GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 8506/1
Permit Holder:	Shire of Wongan Ballidu
Duration of Permit:	From 12 December 2020 to 12 December 2030

The permit holder is authorised to clear native vegetation subject to the following conditions of this permit.

PART I – CLEARING AUTHORISED

1. Clearing authorised (purpose)

The permit holder is authorised to clear native vegetation for the purpose of road widening.

2. Land on which clearing is to be done

Waddington-Wongan Hills Road Reserve (PINs 11488722, 11488754 and 11488755), Wongan Hills.

3. Clearing authorised

The permit holder must not clear more than 0.6 hectares of native vegetation within the areas cross-hatched yellow in Figures 1a-d of Schedule 1.

4. Period during which clearing is authorised

The permit holder must not clear any native vegetation after 12 December 2025.

5. Application

This permit allows the permit holder to authorise persons, including employees, contractors and agents of the permit holder, to clear native vegetation for the purposes of this permit subject to compliance with the condition of this permit and approval from the permit holder.

PART II – MANAGEMENT CONDITIONS

6. Avoid, minimise, and reduce impacts and extent of clearing

In determining the native vegetation authorised to be cleared under this permit, the permit holder must apply the following principles, set out in descending order of preference:

(a) avoid the clearing of native vegetation;

(b) minimise the amount of native vegetation to be cleared; and

(c) reduce the impact of clearing on any environmental value.

7. Weed management

When undertaking any clearing authorised under this permit, the permit holder must take the following measures to minimise the risk of introduction and spread of *weeds*:

(a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;

(b) ensure that no known weed-affected soil, mulch, fill, or other material is brought into the area to be cleared; and

(c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

8. Directional clearing

The permit holder must conduct clearing activities in a slow, progressive manner (e.g. west to east) to allow fauna to move into adjacent native vegetation ahead of the clearing activity.

9. Flora management

Where *threatened flora* and *priority flora* species are identified in 'Vegetation and flora survey of the southern portion of the Waddington-Wongan Hills Road for the Shire of Wongan-Ballidu' report (November 2019), the permit holder shall:

(a) demarcate the identified individuals or populations of *threatened flora* and *priority flora*; and

(b) not clear the identified individuals or populations of *threatened flora* and *priority flora.*

10. Wind erosion management

The permit holder shall not clear native vegetation unless development commences within three months of the authorised clearing being undertaken.

11. Offset – Revegetation and rehabilitation requirements

The permit holder shall *revegetate* and *rehabilitate* 1.09 hectares of land within the area cross-hatched red in Figure 2 of Schedule 1 by implementing and adhering to the Waddington-Wongan Hills Road Offsite Revegetation Plan, including but not limited to the following actions:

(a) at an *optimal time* following clearing authorised under this permit commences *revegetating* and *rehabilitating* the area cross-hatched red in Figure 2 Schedule 1 by:

(i) deliberately *planting* of tube stock that will achieve the completion criteria below; and

(ii) ensuring only *local provenance* propagating material are used to *revegetate* and *rehabilitate* the area.

(b) implement hygiene protocols by cleaning earth-moving machinery of soil and vegetation prior to entering and leaving the site;

(c) undertake *weed* control activities on an 'as needs' basis;

(d) achieve the following completion criteria after the five year monitoring period for areas *revegetated* and *rehabilitated* under this Permit:

(i) at least 70 per cent survival rate of all plantings;

(ii) at least 90 per cent of species installed are represented in total species composition by year 3;

(iii) a maximum of 20 per cent weed coverage within the *revegetation/rehabilitation* area;

(iv) maximum patch size of bare ground is $30m^2$.

(e) undertake remedial actions for area *revegetated* and *rehabilitated* where monitoring indicates that revegetation has not met the completion criteria, outlined in condition 11(d), including:

(i) *revegetate* the area by deliberately *planting* native vegetation in the minimum target in condition 11(d) and ensuring only *local provenance* propagating material are used;

(ii) undertake further *weed* control activities; and

(iii) annual monitoring by an *environmental specialist* of the *revegetated* and *rehabilitated* site, until the completion criteria outlined in condition 11(d) are met.

12. Offset – Conservation covenant

By 12 December 2021, the permit holder shall provide to the *CEO* a copy of the conservation covenant under section 30B of the *Soil and Conservation Act 1945* setting aside the area cross-hatched red in Figure 2 of Schedule 1, for the protection and management of native vegetation in perpetuity.

PART III - RECORD KEEPING AND REPORTING

13. Records that must be kept

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	(a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared; (d) the size of the area cleared (in hectares); (e) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 6; (f) actions taken to minimise the risk of the introduction and spread of weeds and dieback in accordance with condition 7; (g) actions taken in accordance with condition 8; and (h) actions taken in accordance with condition 10.
2.	In relation to flora management pursuant to condition 9	(a) The date that demarcation of *threatened flora* and/or *priority flora* occurred; (b) actions taken to demarcate each *threatened flora* and/or *priority flora* species recorded and their relevant buffers; and (c) actions taken to avoid the clearing of *threatened flora* and/or *priority flora* species.
3.	In relation to revegetation pursuant to condition 11	(a) A description of the *revegetation* and *rehabilitation* activities undertaken; (b) The size of the area *revegetated* and *rehabilitated* (in hectares); (c) The date the area was *revegetated* and *rehabilitated;* (d) Remedial actions undertaken; and (e) The date completion criteria were met as determined by an *environmental specialist.*

14. Reporting

(a) The Permit Holder must provide to the *CEO* on or before 30 June of each year, a written report:

(i) of records required under condition 13 of this Permit; and

(ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.

(b) If no clearing authorised under this Permit was undertaken between 1 January to 31 December of the preceding calendar, a written report confirming that no clearing under this permit has been carried out, must be provided to the *CEO* on or before 30 June of each year.

(c) Prior to 12 September 2030, the Permit Holder must provide to the *CEO* a written report of records required under condition 13 of this Permit where these records have not already been provided under condition 14(a) of this Permit.

DEFINITIONS

In this permit, the terms in Table have the meanings defined.

Table 2: Definitions

Term	Definition
CEO	Chief Executive Officer of the department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*.
clearing	has the meaning given under section 3(1) of the EP Act.
condition	a condition to which this clearing permit is subject under section 51H of the EP Act.
direct seeding	means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species;
fill	means material used to increase the ground level, or to fill a depression.
department	means the department established under section 35 of the *Public Sector Management Act 1994* (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
environmental specialist	means a person who holds a tertiary qualification in environmental science or equivalent, and has a minimum of 2 years work experience relevant to they type of environmental advice that an environmental specialist is required to provide under this permit, or who is approved by the *CEO* as a suitable environmental specialist.
EP Act	*Environmental Protection Act 1986* (WA)
local provenance	means native vegetation seeds and propagating material from natural sources within 100 kilometres and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared.
mulch	means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation.
native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act.
planting	means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species.
priority flora	means those plant taxa described as priority flora classes 1, 2, 3, or 4 in the Department of Biodiversity, Conservation and Attractions *Threatened*

Term	Definition
	and Priority Flora List for Western Australia (as amended from time to time).
regenerate/ed/ion	means re-establishment of vegetation from in situ seed banks and propagating material (such as lignotubers, bulbs, rhizomes) contained either within the topsoil or seed-bearing *mulch.*
revegetate/ed/ion	means the re-establishment of a cover of *local provenance* native vegetation in an area using methods such as natural *regeneration*, *direct seeding* and/or *planting*, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area.
threatened flora	means those plant taxa listed as threatened flora under the *Biodiversity Conservation Act 2016.*
weeds	means any plant – (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.

Mathew Gannaway
MANAGER
NATIVE VEGETATION REGULATION

Officer delegated under Section 20
of the Environmental Protection Act 1986

19 November 2020

Schedule 1

The boundary of the area authorised to be cleared is shown in the map below (Figures 1a-d)

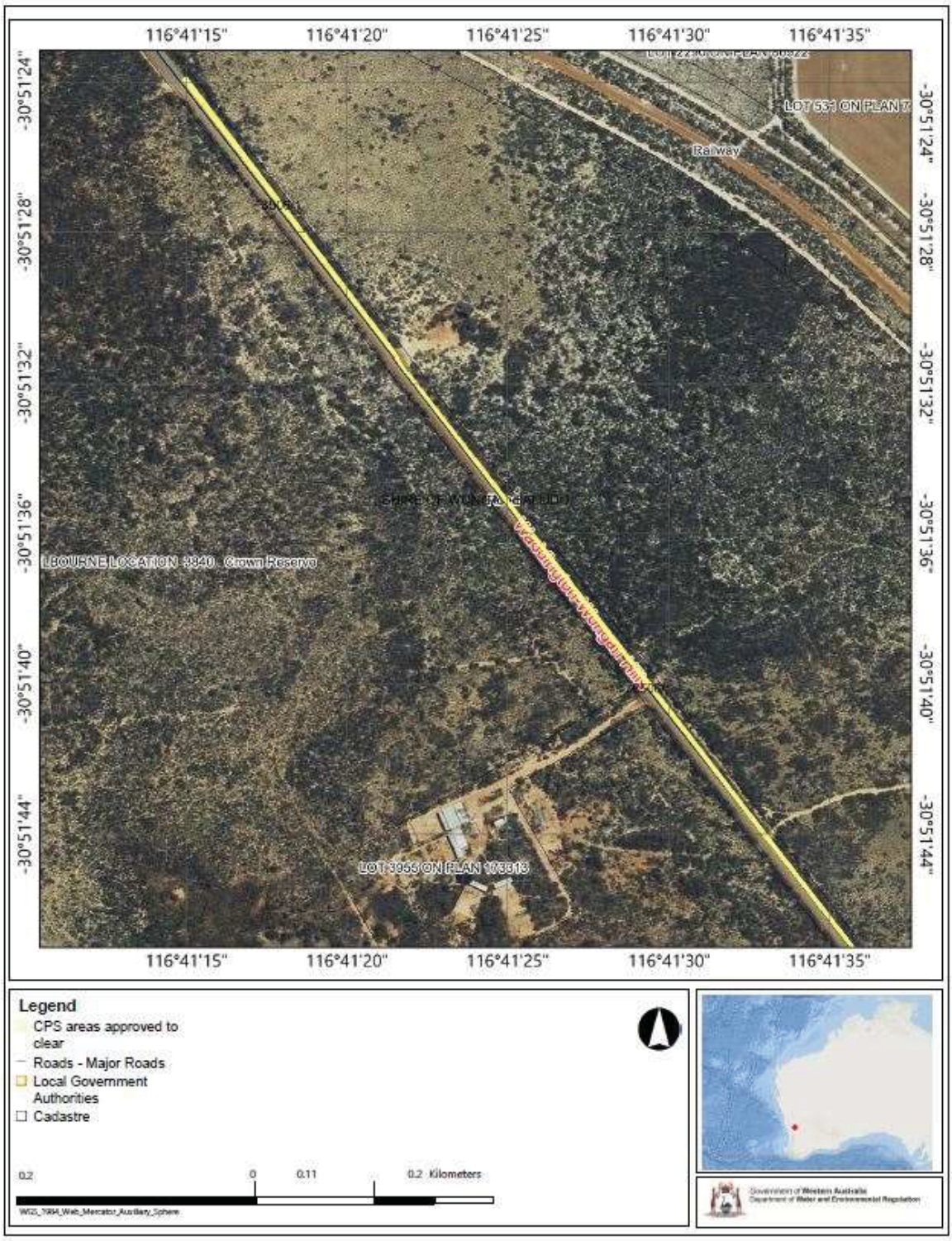


Figure 1a: Map of the boundary of the area within which clearing may occur

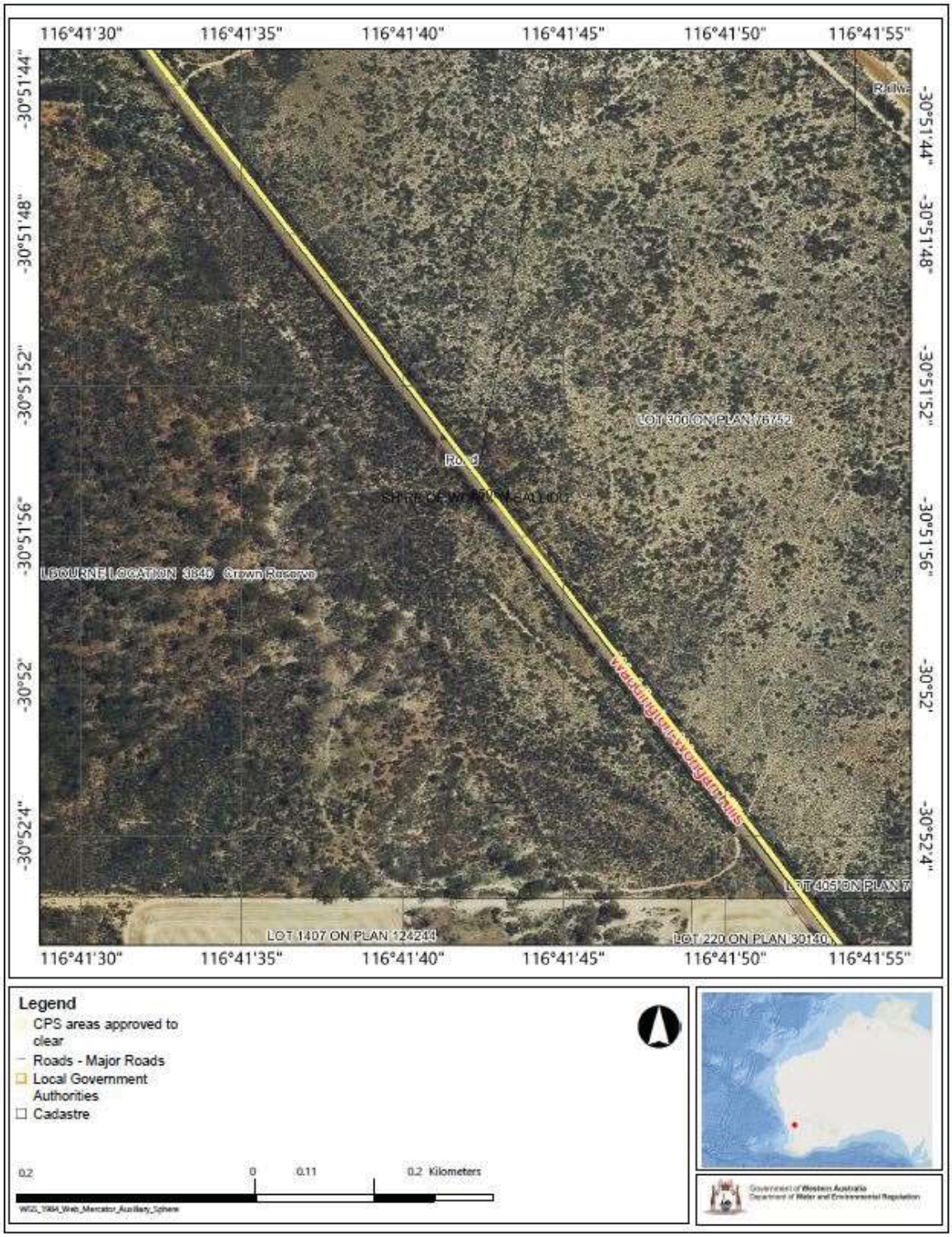


Figure 1b Map of the boundary of the area within which clearing may occur

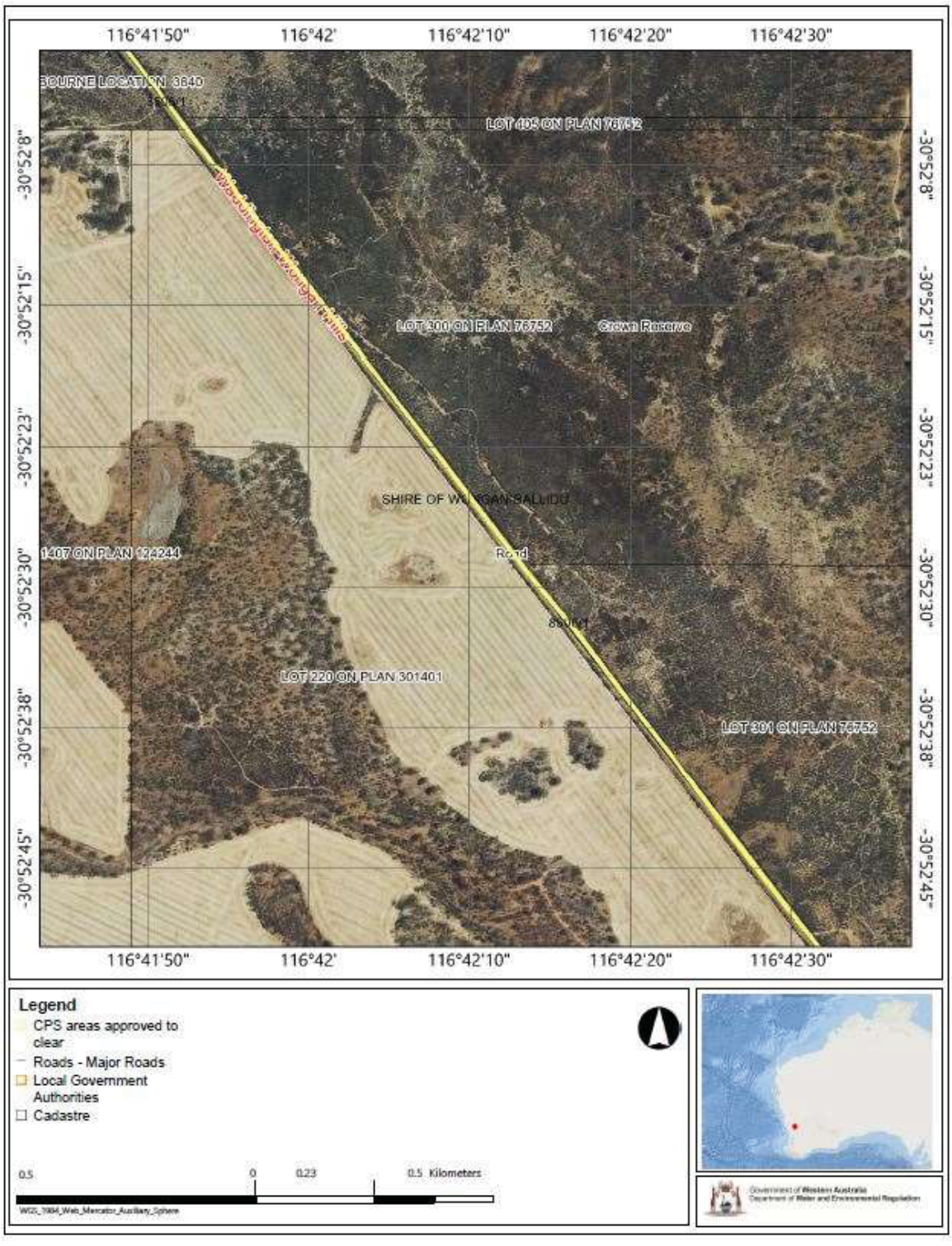


Figure 1c: Map of the boundary of the area within which clearing may occur

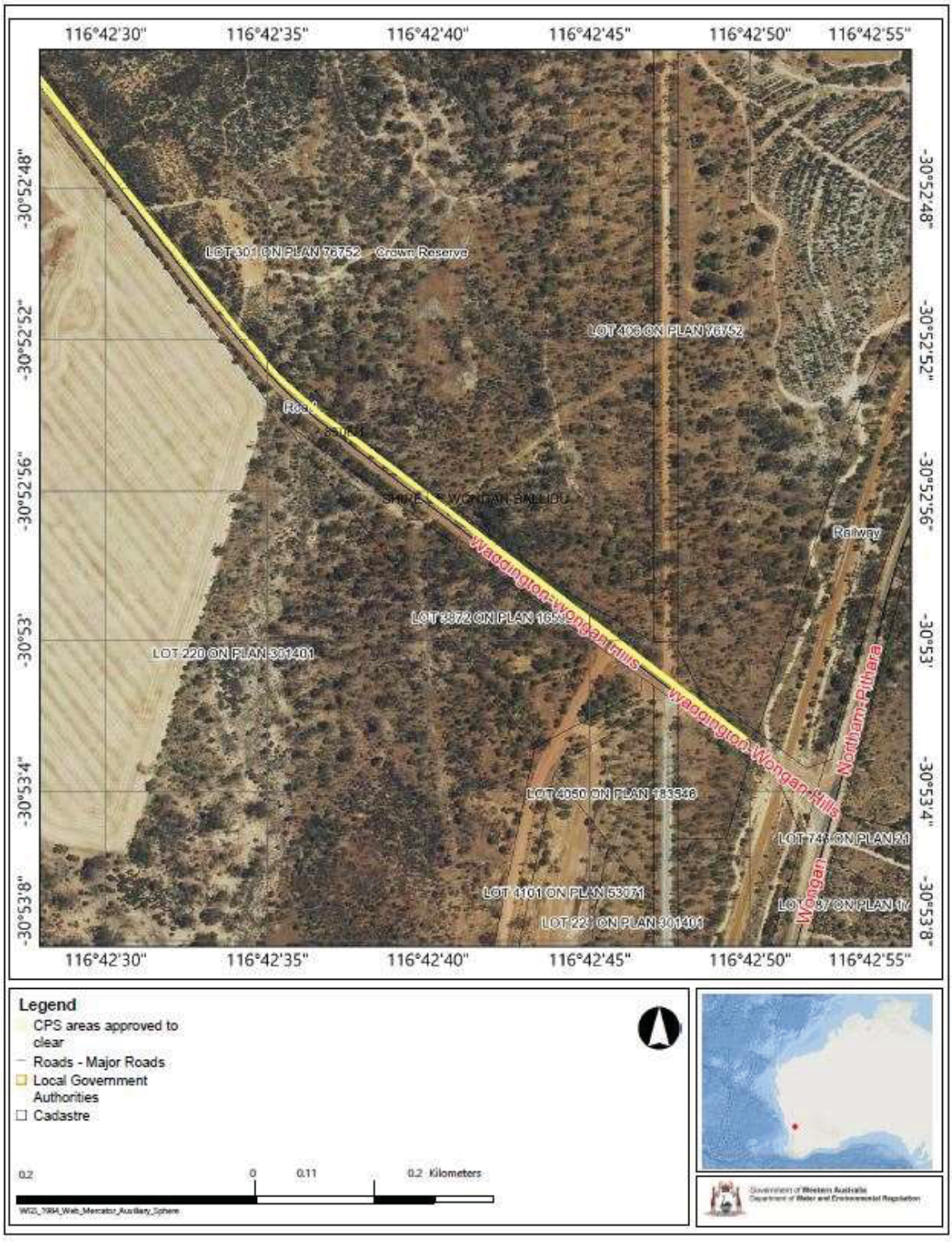


Figure 1d: Map of the boundary of the area within which clearing may occur

The boundary of the area to be revegetated/rehabilitated is shown in the map below (Figure 2).

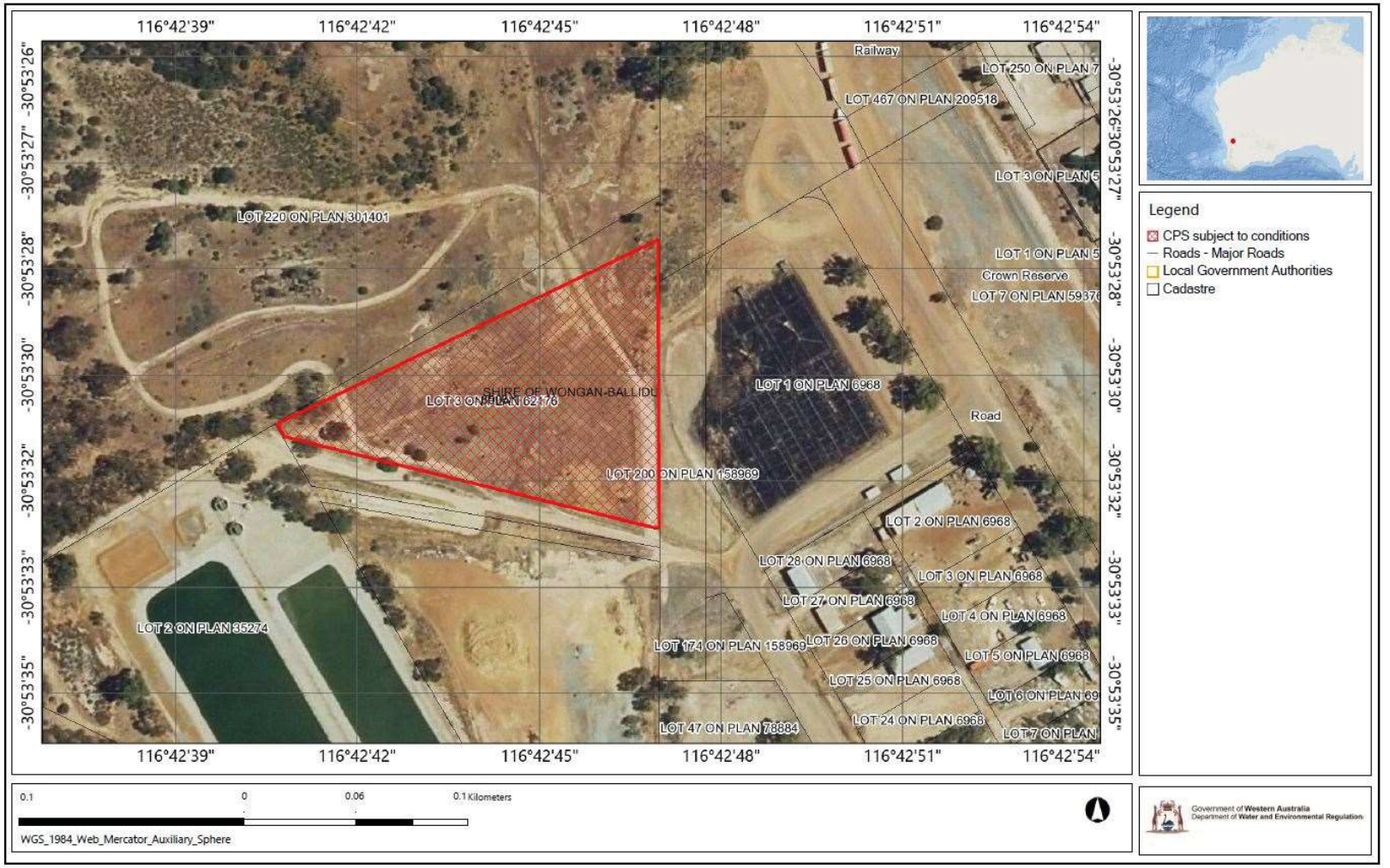


Figure 2: Revegetation/rehabilitation area approved as offset

Clearing Permit Decision Report

1. Application details and outcome

1.1. Permit application details

Permit number:	CPS 8506/1
Permit type:	Purpose permit
Applicant name:	Shire of Wongan-Ballidu
Application received:	24 May 2019
Application area:	0.6 hectares (ha) of native vegetation
Purpose of clearing:	Road widening
Method of clearing:	Mechanical removal
Property:	Waddington-Wongan Hills Road Reserve (PINs 11488722, 11488754 and 11488755)
Location (LGA area/s):	Shire of Wongan-Ballidu
Localities (suburb/s):	Wongan Hills

1.2. Description of clearing activities

The vegetation applied to be cleared is contained within the eastern side of Waddington-Wongan Hills Road reserve, requiring removal to facilitate road widening (see Figure 1, Section 1.5). Waddington-Wongan Hills Road reserve provides access to CBH from the west and from the Northam-Pithara Road to the east, resulting in high traffic during wheat harvest comprising B-double trucks delivering grain. The current width of the sealed section of the road is insufficient for safe passing of vehicles without going on to the shoulders (JBBC, 2019). The Shire of Wongan-Ballidu (the Shire) is proposing to widen the sealed section of the road which will require the clearing of up to two metres wide on the eastern side of the road reserve. The size of the area and amount of clearing proposed was reduced during assessment, from 1.6 ha to 0.6 ha.

1.3. Decision on application and key considerations

Decision:	Granted
Decision date:	19 November 2020
Decision area:	0.6 hectares (ha) of native vegetation, as depicted in Section 1.5, below.

1.4. Reasons for decision

This clearing permit application was made in accordance with section 51E of the *Environmental Protection Act 1986* (EP Act) and was received by the Department of Water and Environmental Regulation (DWER) on 25 June 2019. DWER advertised the application for public comment and two submissions were received (Appendix B).

In undertaking their assessment, and in accordance with section 51O of the EP Act, the Delegated Officer has given consideration to the Clearing Principles in Schedule 5 of the EP Act (see Appendix D), relevant planning instruments, and any other pertinent matters they deemed relevant to the assessment (see Sections 3 and 4). Consideration of matters raised in the public submissions is summarised in Appendix B.

In particular, the Delegated Officer has determined that:

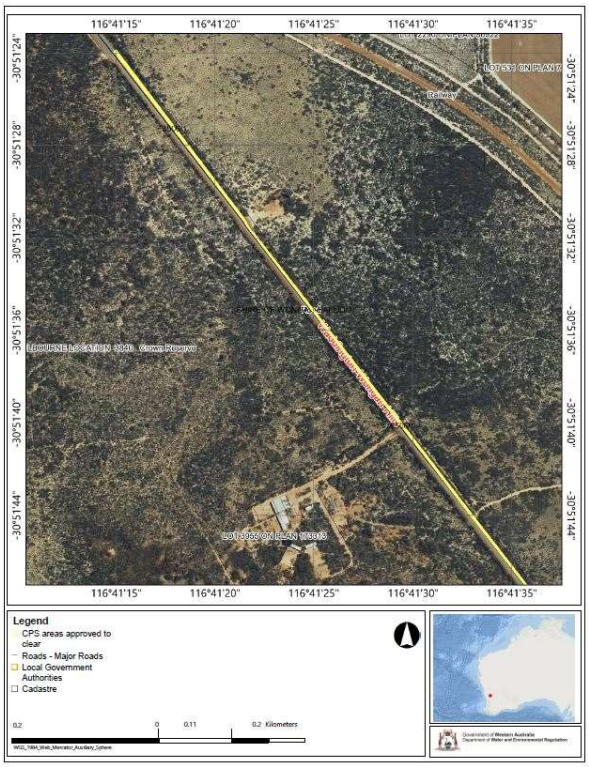
- the clearing is not likely to have a significant impact on the local population or conservation status of conservation significant flora species (see Section 3.2.1). The implementation of a condition requiring the demarcation of conservation significant flora individuals or populations recorded from the JBBC survey (2019) will minimise the impact of clearing on these species.

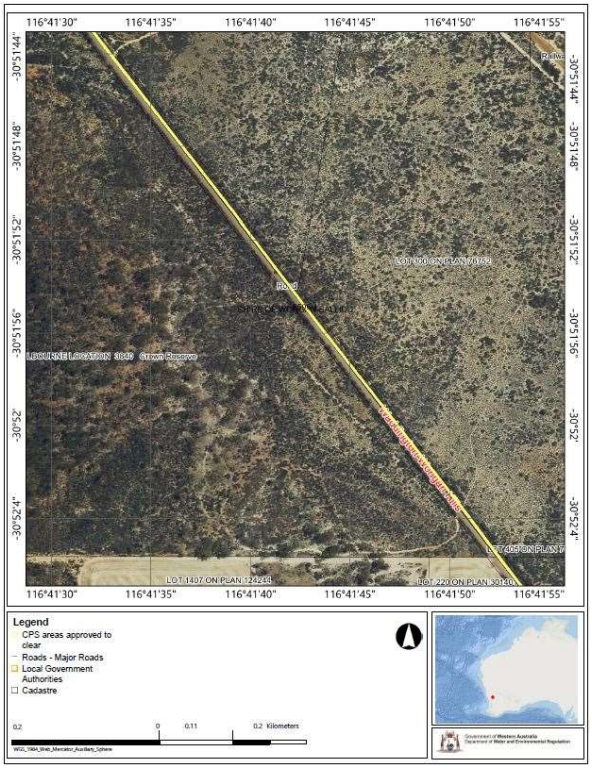
- the implementation of a suitable weed management condition is appropriate to mitigate the impact of spreading weeds into adjacent vegetation (see Section 3.2.1).
- the applicant has suitably demonstrated avoidance and minimisation measures (see Section 3.1)
- the offset provided by the applicant consisting of revegetating 1.09 hectares of land to restore the site to a self-sustaining ecosystem and including a range of flora species that will provide habitat for conservation significant fauna, adequately counterbalances the impacts to highly diverse flora and vegetation, which is part of a significant remnant in an extensively cleared landscape (see Section 4).

The Delegated Officer also took into consideration the purpose of the clearing is to improve road safety by widening the road as the road experiences high traffic of B-double trucks, school buses and tourists.

In determining to grant a clearing permit subject to conditions, the Delegated Officer found that the proposed clearing is not likely to lead to an unacceptable risk to the environment.

1.5. Site map





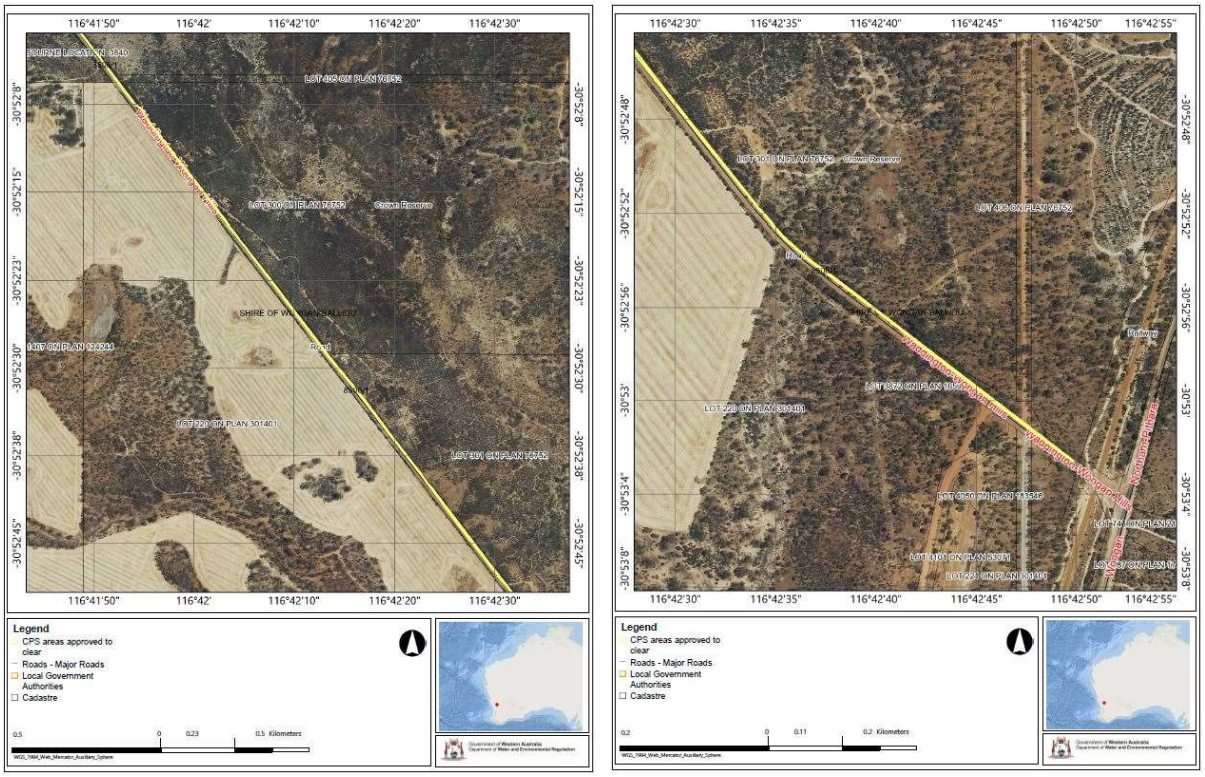


Figure 1. Maps of the application area.

The area outlined yellow indicates the area authorised to be cleared under the granted clearing permit.

2. Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.3), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

1. the precautionary principle;
2. the principle of intergenerational equity;
3. the principle of the conservation of biological diversity and ecological integrity; and
4. the polluter pays principle

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)

Relevant policies considered during the assessment were:

- *Environmental Offsets Policy* (2011)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (December 2013)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)
- *Environmental Offsets Guidelines* (August 2014)
- Technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016)
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)

3. Detailed assessment of application

3.1. Avoidance and mitigation measures

Evidence was submitted by the applicant, demonstrating that:

- Minimising the amount of clearing required was considered in the design of the proposed road widening. The application area was reduced from 1.6 ha to 0.6 ha, which allows for some trimming of vegetation to occur and the avoidance of conservation significant flora.
- Suggestions from public submissions were considered (widening the running surface of the road without widening the entire formation and improving the quality of the pavement/shoulders or sealing the shoulders). The applicant advised that the section of the road to be widened is currently 6.2 metres with only half a metre of unsealed shoulder. This is not adequate as when two trucks pass each other some vegetation are being clipped by side mirrors. The Shire proposes to have an 8-metre running surface with a one metre shoulder, not 2.5 metres as recommended.

The applicant advised that reducing speed limits or installing barriers to avoid and minimise clearing would not reduce the safety risk as the road is too narrow for heavy vehicle traffic (Shire of Wongan-Ballidu, 2020a).

The above adequately demonstrated that all reasonable efforts had been taken to avoid and minimise potential impacts of the clearing on environmental values.

After consideration of avoidance and mitigation measures, it was determined that an offset to counterbalance the significant residual impacts to the highly diverse flora and significant remnant vegetation was necessary. In accordance with the WA State Government's *Environmental Offsets Policy* and *Environmental Offsets Guidelines*, these significant residual impacts have been addressed through the conditioning of environmental offset requirements on the permit. The nature and suitability of the offset provided are summarised in Section 4.

3.2. Assessment of environmental impacts

In assessing the application in accordance with section 51O of the EP Act, the Delegated Officer has examined the application and site characteristics (Appendix C) and considered whether the clearing poses a risk to environmental values. The assessment against the Clearing Principles is contained in Appendix D.

This assessment identified that the clearing may pose a risk to the biological values of flora and fauna, significant remnant vegetation and conservation areas, and that these required further consideration. The detailed consideration and assessment of the clearing impacts against the specific environmental values is provided below. Where the assessment found that the clearing presents an unacceptable risk to environmental values, conditions aimed at controlling and/or ameliorating the impacts have been imposed under sections 51H and 51I of the EP Act. These are also identified below.

3.2.1. Environmental value: biological values (flora) – Clearing Principles (a) to (c)

Assessment: A flora and vegetation survey of the application area and its surroundings was conducted by JBBC (2019). A total of 154 flora taxa were recorded from 35 families and 85 genera.

The survey recorded six flora species of conservation significance within the survey area (JBBC, 2019):

- *Daviesia euphorbioides* (Threatened);
- *Acacia phaeocalyx* (Priority 3);
- *Acacia filifolia* (Priority 4);
- *Acacia semicricinalis* (Priority 4);
- *Daviesia spiralis* (Priority 4); and
- *Hemigenia conferta* (Priority 4).

Daviesia euphorbioides has been recorded from scattered occurrences in the Wongan Hills, Goomalling and Dowering areas, growing in grey or brown sandy loam or clay over laterite in shrubland and heath with *Allocasuarina campestris, Grevillea Hookeriana, G. armigera, Hakea scoparia* and *Ecdeiocolea monostachya* (Western Australian Herbarium,1998-). One plant was recorded at the site of a previous record; it was located four metres east of the edge of the bitumen, and two metres east of the edge of the shoulder. The proposed road widening may result in inadvertent damage or indirect impacts, as the current vegetative buffer will be removed. An indeterminant amount of soil stored seed is also likely to be taken by the proposed works. This population extends into the adjacent Elphin Nature Reserve where 50 plants were recorded when last surveyed in 2014 (DBCA, 2020a). Providing the indirect impacts are minimal, the conservation status of the species is unlikely to be affected (DBCA, 2020a). The applicant has obtained an Authorisation to take threatened flora from DBCA for the proposed works.

Acacia phaeocalyx occurs in yellow or white sand, often over laterite and on flats or hillsides (Western Australian Herbarium,1998-). One plant was recorded outside of the impact area (JBBC, 2019). A population of 600 plants has

been recorded within a few hundred metres of the proposed works. Indirect impacts as a result of the proposed works are unlikely to affect the conservation status of the species (DBCA, 2020a).

Acacia filifolia is known to occur on sandplains, in yellow or gravelly lateritic sand (Western Australian Herbarium,1998-). The survey recorded 58 individuals, with 18 potentially to be impacted by proposed works due to being within three metres of the road on the north-eastern verge area (JBBC, 2020). There is a population approximately one kilometre east of the proposed works that was recorded to have 1,000 plants when last surveyed. There are a number of other records for this species within a five kilometre radius, therefore the proposed clearing is unlikely to be significant at a regional scale (DBCA, 2020a).

Acacia semicircinalis grows in gravelly soils and laterite on hills (Western Australian Herbarium,1998-). This species is restricted to the Wongan Hills area. Two plants were recorded on the southern aspect of the road, outside of the impact area (JBBC, 2019). Given this species is known from a number of large populations, indirect impacts resulting from the proposed works are unlikely to affect the conservation status of the species (DBCA, 2020a).

Daviesia spiralis occurs in gravelly lateritic clay and sand (Western Australian Herbarium,1998-). Thirty-eight plants were recorded from the survey (JBBC, 2019), of which none were in the impact area. Approximately two kilometres east of the proposed works, there are three populations of around 700 plants in total (DBCA, 2020a), therefore any indirect impacts to the plants recorded from the survey are unlikely to be significant at a regional scale.

Hemigenia conferta grows in shallow soils (Western Australian Herbarium,1998-). There were 101 plants recorded from the survey, all plants were outside of the impact area and are unlikely to be impacted by the proposed clearing. Given this species has not been recorded from the area previously, the population of 101 plants is significant and indirect impacts should be avoided where possible. However, providing indirect impacts are minimal, the conservation status is unlikely to be affected (DBCA, 2020a).

The applicant will be required to demarcate the above conservation significant flora individuals or populations recorded from the survey (JBBC, 2019) to ensure no inadvertent clearing of conservation significant flora occurs and that there will be minimal indirect impacts. Weed management practices will also mitigate any potential impacts to adjacent vegetation.

According to available databases, three additional conservation significant flora species have the potential to occur within the application area:

- *Conostylis wonganensis* (Threatened). This species grows in yellow sand or sandy clay. No plants were observed during the survey and previous record sites were checked (JBBC, 2019).
- *Melaleuca sciotostyla* (Threatened). This species has been recorded in orange clayey sand with lateritic pebbles, and scree slopes. No plants were observed during the survey and no clearing will occur around a previously known record (JBBC, 2019).
- *Stylidium coroniforme* F.L. Erickson & J.H. Willis subsp. *coroniforme* (Threatened). This species is known to occur in shallow sand over laterite, upland habitats. Associated vegetation include *Allocasuarina* and Dryandra shrubland, and mallee woodland. No plants were recorded during the survey. This species is a perennial with a woody rootstock which remains viable after aerial growth has died off. The dried off aerial parts would still be identifiable if it had occurred within the road reserve (JBBC, 2019).

Given that the species above were not recorded during the survey, the proposed clearing is not likely to have a significant impact on these species.

During a site inspection undertaken by DWER (2019), a patch of vegetation within the proximity of the application area was noted to potentially ascribe to the Commonwealth listed Eucalypt Woodlands of the Western Australian Wheatbelt threatened ecological community, which is also a State listed Priority 3 priority ecological community. DBCA advised that due to the mallee growth form of the eucalypt woodland which is a contra-indicator according to the Approved Conservation Advice for this ecological community (DotE, 2015), it is unlikely to be present within the application area (DBCA, 2020b). Therefore, the ecological community is unlikely to be impacted by the proposed clearing.

Outcome: Based on the above assessment, the Delegated Officer has determined that subject to relevant conditions (see below), the proposed clearing is considered to not likely to have a significant impact to this environmental value.

Conditions: To address the above impacts, the following conditions will be added to the permit:

- Weed management to manage potential impacts to adjacent vegetation as a result of the proposed clearing.
- Flora management condition requiring the demarcation of threatened flora and priority flora individuals or populations recorded from the survey, to ensure that no clearing of conservation significant flora occurs.

3.2.2. Environmental value: biological values (fauna) – Clearing Principle (b)

Assessment: According to available databases, the following threatened and priority fauna have been recorded within the local area and may occur within the application area:

- *Idiosoma nigrum* (Endangered)
- *Idiosoma castellum* (Priority 4)
- *Leipoa ocellata* (Vulnerable)
- *Calyptorhynchus latirostris* (Endangered)

These species are discussed below.

Idiosoma nigrum (Shield-backed Trapdoor Spider)

The Shield-backed trapdoor spider is listed as Endangered under the BC Act and Vulnerable under the EPBC Act. The species was once considered wide ranging throughout much of the Western Australian Wheatbelt and into the arid zone prior to a revision by Rix et al. (2018). Rix et al. (2018) split *I. nigrum* into 15 species and restricts true *I. nigrum* to a small portion of the northern Wheatbelt including Wongan Hills from where it was first described (Main, 1952). The species occurs in remnant bushland patches near Wongan Hills including within vegetation contiguous with the application area. The species has been recorded approximately 180 metres from the application area. Due to this, the species was considered to have a high likelihood of occurrence within the application area. Advice was received regarding the importance of roadside vegetation for trapdoor spider habitat. As Wongan Hills is the type locality for the Shield-backed trapdoor spider, a targeted survey was mandatory to determine potential impacts from the proposed clearing (Rix, 2020). A targeted survey was conducted to determine the occurrence of this species within the application area, involving active searching across the entire site including the raking of leaf litter (Invertebrate Solutions, 2020). No individuals or evidence of this species were recorded; therefore the proposed clearing is not likely to have a significant impact to this species.

Idiosoma castellum (Tree stem trapdoor spider)

The Tree stem trapdoor spider is a Priority 4 species and has been recorded approximately 200 metres from the application area. This species builds distinctive palisade of twigs beside tree trunks and is found only in the Western Australian Wheatbelt where it was first described from the town of Minnivale. A targeted survey conducted for this species did not record any evidence of *I. castellum* (Invertebrate Solutions, 2020), therefore the proposed clearing is not likely to have a significant impact to this species.

Leipoa ocellata (Malleefowl)

Malleefowl is listed as Vulnerable under the BC Act and EPBC Act. This species can be found in arid and semi-arid areas dominated by mallee eucalypts on sandy soils (DPaW, 2016). They are known to also occur in Mulga (*Acacia aneura*), Broombush (*Melaleuca uncinata*), Scrub Pine (*Callitris verrucosa*), Eucalypt woodlands and coastal heathlands. Malleefowl require abundant leaf litter and a sandy substrate for the successful construction of nest mounds (DPaW, 2016). Its remaining populations are highly fragmented due to extensive land clearing. Given its known habitats, the application area may provide habitat for malleefowl. A fauna survey that was undertaken did not record any mounds or tracks within the survey area and no individuals were observed (Western Ecological, 2020). Noting this and the presence of nature reserves and larger extents of remnant vegetation within the local area, the linearity of the application area and that the proposed clearing will occur adjacent to an existing road, the application area is not likely to provide significant habitat for this species.

Calyptorhynchus latirostris (Carnaby's cockatoo)

Carnaby's cockatoo is listed as Endangered under the BC Act and EPBC Act. They are known to nest in hollows in live or dead trees of wandoo, York gum, salmon gum, powderbark wandoo (*Eucalyptus accedens*), marri (*Corymbia calophylla*), jarrah (*Eucalyptus marginata*), flooded gum (*Eucalyptus rudis*), tuart (*Eucalyptus gomphocephala*) and karri (*Eucalyptus diversicolor*) (Commonwealth of Australia, 2012). This species forages on the seeds, flowers and nectar of native proteaceous plant species (e.g. Banksia, Hakea and Grevillea species), Eucalyptus and Callistemon species (Commonwealth of Australia, 2012).

A black cockatoo habitat assessment recorded two species of Eucalyptus, salmon Gum and York Gum, within the survey area in the south-eastern section of Waddington-Wongan Hills road (Western Ecological, 2020). These trees were not of a suitable width or size for breeding, and there were also no observable hollows present in any trees (Western Ecological, 2020). Therefore, no potential breeding habitat is present in the application area.

A number of shrub species recorded in the fauna survey were considered to be Carnaby's Black Cockatoo foraging species. *Acacia saligna* (Orange Wattle), *Grevillia armigera* (Prickly Toothbrushes), *G. paniculata* (Kerosene Bush), *G. petrophiloides* (Pink Poker) and *Hakea multilineata* (Grass Leaf Hakea) (Johnstone & Kirkby 2011, DEC 2011). These species were recorded in the areas of shrubland in the survey area. It was noted that all of the species recorded in the survey area and listed as Carnaby's black cockatoo foraging species are considered as low priority foraging species and as such are considered limited in their value to the species (Western Ecological, 2020). No foraging evidence in the way of chewed nuts or cones was recorded during the survey.

According to available databases, the closest records of roosting sites are approximately 45 kilometres southeast and 47 kilometres southwest of the application area.

Noting the above, it is unlikely that the application area is a significant breeding, foraging or roosting habitat for Carnaby's black cockatoos.

Outcome: Based on the above assessment, the Delegated Officer has determined that the proposed clearing is not likely to have a significant impact to fauna habitat.

Conditions: The following condition will be added to the permit to assist in minimising impact to individual fauna that may occur within the application area at the time of clearing:

- Slow, progressive one directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of clearing activity.

3.2.3. Environmental value: significant remnant vegetation and conservation areas – Clearing Principles (e) and (h)

Assessment: The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). The application area is within an extensively cleared landscape as the local area retains approximately 10 per cent remnant vegetation. The application area is considered to be significant as a remnant in an area that has been extensively cleared due to the highly diverse flora and vegetation that contains habitat suitable for conservation significant flora and fauna. Given the extent to which the local area has been previously cleared, the application area may contribute towards fauna dispersal between the conservation areas adjacent to the application area and remnant vegetation located within the local area. However, due to the vegetation that will remain within the road reserves after the proposed clearing, it is not likely that the proposed clearing will have a significant impact to linkage and dispersal values.

Due to the conservation areas adjacent to the application area, the proposed clearing has the potential to impact these conservation areas through weed invasion. This will be managed by the requirement to manage weeds under the permit.

Outcome: Based on the above assessment, the Delegated Officer has determined that the proposed clearing is likely to have a significant impact to this environmental value. Taking into account the Shire's avoidance, minimisation and mitigation measures, the Delegated Officer determined that the loss of 0.6 ha of vegetation that is a significant remnant within an extensively cleared landscape can be addressed through a suitable offset (as conditioned on the clearing permit). Section 4 of this report provides further information on the offset provided. Additional conditions imposed on the clearing permit will manage potential impacts to adjacent vegetation (see below).

Conditions: To address the above impacts, the following conditions will be added to the permit:

- Provision of an offset to address significant residual impacts of the proposed clearing (Section 4).
- Weed management to manage potential impacts to adjacent vegetation as a result of the proposed clearing.

3.3. Relevant planning instruments and other matters

It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972* (WA) and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

4. Suitability of offsets

Through the detailed assessment outlined in Section 3.2 above, the Delegated Officer has determined that the following significant residual impacts remain after the application of the avoidance and mitigation measures summarised in Section 3.1:

- 0.6 ha of highly diverse flora and vegetation, which is part of a significant remnant in an extensively cleared landscape.

The applicant proposed an environmental offset consisting of revegetating 1.09 ha within Lot 3 on Plan 62176, Wongan Hills, approximately 785 metres south of the application area (Figure 2 and Figure 3), with the aim to restore the site to a self-sustaining ecosystem and including a range of flora species that will provide habitat for conservation significant fauna (Shire of Wongan-Ballidu, 2020b). A conservation covenant will be required to be placed over the site to ensure appropriate management and security for the revegetated site.

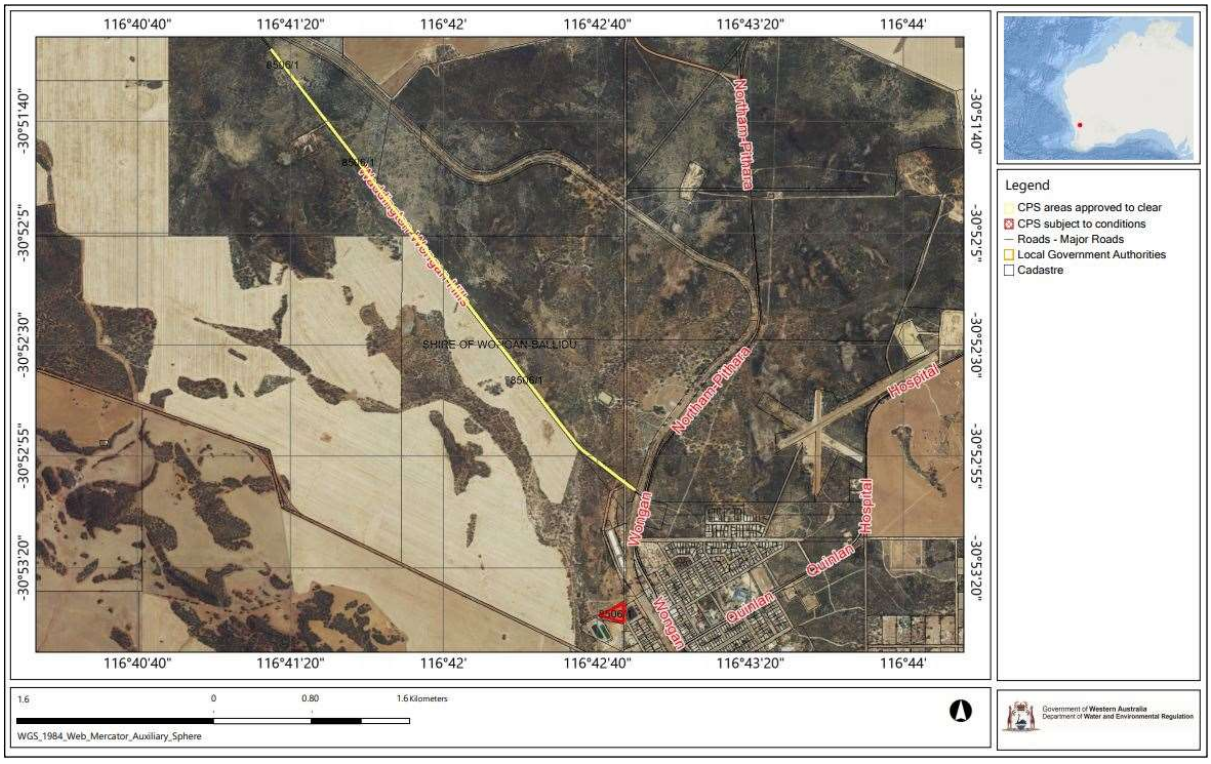


Figure 2: Revegetation area (outlined in red) in context of application area (outlined in yellow)

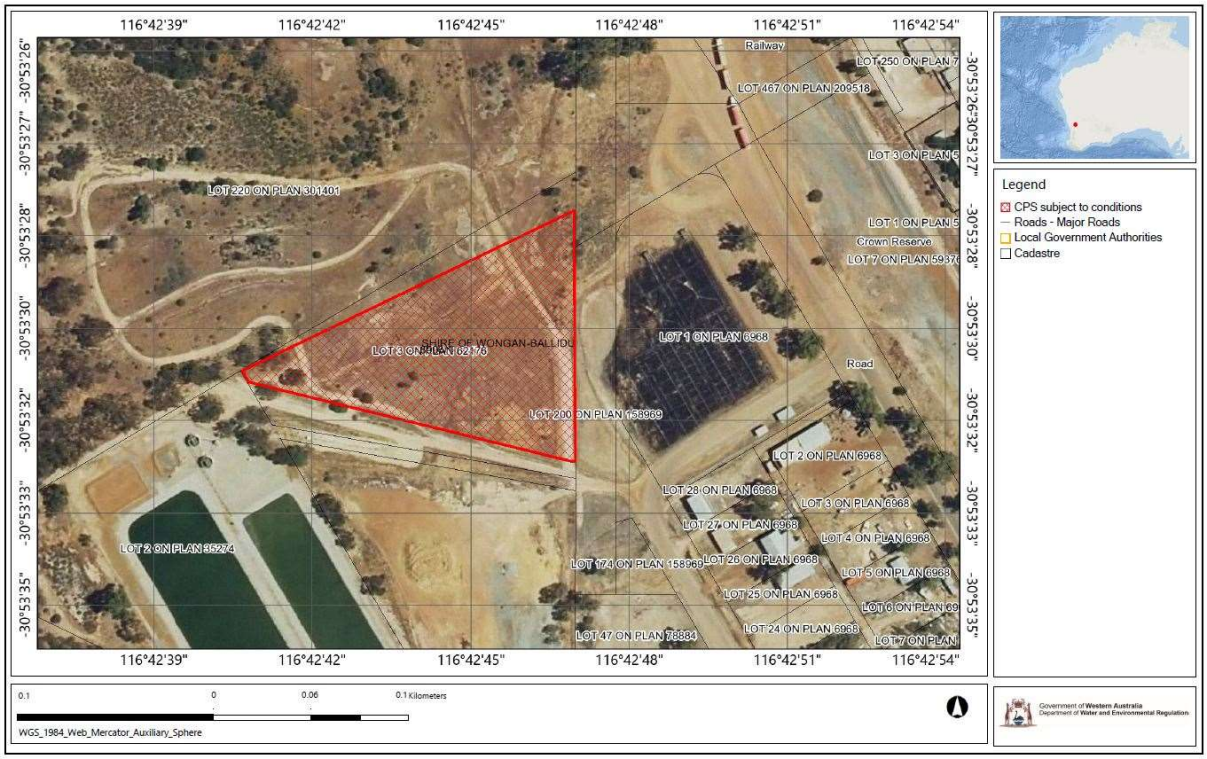


Figure 3: Revegetation area approved as offset (cross-hatched in red)

The Shire submitted a revegetation plan which detailed the location and key characteristics of the revegetation site, outlined management aims and objectives, described rehabilitation activities and methodology, provided completion criteria, monitoring and maintenance requirements as well as contingency plans (Shire of Wongan-Ballidu, 2020b). The revegetation plan includes incorporating local provenance species using methodologies consistent with DWER's guidance on revegetation plans (DWER, 2018). The completion criteria are considered to be adequate to ensure aims and objectives are attained.

In assessing whether the proposed offset is adequately proportionate to the significance of the environmental value being impacted, DWER undertook a calculation using the Department of Agriculture, Water and Environment (DAWE) Offsets Assessment Guide 'calculator'. The calculator indicated that the revegetation of 1.09 ha from 'Completely Degraded to Degraded' condition to 'Good' condition within the proposed revegetation area is adequate to counterbalance the significant residual impacts upon 0.6 ha of highly diverse flora and vegetation which is part of a significant remnant in an extensively cleared landscape.

The Delegated Officer considers that this adequately counterbalances the significant residual impacts listed above.

The justification for the values used in the offset calculation is provided in Appendix F.

Appendix A – Additional information provided by applicant

Summary of information	Consideration of comment
Changes to application area: a reduction from 1.6 ha to 0.6 ha to further avoid and minimise impacts of proposed works	The assessment was revised to reflect the proposed clearing of 0.6 ha.
Survey information provided (flora and vegetation, and fauna survey reports)	The survey information provided were used to inform the assessment of the application (refer to Section 3.2).
Offset and revegetation plan	The applicant's offset proposal in the form of revegetation was assessed for adequacy (refer to Section 4 for offset suitability).

Appendix B – Details of public submissions

Summary of comments	Consideration of comment
Lack of information provided in clearing permit application form, reason for proposed road widening and area proposed to be cleared unknown.	Reason for proposed road widening is provided in Section 1.2 and areas proposed to be cleared are outlined within the figures in Section 1.5.
Recommendation for the Shire to maintain bushlands in various reserves and manage weeds within road reserves, as an offset.	Refer to Section 4 for the consideration of suitability of offset associated with this application. Weed management will be required under the granted permit to minimise the spread of weeds within the road reserve and into the adjacent vegetation.
No details on priority or threatened flora and fauna species or surveys that have been conducted to identify what might be impacted by the clearing.	Biological surveys were undertaken post submission of the application and impacts to environmental values are considered in Section 3.2.
No alternatives to avoid or minimise clearing have been considered by the applicant. Suggestions to avoid and minimise clearing presented: • minimising the amount of clearing required, i.e. widening to occur on less vegetated side of road reserve • widening the running surface of the road without widening the entire formation • improving the quality of the pavement or shoulders, or sealing the shoulders • reducing or setting speed limits • installing W-beam steel road safety barriers where necessary.	Considered in the avoidance and mitigation measures section (refer to Section 3.1).

Appendix C – Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to DWER at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix D.

1. Site characteristics

Site characteristic	Details
Local context	The application area is along a four kilometre section of Waddington-Wongan Hills Road. There are two reserves, Elphin Nature Reserve and a Conservation Park managed by DBCA, adjacent to the northern and eastern sections of the road. Much of the southwestern road reserve is bordered by farmland. The application area is part of a 'flora road', containing highly diverse vegetation. Flora roads highlight roadsides with high conservation flora as a tourist asset to local communities. The Flora Roads program began as an initiative of the Roadside Conservation Committee (RCC), and roads are designated as flora roads only after surveying for conservation value, nomination to the RCC and being declared by the managing authority. Spatial data indicates the local area (20 km radius of the application area) retains approximately 10% of the original native vegetation cover.
Vegetation description	Vegetation survey (JBBC, 2019) indicates the vegetation within the application area consists of Allocasuarina – Melaleuca shrubland mosaic, *Banksia armata* shrubland – Ecdeiocolea sedgeland complex and woodland areas. Representative photos, the full survey descriptions and mapping are available in Appendix G. This is consistent with the mapped vegetation types: • Beard Vegetation Association (BVA) 1024, which is described as Shrublands; mallee and casuarina thicket. • BVA 1049, Medium woodland; wandoo, York gum, salmon gum, morrel and gimlet.
Vegetation condition	Vegetation survey (JBBC, 2019) indicates the vegetation within the application area is in Good to Excellent (Keighery, 1994) condition. The full Keighery condition rating scale is provided in Appendix E. Representative photos, the full survey descriptions and mapping are available in Appendix G.
Soil description	The soil is mapped as: • **Wongan Hills 1 Subsystem, 256Wg_1:** Undulating low hills, with granite rock outcrops, grey brown shallow and deep loamy duplex, sandy and loamy earth and minor of shallow and deep sand. • **Wongan Hills 2 Subsystem, 256Wg_2:** Gradual rise to undulating low hills. Mainly loamy gravel, deep sandy gravel and shallow gravel, minor of loamy earth and clay.
Land degradation risk	There is low risk of salinity, water erosion and waterlogging over the application area. There is however a relatively moderate to high risk of wind erosion.
Waterbodies	The desktop assessment and aerial imagery indicated that one ephemeral watercourse transects a section of the application area. Drainage lines within the application area are ephemeral being dry for much of the year, with flows during the wetter winter period and occasional flows following intense summer rainfall events (JBBC, 2019).
Conservation areas	There are two reserves adjacent to the northern and eastern sections of the road, Elphin Nature Reserve and a Conservation Park managed by DBCA.
Climate and landform	The climate of the Wongan Hills area is described as Mediterranean with hot dry summers and cool wet winters, although well above average rainfall has been recorded in January 2017 and 2018, and in February 2017. This is often as a result of tropical depressions (sometimes ex-tropical cyclones) moving south. The mean annual rainfall

Site characteristic	Details
	of 388.3 mm has been recorded at Wongan Hills (Bureau of Meteorology (BOM) Station 008137) over the period 1907 – 2019. The application area lies within the Yilgarn block which is chiefly composed of granites and gneiss enclosing a number of greenstone belts of metamorphosed layered rocks which are harder and more resistant to weathering, often forming ranges of hills (e.g. Wongan Hills), with the granite and gneiss underlying the sandplains. The application area is underlain by granites and gneiss which are close to the surface at a number of locations (JBBC, 2019). The application area is located within the Wongan Hills System, northern zone of rejuvenated drainage, on a gently sloping low rise with drainage to the south into Lake Ninan and into the seasonally flowing Mortlock River which drains south into the Avon paleodrainage system.

2. Flora, fauna and ecosystem analysis

With consideration for the site characteristics set out above, relevant datasets (see Appendix G), and biological survey information, the following conservation significant flora and fauna species, and ecological communities will or may be impacted by the clearing.

Species / Ecological Community	Distance of closest record to application area (kilometres)	Suitable soil type? (flora, ecological community)	Suitable vegetation type? (flora, ecological community)	Suitable habitat features (fauna)	Are surveys adequate to identify? (Y, N, N/A)
Flora					
Conostylis wonganensis (T)	0.016	Y	Y	N/A	Y
Daviesia euphorbioides (T)	0.007	Y	Y	N/A	Y
Melaleuca sciotostyla (T)	0.009	Y	Y	N/A	Y
Stylidium coroniforme subsp. *coroniforme* (T)	0.011	Y	Y	N/A	Y
Acacia phaeocalyx (P3)	0.119	Y	Y	N/A	Y
Acacia filifolia (P4)	0.001	Y	Y	N/A	Y
Acacia semicircinalis (P4)	0.468	Y	Y	N/A	Y
Daviesia spiralis (P4)	0.198	Y	Y	N/A	Y
Hemigenia conferta (P4)	7.61	Y	Y	N/A	Y
Fauna					
Idiosoma nigrum (Endangered)	0.18	N/A	N/A	Y	Y
Idiosoma castellum (P4)	0.21	N/A	N/A	Y	Y
Leipoa ocellata (Vulnerable)	0.14	N/A	N/A	Y	Y
Calyptorhynchus latirostris (Endangered)	0.17	N/A	N/A	Y	Y

3. Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	% remaining	Current extent in all DBCA managed land (ha)	% current extent in all DBCA managed land (proportion of pre-European extent)
IBRA bioregion					
Avon Wheatbelt	9,517,109.95	1,761,187.42	18.51	174,980.68	1.84
Vegetation Association					
1024	739,926.59	84,606.91	11.45	6,622.91	0.90
1049	833.384.77	56,618.34	6.79	3,375.83	0.41

Appendix D – Assessment against the Clearing Principles

Assessment against the Clearing Principles	Variance level	Is further consideration required?
Environmental value: biological values		
Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."* Assessment: The application area contains diverse vegetation, conservation significant flora and habitat for conservation significant fauna.	Is at variance	Yes Refer to Section 3.2.2 above.
Principle (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."* Assessment: The application area contains foraging habitat for conservation significant fauna.	Is not likely to be at variance	Yes Refer to Section 3.2.2 above.
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: The application area is likely to contain habitat for flora species listed under the BC Act, and the proposed clearing is within the buffer for a threatened flora species.	Is at variance	Yes Refer to Section 3.2.2 above.
Principle (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."* Assessment: The application area does not contain species that resemble a threatened ecological community as listed by the Minister for Environment.	Is not likely to be at variance	No
Environmental values: significant remnant vegetation and conservation areas		

Assessment against the Clearing Principles	Variance level	Is further consideration required?
Principle (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."* Assessment: The extent of native vegetation in the local area is inconsistent with the national objectives and targets for biodiversity conservation in Australia. The vegetation within the application area is considered a significant remnant as it is highly diverse and provide ecological linkage values within an extensively cleared area.	Is at variance	Yes Refer to Section 3.2.2 above.
Principle (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."* Assessment: Given the conservation areas adjacent to the application area, the proposed clearing may have an impact on the environmental values of adjacent conservation areas.	May be at variance	Yes Refer to Section 3.2.2 above.
Environmental values: land and water resources		
Principle (f): *"Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."* Assessment: One non-perennial watercourse is mapped within the south-western section of the road reserve. No riparian vegetation communities were recorded within this section of the application area. Therefore, the proposed clearing is not likely to impact vegetation associated with a watercourse or wetland.	Is not likely to be at variance	No
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: The application area includes soils which are susceptible to wind erosion and subsurface acidification. Noting the linearity of the application area, the proposed clearing is not likely to cause significant wind erosion or subsurface acidification. The soils will be exposed on a short-term basis with cleared areas to be covered by bitumen and gravel, any wind erosion is likely to be minimal given that soil exposure is short term. As a condition of the permit, the applicant will be required to commence road upgrade activities within three months of clearing.	Is not likely to be at variance	No
Principle (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."* Assessment: One non-perennial watercourse intersects the south-western section of the road reserve. It is unlikely that the proposed works of a linear nature within 0.6 ha will be of a scale that would result in a perceptible deterioration of surface water quality. Given that the application area occurs within an existing road reserve and that native vegetation persists adjacent to the road reserve, it is considered that the	Is not likely to be at variance	No

Assessment against the Clearing Principles	Variance level	Is further consideration required?
proposed clearing is not likely to lead to a perceptible rise in the water table and thus an increase in groundwater salinity levels.		
Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."* Assessment: The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding. The application area also has a low risk of waterlogging.	Is not likely to be at variance	No

Appendix E – Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Measuring Vegetation Condition for the South West and Interzone Botanical Province (Keighery, 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, with disturbance affecting individual species; weeds are non-aggressive species.
Very Good	Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or 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/or grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix F – Offset calculator value justification

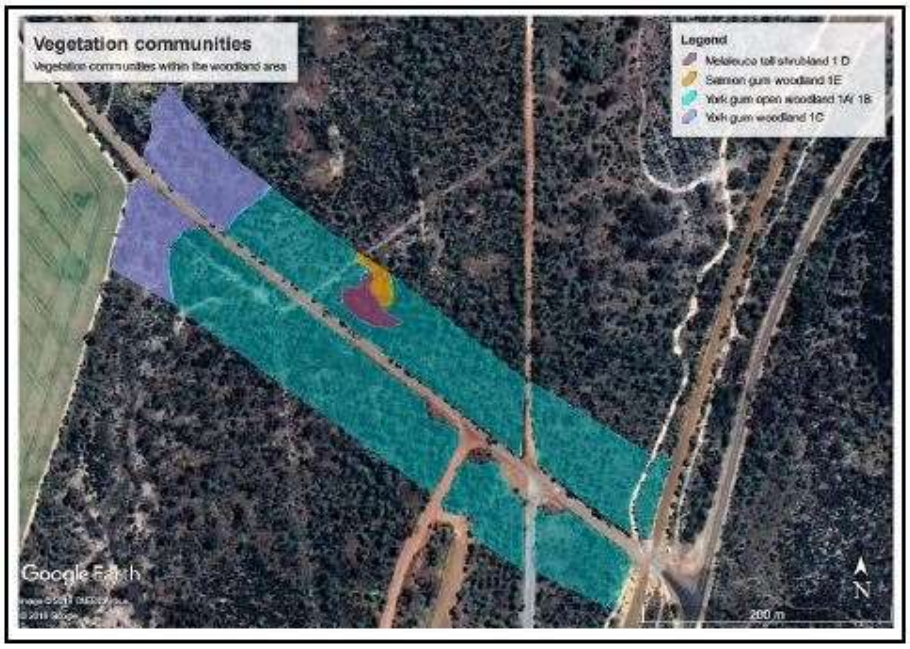
Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	0 – high biodiversity and significant remnant in an extensively cleared area does not have an IUCN criteria
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	0.6 hectares of highly biodiverse, significant remnant in an extensively cleared area.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability.	5 - vegetation condition within application area ranged from degraded to excellent. Averaged to be good to very good.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	20 - The revegetated site will be digitised in DWER's clearing permit system, and the applicant will be required to place a conservation covenant over the revegetated site, providing a level of security for the site. 20 years is the maximum value associated with this field.

Field Name	Description	Justification for value used
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	10 - It is assumed that the environmental values obtained from revegetation will not be evident until 10 years post revegetating.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	1.09 hectares – the required hectares to counterbalance the significant residual impacts.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	1 - the area to be revegetated is in Completely Degraded to Degraded condition.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	1 - it is assumed that the area would maintain its Completely Degraded to Degraded condition if no revegetation occurs.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	4 - it is assumed that the revegetation area could improve the vegetation condition to a Good condition.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	80% - the area is within a freehold lot. It is assumed that there is a high risk that the area could be lost due to the potential for development.
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	15% - It is considered that the risk of development will be reduced with the revegetated site being captured in DWER's clearing permit system and a conservation covenant will be placed over the revegetated site.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	90% - It is considered that there is a high level of confidence the measure will be successful in mitigating the risk of loss of the site.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	70% - there is a lower level of confidence that the revegetation will be successful due to the proximity to town and in turn, disturbance. However with proposed monitoring, implementing weed control and supplementary planting/seeding, there is some confidence it will be successful.

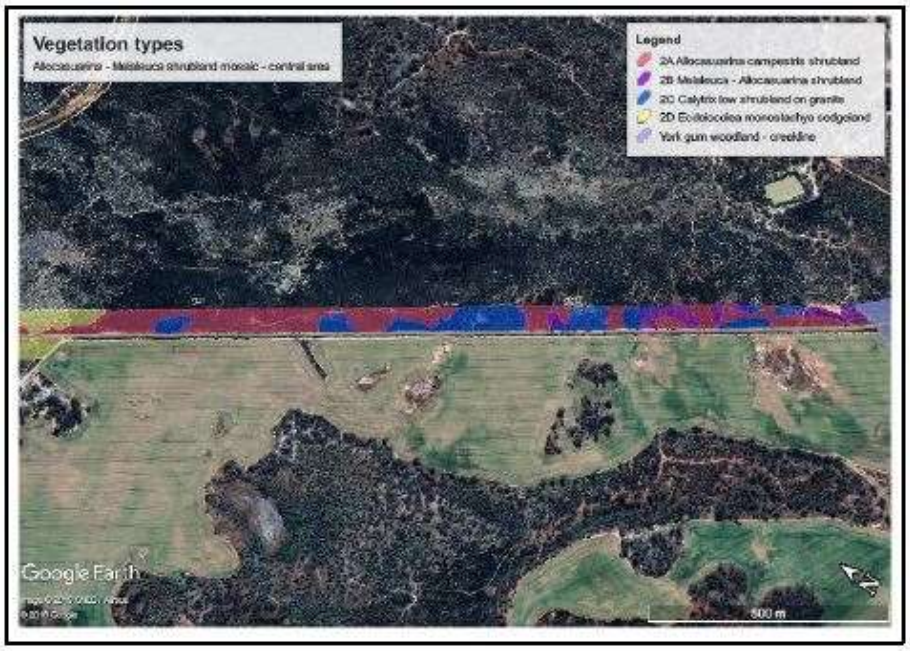
Field Name	Description	Justification for value used
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	100% - output from variable above

Appendix G – Biological survey information excerpts / photographs of the vegetation

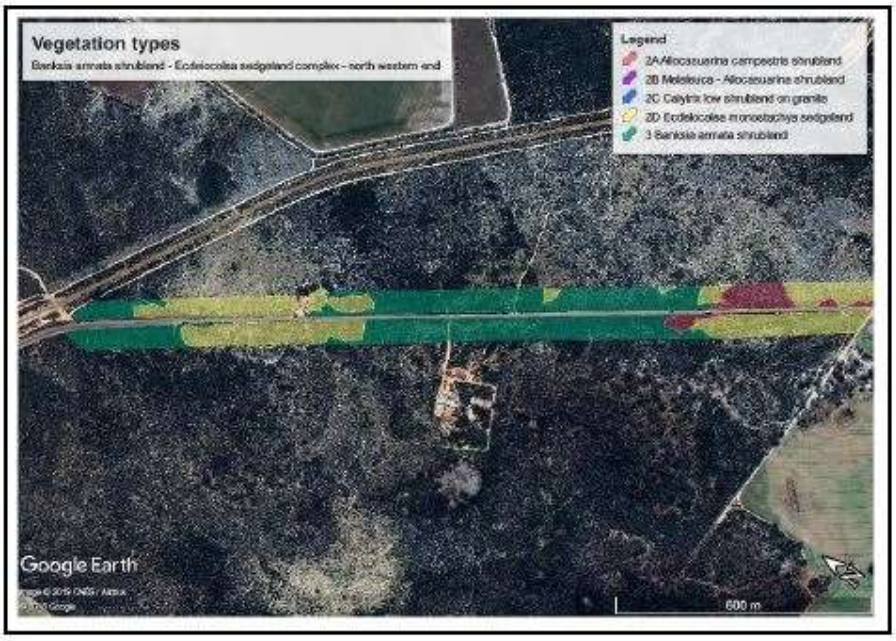
Vegetation communities mapping (JBBC, 2019)



Vegetation community mapping for the southern woodland area (0 – 0.5 km from townsite)



Vegetation community mapping of *Allocasuarina* – *Melaleuca* mosaic in the central area (0.5 – 3.0 km west of townsite)



Vegetation community mapping of *Banksia armata* – *Ecdeiocolea* sedgeland association (3 – 4 km from townsite)

Vegetation community descriptions (JBBC, 2019)

Vegetation Community 1A: *Eucalyptus loxophleba* subsp. *loxophleba* and *Acacia acuminata* low open woodland to low woodland over *Grevillea paniculata* open shrubland (TEC)	
Landform: Broad valley; gently sloping with drainage to the south west	
Relevés:R01 GPS: 472584 E/ 6583277 N R02 GPS: 472538 E/ 6583323 N	
Condition: Good to very good Description: *Eucalyptus loxophleba, Acacia acuminata* low isolated trees to low open woodland over *Grevillea paniculata* open shrubland over *Avena fatua*, Dianella revoluta* var. *divaricata, Waitzia acuminata, Ptilotus polystachyus* and *Enchylaena tomentosa* low tussock grassland.	
Condition: very good Description: *Eucalyptus loxophleba* subsp. *loxophleba, Acacia acuminata* low woodland over *Grevillea paniculata, Ericomyrtus tenuior, Rhagodia drummondii, Acacia colletioides* open shrubland over *Avena fatua*, Opercularia vaginata, Monachather paradoxus, Grevillea paniculata, Briza maxima** low tussock grassland	
Other species: *Borya sphaerocephala, Dampiera lavandulacea, Daviesia Leptosema, Desmocladus myriocladus, Glischrocaryon flavescens, Halgania lavandulacea, Melaleuca concreta, Neurachne alopecuroidea, Ptilotus eremita, Santalum spicatum, Schoenia cassiniana, Thysanotus manglesianus, Velleia rosea*	
Disturbances: weeds (dense cover in some areas); vehicle access tracks; clearing (old)	
Conservation taxa: *Santalum spicatum* (sandalwood)	

Vegetation type 1B: Eucalyptus loxophleba subsp. loxophleba, Acacia acuminata woodland (TEC)	
Landform: Broad ephemeral drainage line; drainage to the south	
Relevés: R04	
Condition: Very good Description: *Eucalyptus loxophleba* subsp. *loxophleba, Acacia acuminata woodland over Grevillea paniculata, Stylobasium australe, Acacia microbotrya* open shrubland over *Austrostipa elegantissima, Monachather paradoxus, Enchylaena tomentosa, Rhagodia drummondii, Lepidosperma costale* open tussock grassland	
Other species: *Avena fatua*, Arthropodium dyeri, Dianella revoluta var. divaricata, Gilberta tenuifolia, Hordeum leporinum*, Melaleuca hamata, M. hamulosa, Monoculus monstrosus*, Trifolium hirtum**	
Disturbances: moderate weed cover; disturbance from construction of the road; ongoing road maintenance, rabbits	

Vegetation type 1C: Melaleuca hamata, Eucalyptus loxophleba subsp. loxophleba tall shrubland	
Landform: Broad valley; ephemeral drainage line	
Relevés: 03	
Condition: Very good to excellent	
Description: *Melaleuca hamata, Eucalyptus loxophleba* subsp. *loxophleba* tall shrubland (with isolated low trees) over *Lepidosperma costale, Desmocladus myriocladus, Dianella revoluta var. divaricata, Grevillea paniculata* and *Austrostipa trichophylla* open sedgeland	
Other species: *Acacia acuminata, Avena fatua*, Briza maxima*, Monachather paradoxus, Waitzia acuminata*	
Disturbances: weeds – mostly sparse; the understorey is in much better condition than the surrounding York gum woodland	

Vegetation type 1D: *Melaleuca* tall shrubland	
Landform: Broad valley; lower slope of small rise adjacent to ephemeral drainage line; granitic rock close to surface	
Relevés: 3b	
Condition: Excellent	
Description: *Melaleuca hamulosa, M. adnata* tall shrubland over *Grevillea hakeoides* subsp. *stenophylla, Gastrolobium bennettsianum* low isolated shrubs	
Disturbances: Old tracks and clearing adjacent to the area (north) – powerline; isolated weeds	

Vegetation type 1E: *Eucalyptus salmonophloia* woodland (TEC)	
Small patch adjacent to York gum woodland (south) and clearing to the north for a powerline	
Relevés: 3c	
Condition: Very good	
Description: *Eucalyptus salmonophloia* woodland over *Santalum acuminatum, S. spicatum* low isolated trees over *Daviesia nematophylla, Acacia colletioides, Rhagodia preissii* open shrubland over *Rhagodia drummondii, Dianella revoluta* var. *divaricata, Monachather paradoxus, Austrostipa elegantissima* and *Waitzia acuminata* low open shrubland	
Other species: *Acacia acuminata, Austrostipa trichophylla, Desmocladus myriocladus, Chamaexeros fimbriata, Grevillea hakeoides* subsp. *stenophylla, Velleia rosea*	
Disturbances: clearing; weeds (low to moderate)	
Conservation taxa: *Santalum spicatum* (Sandalwood)	

Vegetation type 2A: *Allocasuarina campestris* shrubland	
Relevés: 05; GPS 472259 E/ 6583518 N; R06	
Condition: Very good	
Description (R05): *Allocasuarina campestris, Daviesia hakeoides* subsp. *subnuda, Grevillea paniculata, Ericomyrtus tenuior, Hibbertia glomerosa* var. *glomerosa* shrubland to closed shrubland over *Hibbertia glomerosa* var. *glomerosa, Austrostipa elegantissima, Acacia restiacea, Stenanthemum pomaderroides, Opercularia vaginata* low open shrubland with sparse forbland and isolated grass tussocks	
Description (R06 – Mature): *Allocasuarina campestris* tall shrubland over *Melaleuca cordata, Hibbertia , Astroloma serratifolium, Calytrix depressa* shrubland over *Borya sphaerocephala, Ptilotus declinatus, Hyalosperma glutinosum* open forbland	
R09 – R10: *Allocasuarina campestris* regrowth; with *Gastrolobium bennettsianum, Acacia lasiocarpa var. bracteolata, Acacia filifolia* P3 (edge of road), *Hypocalymma angustifolium, Leptospermum erubescens*	
Other species: *Acacia assimilis* subsp. *assimilis, Austrostipa trichophylla, Avena fatua*, Briza maxima*, Dampiera lavandulacea, Eucalyptus loxophleba* subsp. *loxophleba* (isolated small trees), *Gastrolobium bennettsianum, Lepidosperma tenue, Monachather paradoxus, Muehlenbeckia adpressa, Olearia subsp. Eremicola, Waitzia acuminata*	
Disturbances: road maintenance; rabbits weeds - this photo is taken near the edge of the road and comprises some semi-mature regrowth, with mature shrubland in the background	

Vegetation type 2A: *Allocasuarina campestris* tall shrubland	
Relevés: Cleared area (old road)	
Condition: Degraded	
Description: isolated *Petrophile shuttleworthiana* and *Isopogon scabriusculus* subsp. *scabriusculus* low shrubs	
R10 – R11 (GPS: 471548 E/ 6584421 N): *Allocasuarina campestris* tall closed shrubland over *Melaleuca conothamnoides, Astroloma serratifolium* low isolated shrubs over *Neurachne alopecuroidea* low isolated grass tussocks	
Other species: *Acacia acuminata, Hakea scoparia, Hemigenia dielsii, H. westringioides, Verticordia brachypoda, V. chrysanthella*	
Disturbances: clearing – old road, compacted clay and laterite	

Vegetation type 2B: *Melaleuca – Allocasuarina* shrubland with isolated low trees	
Landform: low hill; pale brown shallow clay loam soils over granitic rock	
R08 – R09 GPS: 471912 E/ 6583953 N	
Condition: Excellent	
Description: *Allocasuarina campestris, Acacia saligna* tall sparse shrubland over *Melaleuca platycalyx, Hypocalymma angustifolium, Allocasuarina campestris, Hakea cygna* subsp. *cygna* shrubland over *Melaleuca marginata, Calytrix depressa, Stypandra glauca* low shrubland over isolated forbs	
Relevés: R09 471871 E/ 6584036 N	
Condition: Very good	
Description: Isolated *Acacia acuminata* and *Santalum spicatum* low trees over *Melaleuca concreta, Allocasuarina campestris, Melaleuca marginata, Hakea scoparia* shrubland over *Melaleuca marginata, Cassytha pomiformis* (vine), *Astroloma serratifolium, Melaleuca conothamnoides, Ecdeiocolea monostachya* low shrubland over *Neurachne alopecuroidea, Borya sphaerocephala* and *Waitzia acuminata* low sparse grass tussocks and forbs	
Other species: *Calothamnus quadrifidus* subsp. *angustifolius, Dampiera lindleyi, Daviesia hakeoides subsp. subnuda, Dodonaea divaricata, Eucalyptus loxophleba subsp. loxophleba (edge of road), Gastrolobium bennettsianum, Goodenia glareicola, Grevillea hakeoides* subsp. *stenophylla, G. paniculata, Hibbertia rupicola, Isopogon divergens, Melaleuca radula, Santalum acuminatum, Verticordia chrysanthella*	
Disturbances: road maintenance; old tracks and clearing (mostly with regrowth)	
	
Melaleuca platycalyx	*Calothamnus quadrifidus*

Vegetation type 2B	
Landform: low rise; pale brown clay loam over laterite and granite	
Relevés: 10	
Condition: Good to very good	
Description: *Acacia acuminata* tall isolated shrubs or low trees over *Allocasuarina campestris, Melaleuca adnata* open shrubland over *Astroloma serratifolium, Ericomyrtus tenuior, Hemigenia conferta, Hakea scoparia, Verticordia monadelpha* low shrubland over *Neurachne alopecuroidea, Amphipogon turbinatus, Waitzia acuminata* low sparse tussock grassland and sparse forbs	
Other species: *Melaleuca conothamnoides*	
Disturbances: old gravel pit; clearing; tracks; surface erosion around pit area.	

Vegetation type 2B: Disturbance vegetation on road verges: mixed shrubland; 2 – 5 m wide *Acacia dielsii, Allocasuarina campestris, Daviesia spiralis, Grevillea armigera, Verticordia brachypoda, Hypocalymma angustifolium, Cassytha pomiformis* (vine)	
Relevés:	
Condition: Very good	
Description: Mixed shrubland to open shrubland; species diversity much higher than *Allocasuarina campestris shrubland; Daviesia spiralis, Acacia dielsii* and *Grevillea armigera* very common; the parasitic *Cassytha pomiformis* (Dodder laurel) was present on many shrubs	
Other species: *Acacia acuminata, A. filifolia, A. lasiocarpa var. bracteolata, Allocasuarina acutivalvis* subsp. *acutivalvis, Astroloma serratifolium, Austrostipa elegantissima, Avena fatua** (Wild oats), *Bossiaea eriocarpa, Briza maxima** (Blowfly grass), *Comesperma integerrimum, Eragrostis curvula** (African lovegrass), *Ericomyrtus tenuior, Eucalyptus loxophleba* subsp. *loxophleba, Gastrolobium spinosum, Grevillea hakeoides subsp. stenophylla, G. petrophiloides subsp. petrophiloides, Hakea scoparia, Hemigenia dielsii, H. westringioides, Hibbertia glomerosa var. glomerosa, Monachather paradoxus, Olearia sp. Eremicola, Santalum acuminatum, S. spicatum, Triticum aestivum** (wheat), *Verticordia brachypoda, V. chrysanthella , V. densiflora var. cespitosa, V. eriocephala, V. monadelpha, Waitzia acuminata*	
Disturbances: clearing (historic and recent); road maintenance; weeds – variable sparse to dense	

Vegetation type 2Ca: *Calytrix depressa* low open shrubland over *Borya sphaerocephala* open forbland	
GPS: 472204 E/ 6583647 N (degraded gravel pit area); 472097 E/ 6583766 N (edge of road)	
Landform: low rise; shallow brown sandy soils over granitic rock	
Image: R07 4722088 E/ 6583819 N	
Condition: excellent	
Description (R07): *Calytrix depressa* and *Stypandra glauca* low open shrubland over *Borya sphaerocephala, Ptilotus declinatus, Waitzia acuminata, Schoenia cassiniana, Schoenus hexandrus*	
Other species: *Allocasuarina campestris, Dianella revoluta var. divaricata, Ericomyrtus tenuior, Lolium rigidum*, Melaleuca fulgens subsp. fulgens, Muehlenbeckia adpressa, Opercularia vaginata, Seringia velutina*	
Disturbances: gravel removal; road maintenance; weeds; old tracks	

Vegetation type 2Cb: *Acacia acuminata* isolated low trees over *Grevillea paniculata* shrubs	
Landform: granite outcrop; shallow sandy soils over rock	
Relevés: R08 471992 E/ 6583873 N	
Condition: Degraded to good	
Description: *Acacia acuminata* isolated low trees over *Grevillea paniculata, Avena fatua*, Dianella revoluta var. divaricata, Acacia restiacea, Ptilotus polystachyus, Calytrix depressa* low sparse shrubland/ open tussock grassland over *Waitzia acuminata, Borya sphaerocephala, Hyalosperma glutinosum, Hibbertia glomerosa* var. *glomerosa, Briza maxima** low forbland; bare granite outcrop areas away from the road ~ 20 m	
Other species: *Alyxia buxifolia, Acacia assimilis* subsp. *assimilis, A. saligna, Allocasuarina campestris, Austrostipa elegantissima, Cassytha pomiformis , Comesperma integerrimum, Eragrostis curvula*, Eucalyptus loxophleba* subsp. *loxophleba* (edge of road), *Melaleuca marginata, M. platycalyx, Podolepis lessonii, Solanum hoplopetalum, Stypandra glauca*	
Disturbances: clearing; moderate to dense weeds, mainly grasses; old tracks	

Vegetation type 2D: *Ecdeiocolea monostachya* open sedgeland with *Allocasuarina campestris* at the edges	
Landform: low hill; pale yellow sandy loam; sandplain	
Relevés:	
Condition:	
Description: *Allocasuarina campestris, Acacia filifolia* tall isolated shrubs to tall sparse shrubland over *Ecdeiocolea monostachya, Verticordia brachypoda, V. monadelpha, Psammomoya choretroides* open sedgeland over *Waitzia acuminata, Neurachne alopecuroidea* low open forbland	
Description (470228 E/ 6586113 N): *Eucalyptus moderata, E. pyriformis, Callitris roei* isolated mallee and low trees over *Allocasuarina campestris, Callitris roei* isolated shrubs over *Ecdeiocolea monostachya, Gastrolobium bennettsianum, G. spinosum, Melaleuca conothamnoides, Mesomelaena preissii* sedgeland over *Waitzia acuminata* low sparse forbland	
Other species: *Acacia sericocarpa, Banksia armata* var. *ignicida, Beaufortia bracteosa, Borya sphaerocephala, Cassytha pomiformis , Daviesia spiralis* (roadside), *Gazania linearis** (roadside); *Grevillea armigera, Grevillea hakeoides* subsp. *stenophylla, Opercularia vaginata, Stylidium repens, Tricoryne tenella*	
Disturbances: fire; old tracks; isolated weeds; road maintenance; gravel pit	
	
Eucalyptus pyriformis	*Tricoryne tenella*

Vegetation type 3: *Banksia armigera* shrubland	
Landform: Low hill, crest and upper slopes; sandy loam with lateritic gravel over laterite	
Relevés: R10	
Condition: Very good to excellent	
Description: *Eucalyptus pyriformis* isolated mallee shrubs over *Allocasuarina acutivalvis* subsp. *acutivalvis, Petrophile shuttleworthiana, Santalum acuminatum* tall open shrubland over *Banksia armata* var. *ignicida, Gastrolobium spinosum, Grevillea armigera, Persoonia coriacea, Allocasuarina campestris* shrubland over *Opercularia vaginata, Mesomelaena preissii* sparse forbland (perennial)	
Other species: *Acacia filifolia, A. semicircinalis, A. latipes* subsp. *latipes, Allocasuarina corniculata, Beaufortia bracteosa, Calytrix depressa, Cassytha aurea var. hirta (on Banksia) , Conospermum stoechadis, Conostylis setigera subsp. setigera (sterile; tentative), Daviesia spiralis, Eucalyptus leptopoda* subsp. *arctata (sterile; tentative), E. moderata, E. torquata (roadside; planted), Grevillea eryngioides, Hakea scoparia, Isopogon divergens, Leptospermum erubescens, Leucopogon sp. Avon, Melaleuca conothamnoides, M. cordata, Persoonia rufiflora, Petrophile shuttleworthiana, Santalum acuminatum, Scaevola humifusa, Stenanthemum pomaderroides, Verticordia eriocephala, Waitzia acuminata*	
Disturbances: road maintenance; isolated weeds; old tracks; clearing – edge effects; fire, rabbits	

Appendix H – References and databases

1. GIS datasets

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- Aboriginal Heritage Places (DPLH-001)
- Cadastre Address (LGATE-002)
- Contours (DPIRD-073)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- IBRA Vegetation Statistics
- Regional Parks (DBCA-026)
- Soil and Landscape Mapping – Best Available

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

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