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Native Vegetation Clearing Permit Application [Purpose Permit] - Supporting Documentation

**Area 8, Lot 9 Weaber Plain
Development Project**

Prepared for
LandCorp
by Strategen
October 2016



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Permit Application
[Purpose Permit] -
Supporting
Documentation**

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Development Project**

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October 2016

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Client: LandCorp

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Appendix 1 Clearing permit (CPS 3432/2)
Appendix 2 NatureMap search
Appendix 3 Pilbara Flora survey (2009)

<All appendices can be found in a CD-ROM accompanying this report>

1. Introduction

1.1 Purpose

This Native Vegetation Clearing Permit (NVCP) application for a purpose permit has been prepared for assessment and approval to clear up to 10 ha of native vegetation in 'Lot 9' (the proposed clearing area), within 'Material Investigation Area 8' (Area 8), of the Ord River Irrigation Area (ORIA) in the Kimberley (the Project; Figure 1). The NVCP application relates to an area of approximately 10 ha of native vegetation proposed to be removed within the site for the purpose of gravel stockpiling for the Ord expansion project.

1.2 Background

Area 8 is an existing source of gravel used in road works associated with the Ord expansion project and is located about 36 km north of Kununurra with access from Carlton Hill Road. Area 8 is under Department of Lands control and has been nominated as a materials source under the Ord Final Agreement meaning that heritage clearances have been obtained.

A purpose permit clearing permit (CPS 3432/2) has previously been granted to clear no more than 192.66 ha of native vegetation within Lots 353 and 355 on Deposited Plan (DP) 211675 dated 20 March 2012. The approved clearing areas to date are provided in Figure 1. Clearing permit CPS 3432/2 expires 30 January 2020; however, the permit includes a requirement that no clearing of native vegetation is to occur after 30 January 2015 (Appendix 1). An internal audit of CPS 3432/2 was conducted in 2014 which found that of the 192.66 ha authorised to be cleared under CPS 3432/2 a total of 76.97 ha was disturbed and 72.5 ha of this disturbance area was rehabilitated (Strategen 2014; Figure 2). The undisturbed areas originally permitted to be cleared by CPS 3432/2 are not expected to contain suitable gravel.

LandCorp seeks a new permit to extend the originally approved clearing area in CPS 3432/2 to cover 10 ha in Lot 9, which sits within Lot 353 on DP 211675 (Figure 1) to ensure extra suitable gravel can be sourced from Area 8 to supplement the existing gravel stockpile. The environmental studies used to support the original permit application are used in this updated application.

1.3 Proposal

LandCorp is proposing to clear approximately 10 ha of native vegetation within Lot 9, Area 8 (Figure 3). The clearing of this native vegetation will result in additional space to source gravel for road building in the Ord expansion project area.

Clearing would be undertaken by mechanical means (i.e. bulldozer and front end loader).

1.4 Location, ownership and tenure

Area 8 is located approximately 36 km north of Kununurra in the Shire of Wyndham-East Kimberley and is under the control of the Department of Lands. The proposed clearing area comprises 10 ha of Lot 353 on Deposited Plan 211675 (Figure 1). Lot 353 is within Reserve 50284 which is currently used for government requirements (raw materials) and protection of Aboriginal heritage and buffer.

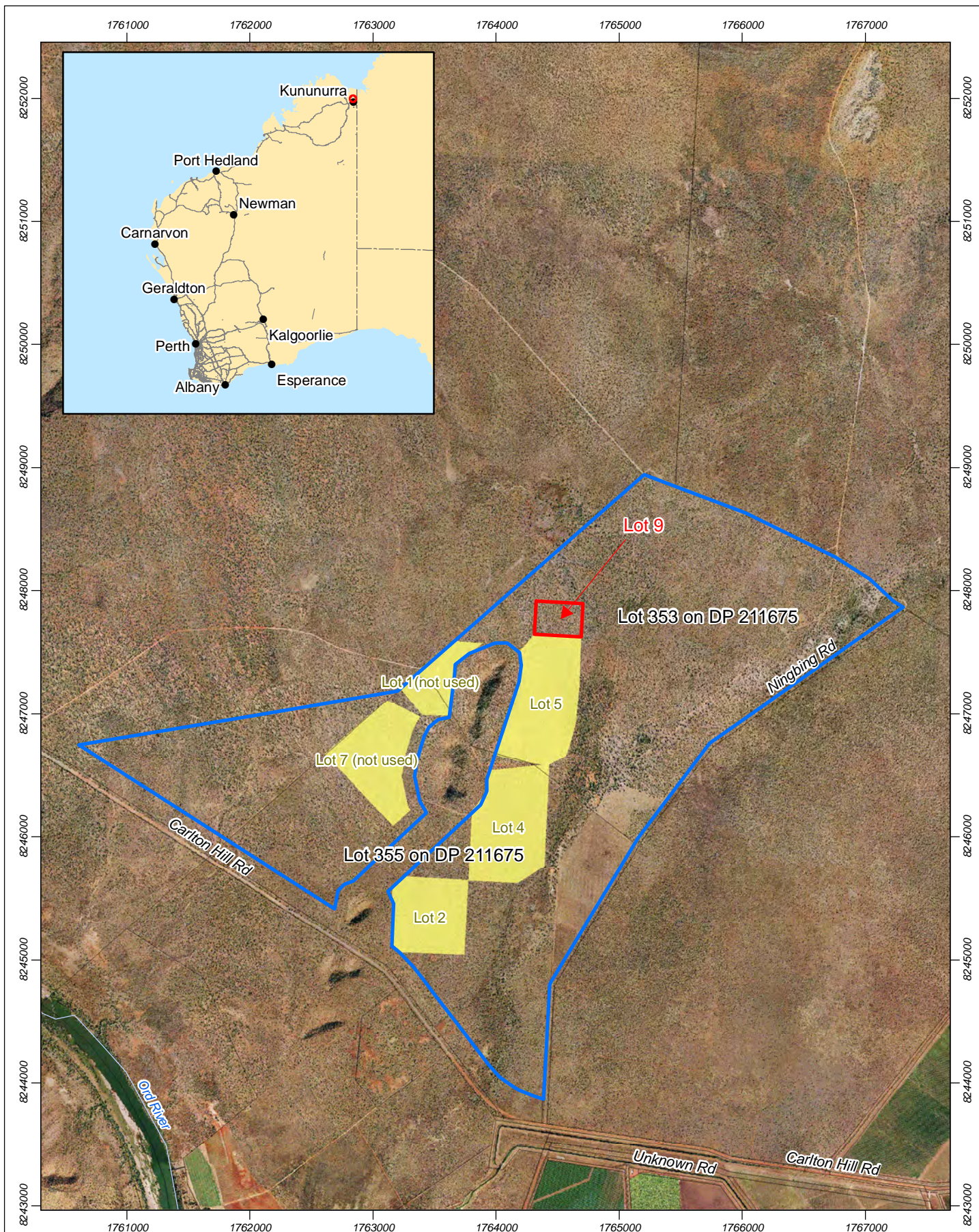


Figure 1: Proposed clearing area

Scale 1:41,996 at A4

0 250 500 750 1,000 1,250 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 13/10/2016

Author: JCrute

Source: Existing cadastre: SLIP, landgate 2016.

Legend

Major river

Area 8

Proposed clearing area (10 ha)

CPS 3432/2 clearing areas

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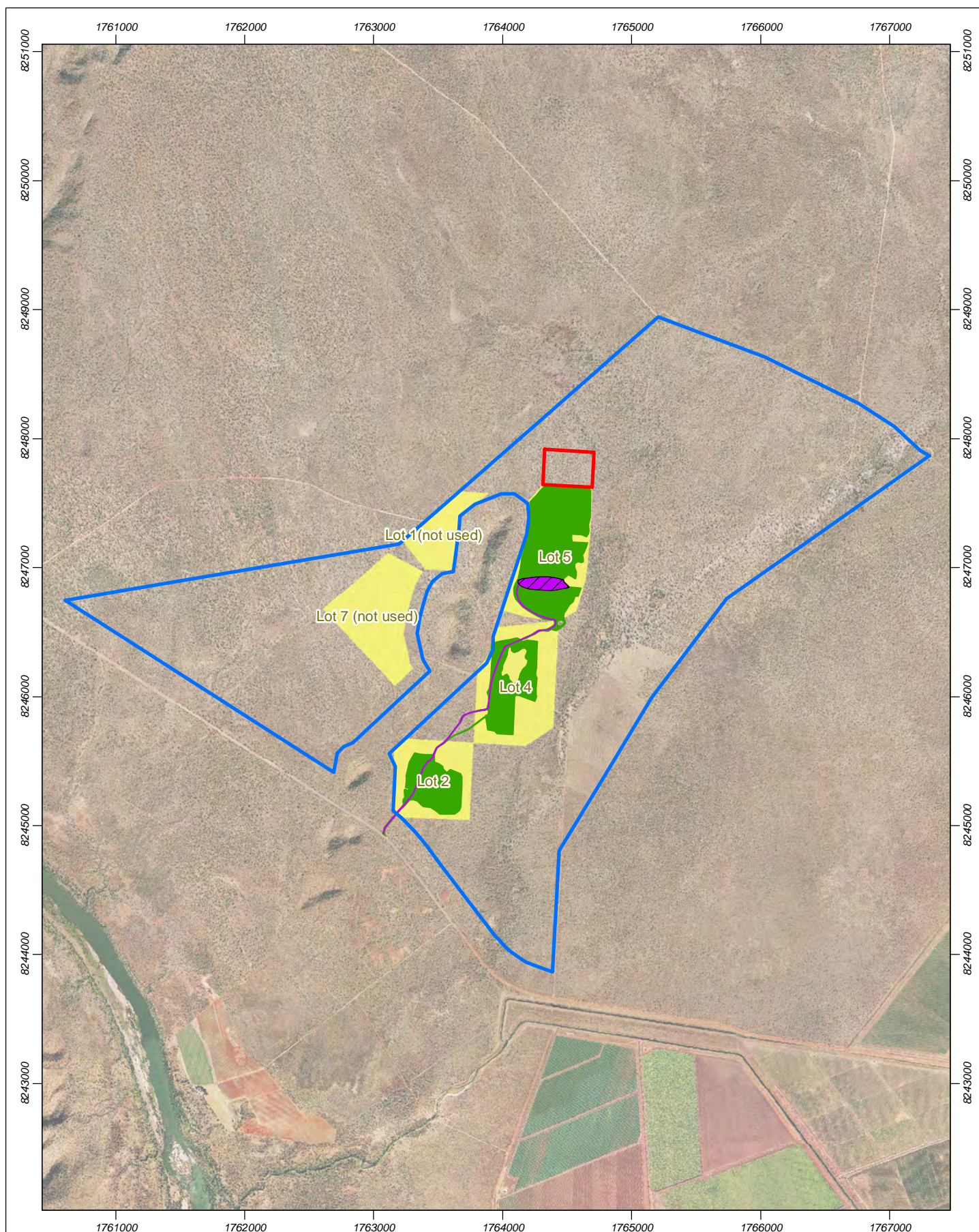


Figure 2: Area 8 cleared and rehabilitated areas

Scale 1:40,000 at A4

0 250 500 750 1,000 1,250 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 13/10/2016

Author: JCrute

Source: Existing cadastre: SLIP, landgate 2016.



Legend

 Area 8

 Proposed clearing area (10 ha)

 Stockpile

 Cleared areas (4.47 ha)

 Rehabilitated areas 2014 (72.5 ha)

 CPS 3432/2 clearing areas

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2. Overview of existing environment

2.1 Geology, landforms and soils

The geology of the proposed clearing area was assessed using the Geological Survey of Western Australia's 1:500,000 interpreted bedrock geology spatial dataset (GSWA 2008). Area 8 is represented by the following geological types:

- Ningbing Group: Undivided; limestone reef complexes; cyanobacterial limestone, limestone breccia, shale, and sandstone; includes Djillira, Wungabal, and Garimala Limestones, and Kamillili and Buttons Formations.
- Cockatoo Group: Undivided, sandstone, conglomerate and limestone; minor dolomite and siltstone; includes Steeple peak, Kelly Knob, Cyril, Abney, Maudobar and Cecil Sandstone, Kununurra, Galloping Creek and Hargreaves Formations, and Ragged Range Conglomerate.
- Carlton Group: Sandstone, siltstone, shale and stromatolitic dolomite.

The proposed clearing area is situated on Cockatoo Group geology. The site is on an alluvial plain landform characterised by a gently inclined to moderate sloping lower slope or plain. The site is made up of sandy clay loams which are moderately well drained with very few coarse fragments.

2.2 Hydrology

2.2.1 Surface water

The proposed clearing area and Area 8 is not adjacent to any surface water features. The nearest surface water feature is the Ord River which is located approximately 1.7 km southwest from the Area 8 boundary (Figure 1).

The Ord River Floodplain is a RAMSAR wetland and is of International Significance, however, the Ord River Floodplain is located more than 30 km from the proposed clearing area and Area 8, and none of the vegetation clearing and extraction of raw materials will affect this wetland.

2.2.2 Groundwater

The general groundwater flow gradient across the Weaber Plain is from the west to the east (KBR 2011). Elevated groundwater levels exist in the Cave Spring Gap approximately 10 km east of Area 8, as a result of existing irrigation activities. The groundwater elevation immediately inside the current irrigation area is around 32 m AHD (KBR 2011). From here, groundwater flows through the Cave Spring Gap and under the Weaber Plain to the north. The elevation of the watertable decreases to be between 10 to 18 m AHD in the vicinity of Brown Ridge (a major basement inlier within Weaber Plain). In the north of the plain, near Point Springs, the groundwater elevation is higher than on the central part of the plain (KBR 2011).

2.3 Vegetation and flora

Desktop and field environmental investigations undertaken from 2009 to 2011 for Lots 5 and 7 have been used to inform Sections 2.3.1 and 2.3.2.

2.3.1 Regional vegetation

Vegetation occurring within the region was initially mapped at a broad scale (1:1 000 000) by Beard during the 1970s. This dataset has formed the basis of several regional mapping systems, including physiographic regions defined by Beard (1990) and the Interim Biogeographic Regionalisation for Australia (IBRA) for Western Australia (DEE 2016a).

Beard (1990) Botanical District

The proposed clearing area is located in the north-eastern Kimberley Region which is situated within the Gardner Botanical District which is characterised by high-grass savannah woodlands, *Eucalyptus tetrodonta*-*E. miniata* alliance with *Plectrachne pungens* and annual *Sorghum* spp. on sandstone; *E. tectifera*-*E. grandifolia* alliance with *Sehima nervosum* and *Sorghum* on basalt (Beard 1990).

IBRA subregion

IBRA divides Western Australia into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation (McKenzie *et al.* 2003). The proposed clearing area is located in the Victoria Bonaparte (VB1) bioregion (McKenzie *et al.* 2003).

Vegetation system association mapping

The proposed clearing area is located within the Victoria Bonaparte 916 vegetation system association, which is described as "Grasslands, high grass savanna woodland; grey box, *Eucalyptus confertifolia* & *E. foelscheana* over spinifex, white & tall upland grass on sandy plain on limestone" as defined by the Government of Western Australia (2015). Vegetation statistics for the Victoria Bonaparte 916 vegetation association are displayed in Table 1.

Table 1: Pre-European and current extent of Victoria Bonaparte 916 vegetation system association

Vegetation system association	Pre-European extent (ha)	Current extent (ha)	% remaining	Amount proposed to be cleared for the Project (ha)	% Current Extent Protected for Conservation
916	82,331.02	82,287.46	99.95	10 ha (approx. 0.0001% of current extent)	0.55

This vegetation association is very well represented locally and regionally, and currently extends over 99.95% of its pre-European area (Government of Western Australia 2015).

2.3.2 Vegetation assessment

Desktop searches

A search of the Department of Environment and Conservation (DEC; now Department of Parks and Wildlife [Parks and Wildlife]) Threatened flora and fauna databases (Parks and Wildlife 2007) was undertaken by Strategen in October 2011 for Lots 5 and 7 in Area 8 within 30 km of Area 8. A subsequent search of Parks and Wildlife NatureMaps database in 2016 was also undertaken within 3 km of the proposed clearing area to confirm if there have been any changes in conservation status of relevant priority flora species (Appendix 2).

Desktop database results

Based on the DEC threatened flora database search conducted in October 2011, 38 species were identified within a 15 km radius and one additional species was identified between a 15 km and 30 km radius of Area 8. No threatened flora species were recorded within Area 8. Two Priority species have historically been recorded within the Area 8 (Table 2; Figure 4) including:

- *Brachychiton tuberculatus* (Priority 3)
- *Fimbristylis laxiglumis* (Priority 2).

Table 2: Priority flora species that have historically been recorded within Area 8

Species	Conservation status*	Description	Recorded on site (Pilbara Flora 2009)
<i>Brachychiton tuberculatus</i>	Priority 3	<i>Brachychiton tuberculatus</i> is described as a shrub or tree growing to 7m high with cream, green, orange and red flowers from April/August to November, and has been recorded on red or yellow sand and undulating plains (cited in Pilbara Flora 2009).	✓
<i>Fimbristylis laxiglumis</i>	Priority 2	<i>Fimbristylis laxiglumis</i> is described as a tufted grass-like or herb (sedge) annual species growing to approximately 0.6 m in height with brown flowers in April, and has been recorded on black clays (DEC & WAH 2011).	×

A subsequent database search was conducted on 10 October 2016, covering an area of 3 km from the proposed clearing area (Appendix 2). No changes were identified between the October 2011 and the October 2016 desktop database investigations.

Pilbara Flora (2009) vegetation assessment

A flora and vegetation survey of Area 8 was conducted in May 2009 (Pilbara Flora 2009;). The survey comprised a 'one season' Level 2 equivalent flora and vegetation survey in accordance with Environmental Protection Authority (EPA) Guidance Statement No. 51 "*Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*" (EPA 2004). The survey involved traversing Area 8 on foot, with vegetation communities differentiated visually and mapped using 50 x 50 m quadrats. Vegetation and floristic data collected for quadrats included species presence, height, percentage foliage cover, community structure, vegetation condition, fire age, general information on soil, and floristic samples for all taxa encountered during the survey. Descriptions were made of any Priority Flora, Declared Rare Flora (DRF), and weeds of significance or weed infestations recorded within the quadrats, or observed when walking through Area 8. Vegetation condition across Area 8 was assessed using the Trudgen (1988) vegetation condition scale for use on Pilbara Rangeland Surveys.

A total of 218 flora species were recorded within Area 8. Average species richness per quadrat was 23 and the highest richness recorded in a single quadrat was 47 species. Given that the survey was conducted soon after the wet season, floral records made during the survey should be representative of actual diversity on site, as most annuals would have emerged.

No DRF or threatened flora was recorded within Area 8. Two priority species were recorded in Area 8 during the 2009 survey (Pilbara Flora [2009]; Table 3; Figure 4). These two priority flora species are not located within the proposed clearing area.

Table 3: Priority flora species recorded within Area 8

Species	Conservation status*	Description	Recorded	Regional distribution
<i>Goodenia brachypoda</i>	Priority 1	<i>Goodenia brachypoda</i> is described as a prostrate herb with stems to 0.25 m with yellow flowers during September that has been recorded on red sandy loam soils.	A single individual was recorded in each of five different locations (Q027, Q030, Q031, Q031, Q033; Figure 4).	This species has been recorded in the northeast Kimberley, north of the Prince Regent River, at the Pentecost River west of Kununurra, near Wyndham, on Carlton Plains northwest of Kununurra, south of Lake Argyle and in the Northern Territory, south of Victoria River and near Bullo River. The main population distribution is an area approximately 300 km by 150 km that fringes the WA/NT border near Kununurra. This species has a recorded distribution that occurs well outside of the vegetation survey areas.

Species	Conservation status*	Description	Recorded	Regional distribution
<i>Brachychiton tuberculatus</i>	Priority 3	<i>Brachychiton tuberculatus</i> is described as a shrub or tree growing to 7 m high with cream, green, orange and red flowers from April/August to November, and has been recorded on red or yellow sand and undulating plains.	A total of 38 individuals were recorded from nine different locations (Q022, Q027, Q030, Q031, Q037, Q039, GPS Points x 3; Figure 4).	This species has been recorded in the Kununurra region extending north to the Cambridge Gulf, west to Carlton Plains and east past the border, and also north of Lake Argyle and in the Northern Territory, near the Daly River and near Fitzmaurice River. The two population distributions include an area approximately 140 km by 90 km centred on Kununurra and a second area along the Daily River. This species has a recorded distribution that occurs outside of the vegetation survey areas.

Source: Pilbara Flora 2009

Vegetation types

The dominant vegetation structure within Area 8 is comprised of a tree canopy layer at 6–12 m and 20–30 % cover, a shrub layer at 1–3 m and 5–10 % coverage and additional moderately dense tussock grasses (Pilbara Flora 2009).

The survey identified the following five vegetation types within Area 8 in May 2009 (Pilbara Flora [2009]; Figure 3).

- G1 – Tussock grassland: *Dichanthium sericeum* subsp. *polystachyum* tussock grassland on black soil plains over *Ludwigia perennis* and *Flemingia pauciflora*.
- W1 – mixed mosaic woodland containing nine distinct mosaic units including:
 - * W1A: *Corymbia greeniana* woodland on alluvial plains
 - * W1B: *Terminalia canescens* and *Melaleuca argentea* woodland on alluvial plains
 - * W1C: *Corymbia confertiflora* and *Corymbia grandifolia* subsp. *lamprocardia* woodland in soak areas
 - * W1D: *Corymbia bella* woodland on alluvial plains
 - * W1E: *Corymbia grandifolia* subsp. *lamprocardia* and *Corymbia abbreviata* woodland on alluvial plains
 - * W1F: *Eucalyptus miniata* and *Corymbia* species woodland on alluvial plains
 - * W1G: *Eucalyptus tetradonta* and *Acacia difficilis* woodland on alluvial plains
- W4 – Mixed woodland: *Corymbia grandifolia* subsp. *lamprocardia*, *Corymbia greeniana* and *Erythrophleum chlorostachys* woodland on alluvial plains.
- W5 – Mixed woodland: *Eucalyptus microtheca* and *Melaleuca nervosa* subsp. *crosslandiana* woodland on soak areas. Low woodland of *Eucalyptus microtheca* over *Melaleuca nervosa* subsp. *crosslandiana* and *Excoecaria parvifolia* over *Schoenoplectus praelongatus*.
- W8 – Mixed Woodland: *Eucalyptus tectifera* and *Excoecaria parvifolia* woodland on black soil plains. *Eucalyptus tectifera* and *Excoecaria parvifolia* over *Eragrostis* sp., *Ludwigia perennis* and *Eragrostis tenellula*.

The proposed clearing area is composed of vegetation type W1 mixed mosaic woodland and appears to be dominated by mosaic unit W1A: *Corymbia greeniana* woodland on alluvial plains. This vegetation type is well represented in Area 8 (Figure 3).

Vegetation condition

The majority of vegetation in Area 8 is described as Excellent condition (Pilbara 2009), including the proposed clearing area, with very little impact from grazing (Pilbara Flora 2009).

The proposed clearing area comprises approximately 1.58% of the remaining native vegetation within Area 8 in Excellent condition (Table 4). Clearing of areas greater than 10 ha within Area 8 in Excellent condition were previously approved in CPS 3432/2.

Table 4: Approximate area (ha) covered by each vegetation condition category within Area 8

Vegetation Condition	Total area (ha) within Area 8	Remaining area (ha) following clearing of approved areas	Percentage of the proposed clearing area (%)
Excellent	822.7	633.7	1.58
Very Good	194.1	189.3	N/A
Completely Degraded	53.0	53.0	N/A
Total	1069.8	876	-

Source: Pilbara Flora (2009)

Introduced species

Three weed species were recorded in Area 8 by during the 2009 survey (Pilbara Flora 2009), the majority of which had coverage of less than 1 % in each quadrat. The presence of weeds identified within Area 8 is considered by Pilbara Flora (2009) to be low with regard to other areas of the Kimberley.

No weeds have been recorded within the proposed clearing area (Figure 4).

Threatened ecological communities

No threatened ecological communities (TECs) or Priority Ecological Communities (PECs) were identified within Area 8 in previous field and desktop environmental studies.

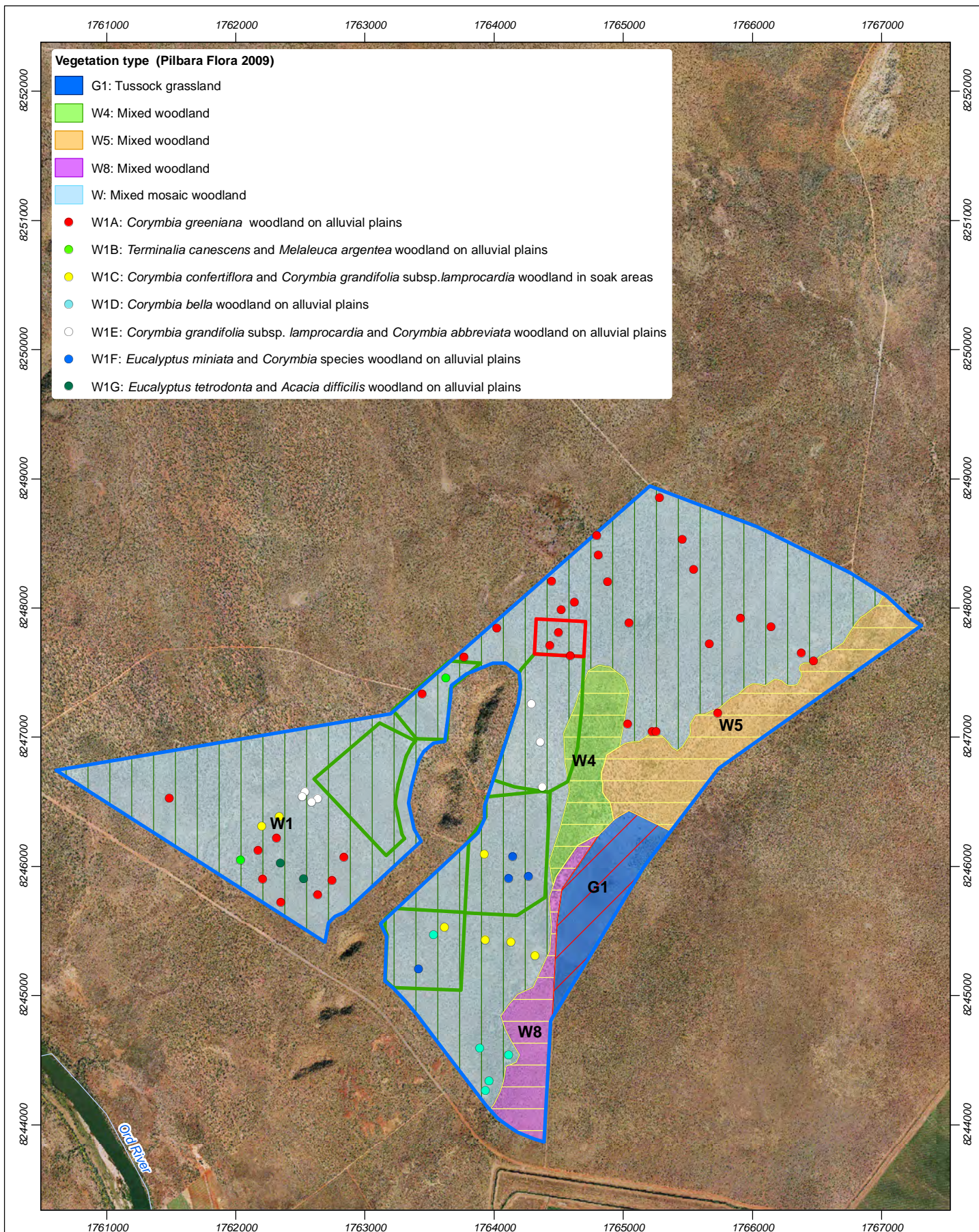


Figure 3: Vegetation type and condition within Area 8

Scale 1:40,000 at A4

0 250 500 750 1,000 1,250 Meters

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 13/10/2016

Author: JCrute

Source: Existing cadastre: SLIP, landgate 2016.

Legend

- Major river
- Area 8
- Proposed clearing area (10 ha)
- CPS 3432/2 clearing areas

Vegetation condition (Pilbara Flora 2009)

- Completely Degraded
- Excellent
- Very Good

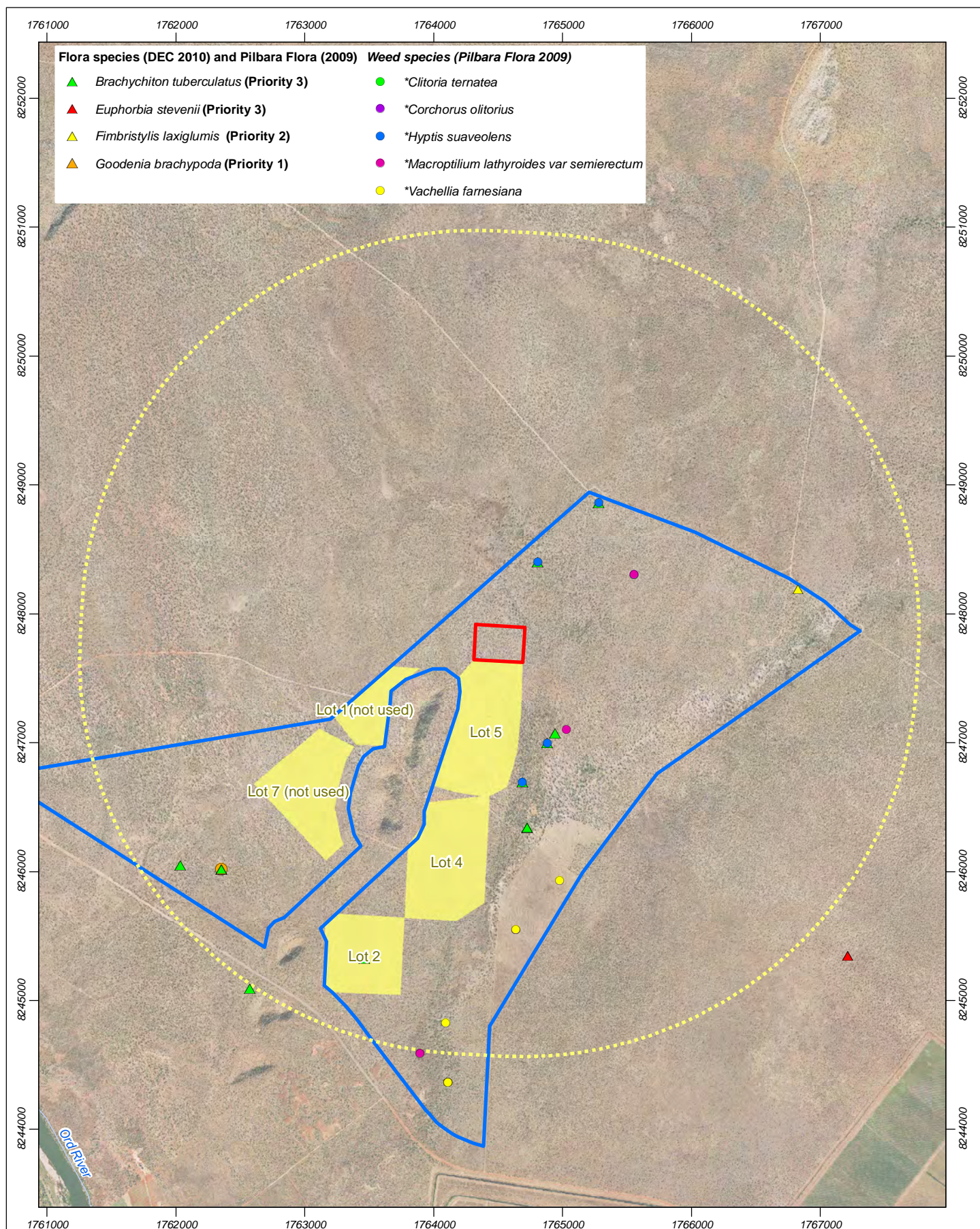


Figure 4: Threatened and priority flora within 3 km of the proposed clearing area

Scale 1:40,000 at A4

0 250 500 750 1,000 1,250 Meters

Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 13/10/2016
 Author: JCrute
 Source: Existing cadastre: SLIP, landgate 2016.

Legend

- 3 km wide buffer
- Area 8
- Proposed clearing area (10 ha)

CPS 3432/2 clearing areas

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2.4 Fauna

2.4.1 Desktop searches

A DEC (now Parks and Wildlife) fauna database search was conducted in December 2011 to determine the occurrence of threatened or priority fauna within a 10 km buffer around the site (Table 5). The fauna database results have been compared to the Strategen (2009) fauna assessment as presented in Table 5.

Table 5: Threatened and priority fauna species within 10 km radius of site

Species	Conservation status	Habitat description	Recorded on site (Strategen 2009)
<i>Cristilabrum spectaculum</i>	T	A terrestrial invertebrate mollusc species.	×
<i>Erythrura gouldiae</i> (Gouldian Finch)	T	In recent times the species has been reliably recorded at only a few sites within the Northern Territory and Western Australia and is rarely observed in the wild in Queensland (Pryke 2010). Key populations of the Gouldian Finch are located in the Wyndham area 100 km west of the Project area.	×
<i>Rhinonictis aurantius</i> (Orange Leaf-nosed Bat)	T	Orange Leaf-nosed Bats prefer warm humid caves, although some have been found in hollow tree trunks and roost together in colonies that can be as small as 20 or as large as a few thousand bats (Australian Museum 2011).	×
<i>Ardeotis australis</i> (Australian Bustard)	Priority 4	The Australian Bustard is most abundant in parts of northern Australia and is commonly found in tussock grassland, <i>Triodia</i> hummock grassland, grassy woodland, low shrublands, and structurally similar artificial habitats, such as croplands and golf-courses (Garnett & Crowley 2000). They will also use denser vegetation, when this has been temporarily opened up by recent burning (Garnett & Crowley 2000).	×
<i>Phaps histrionic</i> (Flock Bronzewing)	Priority 4	The Flock Bronzewing is still periodically and patchily common in the semi-arid tropics and subtropics (Garnett & Crowley 2000). Flock Bronzewings are mainly found in open Mitchell Grass <i>Astrelia pectinata</i> grasslands on black soil plains, but also frequent saltbush <i>Atriplex</i> , bluebush <i>Maireana</i> and <i>Triodia</i> hummock grasslands, grassy woodlands, recently burnt areas, roadsides and agricultural land, particularly favouring run-on areas (Garnett & Crowley 2000).	×

2.4.2 Strategen (2009) fauna assessment

A fauna survey of Area 8 was conducted in July 2009 to identify any environmental issues associated with fauna that may occur on the site (Strategen 2009). Area 8 was traversed by foot, photographed, GPS locations were taken and descriptions of the site were made using fauna habitat proforma.

A small number of abrupt sandstone outcrops occur near the central and south-western portions of Area 8. The outcrops are considered by Strategen (2009) to have high conservation value and are expected to be dependent habitat for Short Range Endemic (SRE) invertebrate taxa and a diverse suite of herpetofauna. Vegetation surrounding the outcrops is also expected to represent peripheral habitat and interzone habitat for a diverse range of fauna species.

The vegetation survey (Pilbara Flora 2009) identified the presence of seven *Corymbia* species and one Eucalypt species, all which contribute to fauna microhabitat including leaf litter, hollow limbs, peeling bark and fallen logs.

Fauna species

The list of animals present in woodland habitats of Area 8 is particularly diverse, due to the array of microhabitats present where the woodlands are of high quality and low disturbance. A total of 31 species of ground dwelling vertebrate fauna were captured from woodland habitats similar to those present in Area 8.

None of the recorded fauna are threatened or priority species or occur in the proposed clearing area. As the woodland habitat of Area 8 is in good condition, mammal species such as the Northern Brush-tailed Possum (*Trichosurus arnhemensis*) may also occur.

3. Assessment against the ten clearing principles

An assessment of the proposed clearing against the ten clearing principles is provided in Table 6. The ten clearing principles are outlined in Schedule 5 of the EP Act and assessment is in accordance with Department of Environment Regulation guidelines (DER 2014).

This assessment demonstrates that the proposed removal of 10 ha of native vegetation is not at variance with any of the clearing principles. On this basis, LandCorp anticipates that the proposed clearing of 10 ha of native vegetation can be permitted to occur.

Table 6: Assessment of native vegetation clearing in accordance with the ten clearing principles

Clearing principle	Assessment	Outcome
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	<p>The proposal is to clear up to 10 ha of native vegetation.</p> <p>The clearing is to occur with 'Area 8', which covers an area of approximately 1070 ha. A 2009 vegetation survey recorded a total of 218 flora species within Area 8 (Pilbara Flora 2009). The average number of species per quadrat was 23 and the highest was 47. These figures are likely to be representative of the true diversity of the site given that the survey was conducted in May, just after the wet season when most annuals would have emerged.</p> <p>These results indicate a relatively high floristic diversity for Area 8 compared to results from other vegetation surveys in the region. A total 192.66 ha of clearing was approved within Area 8 under CPS 3432/2; however, only 76.97 ha was disturbed.</p> <p>Although the Area 8 is relatively biologically diverse, biological diversity within Area 8 is not expected to be significantly affected, due to the proportionally small area of clearing proposed. In addition, once the proposed clearing area is no longer required for materials extraction, cleared areas would be rehabilitated with endemic species.</p>	May be at variance
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	<p>Area 8 comprises a gently inclined to moderate sloping lower slope or plain, with no evidence of recent or historical fire. Groundcover at the time of the survey included leaf litter, fallen logs and termitaria and vegetation comprised a tree canopy layer at 6–12 m, a shrub layer at 1–3 m and moderately dense tussock grasses. When surveyed the woodland was in very good condition with little impact from grazing. Results of a large scale trapping campaign in vegetation habitats similar to those occurring in Area 8 revealed a total of 31 ground dwelling vertebrate fauna species, none of which are considered to be conservation significant (Strategen 2009).</p> <p>The condition of the vegetation within Area 8 would allow for a diverse fauna habitat, in particular litter at the base of tree trunks. These vegetation types are well represented both locally and regionally (Pilbara Flora 2009) and consequently the clearing of 10 ha within Area 8 is not considered to be at variance with this principle. In addition, once the proposed clearing area is no longer required for materials extraction, cleared areas would be rehabilitated with endemic species.</p>	Not at variance
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	Neither the botanical survey (Pilbara Flora 2009) nor the subsequent Parks and Wildlife (2007-) flora database search recorded any DRF within the proposed clearing area, or in Area 8.	Not at variance
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) occur within or in proximity to Area 8.	Not at variance

Clearing principle	Assessment	Outcome
e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	The vegetation types within Area 8 are representative of Beard vegetation association 916, which currently is at 99.95% of its original extent (Government of Western Australia 20155), which indicates the vegetation types located within Area 8 are well represented both locally and regionally. On this basis, the proposed clearing of 10 ha within Area 8 is not expected to be at variance with this principle.	Not at variance
f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The proposed clearing will not occur near a watercourse or wetland. The nearest water body to the site is the Ord River which is located approximately 1.7 km to the south of the site. As the river is located well outside Area 8, the proposed clearing of 10 ha is not expected to have a significant effect on the river banks, habitat for aquatic fauna or water quality.	Not at variance
g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Clearing of 10 ha of native vegetation within Area 8 is not expected to cause appreciable land degradation in surrounding areas due to: <ul style="list-style-type: none"> • the relatively small area of total proposed clearing • the large extent of vegetation that would remain within the local and regional areas • the retention of native vegetation around the clearing area, acting as a buffer against wind and water erosion • the site is made up of sandy clay loams which are moderately well drained and is located on relatively flat alluvial plain, which is expected to shed floodwater at low velocity • no grazing or other threatening processes will occur other than clearing • rehabilitation of disturbed areas once gravel has been pushed up. 	Not at variance
h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Six conservation areas have been established across the East Kimberley region in association with the ORIA expansion project, covering a total area of over 180 000 ha (Livistona Range Conservation Area, Pincombe Range Conservation Area, Ningbing Range Conservation Area, Weaber Range Conservation Area, Mt Zimmerman Conservation Area and Packsaddle Swamp Conservation Area). Furthermore an 11 470 The nearest conservation areas to Area 8 area the Pincombe Range, located approximately 8 km to the east, and Livistona Range, located 2 km from the site on the southern bank of the Ord River. Due to the distance between Area 8 and Pincombe Range Conservation Area (and the other significant conservation areas), and the separation between Area 8 and the Livistona Range Conservation Area via the Ord River, the proposed clearing is not expected to affect these conservation areas.	Not at variance
i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	Vegetation to be cleared would be at least 1.7 km away from any surface water features. The nearest water body is the Ord River, located south of the site and would not be affected by surface runoff from cleared sites given site topography and soils and surrounding vegetation. Clearing of 10 ha would not pose any risk to surface water quality. The site is made up of sandy clay loams which are moderately well drained. The highest risk of contamination would come from refuelling and lubrication of machinery; however, the volumes required will be low. Management actions would be in place to ensure there is no contamination of groundwater from the use of fuels/chemicals used in the construction and maintenance of Area 8.	Not at variance
j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	Area 8 is located on a gently inclined to moderate sloping lower slope or plain. The site is moderately well drained and the soil is sandy clay loam with very few coarse fragments. Basic drainage and flood protection infrastructure would be installed to minimise the risk of ponding and flooding. Therefore, the proposed clearing of 10 ha should not affect water levels or drainage.	Not at variance

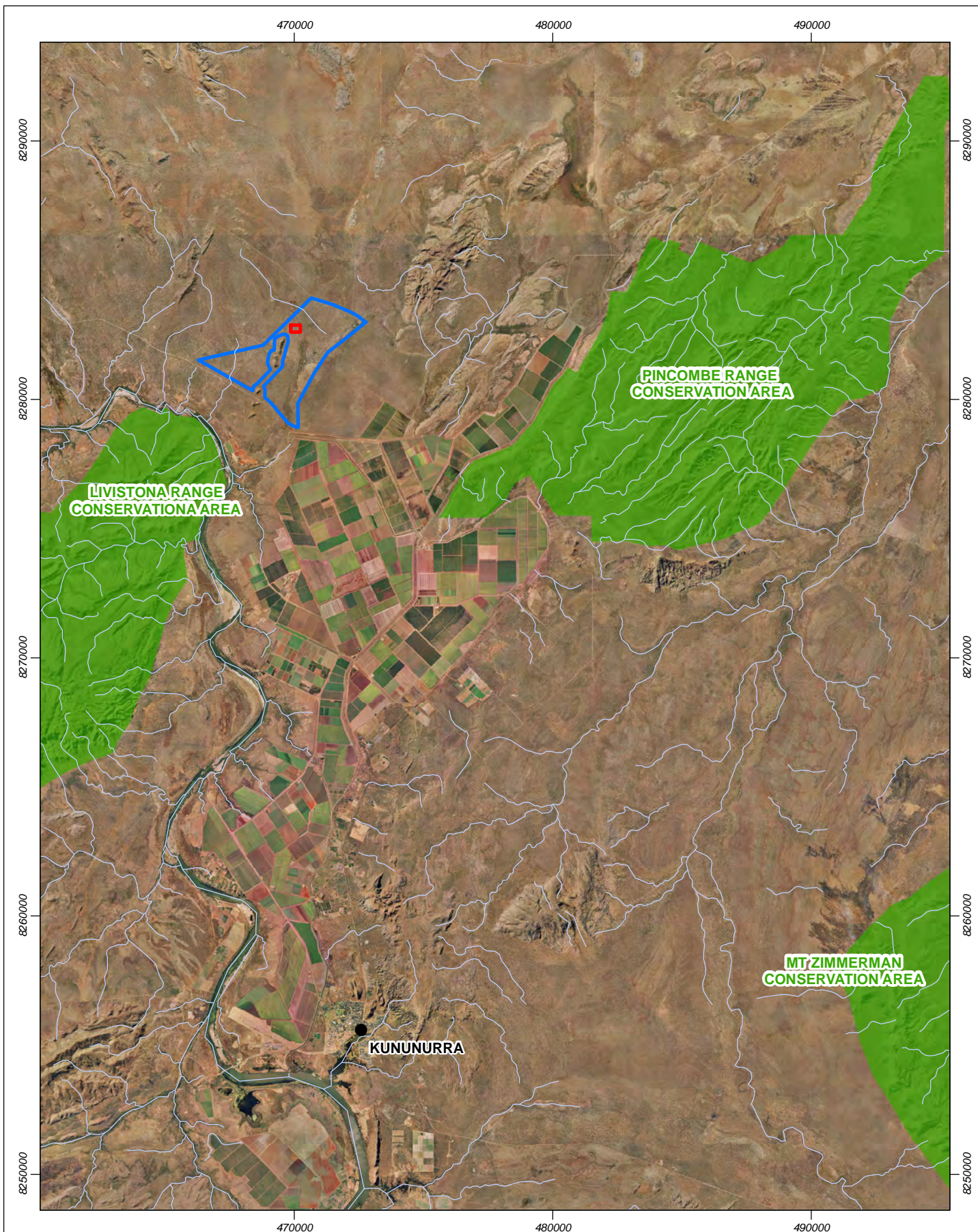


Figure 5: Conservation areas surrounding Area 8

Scale 1:200,000 at A4

0 1 2 3 4 5 Kilometers

Coordinate System: GDA 1994 MGA Zone 52
Note that positional errors may occur in some areas
Date: 13/10/2016

Author: JCrute

Source: Existing cadastre: SLIP, landgate 2016.

Legend

● Town

— Major drainage

□ Area 8

□ Proposed clearing area (10 ha)

■ Conservation areas

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4. Environmental management

This section outlines the mitigation and management strategy that has been implemented for Area 8 to date. This strategy is consistent with environmental management applied to clearing and construction activities of the ORIA expansion project (Strategen 2011).

Internal audits of the Area 8 clearing permit CPS 3432/2 conducted by Strategen in 2014 demonstrated that LandCorp were compliant with the requirements outlined in the permit. Approximately 72.5 ha (or 94%) of previously cleared areas had been rehabilitated to the end of the reporting period (Figure 2). Disturbance also avoided identified conservation significant flora species recorded by desktop and field surveys.

To date, LandCorp has demonstrated good environmental practice at Area 8 and has remained compliant with clearing permit requirements.

4.1 Objective targets and performance indicators

The management objectives, targets and performance indicators for Area 8, including the proposed clearing area are detailed in Table 7.

Table 7: Management objectives, targets and performance indicators for Area 8, including the proposed clearing area

Management objective	Target	Key Performance Indicator
Prevent disturbance occurring outside the designated clearing area	No clearing or disturbance of vegetation outside approved cleared areas	Clearing consistent with the requirements of the NVCP Clearing register
Maintain biodiversity values of the Kimberley region	No loss of priority flora or fauna species	Clearing consistent with the requirements of the NVCP
Minimise potential for introduction of weeds or plant pathogens.	No incidents of machinery or vehicles transporting soil/plant material on-site, unless the material is certified as free of Declared Plants and plant pathogens.	Vehicle/machinery inspection reports.
	No Declared Plants introduced on-site.	Visual observations Incident reports.
Minimise the risk of fire within or beyond the proposed clearing area	No occurrence of fire within or beyond the proposed clearing area	Incident reports.
Rehabilitate disturbed areas.	Areas no longer required following clearing spread with topsoil and vegetation within six months after completion of clearing.	Six month inspection report. Rehabilitation monitoring.
	No Declared Plants present on-site six months after completion of clearing	
	Achieve appropriate rehabilitation of disturbed areas.	
	No soil erosion	
Minimise impact (injury or death) to native fauna	No impacts on native fauna throughout clearing operations.	Incident reports..

4.2 Management actions

Management actions to be implemented to ensure fire, weed, plant pathogen and rehabilitation management objectives are met are detailed in Table 7.

4.2.1 Fire, weeds and pathogens

Overall Area 8 is generally in excellent condition with few introduced species present (Pilbara Flora 2009). It would be important to ensure that no fire damage to vegetation occurs to remaining vegetation and no new highly invasive weed species are introduced within Area 8 during the proposed clearing and maintenance. Weed management would focus on Declared Plants species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DAFWA 2016). Plant pathogens and diseases could also potentially be brought onto Area 8 via soil material attached to vehicles. Therefore, hygiene measures would be implemented for vehicles entering or leaving Area 8, including the proposed clearing area.

4.2.2 Rehabilitation

Effective rehabilitation is required to ensure that disturbed areas not required post works (e.g. for gravel stockpiles and ongoing access) are returned to a condition that reduces adverse impacts on the natural environment. Disturbed areas no longer required following clearing would be stabilised, spread with stripped topsoil and vegetation (if available), and allowed to naturally regenerate.

Vegetative material and topsoil removed by clearing would be retained and stockpiled on site.

Topsoil spreading would commence as soon as practicable after clearing and gravel push up to promote regeneration from the stored seed bank, which would assist in soil stabilisation and reduce potential for erosion.

Table 8: Management actions for fire, weeds, plant pathogens and rehabilitation

Parameter	Action	Timing
Induction	Conduct site inductions for clearing personnel which includes: <ul style="list-style-type: none"> location and identification of priority flora species clearing boundary demarcation. 	Prior to commencing work on-site
Vegetation clearing boundary	Ensure boundary of clearing is clearly demarcated (e.g. fence, flags and signs).	Prior to clearing
	Provide coordinates of vegetation boundary to clearing contractor (as a map or electronically for GPS-controlled machinery, or both).	Prior to clearing
	Conduct pre-clearing flora survey to ensure no priority species are located within the proposed clearing area.	Prior to clearing
	Install temporary signage around the site.	Prior to clearing
Vehicle and machinery	Clean down machinery before entering site.	Prior to commencing work on-site
	Restrict access of vehicles and machinery to the limits of the areas to be cleared by delineating clearing areas (e.g. fence, flags and signs).	Prior to clearing
	Inspect clearing area for previously unrecorded Declared Plant species.	Monthly site inspections
	Stage clearing of vegetation so that areas are cleared only as required.	During clearing activity
Native fauna encounter	Ensure native animals encountered on-site are provided the opportunity to move on if there is no threat to personnel safety in doing so.	At all times
Fire management	Contact fire and emergency services if uncontrollable fire outbreak detected close by or as a result of clearing operations.	During clearing operations
	Monitor re-fuelling for fire outbreaks.	During clearing operations
Topsoil, and vegetation management	Remove top approximate 100 mm of topsoil from all areas to be cleared.	After operation
	Ensure topsoil and cleared vegetation to be used in rehabilitation does not contain Declared weeds.	After operation
	Relocate stripped topsoil and vegetation directly to areas required to be rehabilitated, where possible.	After operation
	Where direct replacement of topsoil and/or vegetation is not possible, stockpile topsoil and vegetation for later use in rehabilitation activities. Large rocks may be stockpiled as well if applicable and if required.	After operation
	Spread stripped topsoil evenly across areas to be rehabilitated (to a depth of 100–150 mm) progressively within six months following completion of project. Following spreading of topsoil, spread cleared vegetation over topsoil, including placing logs and rocks around site as potential habitat.	After operation
	Locate topsoil and vegetation stockpiles within clearing boundary, within already disturbed areas wherever possible.	After operation
Construction sites	Ensure all foreign material is removed (recycled or reused where practicable, or disposed of offsite) before rehabilitation is carried out.	After operation
	Remediate areas suspected to be contaminated by spills or leaks of hydrocarbons and/or inappropriate disposal of wastes.	After operation

Parameter	Action	Timing
Erosion/ land stability	Stabilise disturbed areas through a combination of ripping, contouring and slope stabilisation where applicable.	After operation, prior to topsoil/vegetation spread
	Reshape and contour rehabilitation areas to blend with adjacent relief and drainage as far as practicable. This would include: <ul style="list-style-type: none"> the removal of impediments to run-off diversion of surface run-off around borrow pits to prevent flooding/standing water and potential instability of pit walls filling of borrow pits with sub soil to level of natural ground surface where necessary. 	After operation
Monitoring	Inspect areas rehabilitation areas to ensure adequate spreading of topsoil and vegetation and to determine whether any Declared Plants are present.	Six months following rehabilitation

5. References

- Australian Museum 2011, *Animal species: Orange Leaf-nosed Bat*, Australian Museum, Sydney, New South Wales. [Online]. Available from <<http://australianmuseum.net.au/Orange-Leaf-nosed-Bat>>. Accessed on 14 October 2011.
- Beard J 1990, *Plant Life of Western Australia*, Kangaroo Press, Perth.
- Department of Agriculture and Food Western Australia (DAFWA), Natural Resource Management Information, [Online] available from: <http://maps.agric.wa.gov.au/nrminfo/framesetup.asp> [26 August 2016].
- Department of Environment Regulation (DER) 2014, *A guide to the assessment of applications to clear native vegetation*, Government of Western Australia, Perth, December 2014.
- Department of Parks and Wildlife (Parks and Wildlife) 2007-, *Naturemap, Mapping Western Australia's Biodiversity*, [Online], Government of Western Australia, Available from: <http://naturemap.dec.wa.gov.au/default.aspx> [10 October 2016].
- Department of the Environment and Energy (DEE) 2016a, *Interim Biogeographic Regionalisation for Australia, Version 7*, [Online], Australian Government, Available from: <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra> [10 October 2016].
- Government of Western Australia 2015, *2015 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)*. Current as of June 2015. WA Department of Parks and Wildlife, Perth. Available at: <<https://www2.landgate.wa.gov.au/web/guest/downloader>> [10 October 2016]
- Environmental Protection Authority (EPA) 2004, *Guidance Statement 51 - Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* [Online] available from: <http://epa.wa.gov.au/EPADocLib/1839_GS51.pdf> [11 October 2016].
- Garnett ST and Crowley GM 2000, *The Action Plan for Australian Birds 2000*, Environment Australia, Canberra, Australian Capital Territory.
- GSWA 2008, *1:500 000 Interpreted Bedrock Geology of Western Australia Spatial Data*. Geological Survey of Western Australia. Department of Mines and Petroleum Data and Software Centre. Retrieved 10 October 2016.
- Landgate 2016, Shared Land Information Platform: WA Atlas, [Online], Government of Western Australia, available from: <https://www2.landgate.wa.gov.au/bmvf/app/waatlas/>, [10 October 2016].
- Kellogg Brown & Root Pty Ltd (KBR) 2011, *Ord East Kimberley Expansion Project Weaber Plains Groundwater Modelling Report – Final (including Stage 4 results)*, report prepared for LandCorp, 13 May 2011.
- McKenzie NL, May JE and McKenna S 2003, *Bioregional Summary of the 2002 Biodiversity Audit of Western Australia*, Department of Conservation and Land Management, Perth.
- Pilbara Flora 2009, *Flora and Vegetation Survey of Main Roads Western Australia Potential Borrow Material Investigation Areas at Kununurra*, draft unpublished report prepared for Strategen Environmental Consultants, September 2009.
- Pryke, S 2010, *Ord River Expansion: Stage 2, Gouldian Finch: Preliminary Survey and Recommendations*, Macquarie University and Save the Gouldian Fund, Sydney, New South Wales.

Strategen 2009, *Ord River Irrigation Area – Weaber Plain Development Project: Material Investigation Areas Fauna Report*, draft unpublished report prepared for LandCorp, Perth, Western Australia, November 2009.

Strategen 2011, *Ord River Irrigation Area – Weaber Plain Development Project: Environmental Management Program*, unpublished report prepared for LandCorp, Perth, Western Australia, December 2011.

Strategen 2014, *ORIA Stage 2 Development Project, Internal compliance report – Area 8 & Area 9 clearing permits*, unpublished report prepared for LandCorp, Perth, Western Australia, June 2014.

Trudgen ME 1988, *A Report on the Flora and Vegetation of the Port Kennedy Area*, unpublished report prepared for Bowman Bishaw and Associates, West Perth.

Appendix 1
Clearing permit (CPS 3432/2)

<All appendices can be found in a CD-ROM accompanying this report>

Appendix 2

NatureMap search

<All appendices can be found in a CD-ROM accompanying this report>

Appendix 3
Pilbara Flora survey (2009)

<All appendices can be found in a CD-ROM accompanying this report>