	D-CD	Y	Good
		N	Good
Medium Resource eg. Jarrah woodland Parrot Bush Heath	VG-E	Y	Very Good
		N	Good
	G	Y	Good
		N	Poor
	D-CD	Y	Good
		N	Poor
Low Resource eg. Mixed Tuart/Jarrah Woodland Tuart woodland	VG-E	Y	Good
		N	Poor
	G	Y	Good
		N	Poor
	D-CD	Y	Good
		N	Poor

According to the Foraging Value Rating Matrix the mixed *Banksia* and Jarrah (*Eucalyptus marginata*) woodlands are rated as High Resource vegetation types for foraging by Black Cockatoos. Applying the various vegetation conditions on the site and the fact that foraging evidence was observed in one of these areas the Foraging Values on the site range from Good to Very Good within the *Banksia*/Jarrah woodlands on the site (Figure 4). Approximately 7.09ha of foraging habitat is of Very Good foraging value and approximately 5.49ha is of Good foraging value (Table 5).

Table 5: The Foraging Values Located on the Site

Foraging Value	Approximate Area (ha)
Excellent	0
Very Good	7.09
Good	5.49
Poor	0
Total	12.58

4.3 Roosting

The site does not contain a known roosting site for Carnaby's Black Cockatoos (DoP, 2011). No evidence of the site being utilised as roosting habitat by Black Cockatoos was observed during the site visit.

4.4 Breeding

Black Cockatoos are known to breed in hollows of large eucalypts. The site is not known as a breeding site for Carnaby's Black Cockatoos (DoP, 2011) and is outside of the breeding range for Baudin's Black Cockatoos (SEWPaC, 2012). No evidence of breeding by Black Cockatoos was observed on the site by PGV Environmental in 2014.

PGV Environmental recorded six trees with hollows, one with a potential hollow and one with a spout only. One of the trees that had a few hollows contained a bee hive, preventing this tree from being utilised by cockatoos, and one tree contained a hollow that is utilised by a pair of Australian Ringneck Parrots (*Barnardius zonarius*). Out of the remaining five trees that contained hollows or spouts two trees (Tree Number 2 and 28) had spouts that were potentially large enough to be utilised by Black Cockatoos. Tree Number 2 also contained numerous small hollows however they were unsuitable for use by Black Cockatoos.

The Black Cockatoo Referral Guidelines define trees of certain species with a DBH of 500mm or greater as breeding habitat regardless of the presence or not of hollows. The theory behind this definition is the concept that while the trees may not currently contain hollows they are mature enough that in the next 50 years or so a hollow might form and be of use to Black Cockatoos for the purposes of breeding.

The PGV Environmental survey recorded 28 trees that are classified as potential breeding habitat. These trees consisted of 25 Jarrah (*Eucalyptus marginata*) and three Standing Dead Eucalypt Trees, presumably Jarrah.

The details of the significant trees on the site are in Appendix 1 and are shown on Figure 4.

5 REGIONAL CONTEXT

To assist in determining the significance of any impact on Black Cockatoo habitat on the site an assessment of Black Cockatoo habitat within the vicinity of the site was undertaken.

There are six Bush Forever sites that occur within 5km of the site containing vegetation considered to be habitat for Black Cockatoos. The total area of these Bush Forever sites is 1950.854ha. Five of the sites contain potential foraging and breeding habitat and Site 77 contains potential foraging habitat. The sites are described below in Table 6.

Table 6: Bush Forever Sites within 5km that contain Black Cockatoo Habitat (Government of Western Australia, 2000)

Bush Forever Site	Area (ha)	Proximity to the Site	The Significant Vegetation Complexes within Bush Forever Sites that Consist of Black Cockatoo Habitat	Potential Foraging and/or Breeding Habitat
Henderson Road Bushland, Peel Estate Site 378	116.5	Adjacent to the south-western corner of the site	1) <i>Banksia attenuata</i> and <i>B. menziesii</i> Low Open Forest to Low Woodland with scattered <i>Eucalyptus marginata</i> , <i>Banksia ilicifolia</i> and/or <i>Allocasuarina fraseriana</i> ; and 2) <i>Banksia attenuata</i> , <i>B. menziesii</i> and <i>B. ilicifolia</i> Low Woodland.	Foraging and Breeding
Yangedi Swamp, Keysbrook Site 77	364.954	App. 3.5km south of the site	1) <i>Banksia attenuata</i> , <i>B. menziesii</i> , and <i>B. ilicifolia</i> Low Open Forest.	Foraging
Lowlands Bushland – Eastern Block, Peel Estate Site 368	1034.1	App. 4.4km north-north-east of the site	1) <i>Banksia attenuata</i> and <i>B. menziesii</i> Woodlands to Forest with scattered emergent <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> and with <i>Xylomelum occidentale</i> , <i>Allocasuarina fraseriana</i> , <i>B. grandis</i> and <i>B. ilicifolia</i> ; 2) <i>Eucalyptus gomphocephala</i> Open Forest; 3) <i>Banksia attenuata</i> , <i>B. menziesii</i> and <i>Allocasuarina fraseriana</i> Woodlands to Forests; 4) <i>Banksia attenuata</i> and <i>B. menziesii</i> Woodland over <i>Kunzea glabrescens</i> Closed Tall Scrub; 5) <i>Melaleuca preissiana</i> , <i>Banksia attenuata</i> , <i>B. menziesii</i> and <i>Allocasuarina fraseriana</i> Woodland to Forest; and 6) Woodlands over Sedgelands, where the dominants may be <i>Melaleuca preissiana</i> , <i>Corymbia calophylla</i> and <i>Eucalyptus rudis</i> .	Foraging and Breeding

Bush Forever Site	Area (ha)	Proximity to the Site	The Significant Vegetation Complexes within Bush Forever Sites that Consist of Black Cockatoo Habitat	Potential Foraging and/or Breeding Habitat
Lowlands Bushland – Western Block (Hymus Swamp), Peel Estate Site 372	133.6	App. 3.5km north of the site	<ol style="list-style-type: none"> 1) <i>Banksia attenuata</i> and <i>B. menziesii</i> Woodland over <i>Kunzea glabrescens</i> Closed Tall Scrub; 2) <i>Banksia attenuata</i> and <i>B. menziesii</i> Woodlands to Forest with scattered emergent <i>Corymbia calophylla</i>; 3) <i>Banksia attenuata</i>, <i>B. ilicifolia</i>, <i>Nuytsia floribunda</i> Low Open Forest; and 4) Areas of <i>Eucalyptus gomphocephala</i>, <i>E. rudis</i> and <i>Corymbia calophylla</i> Forest to Woodland. 	Foraging and Breeding
Lake Amarillo, Serpentine River and Adjacent Bushland, Karnup Site 394	168.7	App. 5km south-west of the site	<ol style="list-style-type: none"> 1) <i>Banksia</i> species Open Woodland to Closed Woodland; and 2) <i>Eucalyptus rudis</i> and <i>Eucalyptus gomphocephala</i> Woodland. 	Foraging and Breeding
Baldivis Road Bushland, Baldivis Site 376	133.0	App. 4.5km west of the site	<ol style="list-style-type: none"> 1) <i>Eucalyptus marginata</i>, <i>Banksia attenuata</i> and <i>B. menziesii</i> Low Woodland; 2) <i>Eucalyptus gomphocephala</i> Open Woodland over <i>Banksia attenuata</i>, <i>B. menziesii</i> and <i>B. grandis</i> Low Woodland; and 3) Scattered <i>Eucalyptus marginata</i> over Mixed Open Forest of <i>Corymbia calophylla</i>, <i>Allocasuarina fraseriana</i>, <i>Banksia attenuata</i>, <i>B. menziesii</i> and <i>B. grandis</i>; 4) <i>Corymbia calophylla</i> Low Open Forest over <i>Banksia attenuata</i>, <i>B. menziesii</i> and <i>Allocasuarina fraseriana</i>; 5) Scattered <i>Corymbia calophylla</i> and <i>Eucalyptus marginata</i> over <i>Banksia attenuata</i>, <i>B. menziesii</i> and <i>Allocasuarina fraseriana</i> Low Open Forest; and 6) <i>Eucalyptus gomphocephala</i> Open Woodland. 	Foraging and Breeding

6 SIGNIFICANCE OF IMPACT

According to the EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013), the significance of the impact on Black Cockatoos depends on the sensitivity, value and quality of the environment and the intensity, duration, magnitude and geographic extent of the impacts. The category of listing (for example; Endangered, Vulnerable or Migratory) determines the significant impact criteria for listed flora and fauna species and ecological communities.

This Black Cockatoo Habitat Assessment assumes all of the foraging and potential breeding trees on the site would be cleared during the sand mining operations. Using this assumption the clearing would result in approximately 12.58ha of foraging habitat and 28 potential breeding trees being cleared.

The following assessments are for the Carnaby's Black Cockatoo which is listed as Endangered, the Baudin's Black Cockatoo which is listed as Vulnerable and the Forest Red-tailed Black Cockatoo which is listed as Vulnerable.

Carnaby's Black Cockatoo

The impact on Carnaby's Black Cockatoos from clearing the Black Cockatoo habitat on the site has been assessed against the criteria set out in the Significant Impact Guidelines 1.1 for the impact on an Endangered species and is shown below:

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

There was no evidence that the site supports breeding or roosting of Carnaby's Black Cockatoos and there are large areas of Bush Forever sites within 5km consisting of foraging and potential breeding habitat, therefore clearing of the site will not result in this outcome.

- *Reduce the area of occupancy of the species*

Clearing of the site will not result in a reduction of any known breeding and roosting habitat although it will result in a reduction of approximately 12.58ha of Good and Very Good foraging habitat. Within 5km of the site, however, there is approximately 1950ha of foraging habitat located in Bush Forever sites and therefore clearing of the site will not result in this outcome.

- *Fragment an existing population into two or more populations*

Clearing of the site is unlikely to fragment the population of Carnaby's Black Cockatoos in the area into sub-populations due to the Bush Forever sites in the area providing linkages consisting of large areas of Black Cockatoo habitat. Carnaby's Black Cockatoos can fly large distances between foraging areas. Clearing of the site will therefore not result in this outcome.

- *Adversely affect habitat critical to the survival of a species*

There was no evidence of breeding or roosting by Carnaby's Black Cockatoos on the site. The two trees that contained potentially suitable spouts and the approximate 12.58ha of foraging habitat is not considered to be critical to the survival of the species due to the large amount of foraging and potential breeding habitat within 5km of the site, therefore clearing of the site would not result in this outcome.

- *Disrupt the breeding cycle of a population*

The site contained no evidence of breeding and there were only two trees that contained potentially suitable spouts therefore clearing of the site would not result in this outcome.

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

Clearing of the site will not result in this outcome due to the large extent of Black Cockatoo habitat reserved in Bush Forever sites within 5km of the site.

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

Clearing of the site will not result in the establishment of an invasive species harmful to Carnaby's Black Cockatoos.

- *Introduce disease that may cause the species to decline*

Clearing of the site will not cause disease to be introduced therefore will not result in this outcome.

- *Interfere with the recovery of the species*

The Carnaby's Black Cockatoos that would utilise the site have access to approximately 1950ha of Black Cockatoo habitat within 5km reserved in Bush Forever sites. Therefore any clearing of habitat on the site would not interfere substantially with the recovery of the species.

The conclusion of this assessment in accordance with the criteria set out in the Significant Impact Guidelines 1.1 is that construction of a sand extraction pit at 253 Yangedi Road in Hopelands would not have a significant impact on Carnaby's Black Cockatoos.

Baudin's Black Cockatoo

The impact on Baudin's Black Cockatoos from clearing the Black Cockatoo habitat on the site has been assessed against the criteria set out in the Significant Impact Guidelines 1.1 for the impact on a Vulnerable species and is shown below:

- *Lead to a long-term decrease in the size of an important population of a species*

In the Significant Impact Guidelines 1.1 an important population is defined as "a population that is necessary for a species' long-term survival and recovery" and may be "key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species' range".

The site is outside of the breeding range of Baudin's Black Cockatoo and there was no evidence of breeding occurring on the site. The surrounding area contains a number of Bush Forever sites providing large areas of foraging and breeding habitat for Cockatoos that utilise the site. Clearing of the site would therefore not result in this outcome.

- *Reduce the area of occupancy of an important population*

There was no evidence found of Baudin's Black Cockatoos roosting on the site. Clearing of the site will reduce the area of foraging available by approximately 12.58ha, however there is approximately 1950ha of foraging habitat within 5km of the site in Bush Forever sites therefore clearing of the site would not result in this outcome.

- *Fragment an existing important population into two or more populations*

There are large areas of Bush Forever sites within 5km of the site that provide foraging and potential breeding habitat. Baudin's Black Cockatoos can fly large distances between foraging areas. Therefore clearing of the site would not result in this outcome.

- *Adversely affect habitat critical to the survival of a species*

There was no evidence that Baudin's Black Cockatoos breed on the site and there are large areas of foraging habitat within 5km of the site, as Bush Forever sites, therefore the site is not considered critical to the survival of the species.

- *Disrupt the breeding cycle of an important population*

The site is outside of the breeding range of Baudin's Black Cockatoos and contained no evidence of breeding. There were only two trees that contained potentially suitable spouts. Therefore clearing of the site would not result in this outcome.

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

The large areas of foraging and breeding habitat located in the Bush Forever sites within 5km of the site would prevent the population from declining as a result of clearing of the site.

- *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Clearing the site will not result in invasive species being introduced, therefore would not result in this outcome.

- *Introduce disease that may cause the species to decline*

Clearing the site will not result in disease being introduced, therefore would not result in this outcome.

- *Interfere substantially with the recovery of the species*

The Baudin's Black Cockatoos that would utilise the site have access to approximately 1950ha of Black Cockatoo habitat within 5km reserved in Bush Forever sites. Therefore the clearing of approximately 12.58ha of Baudin's Black Cockatoo habitat on the site would not interfere substantially with the recovery of the species.

In accordance with the criteria set out in the Significant Impact Guidelines 1.1 the conclusion of this assessment is that construction of a sand extraction pit at 253 Yangedi Road in Hopelands would not have a significant impact on Baudin's Black Cockatoos.

Forest Red-tailed Black Cockatoo

The impact on Forest Red-tailed Black Cockatoos from clearing the Black Cockatoo habitat on the site has been assessed against the criteria set out in the Significant Impact Guidelines 1.1 for the impact on a Vulnerable species and is shown below:

- *Lead to a long-term decrease in the size of an important population of a species*

In the Significant Impact Guidelines 1.1 an important population is defined as "a population that is necessary for a species' long-term survival and recovery" and may be "key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species' range".

There was no evidence of breeding occurring on the site and the surrounding area contains a number of Bush Forever sites providing large areas of foraging and breeding habitat for Cockatoos that utilise the site. Development of the site would therefore not result in this outcome.

- *Reduce the area of occupancy of an important population*

There was no evidence found of Forest Red-tailed Black Cockatoos breeding or roosting on the site. Clearing of the site will reduce the area of foraging available by approximately 12.58ha, however there is approximately 1950ha of foraging habitat within 5km of the site in Bush Forever sites therefore clearing of the site would not result in this outcome.

- *Fragment an existing important population into two or more populations*

There are large areas of Bush Forever sites within 5km of the site that provide foraging and potential breeding habitat. Forest Red-tailed Black Cockatoos can fly large distances between foraging areas. Therefore clearing of the site would not result in this outcome.

- *Adversely affect habitat critical to the survival of a species*

There was no evidence that Forest Red-tailed Black Cockatoos breed on the site and there are large areas of foraging habitat within 5km of the site, as Bush Forever sites, therefore the site is not considered critical to the survival of the species.

- *Disrupt the breeding cycle of an important population*

There was no evidence that Forest Red-tailed Black Cockatoos breed on the site and there were only two trees on the site that contained potentially suitable spouts, therefore clearing of the site would not result in this outcome.

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

The large areas of foraging and breeding habitat located in the Bush Forever sites within 5km of the site would prevent the population from declining as a result of clearing of the site.

- *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Clearing the site will not result in invasive species being introduced, therefore would not result in this outcome.

- *Introduce disease that may cause the species to decline*

Clearing the site will not result in disease being introduced, therefore would not result in this outcome.

- *Interfere substantially with the recovery of the species*

The Forest Red-tailed Black Cockatoos that would utilise the site have access to approximately 1950ha of Black Cockatoo habitat within 5km reserved in Bush Forever sites. Therefore the clearing of approximately 12.58ha of foraging habitat on the site would not interfere substantially with the recovery of the species.

In accordance with the criteria set out in the Significant Impact Guidelines 1.1 the conclusion of this assessment is that construction of a sand extraction pit at 253 Yangedi Road in Hopelands would not have a significant impact on Forest Red-tailed Black Cockatoos.

7 BLACK COCKATOO REFERRAL GUIDELINES

The EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus latirostris* Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii* Forest red-tailed Black Cockatoo (vulnerable) *Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) contain several steps to determine whether or not a referral is required. These steps are:

1. The definition of habitat (breeding, roosting and foraging – Table 1 in the Black Cockatoo Referral Guidelines);
2. A description of the type of action that may have a high or low risk of being a significant impact and therefore require referral (Table 3 in the Black Cockatoo Referral Guidelines);
3. Formulation of a mitigation strategy to reduce the scale of impact; and
4. A flowchart to assist in decision making on whether or not an action should be referred.

Step 1 Black Cockatoo Habitat

It should firstly be determined whether the site contains Black Cockatoo habitat. As outlined previously there is approximately 12.58ha of Good and Very Good foraging habitat on the site with evidence of foraging under one Jarrah tree and also 28 trees that are considered to be potential breeding trees under the definition provided by the Department of the Environment. There is however no recorded breeding or roosting on the site or evidence of such.

Step 2 Level of Impact

Foraging

According to Table 3 in the Black Cockatoo Referral Guidelines the clearing of more than 1ha of quality foraging habitat has a high risk of causing a significant impact. Degradation of more than 1ha of quality habitat by things such as altered hydrology or fire regimes has an uncertain risk. The significance of degradation depends on the type of degradation and the quality of the habitat.

The site contained approximately 5.49ha of Good and 7.09ha of Very Good foraging habitat for Black Cockatoos. Therefore clearing of the site will lead to the loss of more than 1ha of quality foraging habitat and result in a high risk of a significant impact.

Roosting

The Black Cockatoo Referral Guidelines consider the clearing of a known roosting site as a high risk of being a significant impact. The site is not mapped as having a known roosting site by the Department of Planning mapping of January 2011, although there are known roosting sites nearby with the closest one approximately 5km to the west. There were no roosting sites recorded during the Significant Tree Survey and the risk of a significant impact on a known roosting site is considered to be low.

Breeding

According to Table 3 in the Black Cockatoo Referral Guidelines the clearing of any known nesting tree has a high risk of being a significant impact. A known nesting tree is defined in the Black Cockatoo

Referral Guidelines as any existing tree in which breeding has been recorded or suspected. There are no known nesting trees that occur on the site and therefore there is no risk of a significant impact on known breeding habitat of Black Cockatoos.

The Black Cockatoo Referral Guidelines also consider that the clearing or degradation of any part of a vegetation community known to contain breeding habitat is likely to have a high risk of a significant impact. In Table 1 of the Black Cockatoo Referral Guidelines breeding habitat is defined as woodlands, forests or isolated trees that contain or consist of live or dead trees of certain species with either a DBH of or greater than 500mm or the presence of suitable nest hollows.

The Black Cockatoo Referral Guidelines state that breeding habitat predominantly applies to those areas within the breeding range of the Black Cockatoo species as shown in the maps attached to the Black Cockatoo Referral Guidelines. The site is within the breeding range of Carnaby's Black Cockatoos while it is not within the breeding range of Baudin's Black Cockatoos. The breeding range of Forest Red-tailed Black Cockatoos is not specified within the map attached to the Black Cockatoo Referral Guidelines, however the site is within the distribution range.

According to the Black Cockatoo Referral Guidelines, the definition of breeding habitat outside of the known breeding range still applies unless proven otherwise. A tree consists of breeding habitat if it is a suitable species, identified in Table 1 of the Black Cockatoo Referral Guidelines, and contains a hollow large enough for a Black Cockatoo to enter and form a nest or has a DBH of or greater than 500mm. The site contained 28 Jarrah trees (live and dead) with a DBH of or greater than 500mm, two of which contained spouts potentially suitable for Black Cockatoos. According to Table 1 of the Black Cockatoo Referral Guidelines Jarrah is a species suitable for breeding by Carnaby's Black Cockatoos and Forest Red-tailed Black Cockatoos, but not Baudin's Black Cockatoos. Therefore the risk of a significant impact on breeding habitat of two species of Black Cockatoos is considered to be high.

Surrounding Habitat

According to the Black Cockatoo Referral Guidelines clearing of vegetation that results in a gap of greater than 4km between patches of Black Cockatoo habitat (foraging, roosting or breeding) has a high risk of having a significant impact. As listed in Table 6 there are three Bush Forever sites within 4km of the site that provide Black Cockatoo habitat as well as other sites in the vicinity. Therefore the risk of creating a gap of greater than 4km between areas of Black Cockatoo habitat is considered to be low.

Step 3 Mitigation

The consideration of a mitigation strategy during the determination of the level of impact and requirement to refer is allowed by the Black Cockatoo Referral Guidelines and setting in place the best practice mitigation strategy may reduce the level of impact and in turn the risk of a significant impact. Mitigation strategies include avoiding impact, managing impact so that there is no net decline in habitat and monitoring the effectiveness of mitigation.

This assessment is based on the entire 12.58ha of foraging habitat and all 28 potential breeding trees being cleared. Putting a mitigation strategy in place during the planning stage may reduce the level of impact on Black Cockatoos from clearing of the site.

Step 4 Referral Advice

The Decision Making flowchart in Figure 1 of the Black Cockatoo Referral Guidelines was applied to the site without consideration of mitigation strategies and is shown in sequence below:

- 1 Could the impacts of your action occur within the modelled distribution of the black cockatoos? – YES
- 2 Could the impacts of your action affect any black cockatoo habitat or individuals? - YES
- 3 Have you surveyed for black cockatoo habitat using the recommended methods? – YES
- 4 Could your action have an impact on black cockatoos or their habitat? – YES
- 5 Is your impact mitigation best practice so that it may reduce the significance of your impacts on black cockatoos? Prioritise impact avoidance over impact minimisation - NO

RESULT – Referral Recommended: High risk of resulting in significant impact.

8 SUMMARY AND CONCLUSION

The proposed construction of a sand extraction pit at 253 Yangedi Road in Hopelands will result in the clearing of native vegetation on the site. A proportion of the site consists of *Banksia* and Jarrah woodlands which could potentially be foraging, roosting and breeding habitat for Black Cockatoos.

PGV Environmental conducted a Black Cockatoo Habitat Assessment for Carnaby's Black Cockatoos, Baudin's Black Cockatoos and Forest Red-tailed Black Cockatoos, species considered likely to utilise the site.

The Black Cockatoo Habitat Assessment identified approximately 12.58ha of foraging habitat on the site in the form of *Banksia* and Jarrah woodland. Evidence of foraging by Black Cockatoos was found underneath one Jarrah tree on the site (Figure 4). The foraging habitat was largely classified as Very Good quality foraging habitat (7.09ha) with 5.49ha as Good. The entire area of foraging habitat on the site consisted of both *Banksia* and Jarrah trees and was therefore considered foraging habitat for all three species of Black Cockatoos.

The site does not contain known breeding sites and no evidence of breeding was recorded on the site. Potential breeding habitat for Carnaby's Black Cockatoos and Forest Red-tailed Black Cockatoos was recorded on the site and consisted of 28 Jarrah trees (live and dead) with a diameter at breast height (DBH) of 500mm or greater. Seven of these trees were recorded to contain hollows or spouts, however only two trees contained spouts that were potentially large enough for breeding by Black Cockatoos (Tree Number 2 and 28).

The site does not contain a known roosting site and no evidence was observed that the site has been used as roosting habitat.

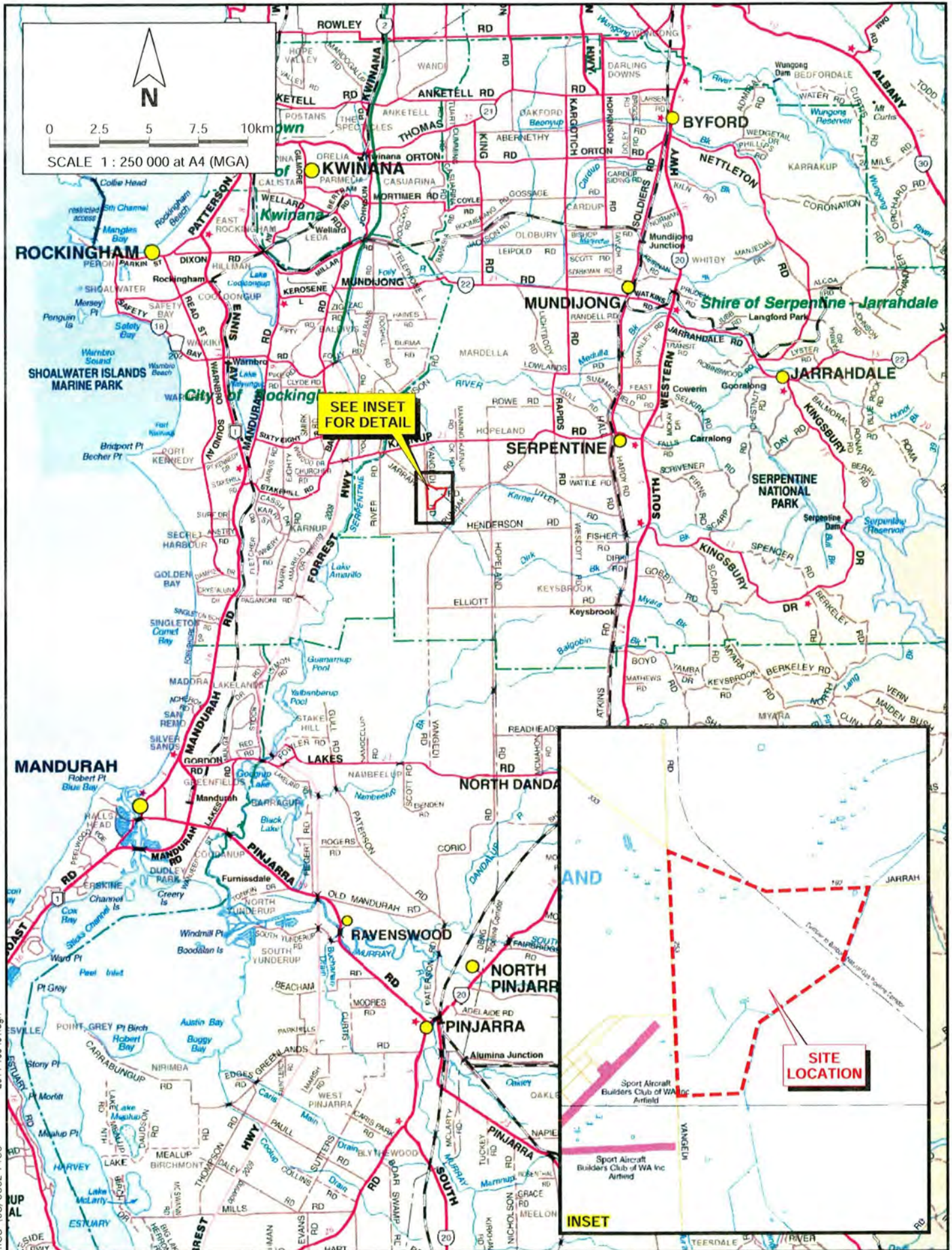
Clearing of the site is likely to result in the loss of all of the Black Cockatoo habitat on the site. The surrounding Bush Forever sites provide a large amount of foraging and potential breeding habitat in close vicinity of the site and are likely to lower the impact that clearing of the site would have on Black Cockatoos. Implementing mitigation strategies may reduce the level of impact clearing of the site will have on Black Cockatoos.

In accordance with the Black Cockatoo Referral Guidelines and on the basis of the extent of clearing of foraging habitat, PGV Environmental consider the impact has a high risk of being a significant impact. Referral to the Department of the Environment under the EPBC Act is recommended. Reducing the level of impact through implementing mitigation strategies could increase the likelihood of the referral being approved and reduce the size of the off-site offsets that may be required.

9 REFERENCES

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FIGURES



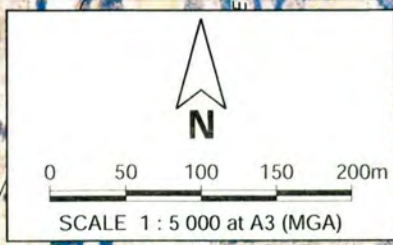
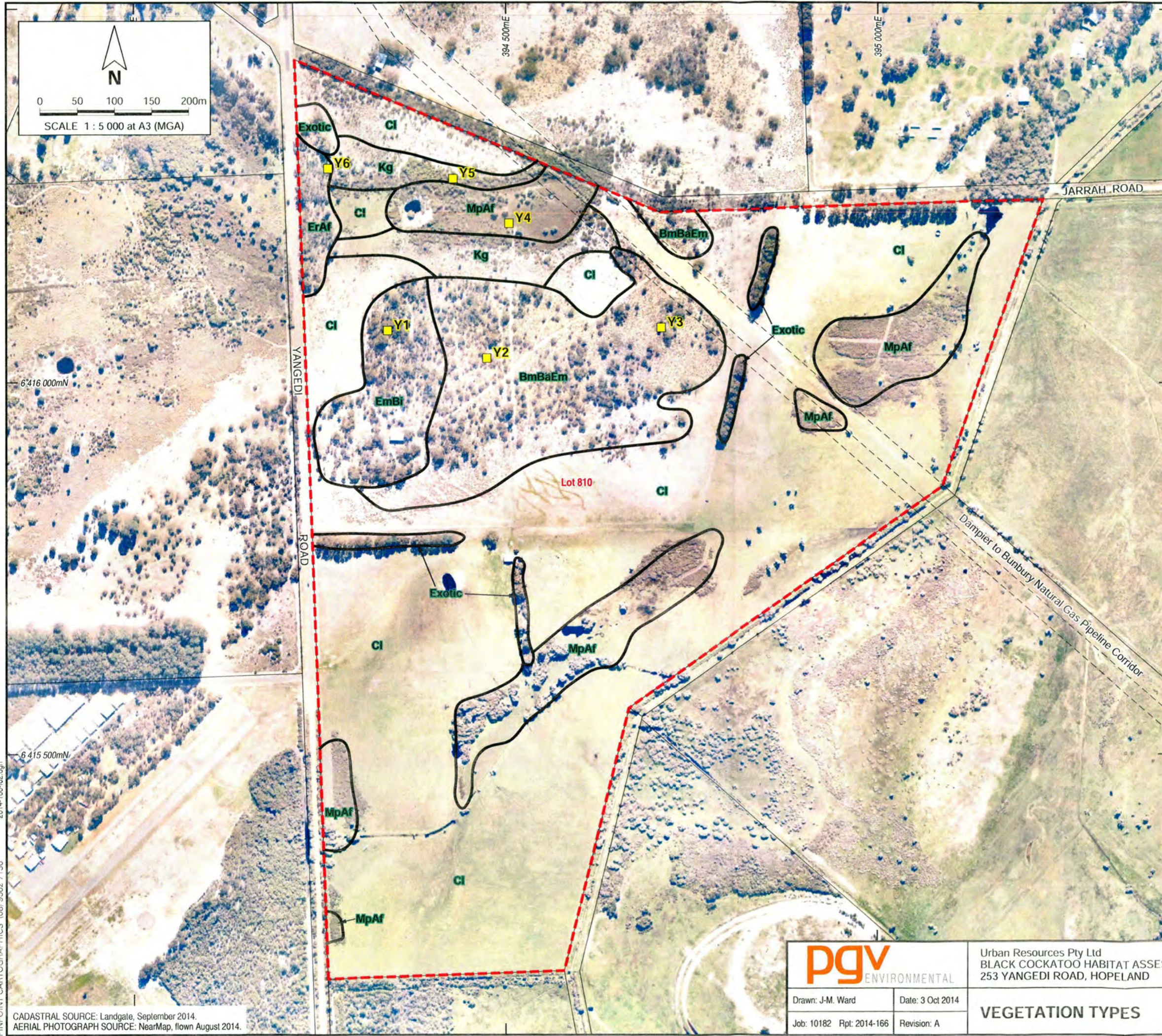
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Urban Resources Pty Ltd
 BLACK COCKATOO HABITAT ASSESSMENT
 253 YANGEDI ROAD, HOPELAND

Drawn: J-M. Ward	Date: 1 Oct 2014
Job: 10182 Rpt: 2014-166	Revision: A

SITE LOCATION

Figure 1



Legend

- - - Site Boundary
- Cadastral Boundary
- Easement Boundary
- Quadrat Location
- Vegetation Type Boundary
- Mp Vegetation Type

Vegetation Types

- EmBi**
Eucalyptus marginata/Banksia ilicifolia Low Open Forest over *Hibbertia hypericoides* Open Low Heath
- BmBaEm**
Banksia menziesii/B. attenuata/Eucalyptus marginata Low Open Woodland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath
- MpAf**
Melaleuca preissiana Low Open Woodland over *Astartea fascicularis* Closed Heath
- ErAf**
Eucalyptus rudis Low Open Forest over *Astartea fascicularis* Shrubland

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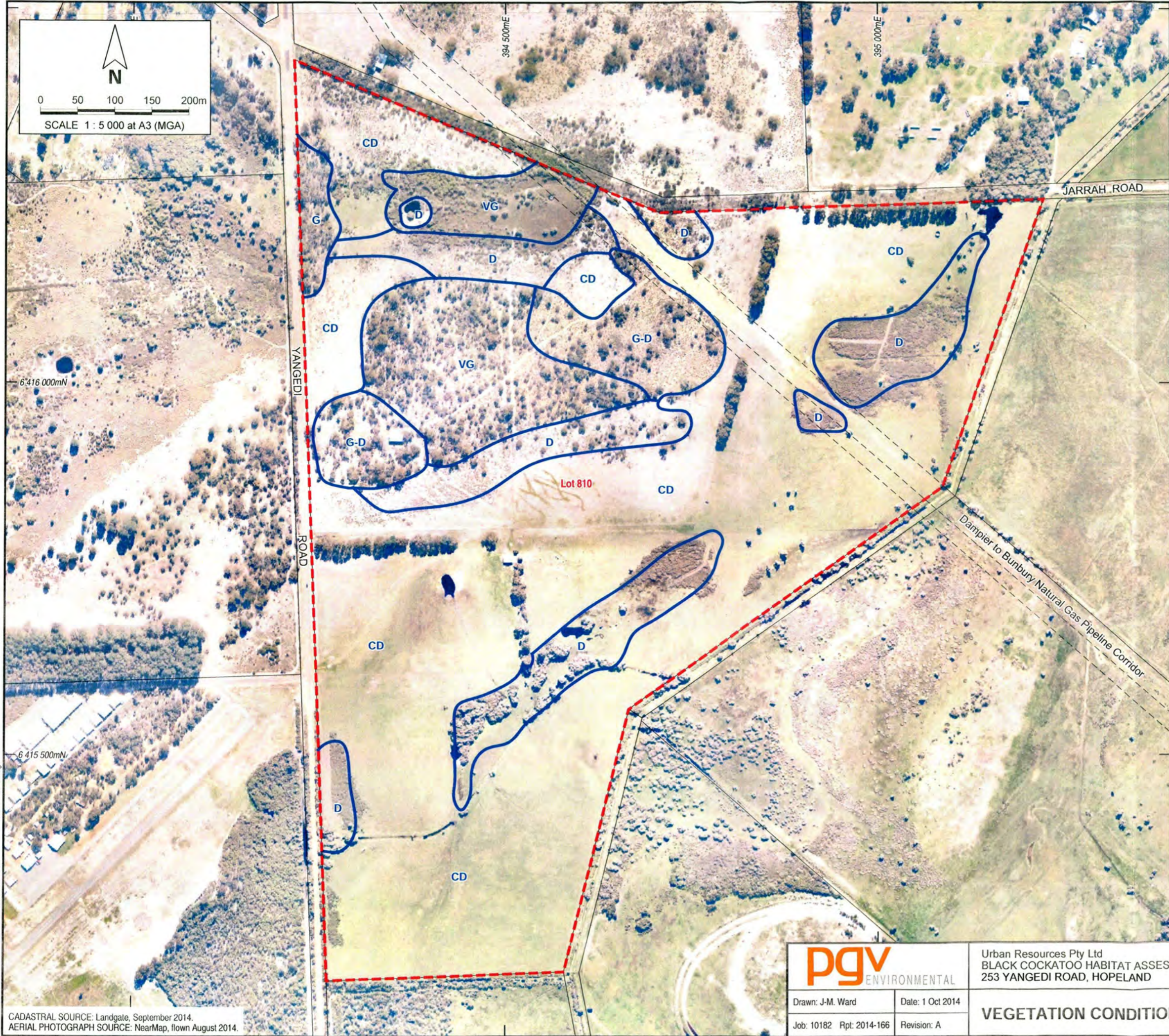
CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

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Drawn: J-M. Ward	Date: 3 Oct 2014
Job: 10182 Rpt: 2014-166	Revision: A

Urban Resources Pty Ltd
 BLACK COCKATOO HABITAT ASSESSMENT
 253 YANGEDI ROAD, HOPELAND

VEGETATION TYPES

Figure 2



Legend

- - - Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Quadrat Location
- Vegetation Condition Boundary
- VG Vegetation Condition

Vegetation Condition
(SOURCE: Bush Forever, Govt. of W.A., 2000)

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

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-166-003.dgn

CADASTRAL SOURCE: Landgate, September 2014.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

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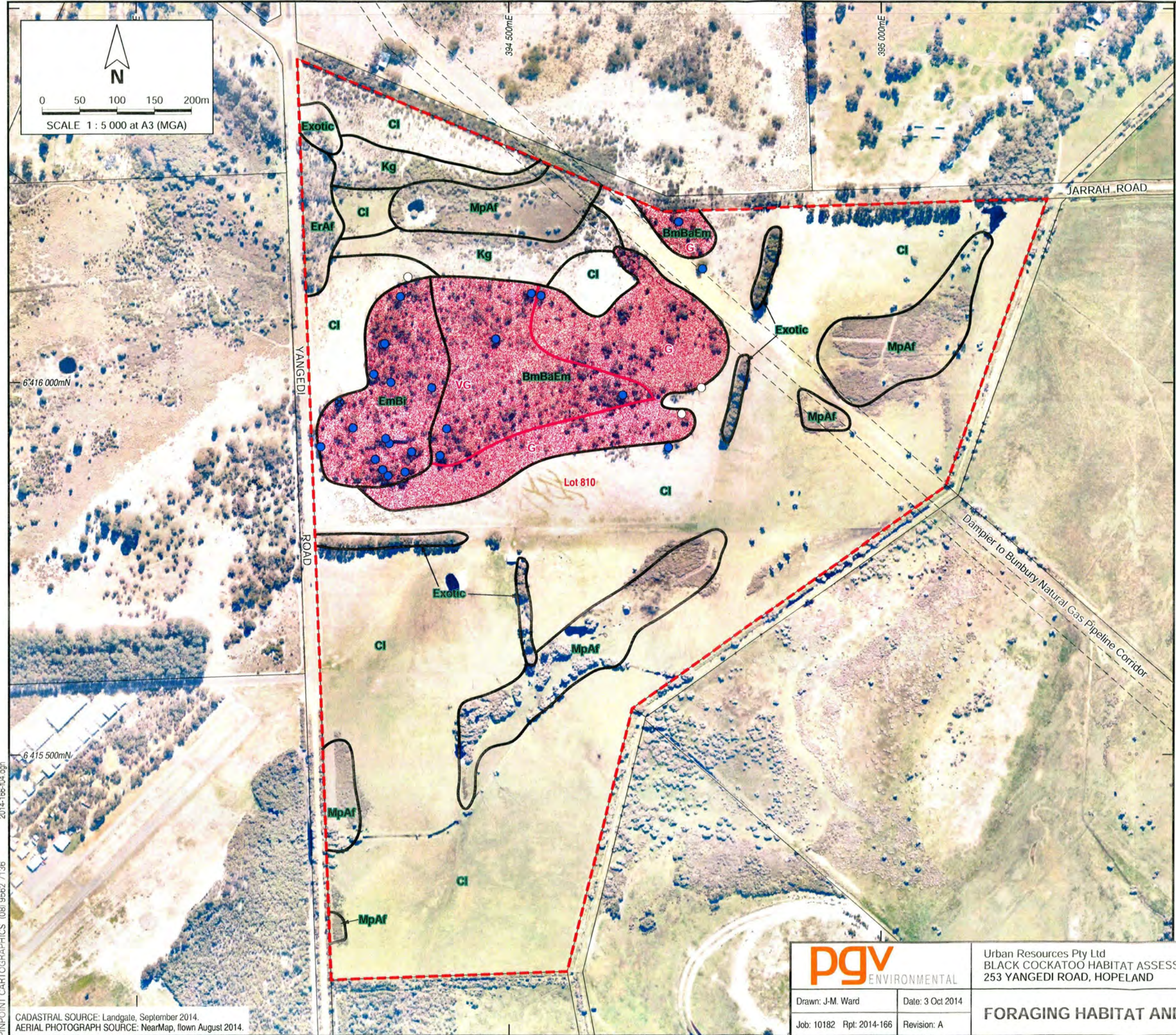
Drawn: J-M. Ward Date: 1 Oct 2014

Job: 10182 Rpt: 2014-166 Revision: A

Urban Resources Pty Ltd
BLACK COCKATOO HABITAT ASSESSMENT
253 YANGEDI ROAD, HOPELAND

VEGETATION CONDITION

Figure 3



- Legend**
- - - Site Boundary
 - Cadastral Boundary
 - - - Easement Boundary
 - Vegetation Type Boundary
 - Mp Vegetation Type
- Significant Trees**
- Jarrah (*Eucalyptus marginata*)
 - Standing Dead Tree
- Foraging Habitat and Condition**
- Foraging Habitat
 - VG Very Good
 - G Good
 - x Foraging Evidence
- Vegetation Types**
- EmBi**
Eucalyptus marginata/Banksia ilicifolia Low Open Forest over *Hibbertia hypericoides* Open Low Heath
- BmBaEm**
Banksia menziesii/B. attenuata/Eucalyptus marginata Low Open Woodland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath
- MpAf**
Melaleuca preissiana Low Open Woodland over *Astartea fascicularis* Closed Heath
- ErAf**
Eucalyptus rudis Low Open Forest over *Astartea fascicularis* Shrubland

PINPOINT CARTOGRAPHICS (08) 9562 7136
 2014-166-04.dgn

CADASTRAL SOURCE: Landgate, September 2014.
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2014.

pgv ENVIRONMENTAL

Drawn: J-M. Ward Date: 3 Oct 2014

Job: 10182 Rpt: 2014-166 Revision: A

Urban Resources Pty Ltd
 BLACK COCKATOO HABITAT ASSESSMENT
 253 YANGEDI ROAD, HOPELAND

FORAGING HABITAT AND SIGNIFICANT TREES

Figure 4

APPENDIX 1
Significant Tree Survey Results

253 Yangedi Road, Hopelands

Tree Number	Species	Easting MGA zn50	Northing MGA zn50	Photo Number	Height (m)	Diameter (mm)	Secondary Branches (mm)	Notes (hollows, bees etc.)
1	Jarrah (<i>Eucalyptus marginata</i>)	394354	6416114	8133	11	1050	250	Hollows, bee hive
2	Standing Dead Tree	394364	6416140	8134	9	800		Numerous small hollows and spouts
3	Jarrah (<i>Eucalyptus marginata</i>)	394530	6416118	8140	10	550		Good condition, no hollows
4	Jarrah (<i>Eucalyptus marginata</i>)	394543	6416115	8141	12	750	450	Crow's nest, no hollows
5	Jarrah (<i>Eucalyptus marginata</i>)	394759	6416151	8146	8	500		Small hollow
6	Jarrah (<i>Eucalyptus marginata</i>)	394727	6416214	8147	9	850	350/250/200/100 /numerous small	Main trunk dead, no hollows
7	Standing Dead Tree	394731	6415957	8149	9	700		Group of dead trees, a few hollows
8	Standing Dead Tree	394757	6415992	8150	8	750	350	Small hollows, one used by Ringnecks
9	Jarrah (<i>Eucalyptus marginata</i>)	394713	6415912	8159	12	800		Good condition, no hollows
10	Jarrah (<i>Eucalyptus marginata</i>)	394652	6415982	8164	12	800		Good condition, small potential hollow
11	Jarrah (<i>Eucalyptus marginata</i>)	394482	6416057	8178	10	500	400/400/250/200	Good condition, no hollows
12	Jarrah (<i>Eucalyptus marginata</i>)	394396	6415992	8184	9	800	250	Burnt branch, no hollows
13	Jarrah (<i>Eucalyptus marginata</i>)	394416	6415937	8188	8	700		Dead branches, sprouting, no hollows
14	Jarrah (<i>Eucalyptus marginata</i>)	394407	6415901	8190	9	1000	200/100/100	Small hollow
15	Jarrah (<i>Eucalyptus marginata</i>)	394369	6415906	8192	11	600	100/100	A few dead branches, no hollows
16	Jarrah (<i>Eucalyptus marginata</i>)	394360	6415879	8194	12	700		Good condition, no hollows
17	Jarrah (<i>Eucalyptus marginata</i>)	394337	6415874	8195	9	500	300	Good condition, no hollows
18	Jarrah (<i>Eucalyptus marginata</i>)	394330	6415882	8196	11	900	200/100	Good condition, no hollows
19	Jarrah (<i>Eucalyptus marginata</i>)	394320	6415896	8197	12	600	600/300/150/100	Dead branches, sprouting, no hollows
20	Jarrah (<i>Eucalyptus marginata</i>)	394339	6415917	8198	12	950	150/100	Dead branches, sprouting, no hollows
21	Jarrah (<i>Eucalyptus marginata</i>)	394334	6415924	8199	11	650	150	Dead branches, no hollows
22	Jarrah (<i>Eucalyptus marginata</i>)	394290	6415938	8200	12	750	400/300/250/250 /200	Bee hive
23	Jarrah (<i>Eucalyptus marginata</i>)	394247	6415913	8201	13	700	150	Dead branches, crow's nest, no hollows
24	Jarrah (<i>Eucalyptus marginata</i>)	394272	6415973	8202	12	800	300/200/150/100 /100/100/100	A few dead branches, no hollows, extensive foraging
25	Jarrah (<i>Eucalyptus marginata</i>)	394330	6416050	8217L	11	700		Good condition, no hollows
26	Jarrah (<i>Eucalyptus marginata</i>)	394333	6416051	8217R	13	900		Good condition, no hollows, bird nest
27	Jarrah (<i>Eucalyptus marginata</i>)	394318	6416010	8227	10	650	550/350/300/200	One trunk burnt out, no hollows
28	Jarrah (<i>Eucalyptus marginata</i>)	394341	6415999	8228	9	600		Dead branches, sprouting, spout

253 Yangedi Road, Hopelands



Tree 1



Tree 2



Tree 3



Tree 4



Tree 5



Tree 6



Tree 7



Tree 8

253 Yangedi Road, Hopelands



Tree 9



Tree 10



Tree 11



Tree 12



Tree 13



Tree 14



Tree 15



Tree 16

253 Yangedi Road, Hopelands



Tree 17



Tree 18



Tree 19



Tree 20



Tree 21



Tree 22



Tree 23



Tree 24

253 Yangedi Road, Hopelands



Tree 25 (left) Tree 26 (right)



Tree 27



Tree 28