GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

PERMIT DETAILS

Area Permit Number: CPS 9117/1

File Number: DWERVT6993

Duration of Permit: From 30 May 2021 to 30 May 2027

PERMIT HOLDER

Shire of Murray

LAND ON WHICH CLEARING IS TO BE DONE

Carrabungup Road (PINs 1369197, 1369187 and 1369188), Nirimba

AUTHORISED ACTIVITY

The permit holder must not clear more than 17 native trees incorporating 0.17 hectares of *native vegetation* within the area cross-hatched yellow in Figure 1 and Figure 2 of Schedule 1.

CONDITIONS

1. 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.

2. Weed and dieback 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* and *dieback*:

(a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
(b) ensure that no known d*ieback* or *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.

3. Flora management

(a) The permit holder shall ensure that no clearing of known locations of *threatened flora* occurs.

4. Vegetation management – fencing (pre-clearing)

(a) Prior to commencing clearing, in the presence of an appropriate Department of Biodiversity, Conservation and Attractions Swan Coastal District Officer, the permit holder shall construct a temporary fence within the areas cross-hatched red in Figures 3 and 4 of Schedule 2.

(b) Temporary fencing shall enclose and avoid all known locations of *threatened flora.*

5. Vegetation management – fencing (post-clearing)

(a) Within 6 months of clearing, in the presence of an appropriate Department of Biodiversity, Conservation and Attractions officer, the permit holder shall construct an appropriately designed permanent fence within the area cross-hatched red in Figure 3 of Schedule 2.

(b) Fencing should allow for the movement of wildlife by being raised 15 centimetres from the ground.

(c) Fencing shall avoid all known locations of *threatened flora.*

(d) Within one month of installing the fence, the permit holder shall notify the *CEO* in writing that the fence has been completed.

6. Vegetation management – *revegetation*

The Permit Holder must within 12 months of undertaking clearing authorised under this Permit:

(a) undertake deliberate *planting* of at least thirty-five native trees of *local provenance* within the area cross-hatched red in Figure 5 of Schedule 2;

(b) ensure plantings include the species; *Eucalyptus rudis, Corymbia calophylla, Casuarina obesa,* and *Melaleuca rhaphiophylla*;

(c) ensure *planting* is undertaken at the *optimal* time;

(d) undertake *weed* control and watering of *plantings* for at least three years post *planting;*

(e) the Permit Holder must within 24 months of planting at least thirty-five native trees of *local provenance* in accordance with *condition* 6(a) of this Permit;

  (i) engage an environmental specialist to make a determination that at least thirty-five native trees will survive; and

  (ii) if the determination made by the *environmental specialist* under *condition* 6(e)(i) that at least thirty-five native trees will not survive, the Permit Holder must plant additional native trees that will result in at least thirty-five native trees persisting within the area cross-hatched red in Figure 5 of Schedule 2.

(f) where additional planting of native trees is undertaken in accordance with *condition* 6(e)(ii) the Permit Holder must repeat the activities required by *condition* 6(c), 6(d) and 6(e) of this Permit.

7. Period during which clearing is authorised

The permit holder must not clear any native vegetation after 30 May 2023.

8. 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	(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) the date construction activities commenced; (f) actions taken to avoid, minimise, and reduce the impacts and extent of *clearing* in accordance with *condition* 1; (g) actions taken to minimise the risk of the introduction and spread of *dieback* and *weeds* in accordance with *condition* 2.
2.	In relation to flora management	(a) actions taken to avoid the clearing of known locations of *threatened flora in* accordance with *condition* 3.
3.	In relation to flora and vegetation management	(a) actions taken to protect adjacent *threatened flora* and native vegetation by the erection appropriate fencing in accordance with *condition 4* and *condition* 5 of this Permit, including the date in which the fence was constructed.
4.	In relation to *revegetation*	(a) *revegetation* activities undertaken in accordance with *condition* 6 of this Permit.

9. Reporting

(a) The permit holder must provide to the *CEO*, on or before 31 December of each calendar year, a written report containing:

(i) the records required to be kept under *condition* 8; and

(ii) records of activities done by the permit holder under this permit between 1 July of the preceding calendar year and 30 June of the current calendar year.

(b) If no clearing authorised under this permit has been undertaken, a written report confirming that no clearing under this permit has been undertaken, must be provided to the *CEO* on or before 31 December of each calendar year.

(c) The permit holder must provide to the *CEO*, no later than 90 calendar days prior to the expiry date of the permit, a written report of records required under *condition* 8, where these records have not already been provided under *condition* 9(a).

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* (WA).
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*.
dieback	means the effect of *Phytophthora* species on native vegetation.
environmental specialist	means a person who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the 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.
fill	means material used to increase the ground level, or to fill a depression.
EP Act	*Environmental Protection Act 1986* (WA)
local provenance	means native vegetation seeds and propagating material from natural sources within 30 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.*
optimal time	means the period from May to July for undertaking *planting.*
planting	means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species.
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

Term	Definition
	(c) not indigenous to the area concerned.

END OF CONDITIONS

Mathew Gannaway
MANAGER
NATIVE VEGETATION REGULATION

Officer delegated under Section 20
of the Environmental Protection Act 1986

7 May 2021

SCHEDULE 1

The boundaries of the areas authorised to be cleared are shown in the maps below (Figure 1; Figure 2).

Figure 1: Map of the boundaries of the areas within which clearing may occur

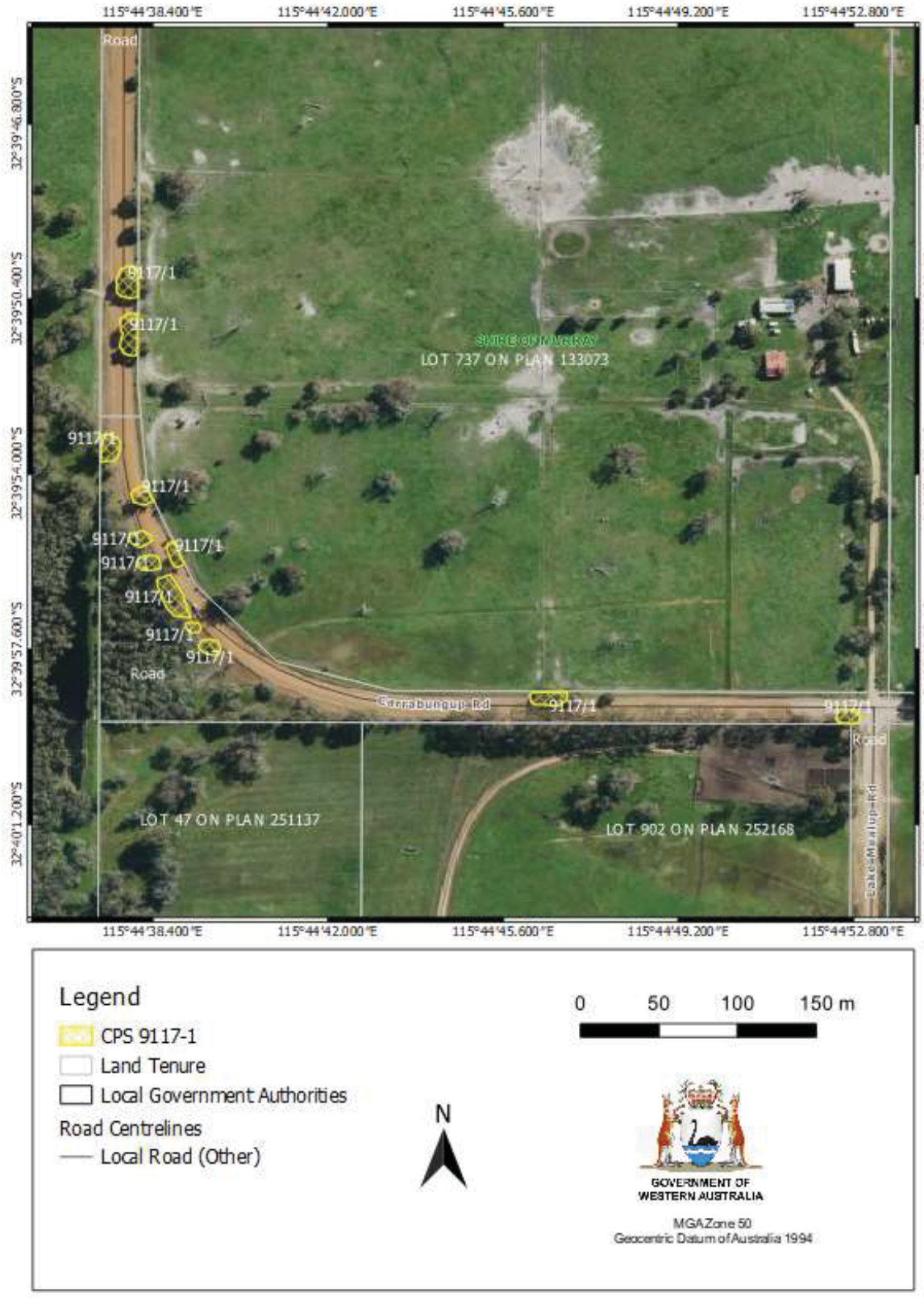
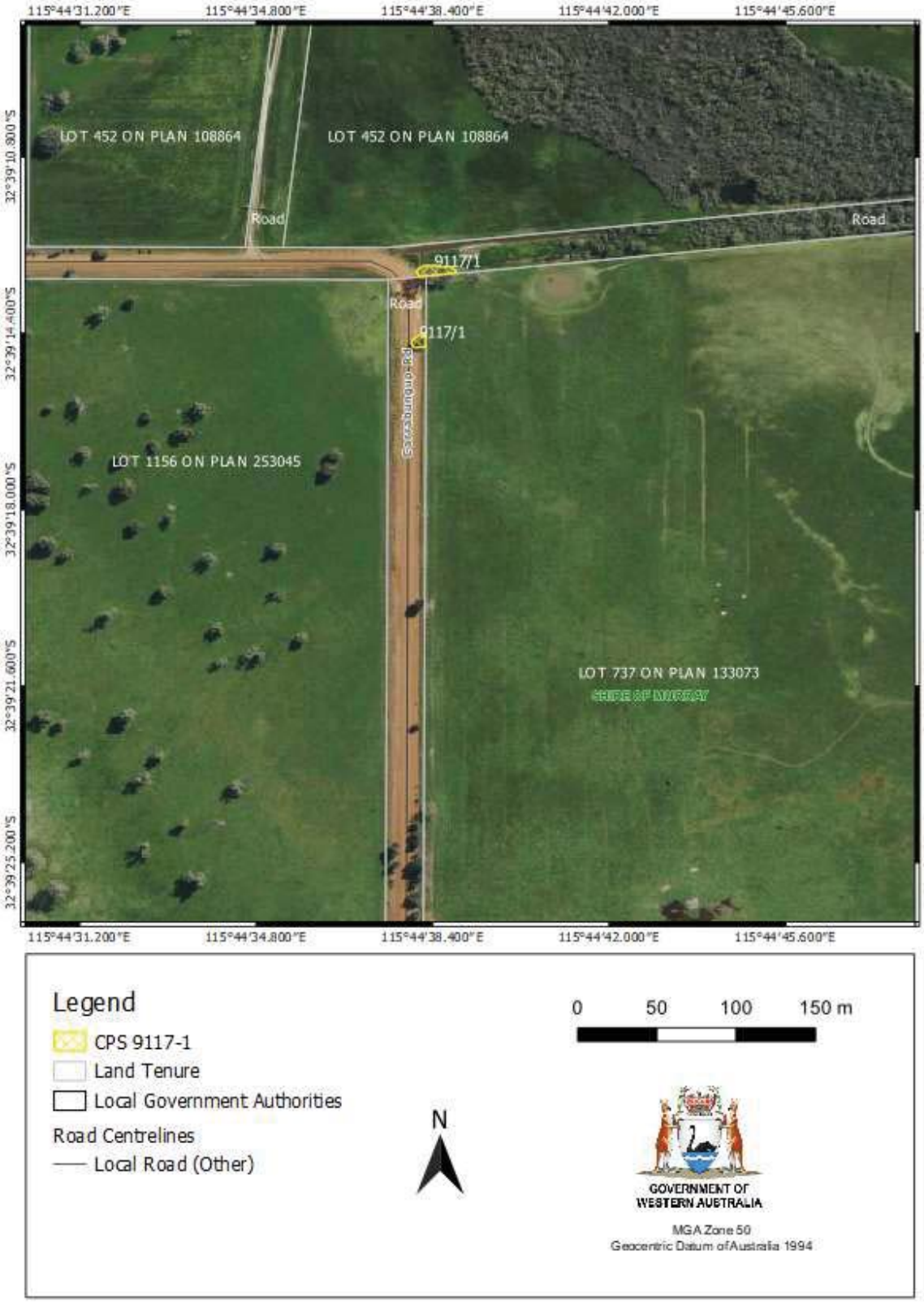


Figure 2: Map of the boundaries of the areas within which clearing may occur



SCHEDULE 2

The boundaries of the areas where specific *conditions* apply are shown in the maps below (Figure 3; Figure 4; Figure 5).

Figure 3: Map of the boundaries of the areas where specific *conditions* apply - Fencing

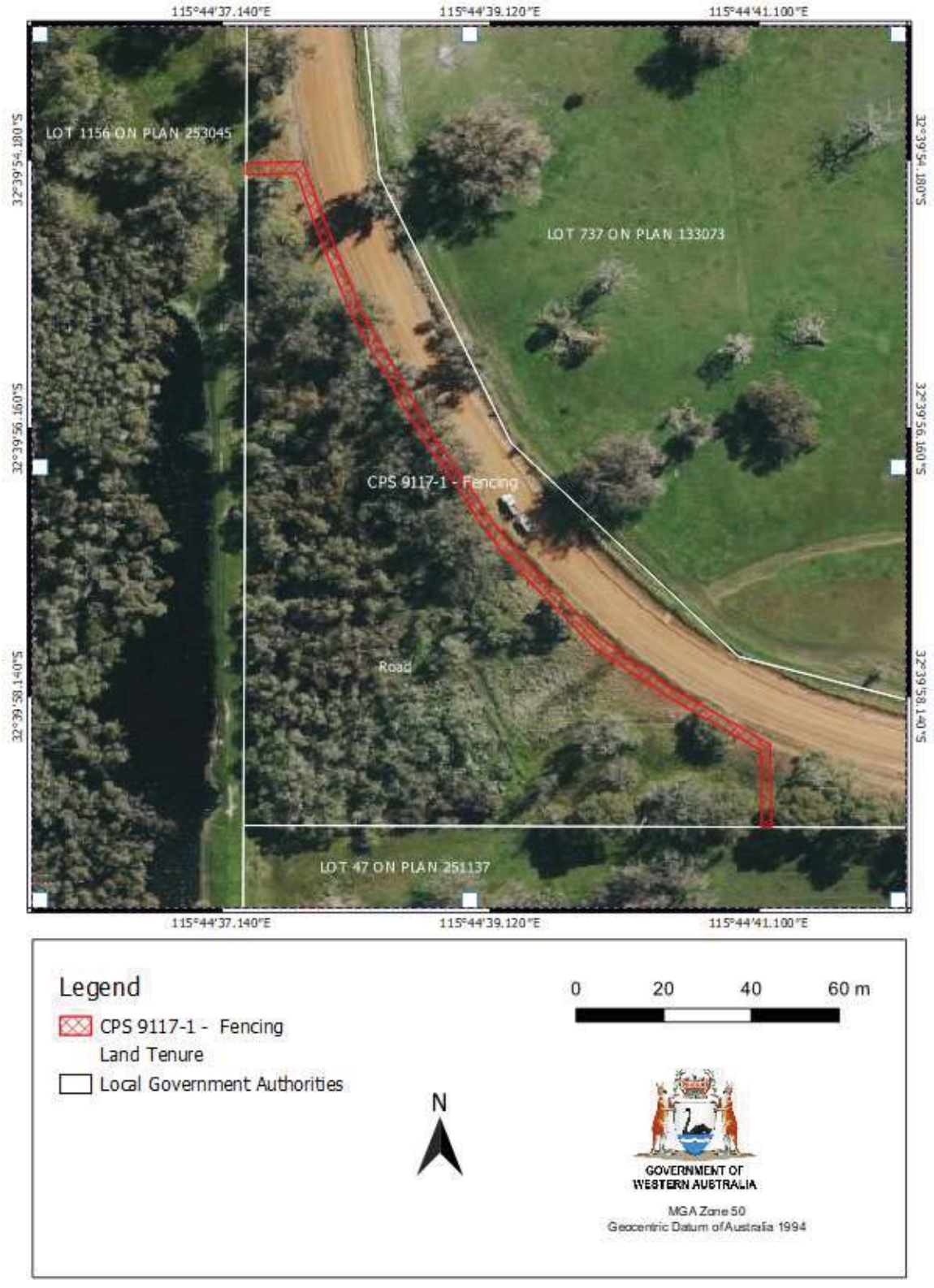


Figure 4: Map of the boundaries of the areas specific *conditions* apply – No works area

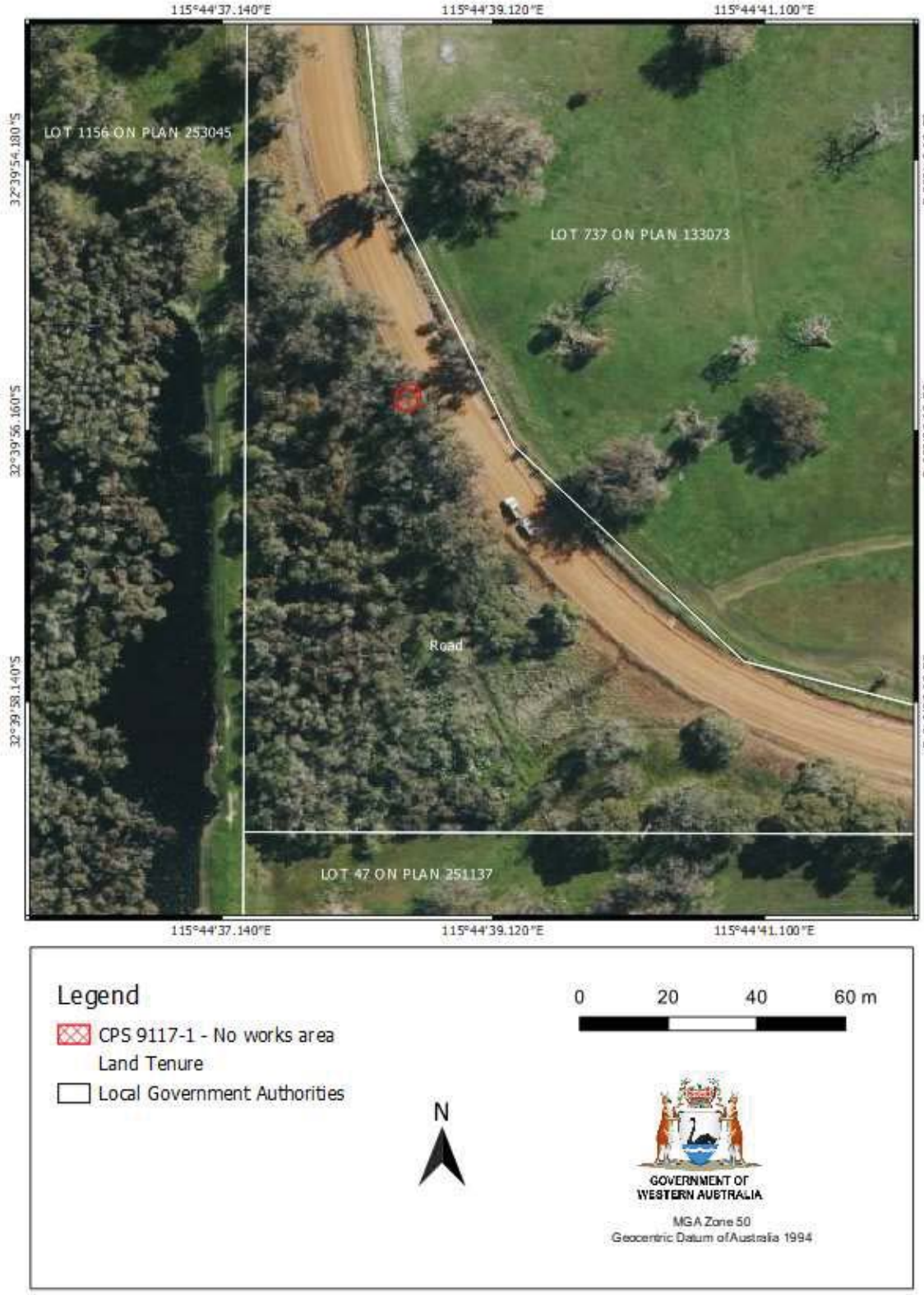
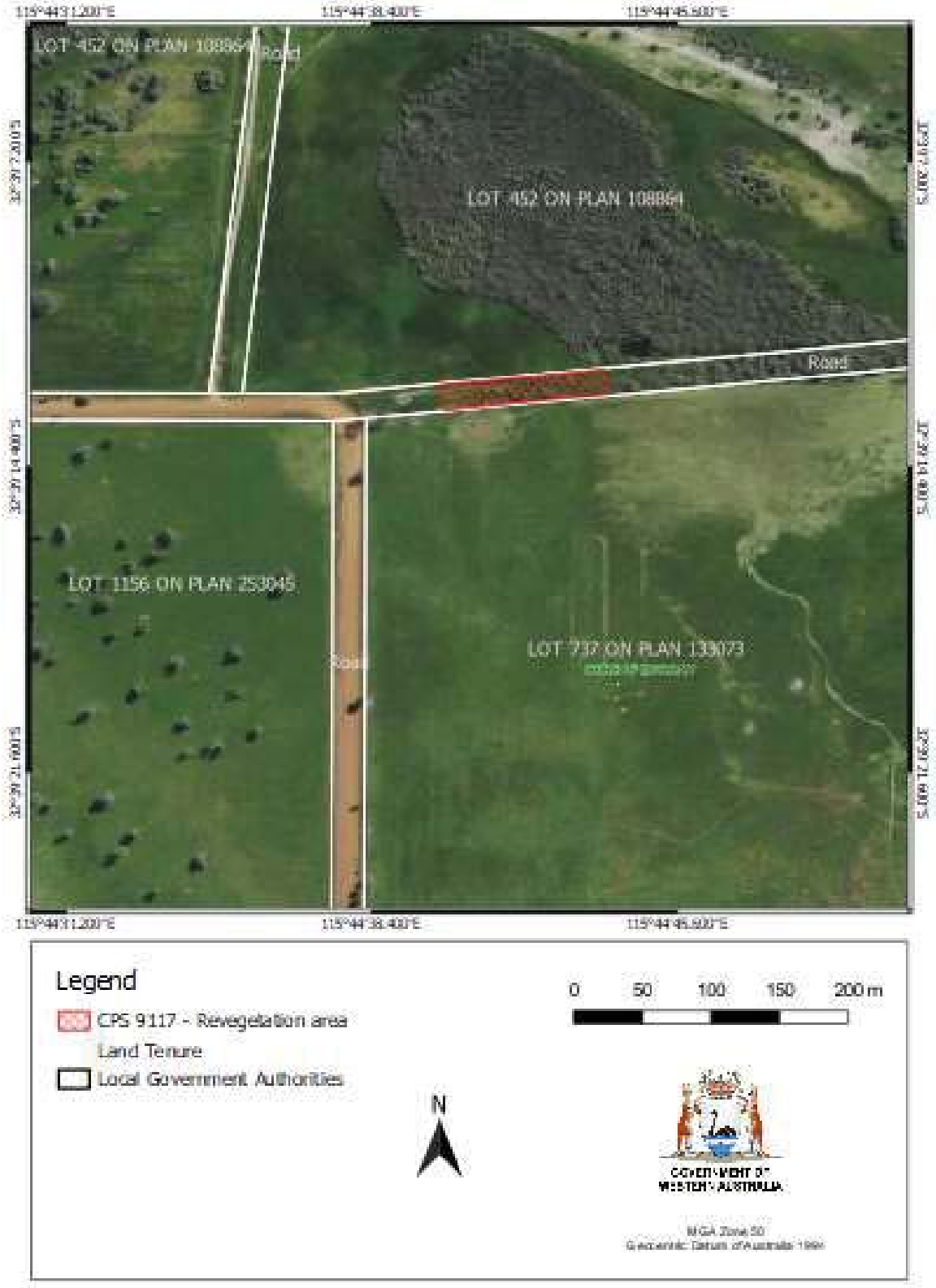


Figure 5: Map of the boundaries of the areas specific *conditions* apply where - Revegetation



Clearing Permit Decision Report

1. Application details and outcome

1.1. Permit application details

Permit number:	CPS 9117/1
Permit type:	Area permit
Applicant name:	Shire of Murray
Application received:	18 November 2020
Application area:	17 native trees, incorporating 0.17 hectares of native vegetation
Purpose of clearing:	Road safety upgrades
Method of clearing:	Mechanical clearing and professional tree loppers.
Property:	Carrabungup Road (PINs 1369197, 1369187 and 1369188), Nirimba
LGA area:	Shire of Murray
Localities:	Nirimba

1.2. Description of clearing activities

The Shire of Murray require the removal of up to 17 native and non-native trees to allow for road upgrades to Carrabungup Road, Nirimba, for public safety purposes. The removal of the trees will result in the clearing of up to 0.17 hectares of native vegetation in a Completely Degraded to Degraded condition (Keighery 1994).

1.3. Decision on application and key considerations

Decision:	Granted
Decision date:	7 May 2021
Decision area:	17 native trees incorporating 0.17 hectares of native vegetation as depicted in Section 1.5, below.

1.4. Reasons for decision

This clearing permit application was submitted, accepted, assessed and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act). The Department of Water and Environmental Regulation (DWER) advertised the application for 21 days and no submissions were received.

In making this decision, the Delegated Officer had regard for the site characteristics (Appendix B), relevant datasets (Appendix G2), representative photographs of the application area (Appendix E), the results of flora and vegetation survey (Section A), the clearing principles set out in Schedule 5 of the EP Act (Appendix C), relevant planning instruments and any other matters considered relevant to the assessment (Section 3). The Delegated Officer also took into consideration the purpose of the clearing to improve public safety.

The assessment identified that the proposed clearing may result in the inadvertent removal of threatened flora species individuals, the introduction or spread of weeds and dieback into adjacent native vegetation that includes a conservation category wetland (CCW), could impact on the quality of adjacent native vegetation and its habitat values, and an overall reduction of vegetation cover in an extensively cleared area. The locations of the threatened flora species in the vicinity of the application area are known to the Shire, and the Shire have committed to not intentionally taking any individuals. The Department of Biodiversity, Conservation and Attractions (DBCA) will be present on site during the construction of a fence to minimise the inadvertent removal of threatened flora species and reduce potential impacts to the CCW during construction. DBCA are also finalising the issuing of a Section 40 authorisation under the *Biodiversity Conservation 2016* (BC Act) for the inadvertent removal of threatened flora species.

After consideration of the available information, as well as the applicant's avoidance, minimisation, and mitigation measures (Section 3.1), the Delegated Officer determined the proposed clearing is not likely to lead to an

unacceptable risk to environmental values. The Delegated Officer decided to grant a clearing permit subject to conditions to:

- avoid, minimise and reduce the impacts and extent of clearing;
- implement weed and dieback management measures to mitigate impacts to adjacent vegetation;
- avoid the clearing of known locations of threatened flora;
- in the presence of an appropriate DBCA officer, install appropriate temporary fencing and designate no work areas to separate a known population of threatened flora and a CCW from roadside upgrade works;
- in the presence of an appropriate DBCA officer, install appropriate permanent fencing to separate a known population of threatened flora and a CCW from Carrabungup Road, to reduce ongoing inadvertent impacts; and
- undertake deliberate planting of at least thirty-five locally provenanced native trees within the Carrabungup Road reserve to mitigate the loss of native vegetation within an extensively cleared landscape.

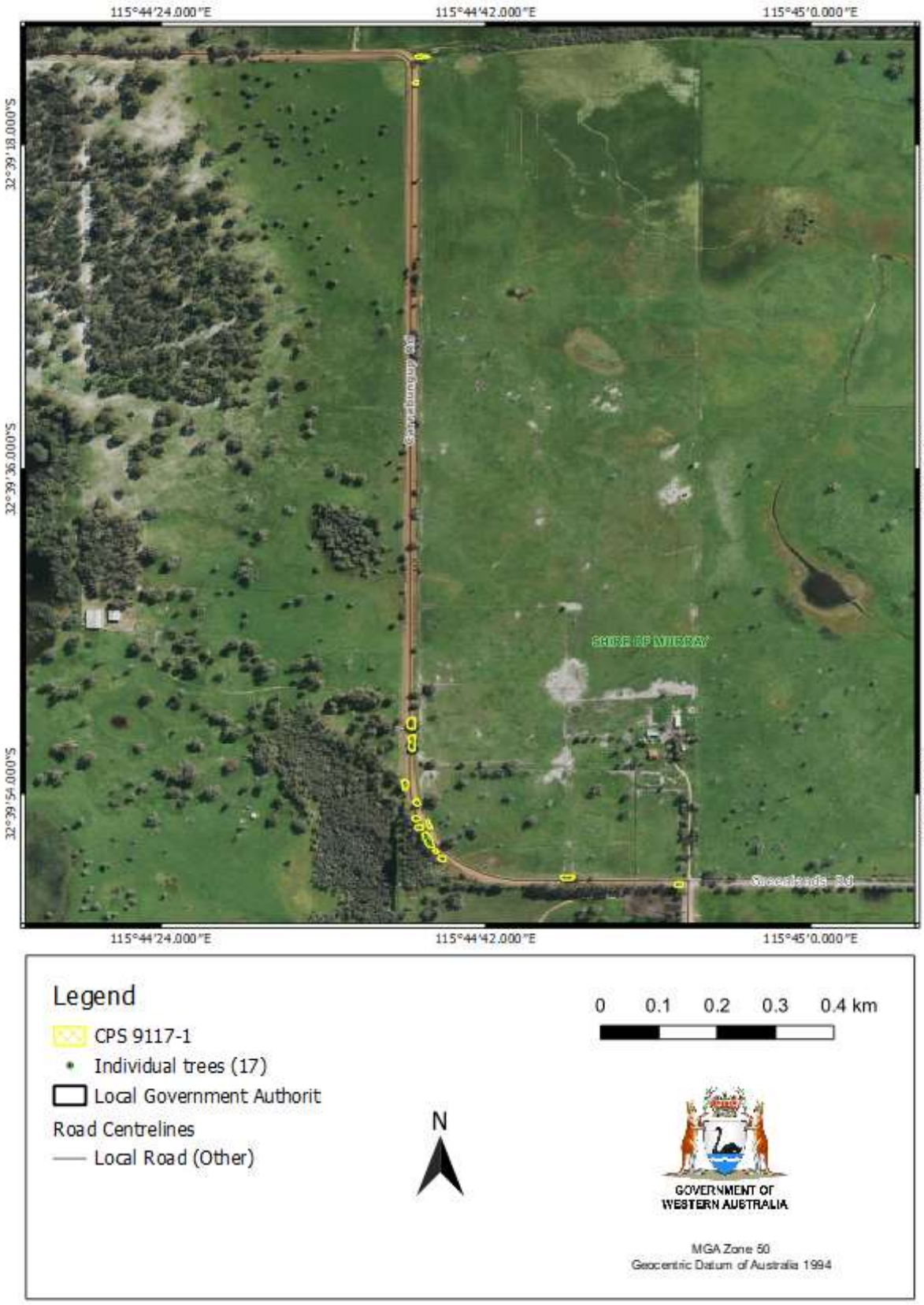


Figure 1. Map of the application area. The areas cross-hatched yellow indicates the area authorised to be cleared under the granted clearing permit.

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 (Section 1.3), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity
- the principle of the conservation of biological diversity and ecological integrity

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Biosecurity and Agriculture Management Act 2007* (BAM Act),
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)

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)
- Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)

3. Detailed assessment of application

3.1. Avoidance and mitigation measures

The road design has been undertaken to have minimal requirement for the removal of native vegetation. Professional tree loppers will be engaged to prune trees rather than clear trees wherever possible. The Shire of Murray (the Shire) has provided both avoidance and mitigation strategies to minimise environmental impact of the proposed road works at the location of a right-angle bend that potentially impacts a population of a threatened flora species (section 3.2.2), and is located immediately adjacent to a conservation category wetland (section 3.2.4) (Shire of Murray 2021).

The road design upgrade proposes a sealed road on the existing road formation only, with no modification to the horizontal road alignment, or increases to the curve radius, that would encroach onto the adjacent threatened flora population (Appendix F). This modified design measure also reduces the extent of the vegetation clearance required.

The modified road design will not alter the existing surface water hydrology as the Shire has committed that no work will occur within the existing drainage on the outside radius of Carrabungup Road. Road construction will utilise the existing road formation width, but will increase the super-elevation of the radius which drains to the inside of the curve. That is, to the opposite side to the CCW (Appendix F).

The Shire has also committed to protect an adjacent threatened flora population by fencing the population from Carrabungup Road (Appendix F1) both prior to, and post, road-works.

The 17 native trees proposed to be removed will be replaced by the Shire by planting appropriate species within a degraded area of the Carrabungup Road reserve at a rate greater than two trees planted for each tree removed, with the Shire committing to planting 40 native trees (Shire of Murray 2021).

3.2. Assessment of impacts on environmental values

The assessment against the clearing principles (Appendix C) identified that the impacts of the proposed clearing present a potential risk to the biological values of significant fauna and flora, remnant vegetation and wetlands. The consideration of these impacts, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below.

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

Assessment: Vegetation over the application area consists of seventeen scaterred trees, both native and non-native, over an either a Degraded (0.129 hectares) or Completely Degraded (0.045 hectares) understorey (Emerge 2021). Immediately adjacent to the application area, to the south and west at a right-angle bend of Carrabungup Road, a CCW occurs (Figure 2). The CCW is known as Munginup Swamp (sumpland UFI-3108). A mapped South West Regional Ecological Linkage parallels the application area (Figure 2). This linkage extends to the north and south of the application area and connects to other mapped linkages.

Two vegetation communities are represented over the application area (and areas immediately adjacent); a low open woodland of *Corymbia calophylla* or *Casuarina obesa* (CcCo), and a low open woodland to forest of *Eucalyptus rudis, Melaleuca rhaphiophylla*, and *M. preissiana* (Emerge 2021).

The application area is within the modelled distribution of three threatened black cockatoo species (Appendix B2). No black cockatoo breeding sites or roosts have been recorded within six kilometres of the application area (DBCA 2019). Scattered Marri *(Corymbia calophylla)* and Flooded Gum *(Eucaluptus rudis)* are the only native eucalypts occurring over the application area. Due to their size, these trees are unlikely to provide roosting or breeding habitat for threatened black cockatoo species. Flooded Gum *(Eucalyptus rudis),* and the Melaleuca species present are not a preferred food species for black cockatoos (Bamford 2013; Groom 2011), and negligible foraging habitat is available over the application area (Emerge 2021).

Twenty-nine shorebirds, and wetland-inhabiting birds of conservation significance, including migratory species have been recorded from the local area. This is predominantly due to the presence of Lake Mealup and Lake Mclarty, three to five kilometres to the south west, and the Peel-Harvey Estuary to the north and west. Most of these species have been recorded within these areas, but not within four kilometres of the application area. However, these species may utilise the adjacent Munginup Swamp particularly when flooded.

The removal of a small area of overstorey trees adjacent to Carrabungup Road is unlikely to impact Munginup Swamp wetland function. Trees will remain within the Carrabungup Road reserve, including the retention of a treed buffer between Munginup Swamp and Carrabungup Road. The mapped South West Regional Ecological Linkage that parallels the application area will not be severed. The Shire has provided a road design aimed at retaining the existing surface water hydrology, and committed that no work will occur within an existing drainage channel on the south-west side of Carrabungup Road. Engineering drawings have been provided and road construction will ensure that drainage reports to the opposite side of Carrabungup Road, away from the CCW (section 3.1; Appendix F). With these strategies in place, the hydrological function of Munginup Swamp will be maintained and indirect impacts to wading shorebirds or any other wetland-inhabiting birds are unlikely.

The Critically Endangered Western Ringtail Possum *(Pseudocheirus occidentalis)* has only been recorded from the west of the Peel Harvey Estuary, approximately eight kilometres distant to the application area, and is unlikely to occur. The threatened Chuditch *(Dasyurus geoffroii),* Priority 4 Western Brush Wallaby *(Notamacropus Irma)* and Conservation Dependant Brush-tailed Phascogale *(Phascogale tapoatafa wambenger)* require large areas of contiguous native vegetation, and occur predominantly where feral predator control is being implemented (Burbidge and McKenzie 1989). They are unlikely to occur in the disjunct remnant vegetation surrounding the application area. The Priority 3 reptiles *Ctenotus ora* and *Lerista lineata* are largely restricted to coastal sandplains and are unlikely to be present in the habitats within the application area.

The Priority 4 Quenda *(Isoodon fusciventer)* is known from within four kilometres of the application area. Quenda require a dense understorey for cover (van Dyck and Strahan 2008), including exotic species, and any dense vegetation within the application area, particularly in the vicinity of Munginup Swamp could potentially be utilised. Quenda may intermittently frequent the application area, particularly from adjacent Munginup Swamp. However, the application area itself does not contain significant habitat for Quenda and the removal of overstorey trees with a Degraded understorey is unlikely to impact the species.

Emerge (2021) recorded 31 non-native flora species over, or immediately adjacent to, the application area. Grass and herb weed cover was high, and two weed species listed as a declared pests (S-22) pursuant to the BAM Act were recorded; *Moraea flaccida* (Cape Tulip) and *Zantedeschia aethiopica* (Arum Lily). Adjacent vegetation is susceptible to weed invasion and dieback disease *(Phytophthora* spp.) which the clearing process may exacerbate, thereby reducing habitat quality.

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire of Murray (Section 3.1), it is considered that potential impacts of the proposed clearing on fauna and adjacent fauna habitat can be managed by appropriate road design and construction, implementing appropriate weed control, and protecting the attributes of Munginup Swamp during road upgrade activities.

Conditions: To address potential impacts to adjacent wetland habitat from proposed road upgrades, and potential weed encroachment, the following management measures will be required as a conditions on the clearing permit.

- Implement weed and dieback management measures to mitigate impacts to adjacent vegetation.
- Install appropriate fencing to separate the adjacent Munginup Swamp from roadside upgrade activities.
- Replant a section of the Carrabungup Road reserve with locally-provenanced tree species at a ratio of at least 2:1.

3.2.2. Environmental value: biological values (threatened flora) – Clearing Principle (c)

Assessment: Vegetation over the application area is either in a Degraded (0.129 hectares) or Completely degraded (0.045 hectares) condition. Immediately adjacent to the application area, to the south and west is a CCW known as Munginup Swamp (Figure 2).

A population of a threatened flora species occurs in association with Munginup Swamp, with two DBCA records present. The species is listed as Vulnerable under the BC Act (WA), as well as the EPBC Act (Commonwealth).

A flora and vegetation survey was undertaken by Emerge (2021) over the application area as well as the immediate surrounds. One threatened flora species was recorded. No other threatened or priority flora species were recorded, or are considered likely to occur, due to a lack of suitable habitat or because they were not recorded during the field survey (Emerge 2021) (Appendix E3).

The threatened flora species recorded prefers moist locations such as low-lying depressions in peaty and sandy clay swamps, and often emerges from standing water (DEWHA 2008). The degree of disturbance over the application area reduces the likelihood that significant flora taxa occur. Nevertheless, the threatened flora species was recorded in a particularly disturbed area growing out of a dense patch of weeds including Couch Grass and Watsonia (Emerge 2021). The level of weed cover amongst individuals of the threatened flora species does not appear to have a negative impact on the plants as they appeared healthy and in full flower (Emerge 2021). The survey was conducted at an appropriate time of year.

Figure 2: Conservation category wetland and threatened flora in the vicinity of the application area

The threatened flora species recorded is known to occur over a range of approximately 430 kilometres north to south, and approximately 230 kilometres east to west, with one outlier 380 kilometres to the north of the main area of occurrence. The species is known from 43 confirmed populations with 7,995 plants in total. Importantly, approximately 5,000 of these are from one single population (DBCA 2021).

Of these populations, only two occur in the Swan Region, including the one within and adjacent to the application area. A further four historical populations occur in the region, however plants have not been recorded at these populations in over 10 years, despite survey effort (DBCA 2021). The nearest population with extant plants is approximately 20 kilometres to the north-west of the application area.

The population within and adjacent to the application area appears to be in decline. Surveys completed by DBCA staff recorded 415 individuals in 2016, and 350 individuals in 2018. A total of 278 individuals were recorded by Emerge (2021).

Brown (1998) describes the habitat for the threatened species recorded as low-lying depressions in peaty and sandy clay swamps that contain water early summer. Any change to surface hydrology has the potential to significantly impact the population (DBCA 2021).

A drain currently parallels Carrabungup Road immediately to the west (Appendix F2). The road upgrade has been designed to not alter the existing surface water hydrology, and the Shire has committed that this existing drainage will not be removed and will remain unaltered, with a commitment that no works will undertaken within the drain (Shire of Murray 2021). Road construction will increase the super-elevation of the Carrabungup Road radius, with drainage reporting to the inside of the curve. That is, to the east and opposite side to the threatened flora population and associated Munginup Swamp (Shire of Murray 2021; Figure 3; Appendix F2).

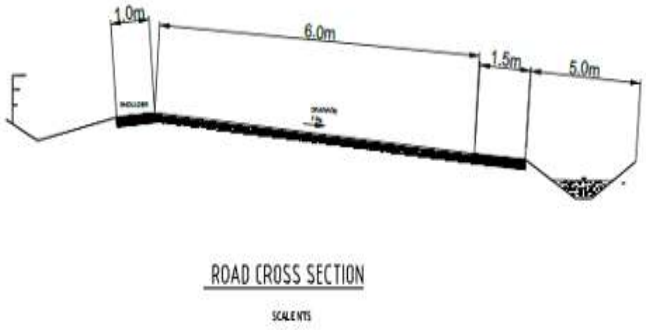


Figure 3: Screen shot of relevant engineering plan showing the cross-section for Carrabungup Road in the vicinity of Munginup Swamp. See Appendix F2 for full plan (Shire of Murray 2021)

Due to spatial errors of the GPS technology used to record individuals of the threatened flora species, it is not possible to accurately determine the number of individuals occurring within the application area (Emerge 2021). The Shire has committed to not intentionally taking any individuals and proposes to protect the population by fencing the population from Carrabungup Road (Appendix F1). Temporary fencing will be installed prior to road works to protect the population during road upgrade work, with permanent fencing installed once all works have been completed. Fencing is proposed to be installed under the supervision of DBCA regional staff (Shire of Murray 2021).

One cluster of the threatened flora species is located on the east (or road side) of the proposed fencing, with a sub-cluster of approximately 11 individuals located on the roadside drain (Figure 4). The Shire of Murray (2021) propose to demarcate this area with temporary fencing prior to, and during, road upgrade works with no works to be undertaken in this area (Figure 4).

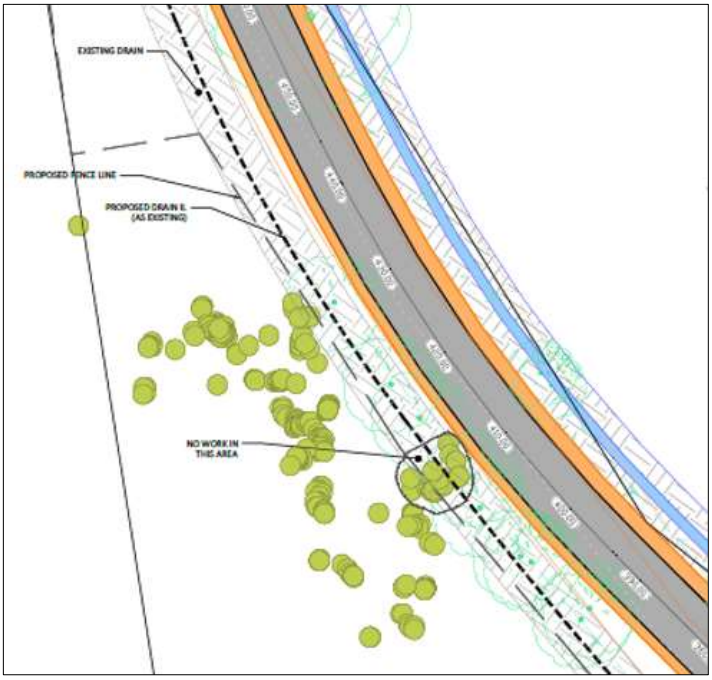


Figure 4: Screenshot of relevant engineering plan showing locations of threatened flora to be avoided during road upgrades, and proposed fencing to protect the population. See Appendix F1 for full plan (Shire of Murray 2021)

The Shire have provided appropriate evidence of avoidance and mitigation actions to minimise impacts to threatened flora (Shire of Murray 2021). The locations of individuals are known to the Shire, and the Shire have committed to not intentionally taking any individual*s.*

Regardless of the GPS technology used to record locations, some individuals may be inadvertently impacted. Installation of fencing that does not disturb soil and vegetation (e.g. conservation style fencing) and supervision by DBCA staff will reduce this risk. DBCA have advised that given the proximity to known plants, the risk of inadvertent take, and for the inadvertent taking of soil-stored seed and underground tubers, an authorisation from the Minister for Environment under section 40 of the BC Act will need to be obtained prior to any clearing (DBCA 2021). A section 40 authorisation under the BC Act is currently being finalized by DBCA.

Prior to the flora and vegetation survey, Emerge (2021) assessed that six threatened flora taxa and 15 priority flora taxa had the possibility of occurring within the application area (Appendix B2). After the survey was conducted, Emerge (2021) concluded that apart from the threatened flora species recorded, no other threatened or priority flora taxa were considered to occur due to a lack of suitable habitat or because they were not recorded during the field survey (Emerge 2021; Appendix B2).

It is highly likely that the species recorded is the only threatened flora species with the potential to occur within the application area. Emerge (2021) recorded 31 non-native flora species over, or immediately adjacent to, the application area. Grass and herb weed cover was high, and two weed species listed as a declared pests (S-22) pursuant to the BAM Act were recorded; *Moraea flaccida* (Cape Tulip) and *Zantedeschia aethiopica* (Arum Lily). Adjacent native vegetation is susceptible to weed invasion and dieback disease which the clearing process may exacerbate, thereby reducing habitat quality.

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire of Murray (Section 3.1), it is considered that potential impacts of the proposed clearing on threatened flora and adjacent habitat can be managed by:

- appropriate road design and construction to avoid alteration to surface hydrology,
- temporary fencing installation and avoidance of known threatened flora individuals during road works,
- permanent fencing of the population post road works, and
- authorisation to take threatened flora under section 40 of the BC Act received from DBCA for any inadvertent disturbance to habitat even if no known plants will be intentionally taken.

Any fencing erected should avoid any threatened flora, be installed in the presence of an appropriate DBCA officer, be undertaken by hand without any disturbance to soil or vegetation, and constructed without any ground disturbance

or associated access tracks. 'Conservation style' fencing should be erected whereby a gap of at least 15 centimetres from the ground is maintained to allow for the movement of ground-dwelling fauna.

The locations of threatened flora in the vicinity of the application area are known to the Shire, and the Shire have committed to not intentionally taking any individual plants. Permit conditions will prevent the clearing of known threatened flora locations, and the applicant has applied for, and is likely to receive, an authorisation from Minister for Environment (administered by DBCA) to manage any inadvertent take of threatened flora under section 40 of the BC Act (DBCA 2021).

Conditions: To address potential impacts to a known population of threatened flora due to proposed road upgrades, the following management measure will be required as conditions on the clearing permit.

- Avoid the clearing of known threatened flora locations.
- Implement weed and dieback management measures to mitigate impacts to adjacent vegetation.
- In the presence of an appropriate DBCA officer, install appropriate temporary fencing and no work areas to separate the known threatened flora locations from roadside upgrades.
- In the presence of an appropriate DBCA officer, install appropriate permanent fencing to separate a known threatened flora population from Carrabungup Road.

Note that no clearing may commence prior to an authorisation from the Minister for Environment under section 40 of the BC Act being issued for the inadvertent take of threatened flora.

3.2.3. Environmental value: significant remnant vegetation– Clearing Principle (e)

Assessment: The national objectives and targets for biodiversity conservation in Australia has a target to prevent the clearance of ecological communities with an extent below 30 per cent of that present prior to the year 1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia 2001).

The application area is located within the Swan Coastal Plain IBRA Bioregion, (SWA) as described by Thackway and Cresswell (1995), and the Perth sub-region (SWA02). The Swan Coastal Plain bioregion has approximately 579,814 hectares of native vegetation remaining, equating to approximately 38.6 per cent of its original extent (Government of Western Australia 2019) (Appendix B3).

Regional Swan Coastal Plain vegetation complex descriptions of Heddle *et al,* (1980) as updated by Webb *et al.* (2016) have been mapped over the application area with two complexes occurring.

- The major component in the central and southern sections of the application area is mapped as the Southern River complex (42). That is, an open woodland of *Corymbia calophylla* (Marri) - *Eucalyptus marginata* (Jarrah) - Banksia species with fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca rhaphiophylla* (Swamp Paperbark) along creek beds. The Southern River complex retains approximately 18.4 per cent of its original extent.
- A minor component in the northern section of the application area is mapped as the Vasse complex (57). That is, a mixture of the closed scrub of Melaleuca species fringing woodland of *Eucalyptus rudis* (Flooded Gum) - Melaleuca species and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri). The Vasse complex retains approximately 31.4 per cent of its original extent.

Two vegetation communities (and an area containing predominantly non-native species or bare ground) were described over the application area during the flora and vegetation assessment of Emerge (2021).

- Approximately 0.09 hectares (or 50 per cent) of the application area consists of the vegetation community ErM. That is, a low open woodland to forest of *Eucalyptus rudis, Melaleuca rhaphiophylla, M. preissiana* over occasional *M. teretifolia* over sedgeland of *Typha sp.* and *Bolboschoenus caldwellii over* forbland **Watsonia meriana, *Zantedeschia aethiopica, * Oxalis pes-caprae, *Lotus subbiflorus and *Lythrum hyssopifolia* over grassland of **Cynodon dactylon* and **Paspalum dilatatum* or bare ground.
- Approximately 0.04 hectares (or 24 per cent) of the application area consists of the vegetation community CcCo. That is, a low open woodland of *Corymbia calophylla* or *Casuarina obesa* over occasional *Xanthorrhoea preissii* over sedgeland of *Baumea juncea* and *Lepidosperma longitudinale* over forbland **Watsonia meriana, *Asphodelus fistulosus, *Stachys arvensis and *Lythrum hyssopifolia* over grassland of **Ehrharta spp., *Eragrostis curvula, *Lolium sp*. and **Paspalum dilatatum* or bare ground.
- Approximately 0.05 hectares (or 26 per cent) of the application area consists of heavily disturbed areas comprising gravel road, non-native trees over weeds or bare ground.

Remnant vegetation has been mapped regionally, and within the local area of a 10 kilometre radius of the application area. Approximately 5,675 hectares of mapped native vegetation remains, or approximately 24.5 per cent of its original extent.

The two vegetation communities described and mapped by Emerge (2021) contain structural components of both the Southern River complex and the Vasse complex. Their condition is either Completely Degraded (0.05 hectares, or 26 per cent of the application area) or Degraded (0.13 hectares, or 74 per cent of the application area) according to the condition scale of Keighery (1994) (Appendix D). Similarly, the majority of the application area (80 per cent) has not been mapped as remnant vegetation.

The Vasse complex exceeds the 30 per cent retention threshold of the Commonwealth of Australia (2001) (Government of Western Australia 2019), and the Southern River complex falls below the 30 per cent retention threshold of the Commonwealth of Australia (2001) (Government of Western Australia 2019). Due to the vegetation condition, native vegetation within the majority of the application area (66 per cent) is not representative of the mapped vegetation complexes, and is not considered significant as a remnant. However, native vegetation on the south-west side of Carrabungup Road in the vicinity of Munginup Swamp and a population of threatened flora (Figure 2) is considered significant.

The 17 native trees proposed to be removed will be replaced by the Shire by planting appropriate species within a degraded area of the Carrabungup Road reserve at a rate greater than two trees planted for each tree removed, with the Shire committing to planting 40 native trees (Shire of Murray 2021). Appropriate species are *Eucalyptus rudis*, *Corymbia calophylla, Casuarina obesa,* and *Melaleuca rhaphiophylla.*

Emerge (2021) recorded 31 non-native flora species over, or immediately adjacent to, the application area. Adjacent native vegetation is susceptible to weed invasion and dieback disease which the clearing process may exacerbate, thereby reducing the condition of adjacent remnant vegetation.

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire of Murray (Section 3.1), it is considered that potential impacts of the proposed clearing on remnant vegetation can be managed by appropriate road design and construction, implementing appropriate weed control, and the planting of appropriate species within the Carrabungup Road reserve.

Conditions: To address potential impacts to adjacent remnant vegetation from proposed road upgrades, and potential weed encroachment, the following management measures will be required as conditions on the clearing permit.

- Implement weed and dieback management measures to mitigate impacts to adjacent vegetation.
- In the presence of an appropriate DBCA officer, install appropriate fencing (section 2.2.2) to separate adjacent remnant vegetation from roadside upgrade activities.
- Replant a degraded section of the Carrabungup Road reserve with locally-provenanced tree species at a ratio of greater than 2:1.

3.2.4. Environmental value: wetlands and water resources – Clearing Principles (f) and (i)

Assessment: No drainage lines or watercourses intersect the application area. However, the entire application area is located within mapped geomorphic wetland of the Swan Coastal Plain. That is, a multiple use wetland; Palusplain (UFI 15227) (Figure 5).

A palusplain is simply a flat that is seasonally water-logged (Semeniuk and Semeniuk 2004). Multiple use wetlands (UW) are considered wetlands with few remaining important attributes and functions (EPA 2004; EPA 2008; Water and Rivers Commission 2001). The management objective should be to take all reasonable measures to retain the wetland's hydrological function (EPA 2008), but is not incompatible with clearing.

Proposed clearing is also located within 2.5 metres of a CCW, known as Munginup Swamp which occurs immediately to the west and south of the application area (Figure 5). The presence of the CCW indicates the area is considered high conservation value (EPA 2008), and has likely been classified as such as it is part of a larger wetland. All vegetated areas of wetlands over 70 hectares on the Swan Coastal Plain have been classified as conservation category (EPA 2008). CCWs are those that support a high level of attributes and functions. These are the most valuable of wetlands and any activity that may lead to further loss or degradation is inappropriate. No development or clearing is considered appropriate.

Figure 5: Mapped conservation category wetland and multiple use wetland in the vicinity of the application area

Proposed clearing is within 50 metres of a CCW. Clearing of vegetation within 50 metres of a CCW is not consistent with EPA Guidance Statement No.33 (Chapter B4) (EPA 2008). DBCA (2021) have advised that the existing hydrological function is vital to the long-term health of the Munginup Swamp, and its supporting vegetation communities (DBCA 2021), including a population of threatened flora (section 3.2.2). Any change in landfall or ground heights is likely to have a detrimental impact (DBCA 2021).

A drain currently parallels Carrabungup Road immediately to the west of the application area (Figure 4; Appendix F2). The proposed works recognise and endeavour to maintain the existing hydrological function of Munginup Swamp. The road upgrade has been designed to not alter the existing surface water hydrology, and the Shire has committed that this existing drainage will not be removed and will remain unaltered, with a commitment that no works will be undertaken within the drain itself (Shire of Murray 2021). Road construction will increase the super-elevation of the Carrabungup Road radius, with drainage reporting to the inside of the curve (Figure 3; Appendix F2). That is, to the east and opposite side of Munginup Swamp (Shire of Murray 2021; Figure 3; Appendix F2).

Vegetation proposed to be cleared includes species considered riparian such as *Eucalyptus rudis* (Flooded Gum) and *Melaleuca* species (Appendix B1). The proposed clearing will impact riparian vegetation that is growing in, or in association with, an environment associated with a wetland. However, considering the size and Completely Degraded to Degraded condition of the vegetation within the application area, the impact on environmental values is considered minor.

Emerge (2021) recorded 31 non-native flora species over, or immediately adjacent to, the application area. Grass and herb weed cover was high, and two weed species listed as a declared pests (S-22) pursuant to the BAM Act were recorded; *Moraea flaccida* (Cape Tulip) and *Zantedeschia aethiopica* (Arum Lily). Adjacent vegetation is susceptible to weed invasion and dieback disease which the clearing process may exacerbate, thereby reducing habitat quality.

The Shire of Murray (2021) have provided drainage plans (Appendix F) that aim to maintain the existing hydrology of the adjacent wetland, and propose to install fencing prior to road works to protect the adjacent wetland during road upgrade work, with permanent fencing installed once all works have been completed. Fencing is proposed to be installed under the supervision of DBCA regional staff (Shire of Murray 2021).

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire of Murray (Section 3.1), it is considered that potential impacts of the proposed clearing on wetland habitat can be managed by appropriate road design and construction, implementing appropriate weed control, protecting Munginup

Swamp (UFI 3108) during road upgrade activities, and replanting a degraded section of Carrabungup Road reserve within a mapped multiple use or resource enhancement wetland with appropriate native species.

Conditions: To address potential impacts to adjacent wetland habitat from proposed road upgrades, and potential weed encroachment, the following management measures will be required as conditions on the clearing permit.

- Implement weed and dieback management measures to mitigate impacts to adjacent vegetation.
- Install appropriate fencing (section 3.2.3) to separate the adjacent CCW known as Munginup Swamp, from roadside upgrade activities.
- Replant a degraded section of the Carrabungup Road reserve within a mapped multiple use or resource enhancement wetland with locally-provenanced tree species including riparian species at a ratio of greater than 2:1.

3.3. Relevant planning instruments and other matters

Clearing Permit application CPS 9117/1 was advertised on the DWER website for a 21 day public comment period on 30 November 2021. No public submissions were received in relation to this application.

The Shire of Murray is the public authority that manages the application area as it is located entirely within Carrabungup Road reserve (PIN 1369197; PIN 1369187; PIN 1369188).

The application area is zoned a local road, surrounded by lands zoned rural. The clearing purpose is consistent with the Shire of Murray Town Planning Scheme No. 4.

Proposed clearing will require the granting of an authorisation from the Minister for Environment for any inadvertent take of threatened flora under section 40 of the BC Act. Such an application has been made by the applicant and is likely to be issued (DBCA 2021).

The application area is located within the Murray Groundwater Area proclaimed area under the *Rights in Water and Irrigation Act 1914* (RIWI Act). It is not located within any Surface Water Areas or Irrigation Districts proclaimed under the RIWI Act, or any *Country Areas Water Supply Act 1947* (CAWS Act) Clearing Control Catchments, or Public Drinking Water Source Areas. Groundwater will not be intercepted, the beds or banks of any watercourses will not be disturbed, and no other permitting by DWER is required.

A Registered Native Title Claim encompasses the application area. That is, Gnaala Karla Booja (WAD6274/1998), and the associated Gnaala Karla Booja Indigenous Land Use Agreement (ILUA) (WI2015/005). A Native Title Claim has also been filed that encompasses the application area. That is, the Single Noongar Claim - Area 1 (WAD6006/ 2003).

Spatial data indicates that no Registered Aboriginal Heritage sites listed in accordance with Section 5 of the *Aboriginal Heritage Act 1972* (WA) occur within the proposed clearing area. Place ID 32696 (Djilba) is located approximately 750 metres to the north of the application area. 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.

Appendix A – Additional information provided by applicant

Information	Description
Representative photographs of the application area (Shire of Murray (2020)	Representative photographs of the application area (Appendix E1)
Flora and Vegetation Assessment (Emerge 2021)	Detailed Flora and Vegetation Assessment Carrabungup Road, Nirimba (IBSA-2021-0038). Excerpts in Appendix B2, Appendix E2, and Appendix E3
Further information regarding the reduction avoidance and minimisation measures (Shire of Murray 2021)	Reduction, avoidance and minimisation information including engineering drawings of road design, drainage, proposed fencing, and planting within Carrabungup Road reserve. This information was included in the consideration of avoidance and minimisation measures (Section 3.1) and within the assessment of environmental impacts (Section 3.2 and Appendix C).

Appendix B – 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 C.

B.1 Site characteristics

Site characteristic	Details
Local context	The application area is located within the Swan Coastal Plain IBRA Bioregion, (SWA) of Thackway and Cresswell (1995) and the Perth sub-region (SWA02). The proposed clearing is of native trees within the Carrabungup Road reserve, including a right-angle bend, in Nirimba within the Shire of Murray, approximately 70 kilometres south of Perth.
Vegetation description (Regional)	Heddle *et al,* (1980) as updated by Webb *et al.* (2016) produced regional vegetation mapping of complexes over the Swan Coastal Plain. Two complexes have been mapped over the application area: Central and Southern sections (Major) • Southern River complex (42): Open woodland of *Corymbia calophylla* (Marri) - *Eucalyptus marginata* (Jarrah) - Banksia species with fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca rhaphiophylla* (Swamp Paperbark) along creek beds. Northern Section (minor) • Vasse complex (57): Mixture of the closed scrub of Melaleuca species fringing woodland of *Eucalyptus rudis* (Flooded Gum) - Melaleuca species and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri).
Vegetation description (application area)	Emerge (2021) describe three areas as occurring over the application area: • **0 -** Heavily disturbed areas comprising gravel road, non-native trees over weeds or bare ground • **CcCo -** Low open woodland of *Corymbia calophylla or Casuarina obesa* over occasional *Xanthorrhoea preissii* over sedgeland of *Baumea juncea* and *Lepidosperma longitudinale* over forbland **Watsonia meriana, *Asphodelus fistulosus*, **Stachys arvensis* and **Lythrum hyssopifolia* over grassland of **Ehrharta* spp., **Eragrostis curvula*, **Lolium* sp. and **Paspalum dilatatum* or bare ground • **ErM -** Low open woodland to forest of *Eucalyptus rudis, Melaleuca rhaphiophylla, M. preissiana* over occasional *M. teretifolia* over sedgeland of *Typha* sp. and *Bolboschoenus caldwellii* over forbland **Watsonia meriana, *Zantedeschia aethiopica, * Oxalis pes-caprae*, **Lotus subbiflorus* and **Lythrum hyssopifolia* over grassland of **Cynodon dactylon* and **Paspalum dilatatum* or bare ground.

Veg ID	ha	Per cent	Data source
0	0.045	26 %	Emerge (2021)
CcCo	0.042	24 %	Emerge (2021)
ErM	0.088	50 %	Emerge (2021)
TOTAL	**0.174**	**100 %**	

<table>
<tr><th>Site characteristic</th><th>Details</th></tr>
<tr><td>Vegetation condition</td><td>Vegetation over the application area is either Completely degraded (0.045 ha or 26 %) or Degraded (0.129 ha or 74 %) utilising the condition rankings of Keighery (1994) (Appendix D).
<table>
<tr><th>Condition</th><th>ha</th><th>Per cent</th><th>Data source</th></tr>
<tr><td>Completely degraded</td><td>0.045</td><td>26 %</td><td>Emerge (2021)</td></tr>
<tr><td>Degraded</td><td>0.129</td><td>74 %</td><td>Emerge (2021)</td></tr>
<tr><td>Total</td><td>0.174</td><td>100 %</td><td></td></tr>
</table></td></tr>
<tr><td>Soil description</td><td>North: Pinjarra P2 Phase (213Pj_P2)
Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam over clay.
Central and south: Bassendean B4 Phase (212Bs_B4)
Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.
South – East: Bassendean B3 Phase (212Bs_B3)
Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.</td></tr>
<tr><td>Land degradation risk</td><td>Land degradation risk for the Pinjarra (North) and Bassendean (Central and south) Systems is summarised in the table below (DPIRD 2017), and is expressed as the percentage of the mapped unit having a high to extreme risk.
<table>
<tr><th rowspan="2">Aspect</th><th colspan="4">Risk</th></tr>
<tr><th colspan="2">Central and south (Bassendean)</th><th colspan="2">North (Pinjarra)</th></tr>
<tr><td>Wind erosion</td><td>M1</td><td>10-30%</td><td>L2</td><td>3-10%</td></tr>
<tr><td>Water Erosion</td><td>L1</td><td><3%</td><td>L1</td><td><3%</td></tr>
<tr><td>Salinity risk</td><td>L2</td><td>3-10%</td><td>M2</td><td>30-50%</td></tr>
<tr><td>Phosphorus export</td><td>H2</td><td>>70%</td><td>L1</td><td><3%</td></tr>
<tr><td>Waterlogging</td><td>H2</td><td>>70%</td><td>H2</td><td>>70%</td></tr>
<tr><td>Flooding</td><td>L2</td><td>3-10%</td><td>L2</td><td>3-10%</td></tr>
</table>
L = Low
M = Medium
H = High

Acid sulphate soil risk is rated at moderate to low risk over the application area, and high to moderate immediately to the west associated with Munginup Swamp.</td></tr>
<tr><td>Waterbodies</td><td>Proposed clearing is:
Within a Geomorphic Wetland of the Swan Coastal Plain:
Multiple use wetland – Palusplain (UFI 15227)
Within 2.5 metres of a Geomorphic Wetland of the Swan Coastal Plain:
Conservation category wetland (CCW) – Sumpland (UFI-3108) - Munginup Swamp.</td></tr>
<tr><td>Hydrogeography</td><td>The application area:
Is located within the Murray Groundwater Area proclaimed under the RIWI Act;
Is <u>not</u> located within any Surface Water Areas or Irrigation Districts proclaimed under the RIWI Act;
Is <u>not</u> located within any CAWS Act Clearing Control Catchments; and</td></tr>
</table>

Site characteristic	Details
	• Is not located within any Public Drinking Water Source Areas. Groundwater has been mapped at 500-1,000 TDS/Mg/L (that is, fresh)
Conservation areas	The Application Area does not intersect with any DBCA managed lands. DBCA lands of interest (PIN 445384) are located within 250 metres to the west of the application area (in the northern section), with Austin Bay Nature Reserve vested in the Conservation and Parks Commission located 750 metres to the north.
Climate and Landform	The south west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters, and the proposed clearing area is situated within the 'Temperate – distinctly dry and warm summer' Köppen climate class (Commonwealth of Australia 2005). An average of 680.6 millimetres (mm) of rainfall is recorded annually from the Pinjarra South weather station. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area. The site is not known to contain any restricted landforms or unique geological features.

B.2 Ecosystem, flora and fauna analysis

With consideration for the site characteristics set out above, relevant datasets (Appendix G2), the following conservation significant ecological communities, flora and fauna species may be impacted by the clearing.

Eight ecological communities of conservation significance have been mapped within ten kilometres of the application area. The Priority 3 Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region has been mapped within a portion of the application area in the vicinity of the right angle bend. However, vegetation is not representative of any TEC or PEC (Emerge 2021).

ID	Ecological Community (Common Name)	WA Status	Comm. Status
SCP3a	*Corymbia calophylla - Kingia australis* woodlands on heavy soils, Swan Coastal Plain (floristic community type 3a as originally described in Gibson *et al.* (1994))	CR	EN
SCP10a	Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson *et al.* (1994))	EN	CR
SCP3b	*Corymbia calophylla - Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (floristic community type 3b as originally described in Gibson *et al.* (1994))	VU	
SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain (floristic community type 15 as originally described in Gibson *et al.* (1994))	VU	
SCP07	Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson *et al.* (1994))	VU	CR
Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	P3	EN
Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	P3	VU
Tuart woodlands	Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain	P3	CR

Code	Community name	TEC/PEC	Level of significance		Likelihood of occurrence	
			WA	EPBC Act	Prior to survey	Post survey
SCP10a	Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. (1994))	TEC	EN	CR	Possible	Unlikley
Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	TEC/PEC	P3	CR	Possible	Unlikley
SCP07	Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson et al. (1994))	TEC	VU	CR	Possible	Unlikley
SCP3a	Corymbia calophylla - Kingia australis woodlands on heavy soils, Swan Coastal Plain (floristic community type 3a as originally described in Gibson et al. (1994))	TEC	CR	EN	Unlikley	Unlikley
SCP3c	Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain (floristic community type 3c as originally described in in Gibson et al. (1994))	TEC	CR	EN	Unlikley	Unlikley
Clifton-microbialite	Stromatolite like freshwater microbialite community of coastal brackish lakes (Lake Clifton)	TEC	CR		Unlikley	Unlikley
SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain (floristic	TEC	VU		Possible	Unlikley
Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	TEC/PEC	P3	VU	Unlikley	Unlikley
Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	PEC	P3	EN	Unlikley	Unlikley
SCP25	Southern Eucalyptus gomphocephala-Agonis flexuosa woodlands	PEC	P3		Possible	Unlikley

Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P3=priority 3, P4=priority 4

Nine threatened flora taxa have been identified from within ten kilometres of the application area.

Taxon	Status (WA)	No. of Records	Closest Distance (km)
Caladenia huegelii	CR	8	7.3
Drakaea elastica	CR	5	2.7
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	CR	4	9.7
Synaphea stenoloba	CR	5	1.4
Diuris purdiei	EN	8	6.5
Drakaea micrantha	EN	1	7.4
Synaphea sp. Pinjarra Plain (A.S. George 17182)	EN	2	9.7
Diuris drummondii	VU	4	0.02
Diuris micrantha	VU	1	8.9

Thirty-one priority flora taxa have been identified from within ten kilometres of the application area.

Taxon	Status (WA)	No. of Records	Closest Distance (km)
Grevillea bipinnatifida subsp. pagna	P1	1	9.9
Acacia benthamii	P2	2	2.8
Caladenia swartsiorum	P2	1	8.2
Craspedia sp. Waterloo (G.J. Keighery 13724)	P2	1	5.9
Eryngium pinnatifidum subsp. umbraphilum (G.J. Keighery 13967)	P2	2	2.8
Grevillea manglesii subsp. ornithopoda	P2	2	7.5
Phyllangium palustre	P2	3	2.7
Amanita drummondii	P3	1	8.6
Blennospora doliiformis	P3	6	5.3
Chamaescilla gibsonii	P3	3	3.8

Taxon	Status (WA)	No. of Records	Closest Distance (km)
Dillwynia dillwynioides	P3	26	4.2
Eryngium pinnatifidum subsp. palustre (G.J. Keighery 13459)	P3	1	3.4
Eryngium sp. Ferox (G.J. Keighery 16034)	P3	2	6.6
Eryngium sp. Subdecumbens (G.J. Keighery 5390)	P3	1	9.9
Hemigenia microphylla	P3	2	3.8
Jacksonia gracillima	P3	1	9.4
Meionectes tenuifolia	P3	2	2.7
Myriophyllum echinatum	P3	3	2.6
Schoenus sp. Waroona (G.J. Keighery 12235)	P3	2	3.8
Sphaerolobium calcicola	P3	1	4.7
Stylidium paludicola	P3	3	8.6
Acacia semitrullata	P4	1	7.8
Caladenia speciosa	P4	2	7.6
Conostylis pauciflora subsp. pauciflora	P4	5	5.1
Eucalyptus rudis subsp. cratyantha	P4	1	8.4
Ornduffia submersa	P4	6	2.6
Rumex drummondii	P4	4	2.7
Schoenus natans	P4	3	5.3
Stylidium longitubum	P4	5	5.5
Tripterococcus sp. Brachylobus (A.S. George 14234)	P4	3	5.1
Trithuria australis	P4	2	5.6

Likelihood of occurrence table (Emerge 2021)

emerge ASSOCIATES

Conservation Significant Flora Likelihood of Occurrence
Carrabungup Road, Nirimba

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence (Prior to survey)	Likelihood of occurrence (Post survey)
	WA	EPBC Act					
Diuris micrantha	VU	V	PG	Dark grey-black sandy clay-loam in winter wet depressions or swamps. Often in shallow standing water.	Aug/Sep-early Oct	Possible	Unlikely
Diuris drummondii	VU	V	PG	In low-lying depressions in peaty and sandy clay swamps.	Nov-Jan	Likely	Recorded
Drakaea micrantha	EN	V	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct	Unlikely	Unlikely
Eleocharis keigheryi	VU	V	P	Clay or sandy loam in freshwater creeks and transient waterbodies such as seasonally wet clay pans.	Aug-Dec	Unlikely	Unlikely
Eucalyptus argutifolia	VU	V	P	Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops	Mar-Apr	Unlikely	Unlikely
Caladenia huegelii	CR	E	PG	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov	Possible	Unlikely
Diuris purdiei	EN	E	PG	Sand to sandy clay soils in areas subject to winter inundation.	late September to mid-October, but only after a summer or early autumn fire (Brown et al., 1998)	Possible	Unlikely
Andersonia gracilis	VU	E	P	Seasonally damp, black sandy clay flats near or on the margins of swamps.	Sep-Nov	Unlikely	Unlikely
Drakaea elastica	CR	E	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically in banksia woodland or thickets of Kunzea glabrescens.	late Sep-Oct/Nov, survey Jul-Aug	Unlikely	Unlikely
Synaphea stenoloba	CR	E	P	Swampy loam in depressions that are occasionally inundated.	Aug but mainly Sep-Oct	Unlikely	Unlikely

	WA	EPBC Act				(Prior to survey)	(Post survey)
Synaphea sp. Pinjarra Plain (A.S. George 17182)	EN	CR	P	White grey clayey sand on edges of seasonally inundated low lying areas.	Sep-Oct	Possible	Unlikely
Synaphea sp. Serpentine (G.R. Brand 103)	CR	CR	P	Seasonally damp areas, loam - sand.	Sep-Oct	Possible	Unlikely
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	CR	CR	P	Low woodland on grey, clayey sand with lateritic pebbles (Pinjarra Plain) near winter wet flats.	Sep-Nov	Unlikely	Unlikely
Grevillea bipinnatifida subsp. pagna	P1	-	P	Grey sandy clay and loam, ironstone. Seasonal wetlands, swamps, roadsides.	Aug or Oct-Nov	Possible	Unlikely
Caladenia swartsiorum	P2	-	PG	Winter-wet creeklines and plains (limited information)	Oct	Possible	Unlikely
Cardamine paucijuga	P2	-	A	Winter wet areas, sand or clay	Sep-Oct	Possible	Unlikely
Eryngium pinnatifidum subsp. Umbraphilum (G.J. Keighery 13967)	P2	-	A/P	Winter wet, clay, sand or limestone soils.	Oct-Nov	Possible	Unlikely
Trithuria australis	P2	-	A	Seasonally wet areas. Edge of wetlands. Grey clay, clay over sand. Sand over laterite.	Oct-Nov	Possible	Unlikely
Chamaescilla gibsonii	P3	-	P	Clay to sandy clay in winter-wet flats, shallow water-filled claypans.	Sep	Possible	Unlikely
Dillwynia dillwynioides	P3	-	P	Winter wet depressions on sandy soils	Aug - Dec	Possible	Unlikely
Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)	P3	-	P	Grey brown sand or clay in winter wet flats.	Sep-Nov	Possible	Unlikely
Hemigenia microphylla	P3	-	P	Sandy clay, peaty clay, granite. Winter-wet depressions.	Sep-Dec	Possible	Unlikely
Jacksonia gracillima	P3	-	P	Sand, often adjacent to winter wet areas	Sep-Dec	Possible	Unlikely
Schoenus sp. Waroona (G.J. Keighery 12235)	P3	-	A	Clay or sandy clay. Winter-wet flats.	Oct-Nov	Possible	Unlikely
Acacia semitrullata	P4	-	P	White/grey sand, sometimes over laterite, clay sometimes in sandplains, swampy areas.	May-Oct	Possible	Unlikely
Rumex drummondii	P4	-	P	Winter-wet disturbed areas.	Aug-Nov	Possible	Unlikely
Acacia benthamii	P2	-	P	Sand, typically on limestone breakaways	Aug - Sept	Unlikely	Unlikely
Blennospora doliiformis	P3	-	A	Grey or red clay soils over ironstone. Seasonally-wet flats.	Oct-Nov	Unlikely	Unlikely

	WA	EPBC Act				(Prior to survey)	(Post survey)
Tripterococcus sp. Brachylobus (A.S. George 14234)	P4	-	P	Winter-wet areas on grey sand.	Oct-Feb	Possible	Unlikely
Conostylis pauciflora subsp. pauciflora	P4	-	P	Grey sand, limestone. Hillslopes, consolidated dunes.	Aug-Oct	Unlikely	Unlikely
Craspedia sp. Waterloo (G.J. Keighery 13724)	P2	-	P	Winter wet flats with clay and sandy clay in wandoo woodland.	Aug-Sep	Unlikely	Unlikely
Eryngium sp. Ferox (G.J. Keighery 16034)	P3	-	P	Winter wet flats on clay	Oct-Mar	Unlikely	Unlikely
Eryngium sp. Subdecumbens (G.J. Keighery 5390)	P3	-	A	Clay in seasonal wetlands.	Sep-Nov	Unlikely	Unlikely
Eucalyptus rudis subsp. cratyantha	P4	-	P	Loam on flats and hillsides.	Jul-Sep	Unlikely	Unlikely
Grevillea manglesii subsp. ornithopoda	P2	-	P	Red-brown loam over clay	Sep-Nov	Unlikely	Unlikely
Meionectes tenuifolia	P3	-	P	Clay loam in seasonally wet areas.	Oct-Dec	Unlikely	Unlikely
Myriophyllum echinatum	P3	-	A	Clay in winter-wet flats.	Nov	Unlikely	Unlikely
Ornduffia submersa	P4	-	A	Sandy clay in inundated wetland/creek.	Aug-Nov	Unlikely	Unlikely
Phyllangium palustre	P2	-	A	Winter-wet claypans, low-lying seasonal wetlands on clay	Oct-Nov	Unlikely	Unlikely
Schoenus natans	P4	-	A	Aquatic, in winter-wet depressions.	Oct	Unlikely	Unlikely
Sphaerolobium calcicola	P3	-	P	White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas.	Jun/Sep-Nov	Unlikely	Unlikely
Stylidium aceratum	P3	-	A	Sandy soils in swamp heathland.	Oct-Nov	Unlikely	Unlikely
Stylidium longitubum	P4	-	A	Sandy clay, clay. Seasonal wetlands.	Oct-Dec	Unlikely	Unlikely
Stylidium paludicola	P3	-	P	Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	Oct-Dec	Unlikely	Unlikely
Stylidium periscelianthum	P3	-	P	Loamy clay, moist soils pockets on wet flats and low granitic hills.	Sep-Oct	Unlikely	Unlikely
Stylidium roseonanum	P3	-	A	Swamps	Oct	Unlikely	Unlikely
Stylidium torticarpum	P3	-	P	Sandy clay and clay loam over laterite adjacent to creeklines, depressions, and beneath breakaways in heath or mallee shrubland.	Sep-Nov	Unlikely	Unlikely
Caladenia speciosa	P4	-	PG	White, grey or black sand.	Sep-Oct	Possible	Unlikely

Forty birds, six mammals, and two reptiles of conservation significance have been recorded from within ten kilometres of the application area.

Common Name	*Taxon*	Status (WA)	No. of Records	Closest Distance (km)	Comment
Curlew Sandpiper	*Calidris ferruginea*	CR	79	4.6	Shorebird
Great Knot	*Calidris tenuirostris*	CR	10	4.6	Shorebird
Eastern Curlew	*Numenius madagascariensis*	CR	13	2.5	Shorebird
Red Knot	*Calidris canutus*	EN	17	5.3	Shorebird
Lesser Sand Plover	*Charadrius mongolus*	EN	2	5.3	Shorebird
Greater Sand Plover	*Charadrius leschenaultii*	VU	11	5.4	Shorebird
Common Sandpiper	*Actitis hypoleucos*	MI	1	6.3	Shorebird
Ruddy Turnstone	*Arenaria interpres*	MI	6	4.6	Shorebird
Sharp-tailed Sandpiper	*Calidris acuminata*	MI	74	4.6	Shorebird
Sanderling	*Calidris alba*	MI	7	5.3	Shorebird
Pectoral Sandpiper	*Calidris melanotos*	MI	13	4.6	Shorebird
Red-necked Stint	*Calidris ruficollis*	MI	131	3.9	Shorebird
Long-toed Stint	*Calidris subminuta*	MI	24	5.1	Shorebird
Latham's Snipe	*Gallinago hardwickii*	MI	1	4.9	Shorebird
Broad-billed Sandpiper	*Limicola falcinellus*	MI	2	5.4	Shorebird
Bar-tailed Godwit	*Limosa lapponica*	MI	51	4.9	Shorebird
Black-tailed Godwit	*Limosa limosa*	MI	31	4.9	Shorebird
Little Curlew	*Numenius minutus*	MI	1	5.5	Shorebird
Whimbrel	*Numenius phaeopus*	MI	9	5.9	Shorebird
Ruff (Reeve)	*Philomachus pugnax*	MI	12	4.8	Shorebird
Pacific Golden Plover	*Pluvialis fulva*	MI	8	4.6	Shorebird
Grey Plover	*Pluvialis squatarola*	MI	48	6.8	Shorebird
Wood Sandpiper	*Tringa glareola*	MI	6	5.2	Shorebird
Common Greenshank	*Tringa nebularia*	MI	134	0.9	Shorebird
Marsh Sandpiper	*Tringa stagnatilis*	MI	37	4.6	Shorebird
Australasian Bittern	*Botaurus poiciloptilus*	EN	3	8.0	Wetland
Blue-Billed Duck	*Oxyura australis*	P4	21	0.8	Wetland
Glossy Ibis	*Plegadis falcinellus*	MI	26	4.6	Wetland
White-winged Tern	*Chlidonias leucopterus*	MI	8	5.1	Tern
Common Tern	*Sterna hirundo*	MI	1	8.0	Tern
Crested Tern	*Thalasseus bergii*	MI	59	3.8	Tern
Peregrine Falcon	*Falco peregrinus*	OS	9	4.6	Raptor
Fork-tailed Swift	*Apus pacificus*	MI	1	9.1	Aerial
Osprey	*Pandion cristatus*	MI	3	7.5	Raptor
Letter-winged Kite	*Elanus scriptus*	P4	1	9.1	Raptor
Masked Owl (Southwest)	*Tyto novaehollandiae novaehollandiae*	P3	2	4.6	Owl
Carnaby's Cockatoo	*Calyptorhynchus latirostris*	EN	273	3.6	Cockatoo
Baudin's Cockatoo	*Calyptorhynchus baudinii*	EN	6	4.8	Cockatoo
Forest Red-tailed Black Cockatoo	*Calyptorhynchus banksii naso*	VU	72	2.4	Cockatoo
Western Ringtail Possum	*Pseudocheirus occidentalis*	CR	155	7.9	Mammal
Chuditch	*Dasyurus geoffroii*	VU	3	6.0	Mammal
Brush-tailed Phascogale (SW)	*Phascogale tapoatafa wambenger*	CD	4	8.0	Mammal
Water-Rat	*Hydromys chrysogaster*	P4	4	8.6	Mammal
Quenda	*Isoodon fusciventer*	P4	54	3.5	Mammal
Western Brush Wallaby	*Notamacropus irma*	P4	1	6.5	Mammal
Coastal Plains Skink	*Ctenotus ora*	P3	2	2.5	Reptile
Perth Slider	*Lerista lineata*	P3	1	8.8	Reptile

B.3 Vegetation extent

Factor	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed land (ha)	Current percentage remaining within all DBCA managed land (%)
IBRA Bioregion					
Swan Coastal Plain	1,501,222	579,814	38.6	153,955	10.3
Vegetation complex					
Southern River complex (42)	58,781	10,832	18.4	940	1.6
Vasse complex (57)	15,692	4,927	31.4	2,294	14.6
Local area (10 km)					
Remnant vegetation	23,175	5,675	24.5		

Appendix C – 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: Native vegetation over the application area is in a Degraded to Completely Degraded condition with little to no ground cover. A total of 16 native and 31 non-native (weed or planted) species were recorded by Emerge (2021). The application area is depauperate with non-native species out-numbering native species by a factor of 2 to 1. Vegetation is not representative of any TEC or PEC (Emerge 2021), and no priority flora taxa were recorded, or are likely to occur, over the application area (Emerge 2021). The native vegetation of the application area does not comprise a high level of biodiversity.	Not at variance	No
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: Trees over the application area are predominantly non-native species or planted. Marri *(Corymbia calophylla)* and Flooded Gum *(Eucaluptus rudis)* are the only native eucalypts occurring. They are unlikely to provide roosting or breeding habitat for threatened black cockatoo species due to their size, and negligible foraging habitat. Twenty-nine wading shorebirds, and wetland-inhabiting birds of conservation significance, as well as the Priority 4, Quenda *(Isoodon fusciventer)* have been recorded in the local area. Impacts to the adjacent wetland may impact these species.	Not likely to be at variance	Yes Section 3.2.1
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: One threatened flora species was recorded during a flora and vegetation survey over the application area (Emerge 2021). A total of 278 individuals were recorded. Utilising the GIS data from the applicant (application area) and Emerge (2021), approximately 27 individual plants are located within the application area. No other threatened species were recorded or are considered to occur. The Shire of Murray have provided an avoidance and mitigation strategy.	May be at variance	Yes Section 3.2.2
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: Five Threatened Ecological Communities endorsed by the Western Australian Minister for Environment have been mapped within 10 kilometres of the application area. Native vegetation proposed to be cleared is unlikely to comprise the whole, or a part of, or be necessary for the maintenance of a Threatened Ecological Community.	Not at variance	No
Environmental values: significant remnant vegetation and conservation areas		
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."*	May be at variance	Yes Section 3.2.3

Assessment against the Clearing Principles	Variance level	Is further consideration required?
Assessment: Two vegetation complexes as described by Heddle et al, (1980) and updated by Webb et al. (2016) have been mapped over the application area (Appendix B2): Southern River complex (42) and Vasse complex (57). The Vasse complex exceeds national targets at a 31.4 per cent retention rate. However, the Southern River complex has a retention rate at 18.4 percent. Approximately 24.5 per cent of native vegetation is retained within a ten kilometres radius of the application area.		
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: The Application Area does not intersect with any DBCA managed lands. DBCA lands of interest (PIN 445384) are located within 250 metres to the west of the application area (in the northern section). This site is contiguous with the Austin Bay Nature Reserve (vested in the Conservation and Parks Commission) located approximately 750 metres to the north of the application area. Given the separation distances, the proposed clearing is not likely to have an impact on the environmental values of adjacent or nearby conservation areas.	Not at variance	No
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: Proposed clearing is located within a Geomorphic Wetland of the Swan Coastal Plain. That is, a multiple use wetland; Palusplain (UFI 15227). Proposed clearing is also located within 2.5 metres of a conservation category wetland (CCW); Sumpland (UFI-3108), known as Munginup Swamp which occurs immediately to the west and south of the application area.	May be at variance	Yes Section 3.2.4
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: Standard and staged road construction methodologies will be employed, including strategies for drainage controls and water erosion (section 3.1) to minimise water-logging (high – Appendix B1). Eutrophication is not likely to be a risk in consideration of the final land use as a public road. Soils will not be excavated at depth, and any impacts to surrounding landscapes, soils and drainage can also be managed through appropriate design (section 3.1). Noting the extent of the proposed clearing, the condition of the vegetation, and management prescription employed (section 3.1) proposed clearing is not likely to cause appreciable land degradation.	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: Soils will not be excavated at depth and risks to groundwater are low. Munginup Swamp occurs immediately to the west and south of the application area and any changes to drainage or surface hydrology associated with the road design may impact the quality of surface water associated with Munginup Swamp. The Shire of Murray have provided drainage management design to mitigate potential impacts.	Not likely to be at variance	Yes Section 3.2.4

Assessment against the Clearing Principles	Variance level	Is further consideration required?
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 extreme north of the application area intersects a mapped 1 in 100 (1 per cent) annual exceedance probability (AEP) floodplain. The majority of the application area is not located in any AEP floodplain and flood risk has been assessed as low (DPIRD-007). Standard and staged road construction methodologies will be employed, including strategies for drainage controls and water erosion (section 3.1). Noting the extent of the proposed clearing and management prescriptions employed, the proposed clearing of native vegetation is not likely to cause, or exacerbate, the incidence or intensity of flooding.	Not likely to be at variance	No

Appendix D – Vegetation condition rating scale

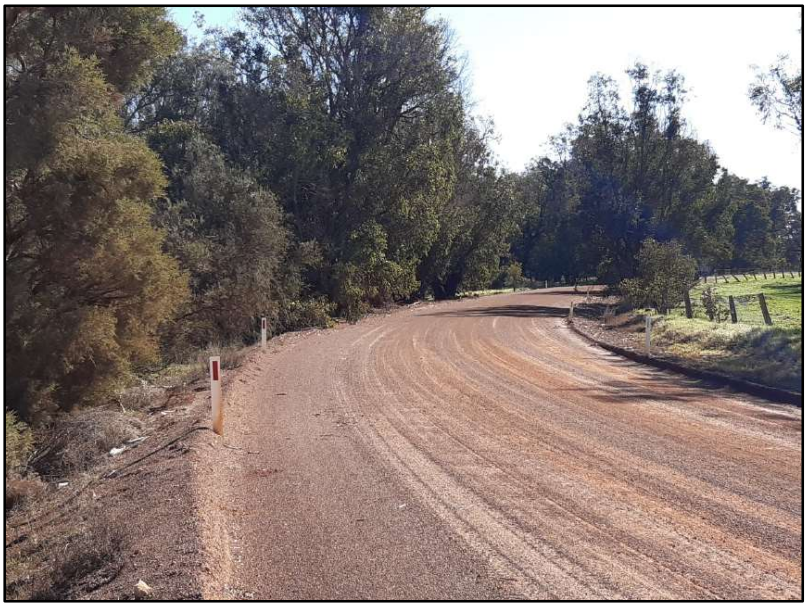
Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree 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 E –Photographs and biological survey exerpts

E.1 Vegetation of the application area (Shire of Murray 2020)



E.2 Vegetation of the application area (Emerge 2021)

*Plate 1: Plant community **CcCo** in 'degraded' condition*

*Plate 2: Plant community **ErM** in 'degraded' condition*

*Plate 3: **Predominantly non-native species or bare ground** in 'completely degraded' cond*

E.3 Biological information (Emerge 2021)

5 Discussion

The site has been subject to significant past disturbance and modification. Approximately 87% of the site was mapped as being in 'completely degraded' condition with approximately 0.2% in 'good – degraded' condition and 13% in 'degraded' condition.

5.1 Threatened and priority flora

The timing of the survey was optimal for detecting the threatened or priority flora with potential to occur in the site. Two visits were conducted and the site was traversed comprehensively.

Generally, wetland habitats are present in the site that could provide habitat for a variety of threatened and priority flora with preferences for poorly drained, sandy clay or loamy soiled habitats (refer Section 4.2.1). However, the degree of disturbance reduces the likelihood that any such species would occur. Nevertheless, *Diuris drummondii* was recorded in particularly disturbed area growing out of a dense patch of **Cynodon dactylon* (couch) and *Watsonia ?meriana* (bulbil watsonia). *D. drummondii* prefers moist locations often emerging from standing water (Department of the Environment 2008). The level of weed cover amongst the *D. drummondii* individuals does not appear to have a negative impact on the plants as they appeared healthy and in full flower.

Given there is historical records of *D. drummondii* in the site it seems likely that this population is relative stable in this location. A total of 307 individuals were recorded, compared to approximately 200 in the historic record in the same location. Records for the species were collected inside and outside of the site. Due to spatial error associated with GPS points the number of *D. drummondii* individuals within the site cannot be reported precisely. Nevertheless, the species was only recorded in one part of the site and is not considered to currently occur elsewhere in the site based on habitat preferences and outcomes of the current survey.

5.2 Vegetation condition

Classifying the condition of vegetation within the site was relatively straight forward. Most of the patches of plant communities CcCo and ErM have been severely modified by historic disturbances. Due to the presence of native overstorey in most patches these plant communities were still recognisable as 'woodland' and so were classed as being in 'degraded' condition. Due to the high weed cover these patches are considered to be at the lower end of the 'degraded' category.

At a fine scale small patches of plant communities CcCo and ErM with native sedges were classified as being in 'good' condition. Small patches are difficult to characterise because as the scale of mapping reduces the vegetation condition improves as plants are mapped in isolation. However, single plants do not represent a vegetation community and so at some point there is little gained in terms of values by focussing on small patches. The small patches in 'good' condition in the site were mapped but are not considered to have significant value as remnants of native vegetation.

5.3 Weeds

Weed cover within the site was high which is a result of the history of disturbance.

The two declared pests recorded, one leaf cape tulip and arum lily, are currently listed by the DPIRD in an 'exempt' keeping category (s-22) and so there is no requirement to take action to manage these weeds under the BAM Act.

6 Conclusions

Native and non-native plants occur on the margins of the site but the majority comprises non-vegetated unsealed road.

One threatened flora species, *Diuris drummondii* (tall donkey orchid), was recorded during the survey. A total of 307 individuals were recorded of which 47 provisionally occur within the site. No other threatened or priority species were recorded or are considered to occur due to a lack of suitable habitat or because they were not recorded during the field survey.

The site contains approximately 0.48 ha of native vegetation (plant communities CcCo and ErM) present in predominately 'degraded' condition. The remainder of the site comprises unsealed road, bare ground or 'completely degraded' non-native vegetation (3.31 ha/87%).

Native eucalypts within site have potential to provide a relatively minor foraging resource for threatened species of black cockatoo along with other ecological services.

Grass and herb weed cover was high across the site. Two declared pests were recorded, **Moraea flaccida* (one leaf cape tulip) and **Zantedeschia aethiopica* (arum lily), which are listed in the exempt keeping category under the BAM Act for which no permit or conditions are required.

Prepared for Shire of Murray Doc No.: EP20-102(05)–006 RAW| Version: 001
Detailed Flora and Vegetation Assessment
Carrabungup Road, Nirimba

Executive Summary

The Shire of Murray engaged Emerge Associates (Emerge) to undertake a detailed flora and vegetation survey along section of Carrabungup Road in Nirimba (referred to herein as the 'site'). Emerge were engaged to conduct a detailed assessment to provide information on the flora and vegetation values to inform a clearing permit application.

As part of the assessment a desktop review of relevant background information was completed and a field survey was undertaken in September and December 2020. During the field survey an assessment was made on the type, condition and values of vegetation across the site.

Outcomes of the survey include the following:

- The site contains approximately 0.48 ha of native vegetation (plant communities **CcCo** and **ErM**) present in predominately 'degraded' condition.
- The remainder of the site comprises unsealed road, bare ground or 'completely degraded' non-native vegetation (3.31 ha/87%).
- One threatened flora species, *Diuris drummondii* (tall donkey orchid), was recorded during the survey. A total of 307 individuals were recorded of which 47 provisionally occur within the site.
- No other threatened or priority species were recorded or are considered to occur due to a lack of suitable habitat or because they were not recorded during the field survey.
- No threatened or priority ecological communities occur within the site.
- Native eucalypts within site have potential to provide a relatively minor foraging resource for threatened species of black cockatoo along with other ecological services.
- Grass and herb weed cover was high across the site. Two declared pests were recorded, **Moraea flaccida* (one leaf cape tulip) and **Zantedeschia aethiopica* (arum lily), which are listed in the exempt keeping category under the *Biosecurity and Agriculture Management Act 2007* for which no permit or conditions are required.

Figure 5: **Plant Communities**

Project: Detailed Flora and Vegetation Assessment
Carrabungup Road, Nirimba

Client: Shire of Murray

Plan Number: EP20-102(05)--F17
Drawn: GAR
Date: 22/01/2021
Checked: TAA
Approved: TAA
Date: 02/02/2021

N

0 50 100 150
Metres

Scale: 1:6,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.
©Landgate (2020). Nearmap imagery date: 10/06/2020

Figure 6: **Vegetation Conditon**

Project:	Detailed Flora and Vegetation Assessment Carrabungup Road, Nirimba
Client:	Shire of Murray

Plan Number:	EP20-102(05)--F18
Drawn:	GAR
Date:	22/01/2021
Checked:	TAA
Approved:	TAA
Date:	02/02/2021

N

0 50 100 150
Metres
Scale: 1:6,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.
©Landgate (2020). Nearmap imagery date: 10/08/2020

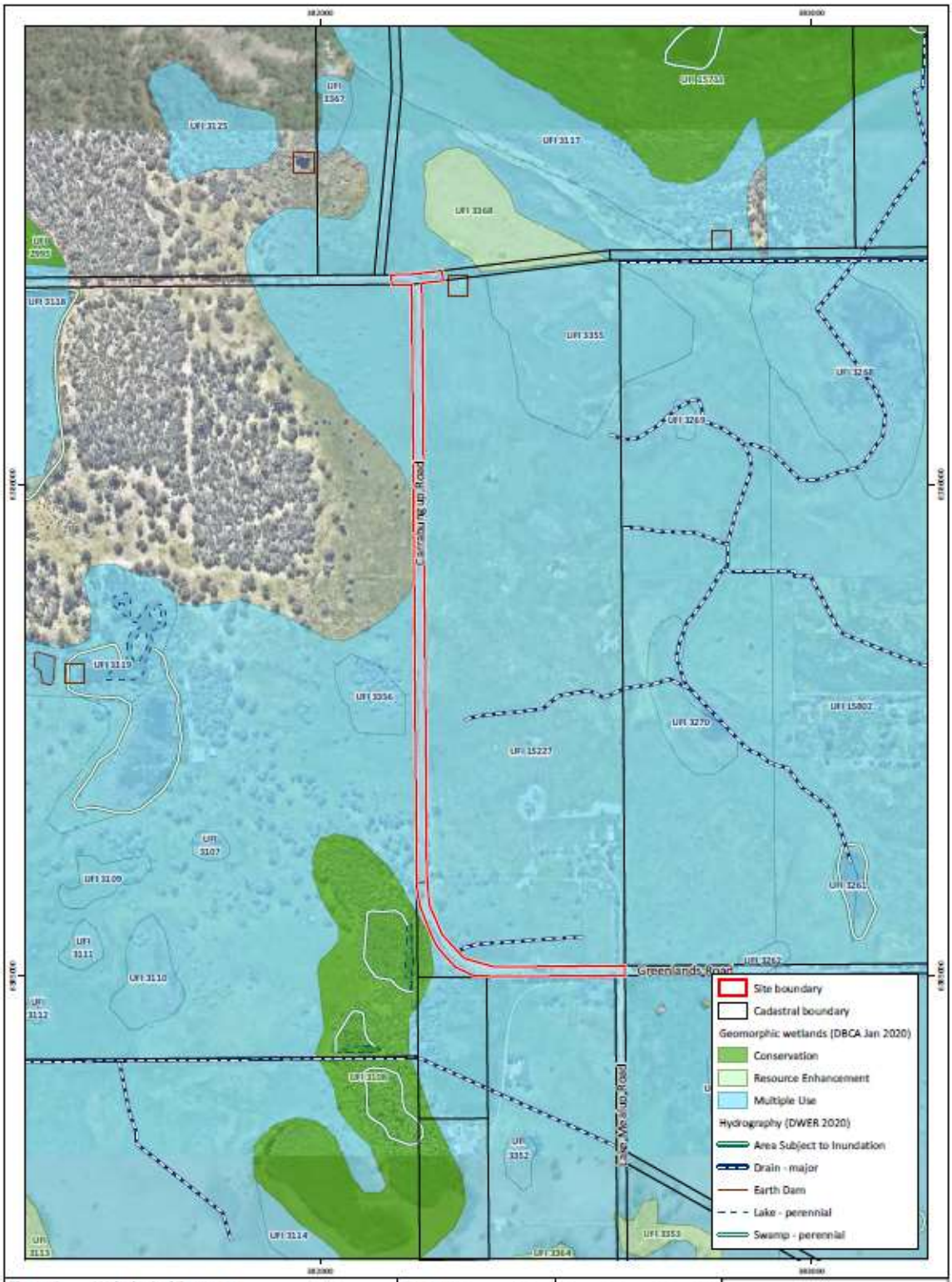


Figure 2: Hydrological Features

Project:	Detailed Flora and Vegetation Assessment Carrabungup Road, Nirimba
Client:	Shire of Murray

Plan Number:	EP20-102(05)--F14
Drawn:	GAR
Date:	22/01/2021
Checked:	TAA
Approved:	TAA
Date:	02/02/2021

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.
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Figure 4: Conservation Significant Flora

Project:	Detailed Flora and Vegetation Assessment Carrabungup Road, Nirimba
Client:	Shire of Murray

Plan Number: EP20-102(05)--F3b
Drawn: GAR
Date: 22/01/2021
Checked: TAA
Approved: TAA
Date: 02/02/2021

N

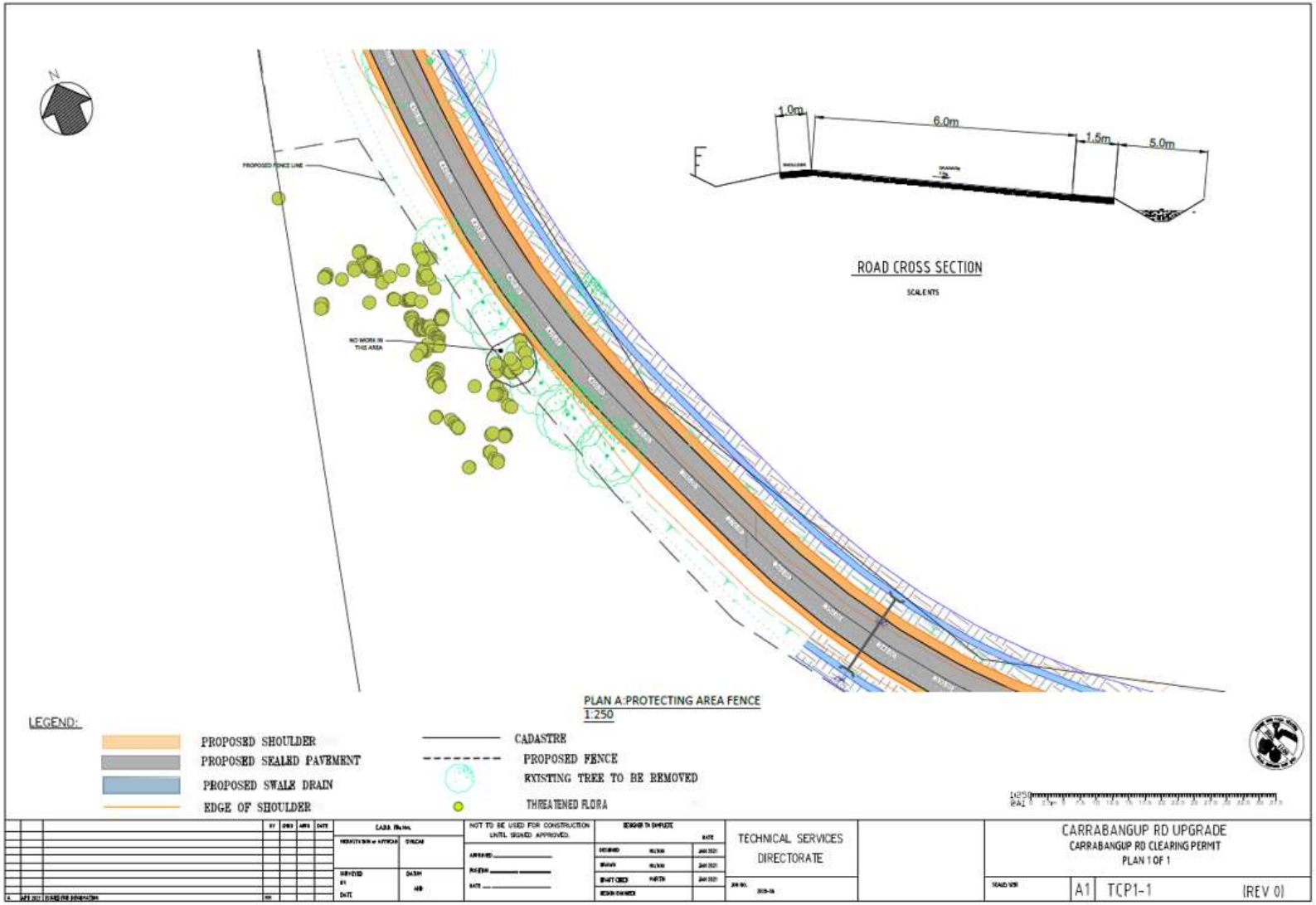
0 75 150
Metres
Scale: 1:6,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

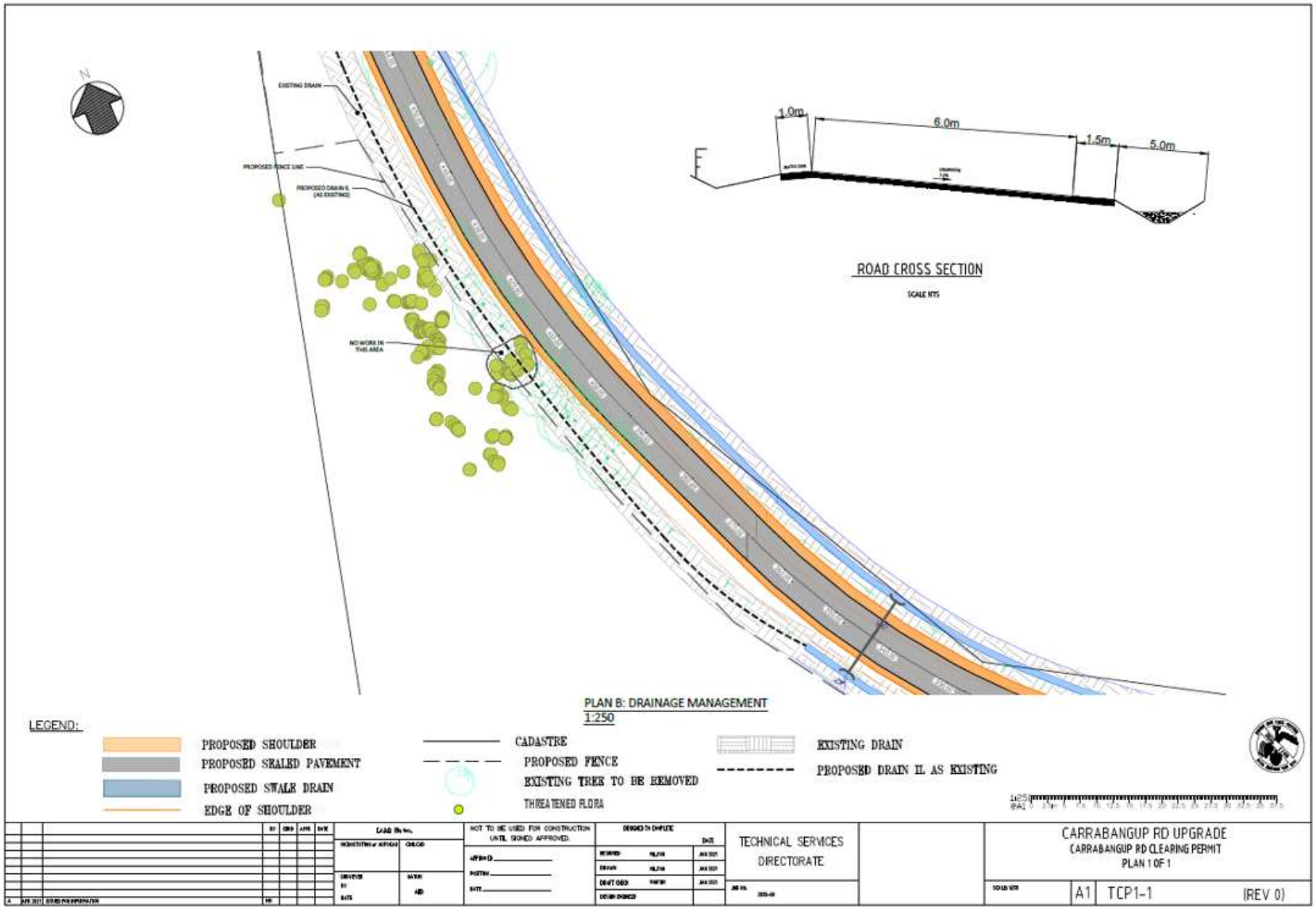
While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.
©Landgate (2020). Nearmap imagery date: 10/08/2020

Appendix F – Engineering drawings

F.1 Plan (a) Protecting area fence (Shire of Murray 2021)



F.2 Plan (B) Drainage management (Shire of Murray 2021)



Appendix G – References and databases

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F.2 GIS databases

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

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- 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)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Pre-European Vegetation Statistics
- Remnant Vegetation, All Areas
- Native Vegetation Extent (DPIRD-005)
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)

- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Wheatbelt Wetlands Stage 1 (DBCA-021)

Restricted GIS Databases used:

- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)