



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 9327/1
Permit Holder:	Shire of Ngaanyatjaraku
Duration of Permit:	From 10 December 2022 to 10 December 2037

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

PART I – CLEARING AUTHORISED

1. Clearing authorised (purpose)

The permit holder is authorised to clear *native vegetation* for the purpose of gravel extraction for road construction.

2. Land on which clearing is to be done

Lot 9 on Plan 91722, Warburton (Crown Reserve 17614)

3. Clearing authorised

The permit holder must not clear more than 66.81 hectares of *native vegetation* within the areas cross-hatched yellow in Figures 2 to 9 of Schedule 1.

4. Period during which clearing is authorised

The permit holder must not clear any *native vegetation* after 10 December 2032.

5. Application

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

PART II – MANAGEMENT CONDITIONS

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

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

- (a) avoid the clearing of *native vegetation*;
- (b) minimise the amount of *native vegetation* to be cleared; and
- (c) reduce the impact of clearing on any environmental value.

7. Weed management

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

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (b) ensure that no known *weed*-affected soil, *mulch*, *fill*, or other material is brought into the area to be cleared;
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared
- (d) where *weed*-affected soil, mulch, fill, or other material is to be removed from the area to be cleared, ensure it is transferred to areas of comparable *weed* status; and
- (e) at least once in each 12-month period, the permit holder must remove or kill any *weeds* growing within areas cleared under this permit.

8. Limitation of clearing

The permit holder must:

- (a) not clear more than one site within the areas crossed hatched yellow in Figures 2 to 9 of Schedule 1 at any given time;
- (b) gravel extraction activities must occur within two months of undertaking any clearing authorised under this permit
- (c) not clear more than two hectares at any given time within the area mention in 8(a) for the purpose authorised under this permit;

9. Directional clearing

The permit holder must conduct clearing activities in a slow, progressive manner in the direction of adjacent *native vegetation* to allow fauna to move into adjacent *native vegetation* ahead of the clearing activity.

10. Flora management – avoidance of priority flora

Prior to undertaking any clearing authorised under this permit, the permit holder shall demarcate the clearing area authorised under this permit to avoid clearing of priority flora outside of the approved clearing area.

11. Rehabilitation and revegetation

The permit holder must

- (a) retain the vegetative material and topsoil removed by clearing authorised under this permit and stockpile the vegetative material and topsoil in an area that has already been cleared;
- (b) construct drainage around the cleared area and topsoil stockpiles
- (c) at an *optimal time* within 12 months following completion of material extraction from each site, *revegetate* the areas not required for the authorised purpose for which they were cleared under this permit, by:
 - (i) ripping the ground on the contour to remove soil compaction; and
 - (ii) laying the vegetative material and topsoil retained under condition 11 (a) on the cleared area(s).
- (d) within 24 months of laying the vegetative material and topsoil on the cleared area in accordance with condition 11(c) of this permit:
 - (i) engage an *environmental specialist* to determine the species composition, structure and density of the area revegetated and rehabilitated; and
 - (ii) engage an *environmental specialist* to make a determination as to whether the composition, structure and density determined under condition 11(d)(i) of this permit will, without further *revegetation*, result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area.
- (e) if the determination made by the *environmental specialist* under condition 11(d)(ii) is that the species composition, structure, and density determined under condition 11(d)(i) will not, without further *revegetation*, result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, the permit holder must *revegetate* the area by deliberately *planting* and/or *direct seeding native vegetation* seeds that will result in a similar species composition, structure, and density of *native vegetation* to pre-clearing vegetation types in that area and ensuring only *local provenance* seeds and propagating material are used
- (f) Where additional *planting* or *direct seeding of native vegetation* is undertaken in accordance with condition 11(e), the permit holder must repeat the activities required by condition 11(d) and 11(e) within 24 months of undertaking the additional *planting* or *direct seeding of native vegetation*.
- (g) Where a determination is made by an *environmental specialist* under condition 11(d)(ii) that the composition, structure and density within areas *revegetated* and rehabilitated will result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, that determination shall be submitted to the *CEO* within three months of the determination being made by the *environmental specialist*.

PART III - RECORD KEEPING AND REPORTING

12. Records that must be kept

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

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	<ul style="list-style-type: none"> (a) the name of persons, contractors and agents given the authorities to clear <i>native vegetation</i> under this permit; (b) the species composition, structure, and density of the cleared area; (c) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994/2020 (GDA94/20), expressing the geographical coordinates in Eastings and Northings; (d) the date that the area was cleared; (e) the size of the area cleared (in hectares); (f) the direction that clearing was undertaken; (g) the date that clearing within each site ceased; (h) the date that gravel extraction from within each site and each two-hectare cell begin; (i) the date that gravel extraction from each two-hectare cell in each site ceased; (j) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 6; and (k) actions taken to minimise the risk of the introduction and spread of <i>weeds</i> in accordance with condition 7
2.	In relation to flora management pursuant to condition 10	<ul style="list-style-type: none"> (a) the name and location of <i>priority flora</i> species, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994/2020 (GDA94/20), expressing the geographical coordinates in Eastings and Northings; (b) actions taken to demarcate each <i>priority flora</i> species recorded and their relevant buffers; and (c) actions taken to avoid the clearing of <i>priority flora</i> species.

No.	Relevant matter	Specifications
3.	In relation to <i>rehabilitation</i> and <i>revegetation</i> of areas pursuant to condition 11 of the permit	<ul style="list-style-type: none"> (a) action taken to retain topsoil; (b) action taken to construct drainage; (c) the size of the area <i>revegetated</i>; (d) the date(s) on which the area <i>revegetation</i> was undertaken; (e) the <i>revegetation</i> activities undertaken; (f) the date(s) where additional <i>planting</i> or <i>direct seeding</i> of <i>native vegetation</i> was undertaken; and (g) the boundaries of the area <i>revegetated</i>, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994/2020 (GDA94/20), expressing the geographical coordinates in Eastings and Northings.

13. Reporting

The permit holder must provide to the *CEO* the records required under condition 12 of this permit when requested by the *CEO*.

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 <i>Environmental Protection Act 1986</i> .
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.
fill	means material used to increase the ground level, or to fill a depression.
department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
direct seeding	means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species
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.

Term	Definition
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
local provenance	means native vegetation seeds and propagating material from natural sources within 25 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 April to May;
planting	means a method of re-establishing vegetation through the use of seedlings/saplings of the desired plant species
revegetation, revegetate, revegetated	means the re-establishment of a cover of native vegetation in an area such that the species composition, structure and density is similar to pre-clearing vegetation types in that area, and can involve regeneration, direct seeding and/or planting;
weeds	means any plant – <ul style="list-style-type: none"> (a) that is a declared pest under section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i>; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.

END OF CONDITIONS



Mathew Gannaway
MANAGER
NATIVE VEGETATION REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

16 November 2022

Schedule 1

The boundary of the area authorised to be cleared is shown in the maps below (Figure 1 to 9).

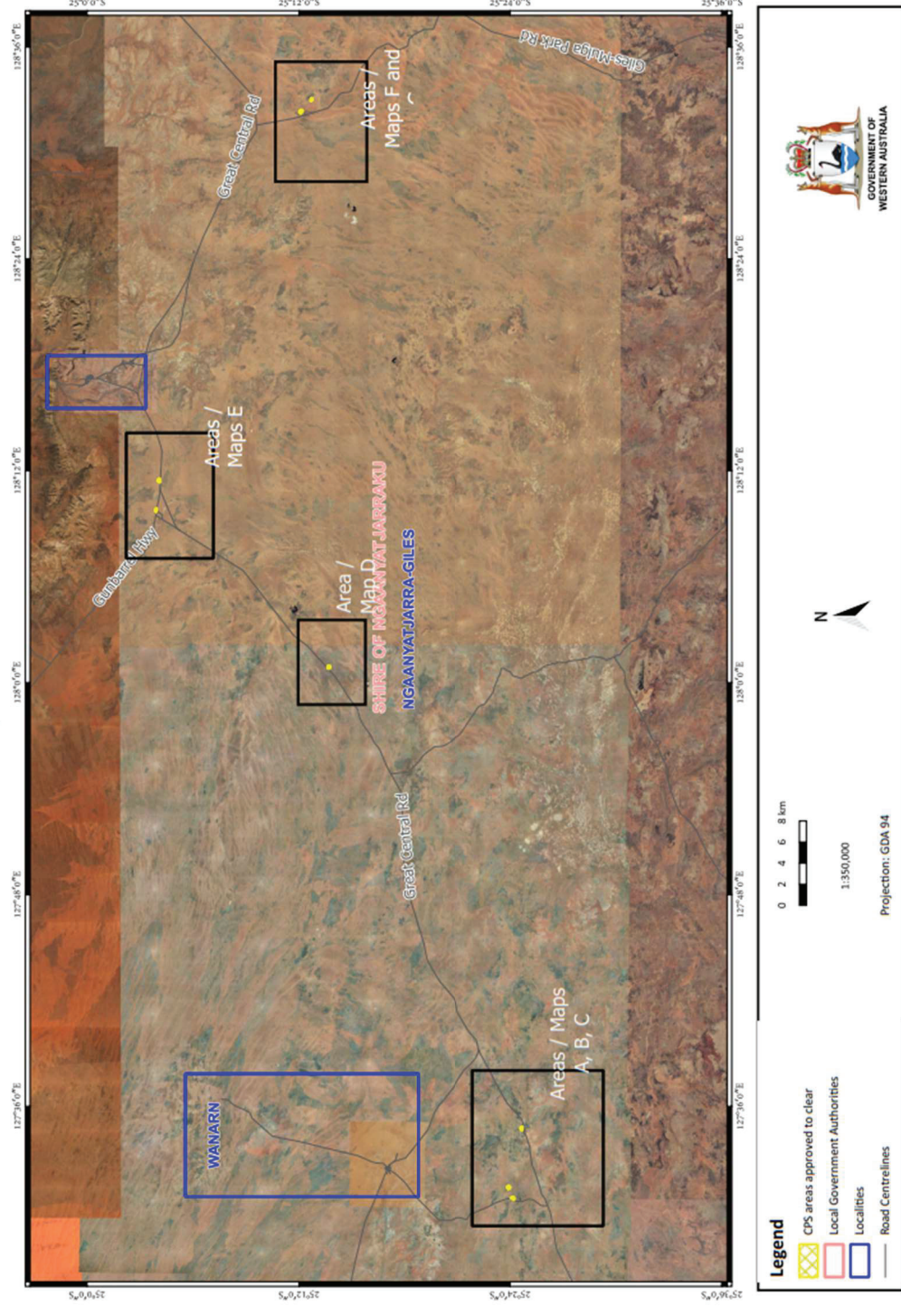


Figure 1: Context map of the areas within which clearing may occur

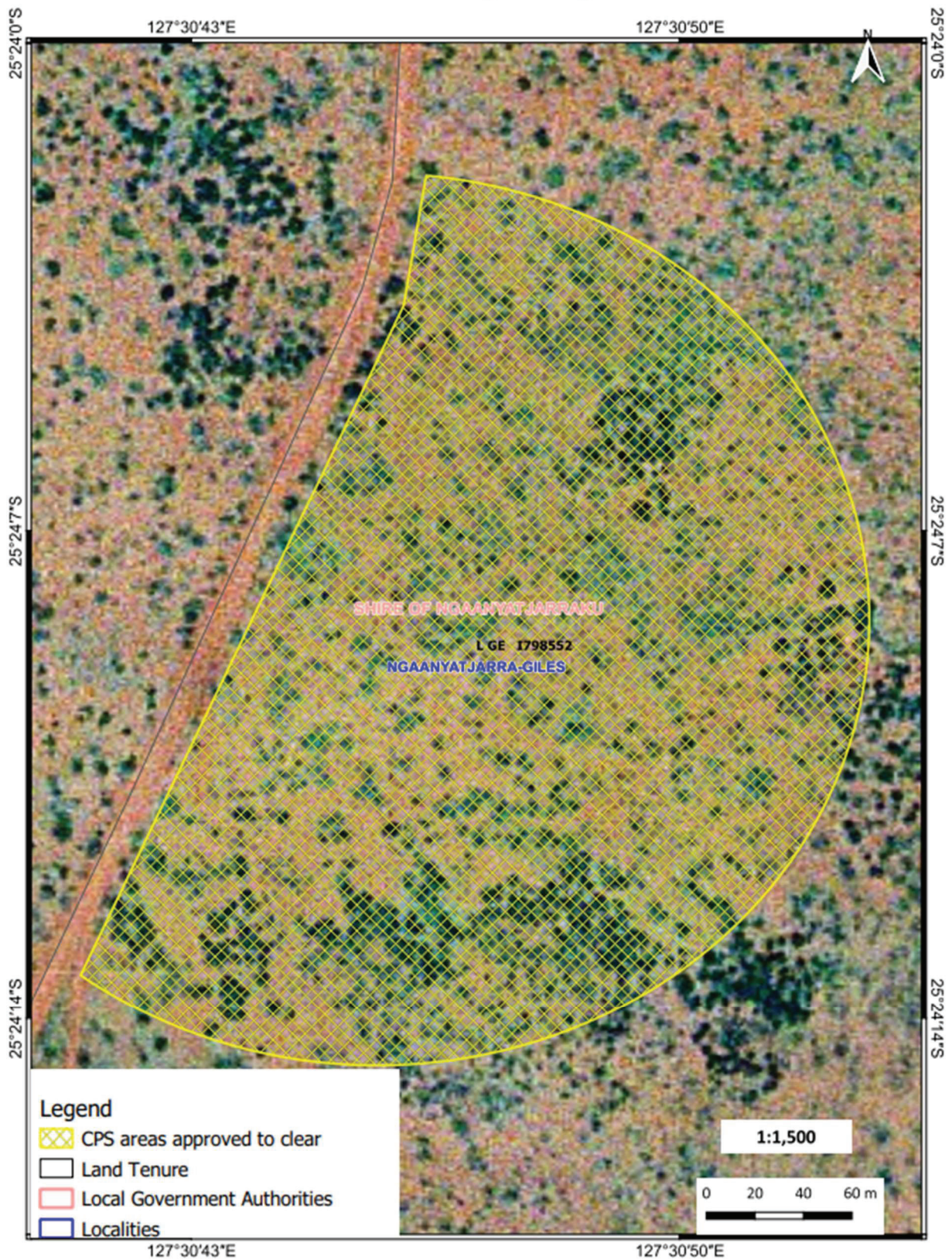


Figure 2: Plan 9327-A. The boundary of the area within which clearing may occur

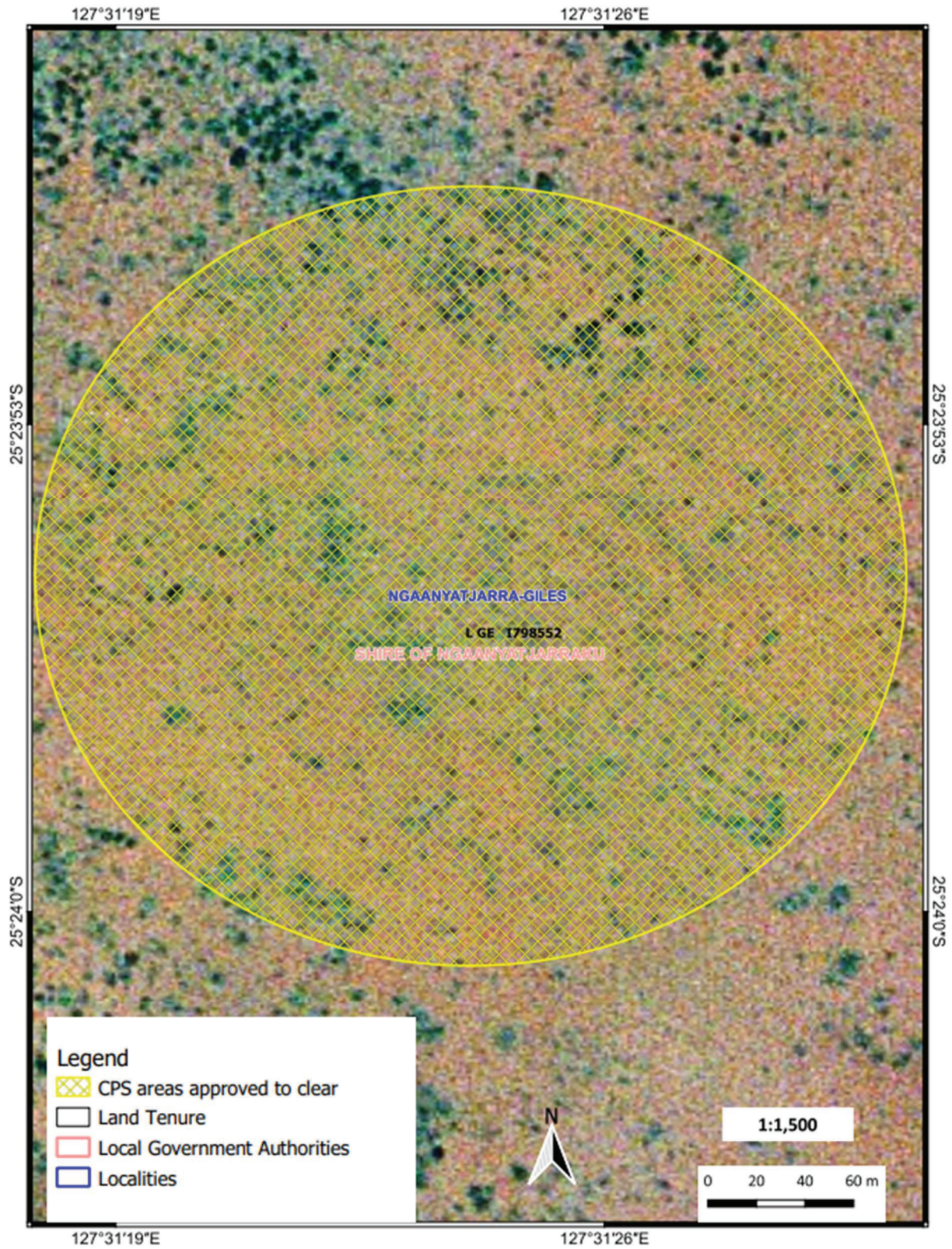


Figure 3: Plan 9327-B. The boundary of the area within which clearing may occur

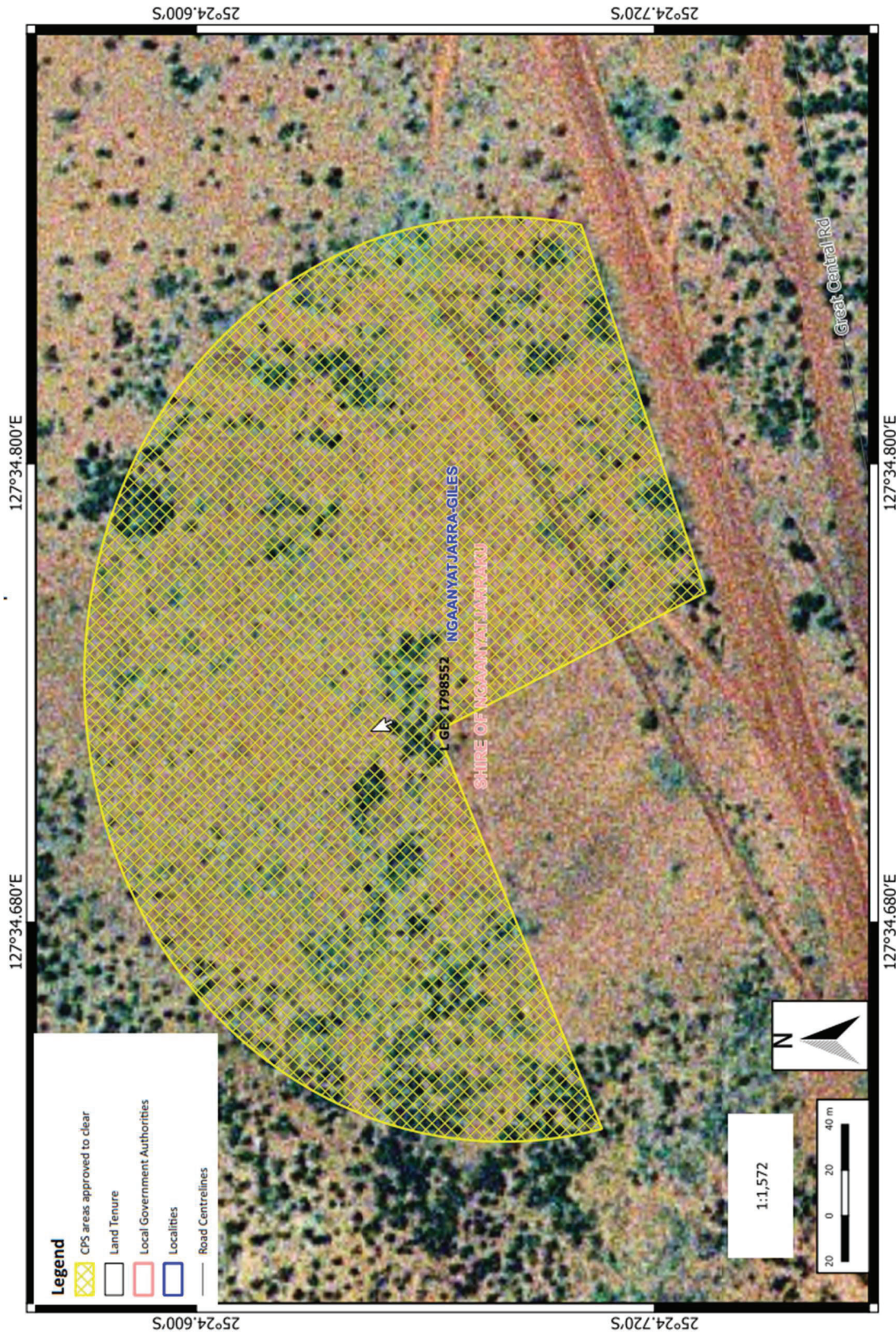


Figure 4: Plan 9327-C. The boundary of the area within which clearing may occur

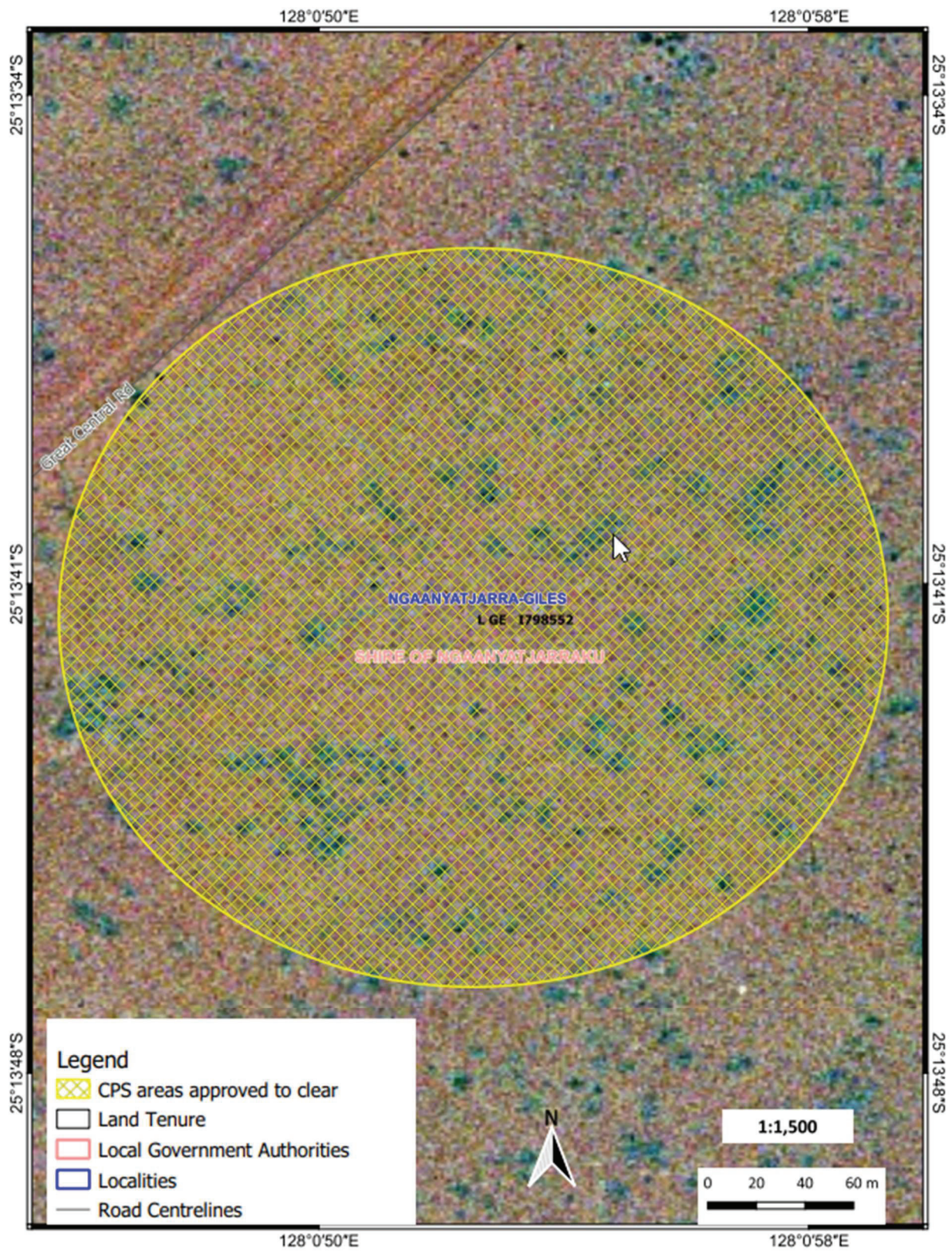


Figure 5: Plan 9327-D. The boundary of the area within which clearing may occur

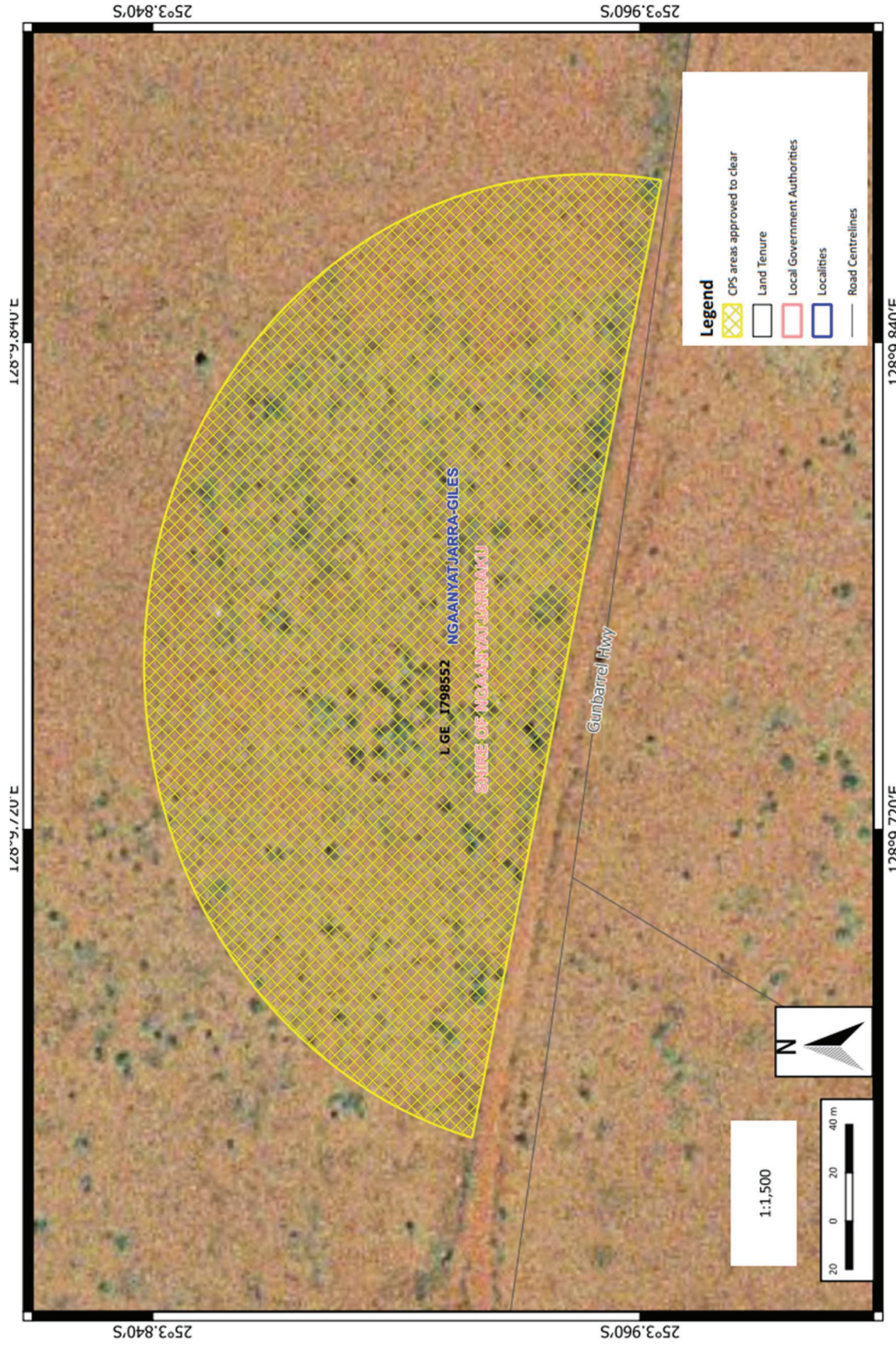


Figure 6: Plan 9327-E. The boundary of the area within which clearing may occur

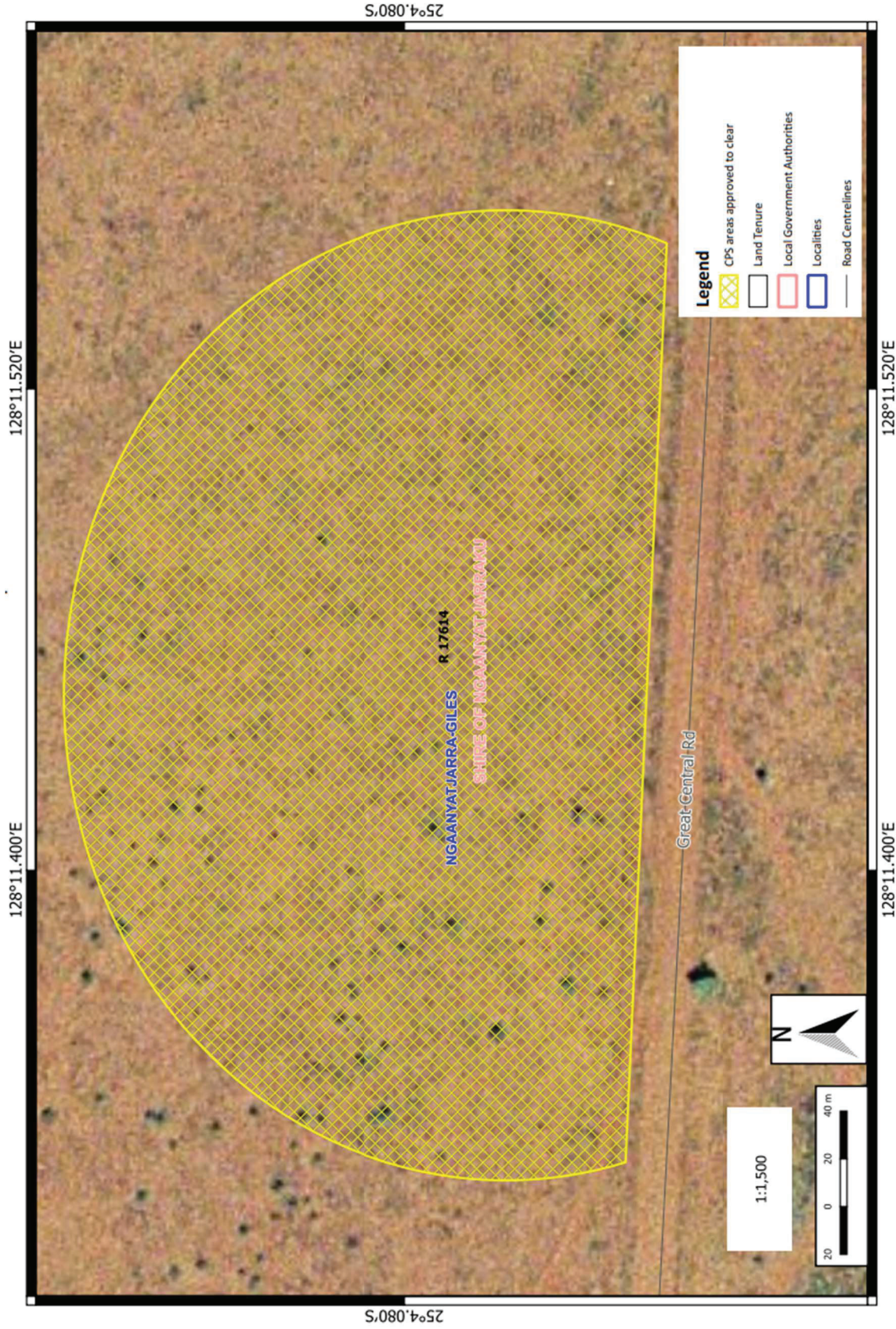


Figure 7: Plan 9327-F. The boundary of the area within which clearing may occur

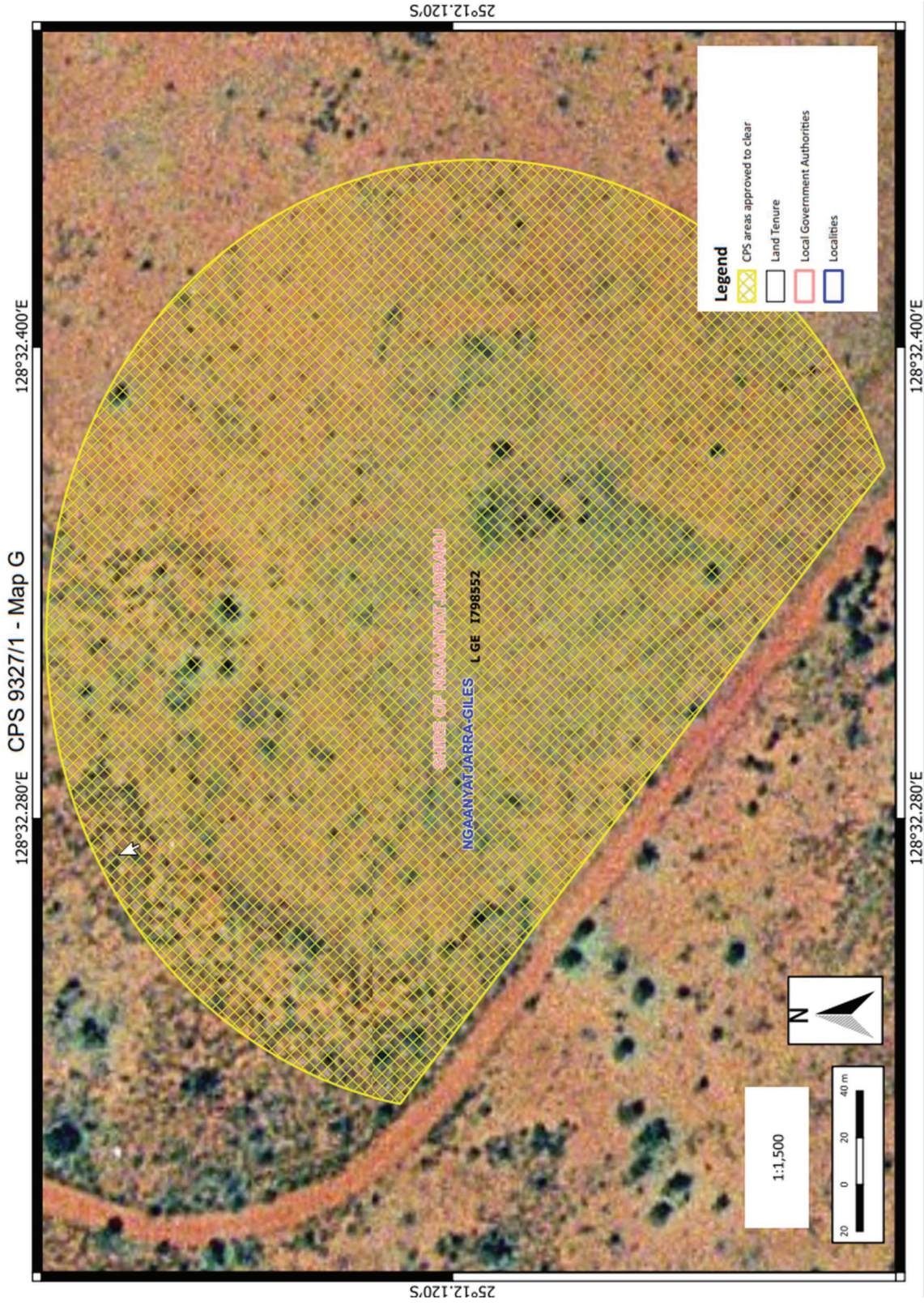


Figure 8: Plan 9327-G. The boundary of the area within which clearing may occur

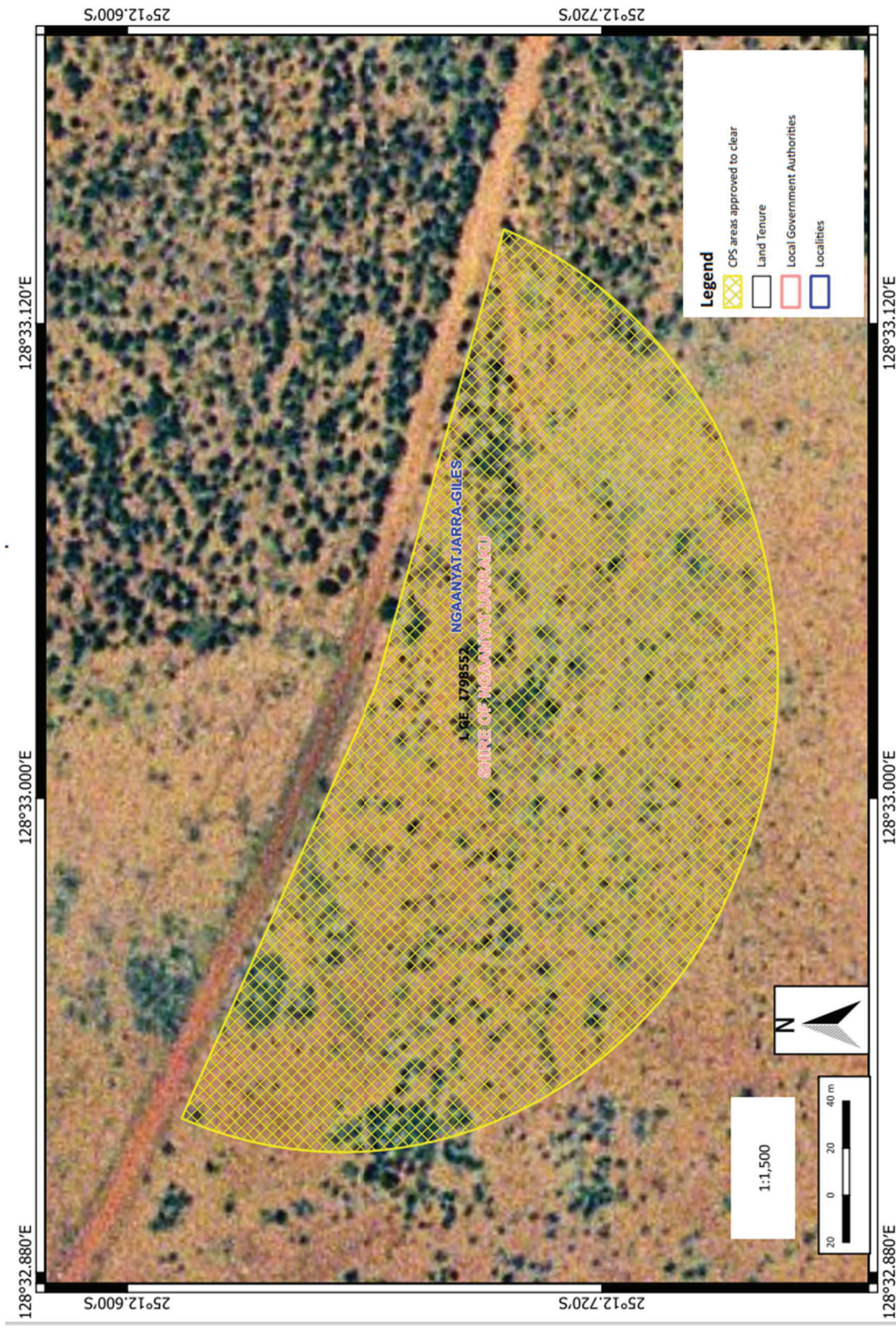


Figure 9: Plan 9327-H. The boundary of the area within which clearing may occur



Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9327/1
Permit type:	Purpose permit
Applicant name:	Shire of Ngaanyatjarraku
Application received:	16 June 2021
Application area:	66.81 (revised) hectares of native vegetation
Purpose of clearing:	Creation of borrow pit for the road construction
Method of clearing:	Mechanical
Property:	Lot 9 on Plan 91722 (Crown Reserve 17614)
Location (LGA area/s):	Shire of Ngaanyatjarraku
Localities (suburb/s):	Ngaanyatjarra-Giles

1.2. Description of clearing activities

The proposal is to clear native vegetation from eight sites, each measuring between approximately six and ten hectares, with a total area of 66.81 hectares. The sites are sparsely distributed over a large area spanning from approximately 88 km south-west of Warakurna to 33 km south-east of Warakurna in the locality of Ngaanyatjarra-Giles. The proposed clearing is required to create gravel pits for the current and future construction and maintenance of new and existing roads in the Shire over the next ten to fifteen years. Current road projects requiring gravel include the construction of the Warburton Bypass and realignment of the Jamieson Road; and the future projects include the construction of the Federal Government funded Gunbarrel Highway connecting the States in the Central Region. Although the Shire of Ngaanyatjarraku applies for the clearing permit, construction of the current and future roads may also be carried out by other entities working in the region including but not limited to the Main Road Western Australia (MRWA).

The application was originally proposed for a five year permit. Upon advice from the Department to rehabilitate after clearing and gravel extraction, the applicant is committed to perform progressive rehabilitation of disturbed areas. Given the nature and amount of road works in the region and time required to perform the progressive rehabilitation, the applicant later proposed for a 10-year duration clearing permit. Clearing will be conducted in stages over the ten year period.

The application area size has been reduced from the original application area of 103 hectares to the current application area (66.81 ha) in response to a request to minimise clearing and avoid the clearing of priority flora species found in the local area.

1.3. Decision on application

Decision:	Granted
Decision date:	16 November 2022
Decision area:	66.81 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 submission was received.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix B), relevant datasets (see Appendix F.1), the findings of a flora and vegetation survey (see Appendix E), the clearing principles set out in Schedule 5 of the EP Act (see Appendix C), relevant planning instruments and any other matters considered relevant to the assessment (see Section 3). The Delegated Officer also took into consideration that the purpose of the clearing is to support the development of public roads in the region.

In particular, the Delegated Officer has considered the following:

- Priority 2 and 3 flora species (*Goodenia virgata* and *G. gibbosa* respectively) occur in the vicinity of the application area. The Delegated Officer acknowledged the applicant's effort to avoid clearing of these flora species by reducing the application area and placing a minimum of 50 meters buffers between known individuals and the clearing area. To further avoid impact on these flora species, demarcation of the clearing area prior to and during clearing is required to prevent inadvertent removal of individuals present nearby.
- *Seringia exastia* individuals formerly listed as Threatened under the BC Act occurred within the application area at the time of a survey conducted in support of this application (GHD, 2021). The flora taxon has since been delisted (Minister for Environment, 2022). Clearing will not impact on the conservation status of this flora taxon.
- Clearing may result in land degradation and exacerbated dust deposition due to wind erosion unless appropriate land management measures are put in place. Staged clearing and progressive rehabilitation and revegetation of cleared area can minimise the risk of wind erosion and dust deposition and is required as a condition on the Permit.
- Clearing can introduce and spread weeds into adjacent vegetation, which could impact on the quality of the adjacent vegetation and its habitat values. Appropriate weed management measures could minimise and mitigate this risk and is required as a condition to the permit.
- Clearing may result in inadvertent loss of fauna individuals that may be present at the time of clearing. To minimise the potential impacts, slow progressive one directional clearing is required as a condition to the permit.

The Delegated Officer decided to grant a clearing permit subject to conditions to:

- avoid and minimise to reduce the impacts and extent of clearing
- take hygiene steps to minimise the risk of the introduction and spread of weeds
- demarcation of clearing area prior to and during clearing and gravel extraction to avoid inadvertent clearing of priority flora individuals
- ensure that no more than 66.81 ha is to be cleared within the application area
- staged clearing and commencement of gravel extraction within two months of authorised clearing
- undertake slow, progressive one directional clearing towards adjacent vegetation
- store topsoils from the cleared areas
- progressively rehabilitate and revegetate cleared area within three months of completion
- construct drainage around gravel pit sites, overburden material and topsoil piles within three months of the authorised clearing to minimise water erosion during rains.

After consideration of the available information, advice from the Department of Biodiversity, Conservation and Attractions (DBCA), as well as the applicant's minimisation and mitigation measures (see Section 3.1), the Delegated Officer determined the proposed clearing is unlikely to lead to appreciable land degradation nor have long-term adverse impacts on the conservation value of priority flora species or the habitat values of adjacent vegetation. Potential impacts of clearing can be minimised and managed to be unlikely to lead to an unacceptable risk to environmental values by imposing management conditions to the permit.

1.5. Site maps

Context Map - CPS 9327/1

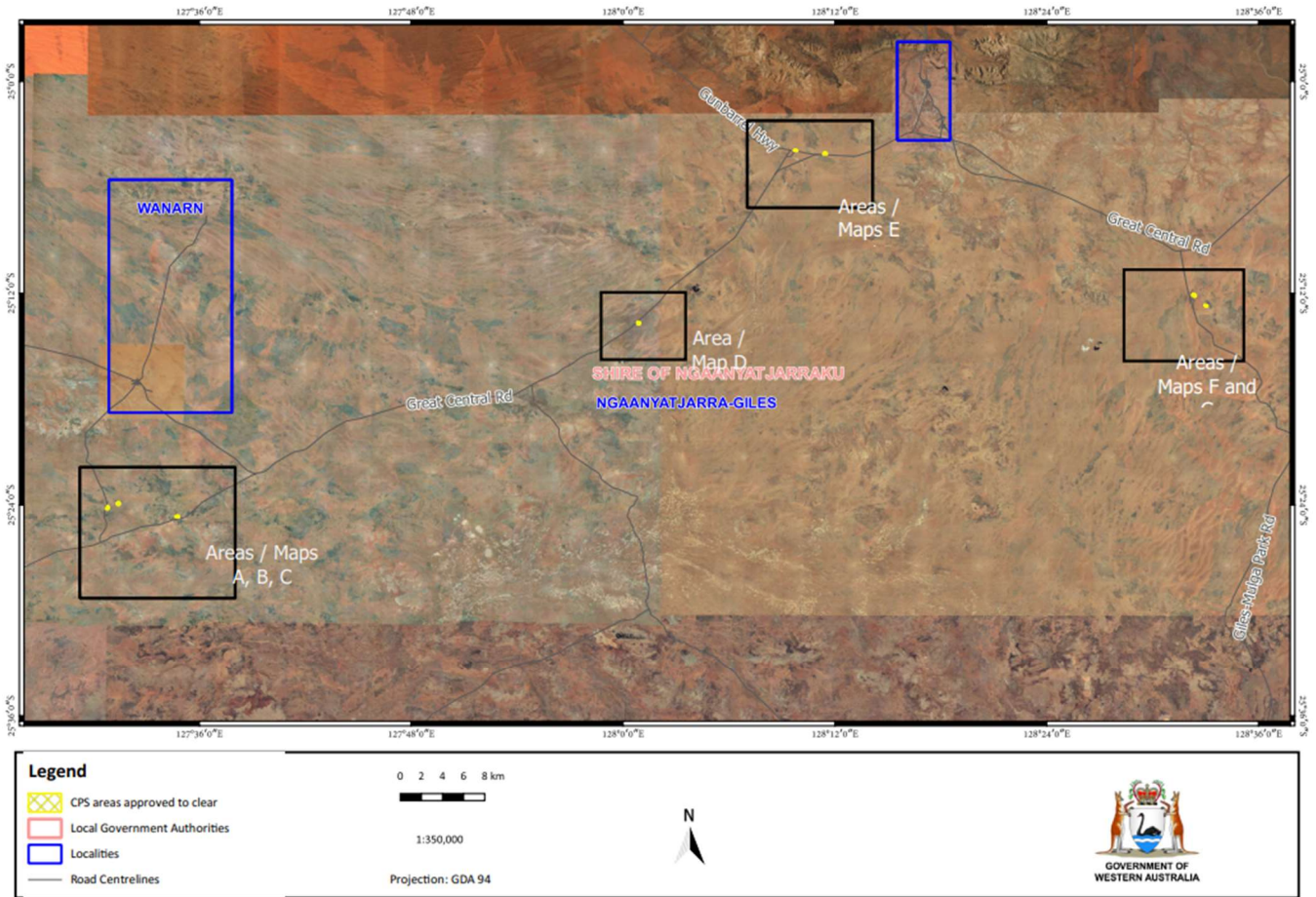


Figure 1 Context map of the application area. Detailed maps of each area are provided in Figure 2 to 9 below.

CPS 9327/1 - Map A



Figure 2. Map A of the application area.

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

CPS 9327/1 - Map B

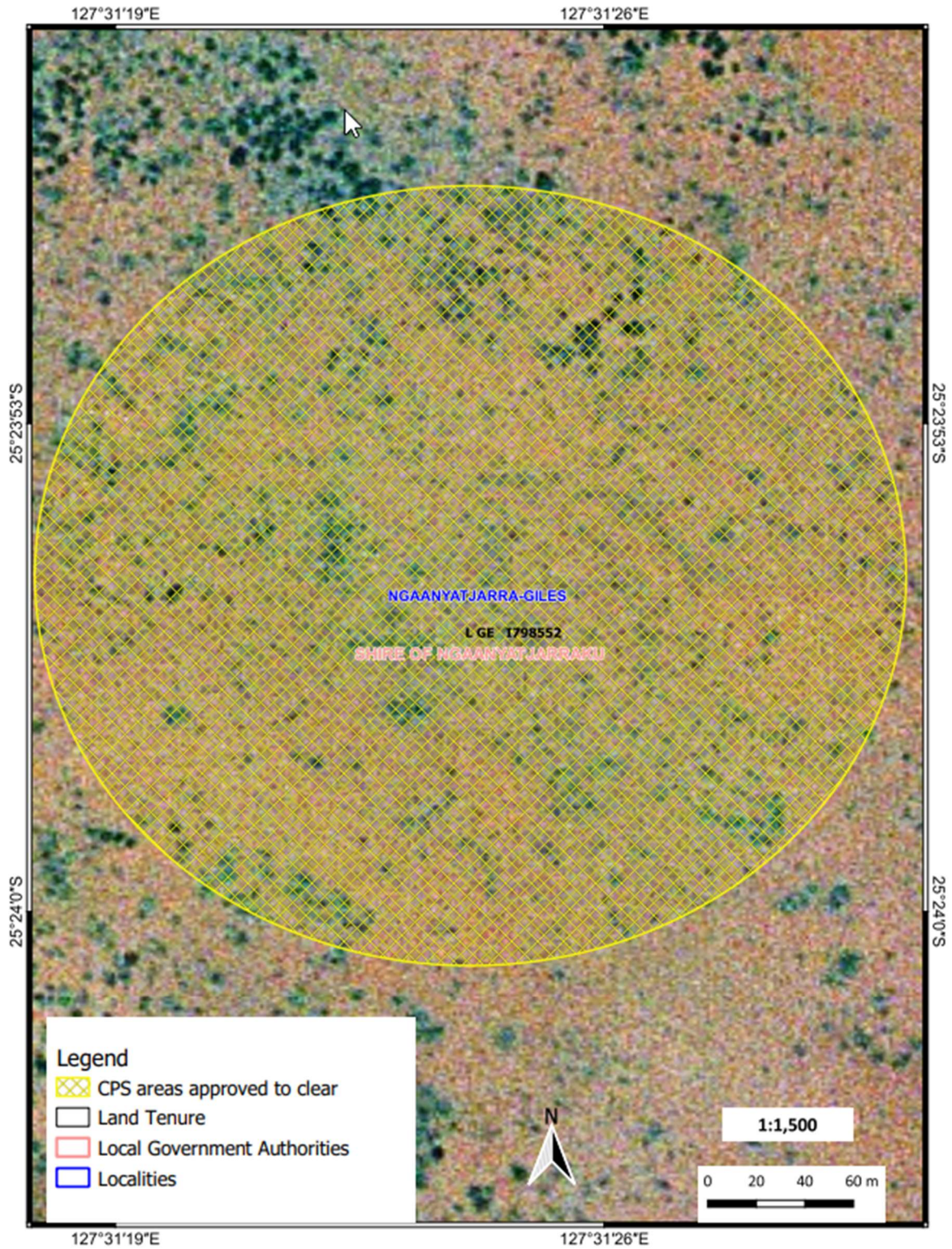


Figure 3. Map B of the application area.

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

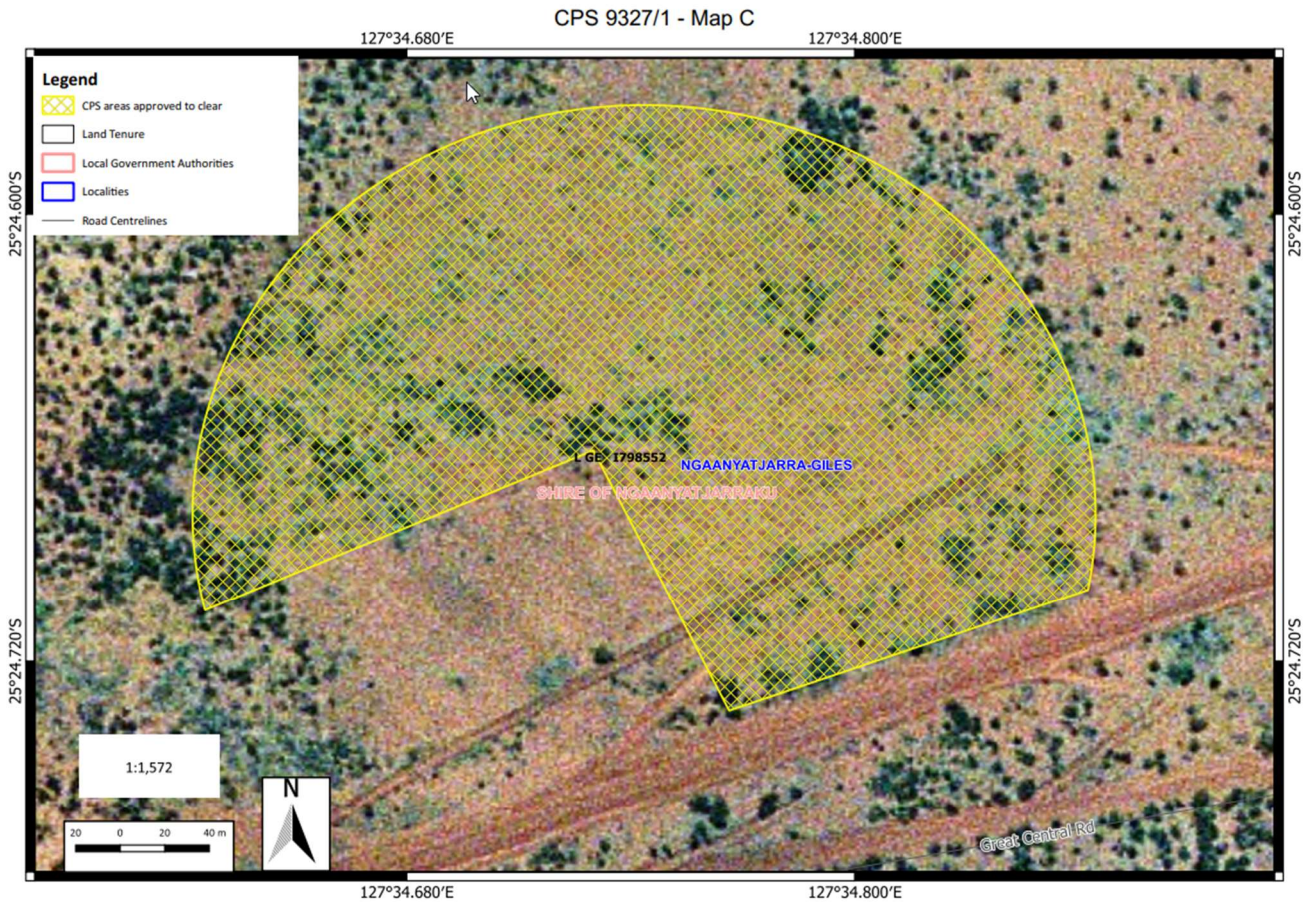


Figure 4. Map C of the application area.

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

CPS 9327/1 - Map D

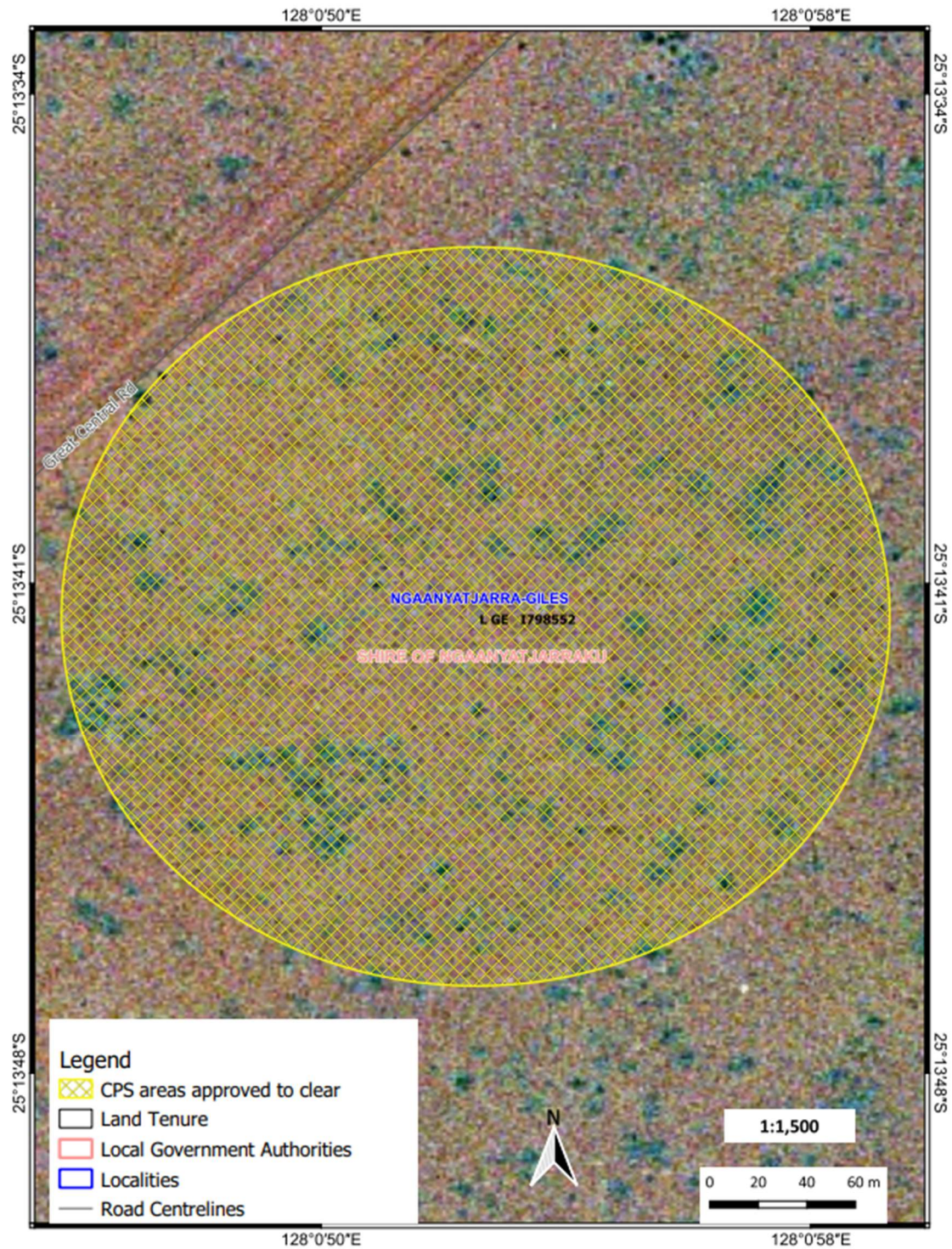


Figure 5. Map D of the application area.

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

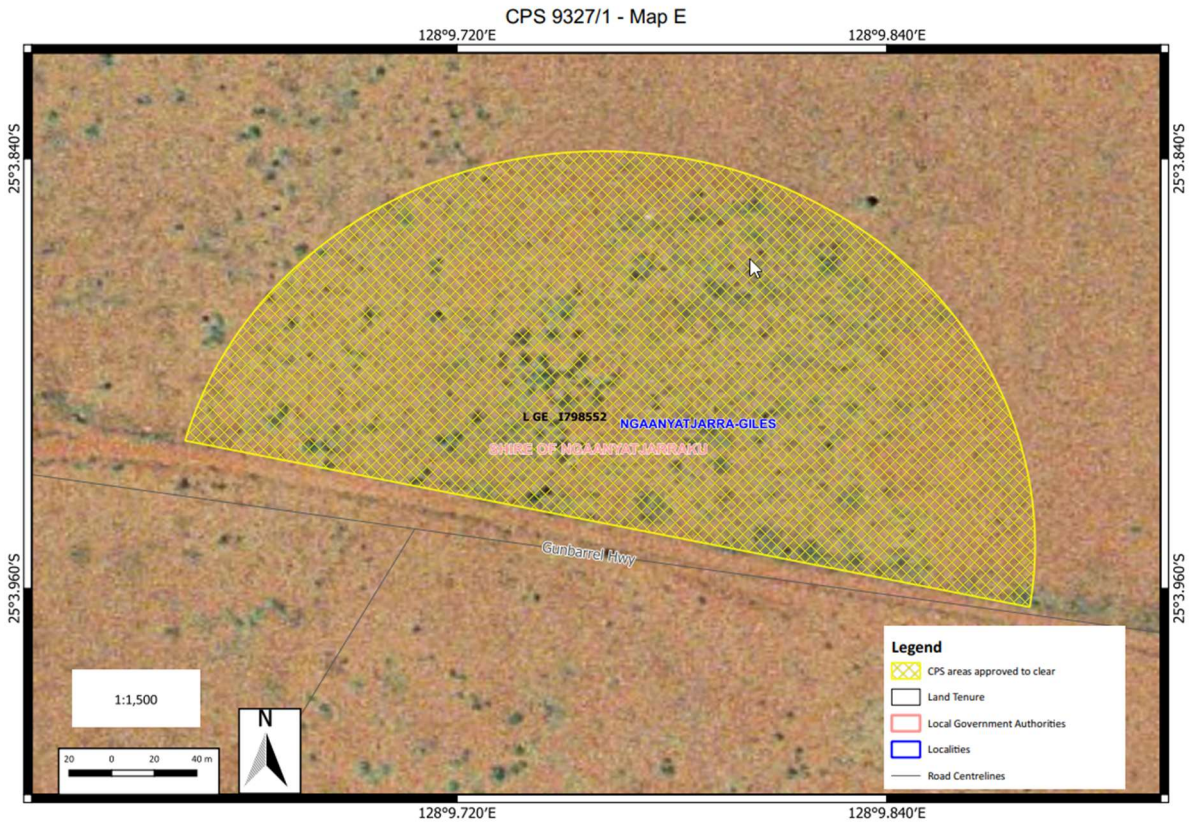


Figure 6. Map E of the application area.

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

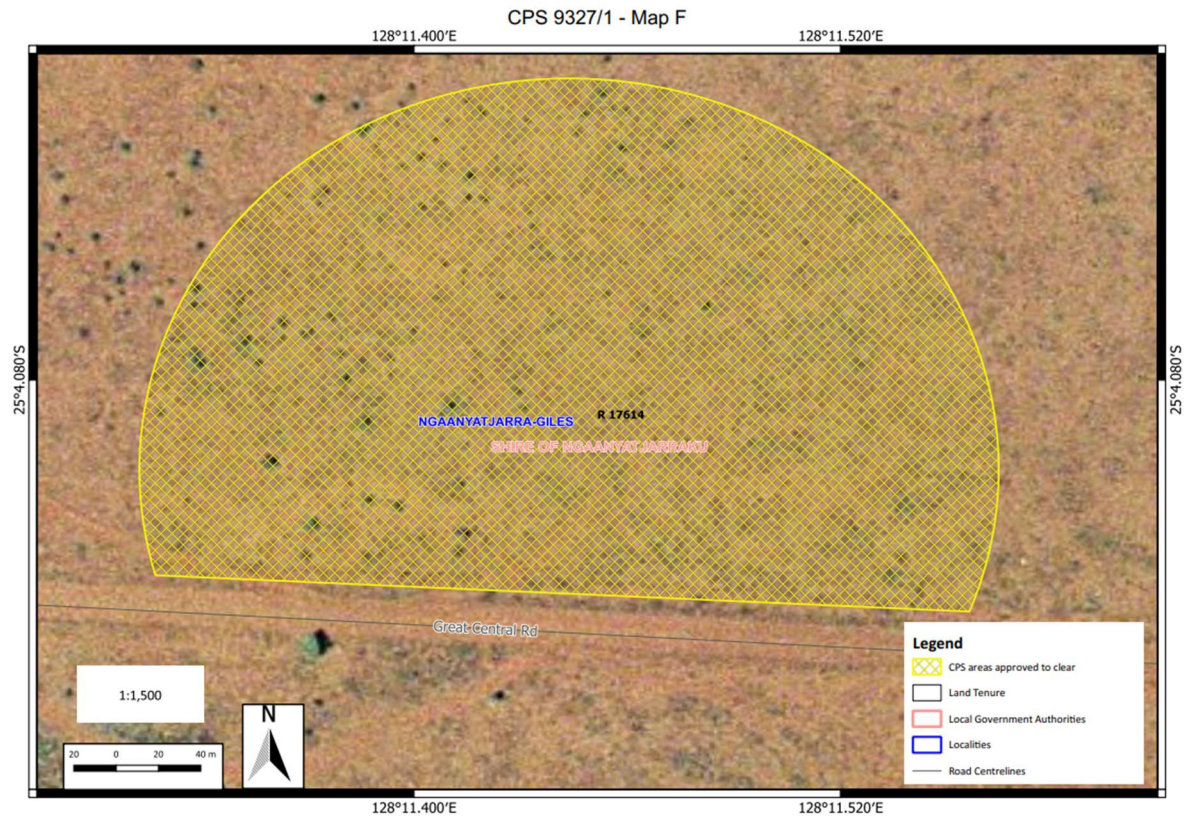


Figure 7. Map F of the application area.

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

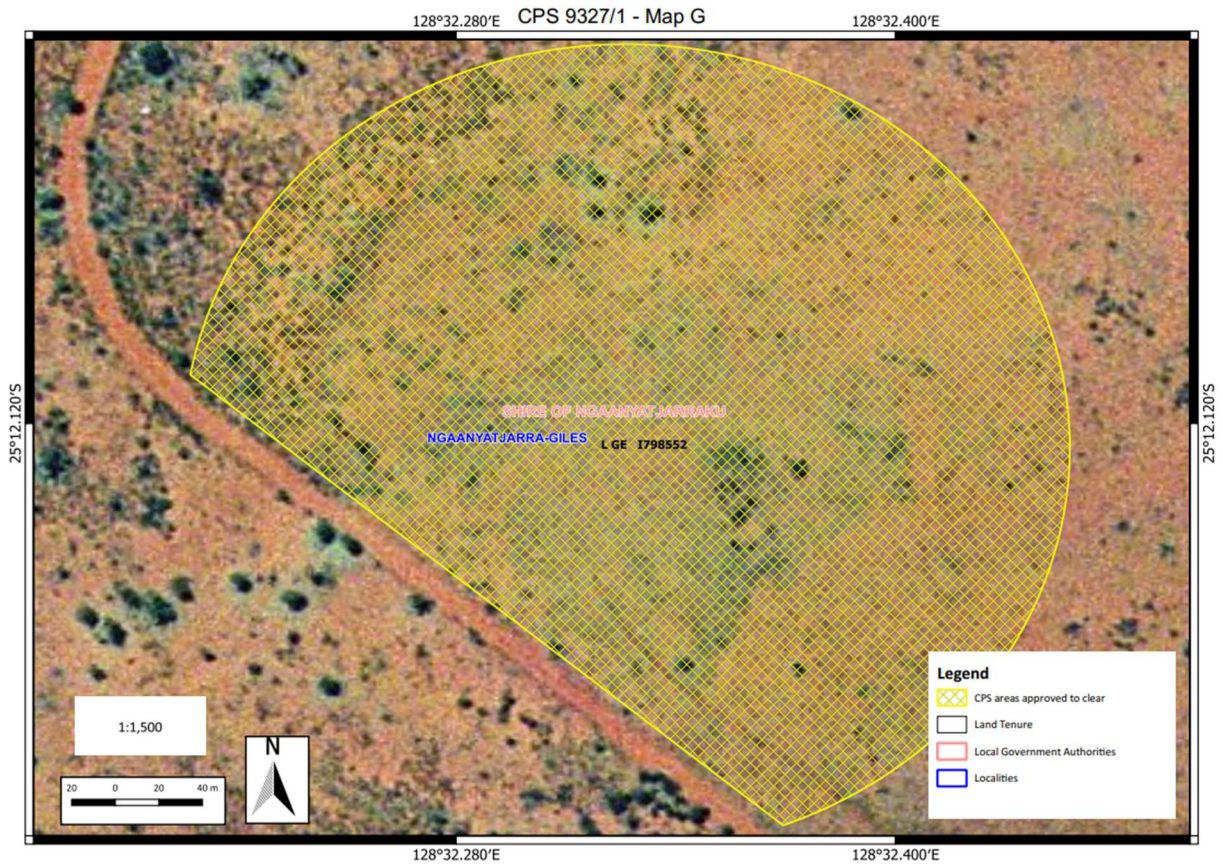


Figure 8. Map G of the application area.

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

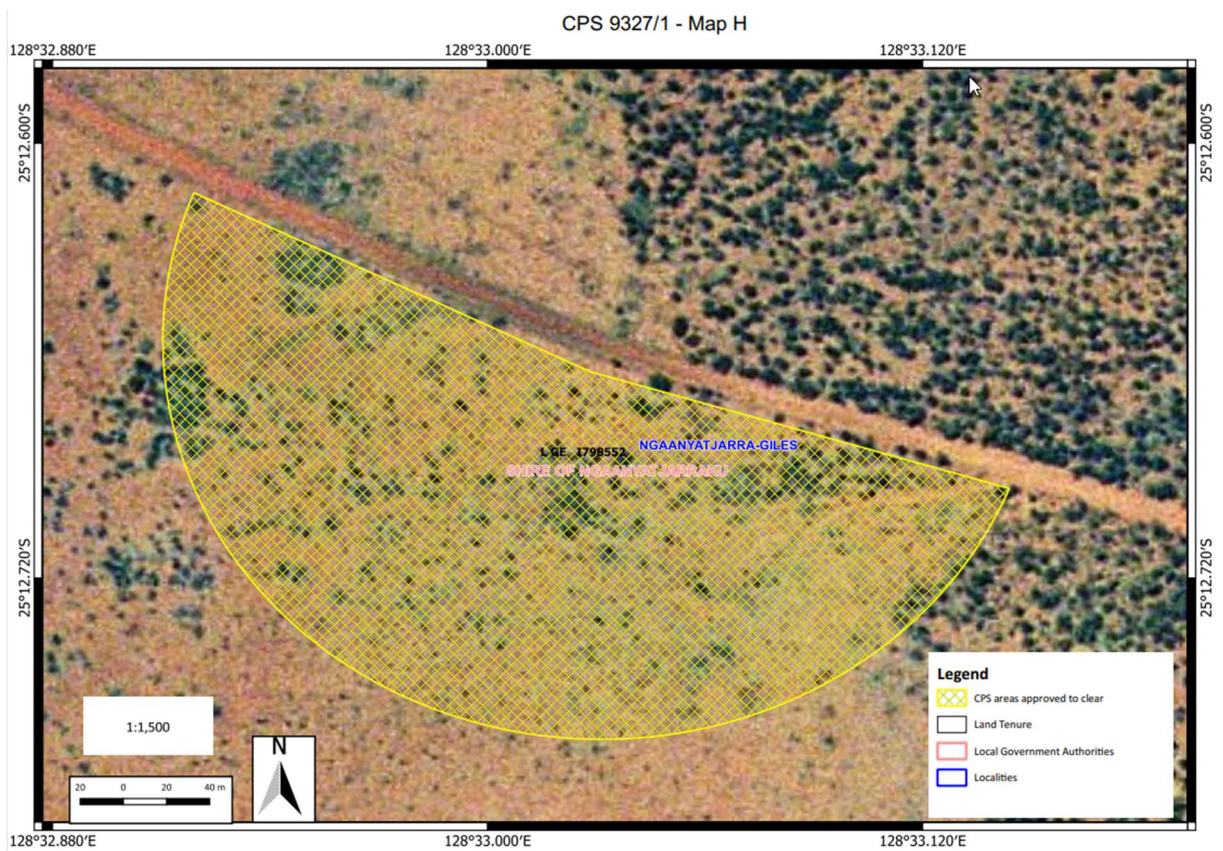


Figure 9. Map H of the application area.

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

2 Legislative context

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

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), 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)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Country Areas Water Supply Act 1947* (WA) (CAWS Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)
- *Soil and Land Conservation Act 1945* (WA)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, 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

Avoidance and minimisation.

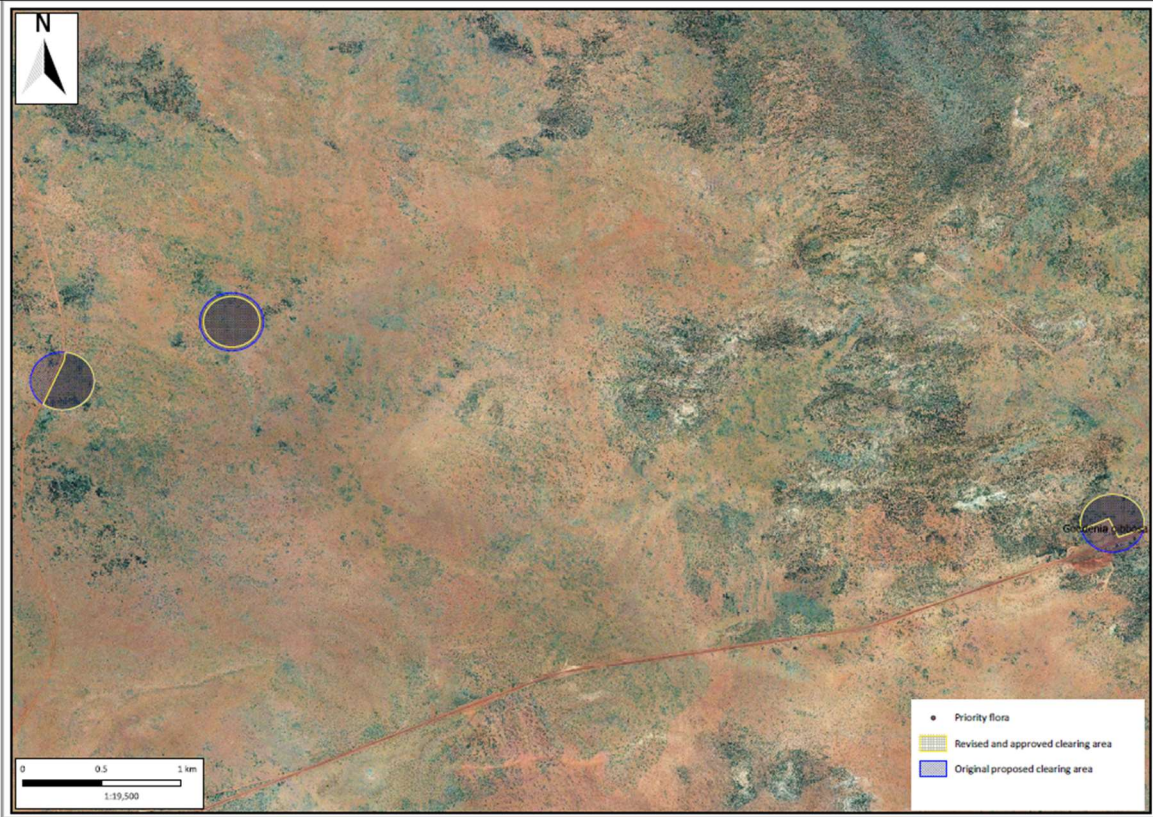
In response to DWER's preliminary assessment and request to minimise the extent and impact of clearing, the applicant reduced the proposed clearing area from 103 hectares to 66.81 hectares to avoid clearing of priority flora species identified in the vicinity and place a minimum of 50 m buffer around the priority flora individuals. The reduced application area also avoids clearing of existing paths or public accesses to the country. Figure 10 depicts the extent of the reduction in the proposed clearing area.

Mitigation

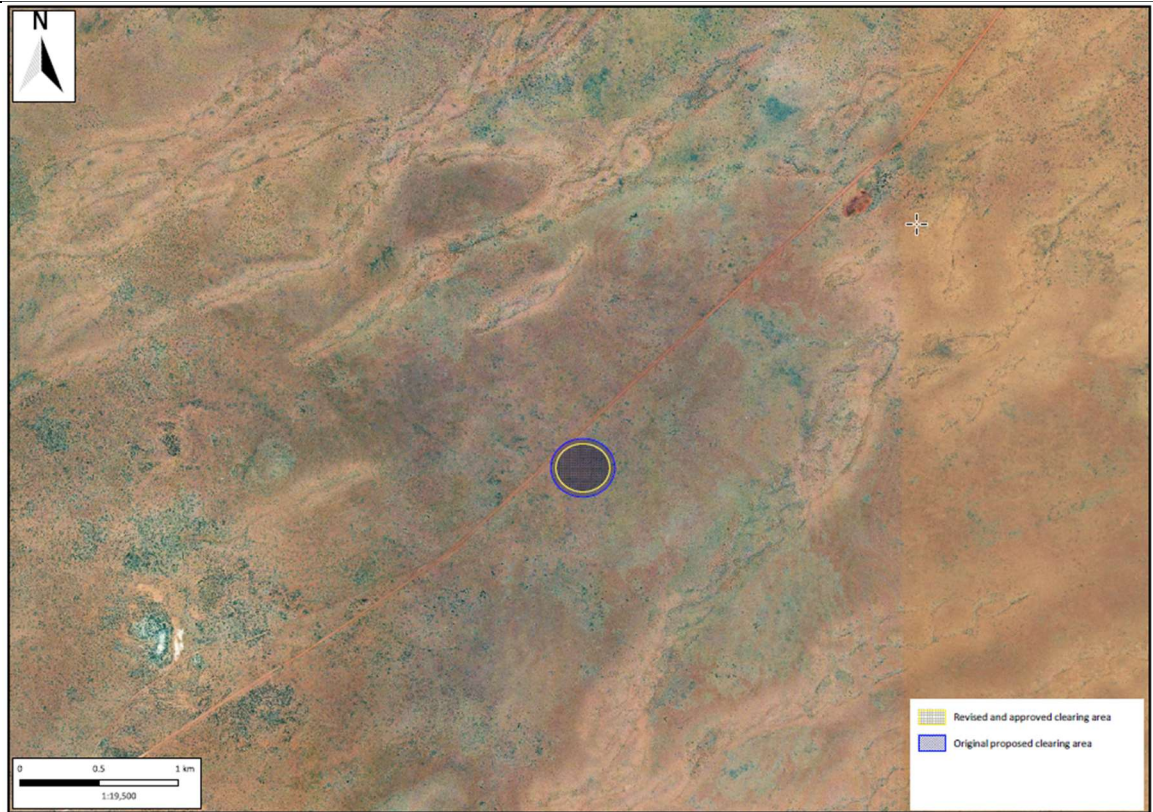
The applicant is committed to :

- conduct clearing in stages. Clearing of the pit area will be closely planned so that only essential areas are stripped of vegetation.
- store topsoils to be used in the rehabilitation and revegetation of cleared area
- store overburden / waste materials in separate stockpiles to that of topsoils.
- perform progressive rehabilitation of the gravel pits at the end of gravel extraction of each pit.

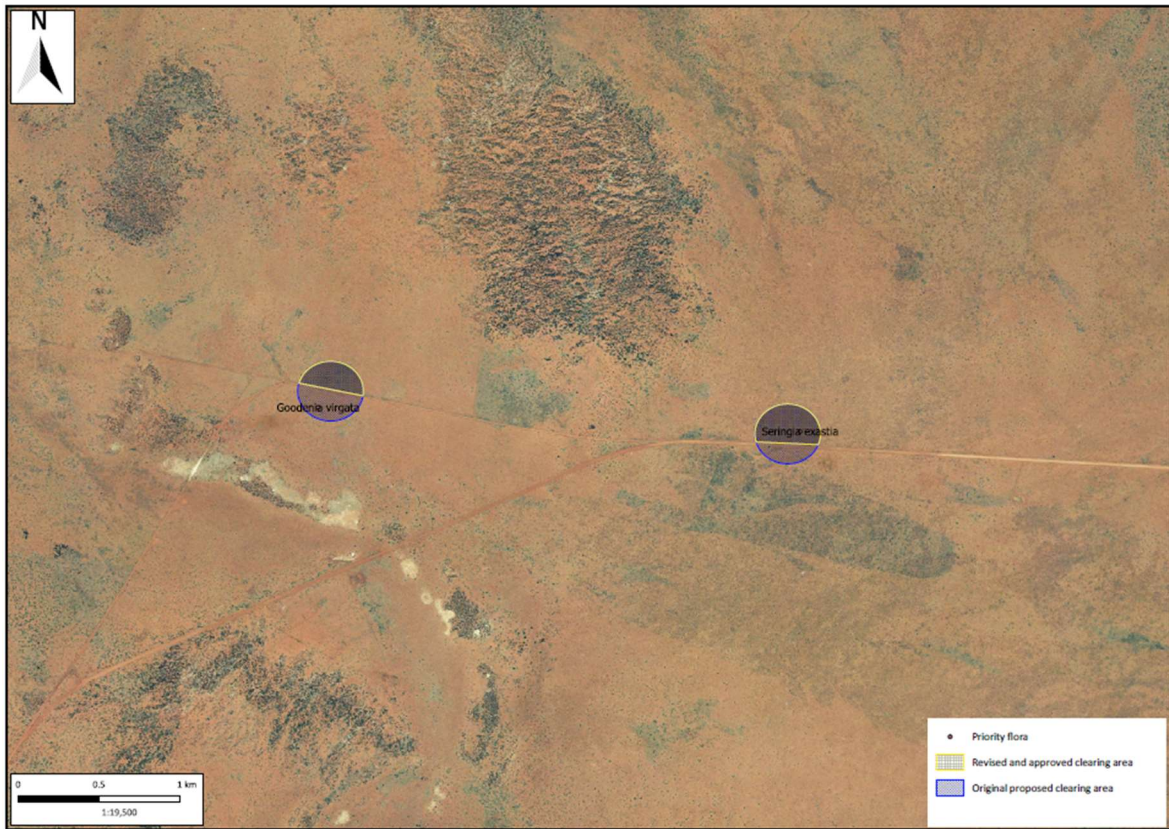
The Delegated Officer was satisfied that the applicant has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values.



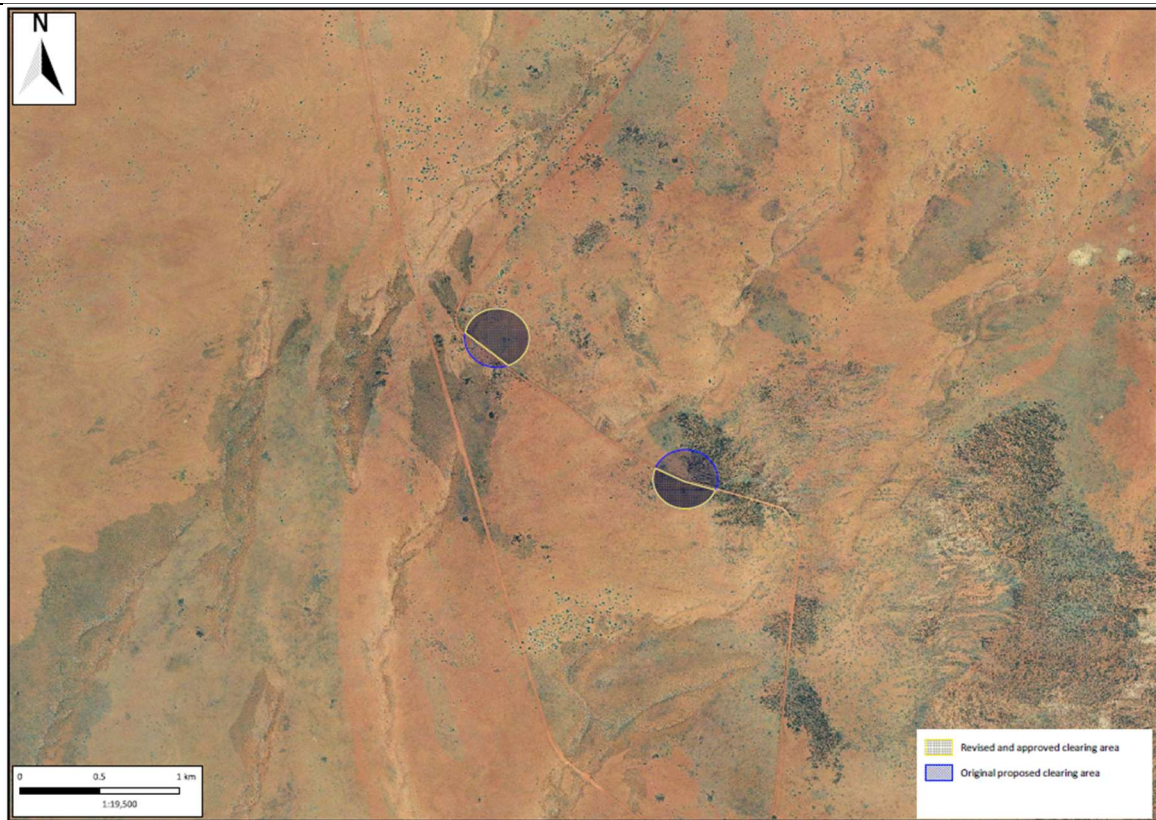
A



B



C



D

Figure 10 (A) to (D). Initial application area and reduced application area. The areas crosshatched blue indicate the initial application area. The areas crosshatched yellow indicate the reduced application area and subsequently the approved clearing area. The application area was reduced from 103 ha to 66.81 ha.

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix B) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, or land and water resource values.

The assessment against the clearing principles (see Appendix C) identified the impacts of the proposed clearing are limited and able to be managed with standard avoid and minimise, weeds, and erosion management conditions.

The assessment against the clearing principles (see Appendix C) identified that the impacts of the proposed clearing may present a risk to adjacent flora, fauna and land resources. 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. Biological values: Biodiversity: Flora and Fauna Clearing Principles (a) and (b)

Assessment

Flora

Several conservation significant flora and fauna species have been recorded from within the local area (20km radius from the application area). The lack of biodiversity records in the area is likely because the Central Ranges bioregion, or the Mann-Musgrave Block subregion, is poorly surveyed. The vegetation in the Central Ranges has only been mapped at a broad scale (1:1,000,000) and was completed at association level (Beard, 1974). The current vegetation extent in the area has been mapped as having more than 99 percent of its pre-European extent.

A flora and vegetation survey was undertaken over the application area and two other sites within the Shire in 2021 (GHD, 2021a). The survey area is depicted in Figure 11, Appendix D. For the proposed gravel pits area, the survey area included 200 m radius from the center of each pit, totalling 103.6 ha in area. The survey broadly describes the dominant vegetation types over the proposed eight gravel pits as Mulga (*Acacia spp.*) woodlands, *Triodia* hummock grasslands, and *Aristida* tussock grasslands (GHD, 2021a). These vegetation types are well represented in the Central Ranges (DBCA, 2021). The survey identified *Seringia exastia*, a flora taxon listed as threatened at the time of the survey, at three of the proposed gravel pits and in abundance in the Shire. The specimen identification of this flora taxon level had been confirmed to the species level by the Western Australian Herbarium (GHD, 2021b). *S. exastia* has since been delisted (Minister for Environment, 2022; DBCA, 2022). The proposed clearing is deemed unlikely to impact on the conservation value of this flora taxon.

Priority 2 and 3 flora species (*Goodenia virgata* and *G. gibbosa* respectively) have been identified at the original proposed gravel pit sites. *G. virgata* and *G. gibbosa* have been recorded on vegetation types that are well represented in the survey area (DBCA, 2021). Regarding *G. virgata*, DBCA advised that the species has been recorded from nine locations in the Arid Regions of WA and the NT and is highly likely to be under-surveyed. However, these records represent a range extension, with no collections from the Central Ranges IBRA subregion. DBCA recommended avoidance of *G. virgata* individuals as they may represent the only records within the region. The applicant was advised of this recommendation and had agreed to avoid areas within 50 meters radius of known *G. virgata* and *G. gibbosa* individuals. As a result of this avoidance, the application area was revised to a much-reduced area size with no impact to the conservation values of the two priority flora species at individual, local and regional levels.

The Central Region remains relatively unexploited with the extent of native vegetation in the region is in the excess of 99 percent. Notwithstanding the large remnant native vegetation cover, nature conservation in the area has been assessed as prone to biodiversity loss due to human activities including extraction of sands and gravel, and feral animals and weed infestations (Ngaanyatjarra Council Land Management Unit, 2002).

Clearing for gravel extraction removes topsoil which contain a seed bank and vegetative propagules of locally provenanced taxa. Retention or storage of this resource for future rehabilitation and revegetation of the cleared area can mitigate this impact on local biodiversity. The applicant has committed to the progressive revegetation of cleared areas utilising the salvaged topsoil, which in turn will increase the likelihood of the re-establishment of local provenance flora including the conservation significant flora species. Further discussion on progressive rehabilitation and revegetation is provided in Section 3.2.2 below.

The flora and vegetation survey identified Buffel grass (*Cenchrus ciliaris*) and *Malvastrum americanum* (Spiked malvastrum) in the application area. The two weed species appear to thrive in some areas in the Shire, particularly along the roadsides and tracks. The survey found that the greater the distance from the road and disturbed areas, the less evident the weeds' presence. Buffel grass has been known as the most widespread weed species in the Arid Zone of Australia, introduced and spread by people movement, feral animals including camels, road and rail corridor development, and the application of dust control measures in the widely scattered Aboriginal communities (Scott et.al. in H. Lambers, 2018). Long-lived seedbanks and vegetative parts of the weed species may be present in the soil and other materials from an area previously infested by the weed species. As the application area contains the weed, a stringent measure that controls the transport and transfer of such soils or materials from the proposed clearing activities is therefore crucial to minimise and mitigate the risks of weed spread and introduction to nearby vegetation. A weed control condition is imposed on the permit to mitigate this impact. In addition, the applicant is committed to stockpiling of topsoil salvaged from cleared areas in designated areas, which can minimise the weed transport and transfer. Progressive rehabilitation and revegetation of cleared and excavated sites using the salvaged topsoils is also required as a condition to the permit, which would further mitigate the potential impacts by reducing the exposure time of the cleared areas and stockpiles to weed seeds deposition, as discussed in section 3.2.2 below.

Fauna

Five conservation significant fauna species have been recorded from the local area. Sources of these records include verbal and written accounts and a survey conducted in 2012. In the absence of a recent fauna survey over the application area, the presence of conservation significant fauna individuals in the area cannot be ruled out. Of the recorded fauna species, *Falco peregrinus* (Peregrine falcon- OS) and the Vulnerable *Petrogale lateralis* subsp. MacDonnell Range (MacDonnell Range black-footed rock-wallaby, warru or central Australian rock-wallaby) are the most likely fauna species to occur or utilise the area for they were recorded the closest to the application area and the most recent.

Five records of Peregrine falcon occur the local area, with the closest record located approximately within one kilometre from the application area. The Peregrine Falcon typically nests on rocky ledges in tall, vertical cliff faces and gorges, or in tall trees associated with drainage lines. The falcon is known to have a wide range of habitat types including plains, open woodlands, and pylons and spires of buildings mimicking the cliff (DAWE, 2021). The application area and surrounds exhibit some of these characteristics that it is likely to provide suitable habitat for the Peregrine Falcon. Whilst the Peregrine Falcon may fly by or utilise the area in transit, given the large home range of the Peregrine Falcon, and the availability of the large and intact tracks of vegetation and rocky landscape within the region, it is unlikely that the application area represents a significant habitat for this species. Clearing is unlikely to impact on the conservation values or significant habitat of this fauna species.

Records of black footed rock wallaby in the area have been known from verbal and written history and a survey in 2012. The nearest record to the application area is from within approximately 1.5 km of one of the gravel sites. In Western Australia, populations of *Petrogale lateralis* subsp. McDonnell Range are known to exist in the Central Ranges region. Rock wallabies prefer rocky habitats with crevices and overhangs for cover from extreme weather and predators (Pearson, 2012). The fauna species lives in group of 10 to 100 individuals, forage on grasses, herbs and forbs usually within 100 m of outcrops without the necessities to have access to free water. Given its habitat preference, its limited foraging range and the availability of similar habitats within the vast area of the Central Ranges, the application area is unlikely to comprise significant habitat for the Rock wallaby. In addition, noting the fauna's relatively large body size and habit to live in large groups, any individuals present at the time of clearing or gravel extraction would be visible that inadvertent impact on the fauna species during clearing is unlikely. Slow clearing in the direction of adjacent vegetation would further minimise potential impacts on any individual present by allowing them to move to nearby vegetation ahead of clearing.

Conclusion:

Based on the above assessment, the Delegated Officer has determined that the proposed clearing is not likely to have a significant impact on any conservation significant flora or fauna recorded within the local area. Management conditions imposed on the permit will further reduce impacts to conservation significant flora and fauna.

Conditions:

To address the above impacts, the following conditions will be imposed on the permit:

- clearly demarcate clearing and extraction areas with temporary fencing prior to clearing and gravel extraction to avoid clearing of any conservation significant flora taxa;

- implement stringent weed management strategies;
- store topsoils for revegetation of cleared area;
- store over burden materials in separate area from that of topsoil;
- progressively revegetate cleared areas using topsoil salvaged from the location within three months of the area no longer being required for the purpose of extraction;
- conduct clearing in slow one directional manner to allow any fauna individuals present to move into adjacent vegetation ahead of the clearing activity.

3.2.2. Land resources - Clearing Principle (g)

Assessment

The application area is in the Arid Internal Region where the soils comprise of sands and the climate is dry. Consequently, in the absence of ground cover, the loose sands are prone to wind erosion. Rainfall is limited and evaporation is high that the risk from water erosion is low. However, where rainfall is sufficient, which may occur between December and March, runoff in the area generally drains as sheet flow (GHD, 2021) which may transport sediment to nearby areas. The sub-bioregion is known to be the source of sediment for the neighbouring regions (Tille, P.J., 2006). Indiscriminate flows of runoff may also exacerbate the spread of seedbank of weeds contained in the sediment (Scott, J.K. et.al, 2018). The application area, typical of the Arid region, may have a high dust load. Dust is known to accumulate on plants, particularly near to the source, and may affect the plant health and the nearby vegetation, even if temporarily. Research on the impacts of dust on plant health in the Arid zones asserted that the accumulation of dust and impacts on plant health in the arid region are driven more by the variability of cumulative rainfall than dust load (Matsuki et.al., 2016).

Noting the considerably large area of clearing and excavation in each gravel site and in total, the low rainfall, and sandy soils of the application area, clearing can increase the risks of dust deposition and land degradation. This may be exacerbated by the longer time required to clear and extract gravel from the large areas which would prolong the exposure of cleared ground to the wind. With water scarcity and low rainfall in the area, watering of the cleared area to suppress dust is not practical. However, limiting the exposure time of cleared area to wind and application of appropriate land management measures during clearing and in post gravel excavation can mitigate the impact. These measures include conducting staged clearing and progressive rehabilitation and revegetation of disturbed areas using stockpiled overburden materials and topsoil at the end of gravel extraction from each site. Progressive rehabilitation and revegetation using stockpiled topsoil from the sites can minimise potential impacts to the surrounding environment by:

- reducing the potential for long-term wind and water erosion;
- reducing the time overburden piles and loose soils are exposed to wind;
- reducing the potential of dust deposition;
- reducing the time topsoil piles are exposed to weeds;
- ensuring topsoil seed viability for use in the revegetation program; and
- re-establishing ecological values that facilitate the movement of fauna.

Construction and placement of drains around the gravel pits and associated overburden piles and topsoil stockpiles could avoid and minimise the potential for indiscriminate flows of runoff during the rainy season. This in turn would minimise and mitigate the risks of sediment transports.

Conclusion

Given the above, the proposed clearing is considered unlikely to result in appreciable and long-term land degradation and dust deposition provided appropriate land management measures are applied.

Conditions:

To address the above impacts, the following management measures will be required as a condition on the clearing permit:

- limit clearing to one site at any given time;
- commencement of gravel extraction no later than two months after authorised clearing;
- limit active gravel extraction to one site at any given time;
- minimise active gravel extraction to no more than two hectares in size within each site at any given time;

- progressively rehabilitate and revegetate cleared areas using stored overburden materials and topsoil; salvaged from the location within twelve months of the area no longer being required for the purpose of extraction;
- constructing drains around the gravel pits, waste rock dumps and topsoil stockpiles to minimise water erosion and sediment transport during the rainy season.

3.3. Relevant planning instruments and other matters

Perpetual lease M350144 and Reserve 17614 within which the application area is located, is vested with the Aboriginal Affairs Planning Authority and leased to the Ngaanyatjarra Land Council (Aboriginal Corporation) (NgLC) for the "Use and Benefit of Aboriginal Inhabitants" and overlapping the Ngaanyatjarra Lands native title determination. NgLC as the landholder of reserves and leases of the area, which are proclaimed under Part III of the *Aboriginal Affairs Planning Authority Act 1972 (WA)*, has provided support for the road works and related gravel pits for the use and benefit of the Ngaanyatjarra people on the leased land (NgCL, 2021).

Several Aboriginal sites of significance have been mapped within the Shire of Ngaanyatjarraku. The Shire had appointed a Senior Anthropologist of the Ngaanyatjarra Land and Culture Unit with the Ngaanyatjarra Council, to perform a heritage survey for the purpose of having a heritage clearance for the works associated with the proposed clearing. The report (Brooks, 2020) was provided with the clearing permit application. The survey was performed on 4 December 2020 with consultation with the community representatives and anthropologists. All proposed gravel pit sites were shown to the anthropologists and community representatives, who assessed each site for heritage considerations. The anthropologists had agreed for all sites to be cleared with an area of not more than 200 m in radius for each site and given the heritage clearance and approval. 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.

Although the Shire of Ngaanyatjarraku applies for the clearing permit, the excavation of materials from the sites may be performed both by the Shire and MRWA. Gravel rocks sourced from the sites could also be utilised by MRWA for the current and future road construction projects within the Shire and the region.

End

Appendix A. Additional information provided by applicant

Summary of comments	Consideration of comment	Information provided by the applicant (Shire of Nganyatjarraka (2022, a, b))
Implementation of the mitigation hierarchy is required to avoid excessive environmental impacts resulting from the proposed clearing.	The original proposed clearing equates to 103 ha. Reduction of the amount is suggested to avoid excessive clearing.	<ul style="list-style-type: none"> The application area has been reduced to 66.81 ha from the original 103 ha applied. This reduction resulted in the avoidance of clearing of priority flora species and existing paths and tracks. The applicant is committed that on each pit site, only essential areas will be cleared. The applicant is committed to rehabilitate and revegetate the pits when excavation ceases. Topsoils will be stockpiled and utilised in the rehabilitation and revegetation of the pits when excavation ceases. Overburden materials will be piled in areas separated from the topsoil stockpiles.
Evidence of efforts taken to avoid, minimise and mitigate clearing of flora of conservation significance.	<p>The following flora species have been identified from within the original application area:</p> <ul style="list-style-type: none"> -Threatened species <i>Seringia exastia</i> in the 'Big Tjuta' and 'Mulga Park Rd No.2' proposed gravel pits. - Priority 2 species <i>Goodenia virgata</i> in the 'Old Gunbarrel' proposed gravel pit, which represents a range extension for this species. - Priority 3 species <i>Goodenia gibbosa</i> in the 'Near Tjulan' proposed gravel pit. Measures are required to minimise and mitigate the impacts of clearing on the above species. 	<ul style="list-style-type: none"> Application area and dimension have been revised to avoid any clearing of the identified Priority 2 and 3 flora species. The revision includes assurance that the identified priority flora species are at least 50 meters away from the outer perimeters of the clearing area. Impacts of clearing to <i>Seringia exastia</i> are not considered significant given the recent delisting of the species.

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

Characteristic	Details
Local context	<p>The area proposed to be cleared comprises of eight separate sites in the extensive land use zone of Western Australia. The nearest communities to these sites are the Wanarn and Warakurna in the Ngaanyatjarraku Giles locality, approximately 70 km west of the state's border with the Northern Territory.</p> <p>The area is within the Central Ranges IBRA bioregion.</p> <p>Aerial imagery indicates the local area (20-kilometre radius from the centre of the area proposed to be cleared) retains approximately 99 per cent of the original native vegetation cover.</p>

Characteristic	Details
Ecological linkage	There are no ecological linkages mapped within this bioregion.
Conservation areas	There are no DBCA conservation estate or reserves located within or in the vicinity of the application area. The nearest conservation area is the Pila Nature Reserve (Gibson Desert) – a Class A reserve located approximately 120 km west of the application area. The Ngaanyatjarraku region, however, is within the Ngaanyatjarraku Indigenous Protected Area (Ngaanyatjarra Council Land Management Unit, 2002).
Vegetation description	<p>Vegetations in the local area surrounding the proposed gravel pits are mapped as:</p> <ul style="list-style-type: none"> • Vegetation association 19 described as low woodland; mulga between sand ridges • Vegetation association 45; described as Shrublands; mallee scrub (Great Victoria Desert) • Vegetation association 230; described as Mosaic: Medium sparse woodland; desert oak between sand dunes / Hummock grasslands, grass steppe; hard spinifex, <i>Triodia basedowii</i>. <p>The current extent of the above-mentioned vegetation associations is 99 percent of its original cover (<i>Government of Western Australia, 2019</i>).</p> <p>Vegetation survey over the application area and surround conducted by GHD in 2021 indicates that the vegetation within the proposed clearing areas consists of mainly the <i>Triodia</i> Hummock Grasslands (VT05, VT06, VT07, VT08, VT09) with the occasional presence of <i>Acacia</i> (Mulga) woodland (VT01). The full descriptions of these vegetation types are available in Appendix E.</p>
Vegetation condition	<p>The GHD vegetation survey conducted in support of this application indicated that the vegetation within the application area is in Very Good to Excellent condition. This assertion is supported by photographs of the sampled vegetation.</p> <p>The full Trudgen (1991) condition rating scale is provided in Appendix D. Excerpts of the survey descriptions and mapping are available in Appendix E.</p>
Climate and landform	<p>The climate of the Central Ranges bioregion is hot and arid. Rainfall in this region can be variable and unpredictable in parts or it can be summer or winter dominant. The area is influenced by a northern tropical/summer climatic pattern where rainfall is greatest in the summer months, and a southern climatic pattern where rainfall is non-seasonal. In general rainfall predominantly occurs between December and March, derived from summer storms. The average annual rainfall at Warburton Airfield is 243.8 mm. The area is warm to hot throughout the year, with a mean maximum daily temperature of 37.8 °C (recorded in January) and a mean minimum temperature of 5.8 °C (recorded in July) (BoM 2021).</p> <p>The survey areas are mapped within the Central Australian Ranges soil landscape region, identified within Western Australia's Rangelands and Arid Interior (Tille, 2006). The Central Australian Ranges region consists of sandplains and dunes (with hills and ranges surrounded by wash plains) on the granitic and volcanic rocks of the Musgrave Complex and the sedimentary rocks of the Amadeus basin.</p>
Soil description	Soils consist of Red sandy earths, Red deep sands, and Red loamy earths (with some Stony soils). Vegetation is dominated by Mulga shrublands and spinifex grasslands (with some other acacias, eucalypts and desert oak) (Tille 2006).
Land degradation risk	Being in the Arid Region and consisting mostly of sands, the soils in the area are prone to wind erosion. The area is also the source of sediments to the neighbouring regions (Tille, P.J., 2006). With limited rainfall and high evaporation, the risk from water erosion

Characteristic	Details
	is low. Where rainfall is sufficient, runoff in the area generally drains as sheet flow (GHD, 2021).
Waterbodies	No significant surface water features or watercourses occur within or in the vicinity of the survey areas. Surface water in the region is severely limited by a combination of high evaporation/ evapotranspiration rates and low annual rainfall. Where rainfall is sufficient, runoff in the area generally drains as sheet flow.
Hydrogeography	The application areas lie within the East Murchison Groundwater Area. The region is characterised by low rainfall and high evaporation. The area is partly underlain by hard fractured rocks; groundwater is difficult to locate.
Flora	Few flora records exist from the Central Ranges. The flora and vegetation survey performed in the area identified two priority flora species, namely <i>Goodenia virgata</i> (P2) and <i>G. gibbosa</i> (P3) in the vicinity of the application area.
Ecological communities	No priority of threatened ecological communities (PEC/TEC) are identified within the application area. The nearest mapped conservation significant ecological community is the Glenayle and Carnegie Downs calccrete groundwater assemblage type on Burnside palaeodrainage PEC located approximately 51 km southwest of the application area.
Fauna	Five conservation significant fauna species have been recorded in the local area. The sources of these records include historical (verbal and written), sighting and museum collection and targeted survey. The largest number of records is that of <i>Falco peregrinus</i> (Peregrine falcon).

B.2. Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed land (ha)	Current proportion (%) of pre-European extent in all DBCA managed land
IBRA bioregion*					
Central Ranges	4,701,529	4,700,252	99.97		
Vegetation association					
19 (low woodland; mulga between sand ridges)	902,980.43	902,371.35	99.93	-	-
45 (Hummock grasslands)	20,776.86	20,776.86	~100.00	-	-
230 (Mosaic: medium sparse woodland, desert oak between sand dunes / Hummock grasslands, grass steppe, hard spinifex, <i>Triodia basedowii</i>)	1,181,953.58	1,180,587.63	99.88	-	-
Local area					
20km radius	5,130,889,190	5,130,889,190	~100%	-	-

*Government of Western Australia (2019a); **Government of Western Australia (2019b)

B.3. Flora analysis table

With consideration for the site characteristics set out above, relevant datasets (see Appendix F.1), and vegetation and flora survey information, impacts to the following conservation significant flora required further consideration.

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Suitable soil type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]	Source / latest year of record
<i>Comesperma viscidulum</i>	4	Y	Y	Y	1.19	1	Y	1958
<i>Eragrostis sp. Erect spikelets (P.K. Latz 2122)</i>	3	N	Y	Y	1.41	1	Y	2016
<i>Fuirena nudiflora</i>	3	N	Y	Y	1.12	1	Y	1967
<i>Goodenia gibbosa</i>	3	Y	Y	Y	0.005	2	Y	GHD (2021)
<i>Goodenia virgata</i>	2	Y	Y	Y	0.005		1	GHD (2021)
<i>Indigofera cornuligera subsp. cornuligera</i>	3	Y	Y	Y	1.45	2	Y	1974
<i>Indigofera gilesii</i>	3	Y	Y	Y	0.99	3	Y	1966
<i>Isotropis winneckeii</i>	1	Y	Y	Y	0.79	1	Y	1967
<i>Prostanthera centralis</i>	3	Y	Y	Y	1.12	6	Y	2012
<i>Ptilotus royceanus</i>	1	N	Y	Y	1.60	1	Y	1974
<i>Schoenus centralis</i>	1	N	Y	Y	1.12	1	Y	1967
<i>Tephrosia sp. Central (P.K. Latz 17037)</i>	3	N	Y	Y	1.60	1	Y	2016
T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority								

B.4. Fauna analysis table

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record (km)	Number of known records (total)	Are surveys adequate to identify?	Source / type of record
<i>Amytornis striatus striatus</i> (Striated grasswren (sandplain))	P4	Y	Y	1.49	2	N/A	Collection (1969)
<i>Falco peregrinus</i> (Peregrine falcon)	OS	Y	Y	1.05	5	N/A	Sighting (2012)
<i>Macrotis leucura</i> (lesser bilby, tjunpi)	EX	Y	Y	1.78	1	N/A	Historical (verbal) - 1945
<i>Petrogale lateralis subsp. MacDonnell Ranges</i> (MacDonnell)	VU	Y	Y	1.36	2	N/A	Historical and

Species name	Conservation status	Suitable habitat features ? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record (km)	Number of known records (total)	Are surveys adequate to identify ?	Source / type of record
Range black-footed rock-wallaby, black-footed rock-wallaby, warru)							survey (2012)
<i>Petrogale lateralis subsp.</i> (MacDonnell Range black-footed rock-wallaby, black-footed rock-wallaby (MacDonnell Ranges), warru [warru or central Australian rock-wallaby])	VU	Y	Y	1.57	1	N/A	Survey (2012)
T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority							

Appendix C. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biological values		
<p>Principle (a): "Native vegetation should not be cleared if it comprises a high level of biodiversity."</p> <p><u>Assessment:</u></p> <p>The region within which the application area is located is poorly surveyed that previous records of conservation significant flora and fauna and biodiversity from the region are limited.</p> <p>A flora survey over the application area (GHD, 2021) identified two priority flora species. The identified priority flora species have been recorded on vegetation types that are well represented in the survey area. With the reduction in the proposed clearing area, the identified flora species will not be cleared.</p>	May be at variance	Yes <i>Refer to Section 3.2.1, above.</i>
<p>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."</p> <p><u>Assessment:</u></p> <p>Five conservation significant fauna species have been recorded from the local area. The sources of these records include verbal and written historical accounts and sightings. Given the absence of a structured fauna survey in the area, the presence of the recorded and other conservation significant fauna species in the application area and its vicinity cannot be ruled out.</p>	May be at variance	Yes <i>Refer to Section 3.2.1, above.</i>
<p>Principle (c): "Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."</p> <p><u>Assessment:</u></p> <p><i>Seringia exastia</i> found in the area by the 2021 survey was listed as threatened under the BC Act at the time of survey. The flora taxon has since been delisted (Minister for Environment 2022; DBCA, 2022). The area proposed to be cleared is unlikely to contain threatened flora.</p>	Not likely to be at variance	Yes <i>Refer to Section 3.2.1, above.</i>

Assessment against the clearing principles	Variance level	Is further consideration required?
<p><u>Principle (d)</u>: <i>“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.”</i></p> <p><u>Assessment</u>:</p> <p>The area proposed to be cleared does not contain species that indicate a threatened ecological community.</p>	Not likely to be at variance	No
Environmental value: significant remnant vegetation and conservation areas		
<p><u>Principle (e)</u>: <i>“Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.”</i></p> <p><u>Assessment</u>: The extent of native vegetation in the local area is approximately 99 percent. This is consistent with the national objectives and targets for biodiversity conservation in Australia. The vegetation proposed to be cleared is not considered to be part of a ecological linkage in the local area.</p>	Not likely to be at variance	No
<p><u>Principle (h)</u>: <i>“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.”</i></p> <p><u>Assessment</u>:</p> <p>Given the distance to the nearest DBCA conservation area, the proposed clearing is not likely to have an impact on the environmental values of conservation areas in the region. Given the approval of the Ngaanyaatjarraku Traditional Council of the project and proposed clearing, potential impact on the Ngaanyatjarraku Indigenous Protected Area is unlikely to be significant.</p>	Not likely to be at variance	No
Environmental value: land and water resources		
<p><u>Principle (f)</u>: <i>“Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.”</i></p> <p><u>Assessment</u>:</p> <p>Given no water courses or wetlands are recorded within the application area, the proposed clearing is unlikely to impact an environment associated with a watercourse or wetland.</p>	Not likely to be at variance	No
<p><u>Principle (g)</u>: <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.”</i></p> <p><u>Assessment</u>:</p> <p>Given the dry environment and the sandy soils of the region, the area can be highly susceptible to wind erosion and dust deposition, particularly in the absence of groundcover. Potential impacts of clearing on land degradation can be managed and mitigated by imposing revegetation and rehabilitation conditions to the permit.</p>	May be at variance	Yes <i>Refer to Section 3.2.2, above.</i>
<p><u>Principle (i)</u>: <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.”</i></p> <p><u>Assessment</u>:</p> <p>Given no water courses or wetlands are recorded within the application area, the proposed clearing is unlikely to impact surface or ground water quality.</p>	Not at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
<p><u>Principle (j)</u>: “Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.”</p> <p><u>Assessment</u>:</p> <p>The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding.</p>	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.

Considering its location, the scale appropriate for the Eremaean and Northern Botanical Provinces (Trudgen, 1991) below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from Trudgen, M.E. (1991) *Vegetation condition scale* in National Trust (WA) 1993 Urban Bushland Policy. National Trust of Australia (WA), Wildflower Society of WA (Inc.), and the Tree Society (Inc.), Perth.

Measuring vegetation condition for the Eremaean and Northern Botanical Provinces (Trudgen, 1991)

Condition	Description
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Very poor	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or ‘parkland cleared’ with their flora comprising weed or crop species with isolated native trees or shrubs.

Appendix E. Flora and vegetation survey information excerpts (GHD, 2021a)

The Shire commissioned GHD to undertake a detailed flora and vegetation assessment of the proposed eight gravel pit sites and two road projects’ sites in the Shire. The purpose of the assessment was to identify key flora and vegetation values within the survey areas. The result of the assessment is used to support clearing permit applications to the DWER for the proposed roadworks and associated gravel pits in the region. The survey area for the proposed gravel pits covered by this assessment included a 200 m radius from the centre of each proposed gravel pit.

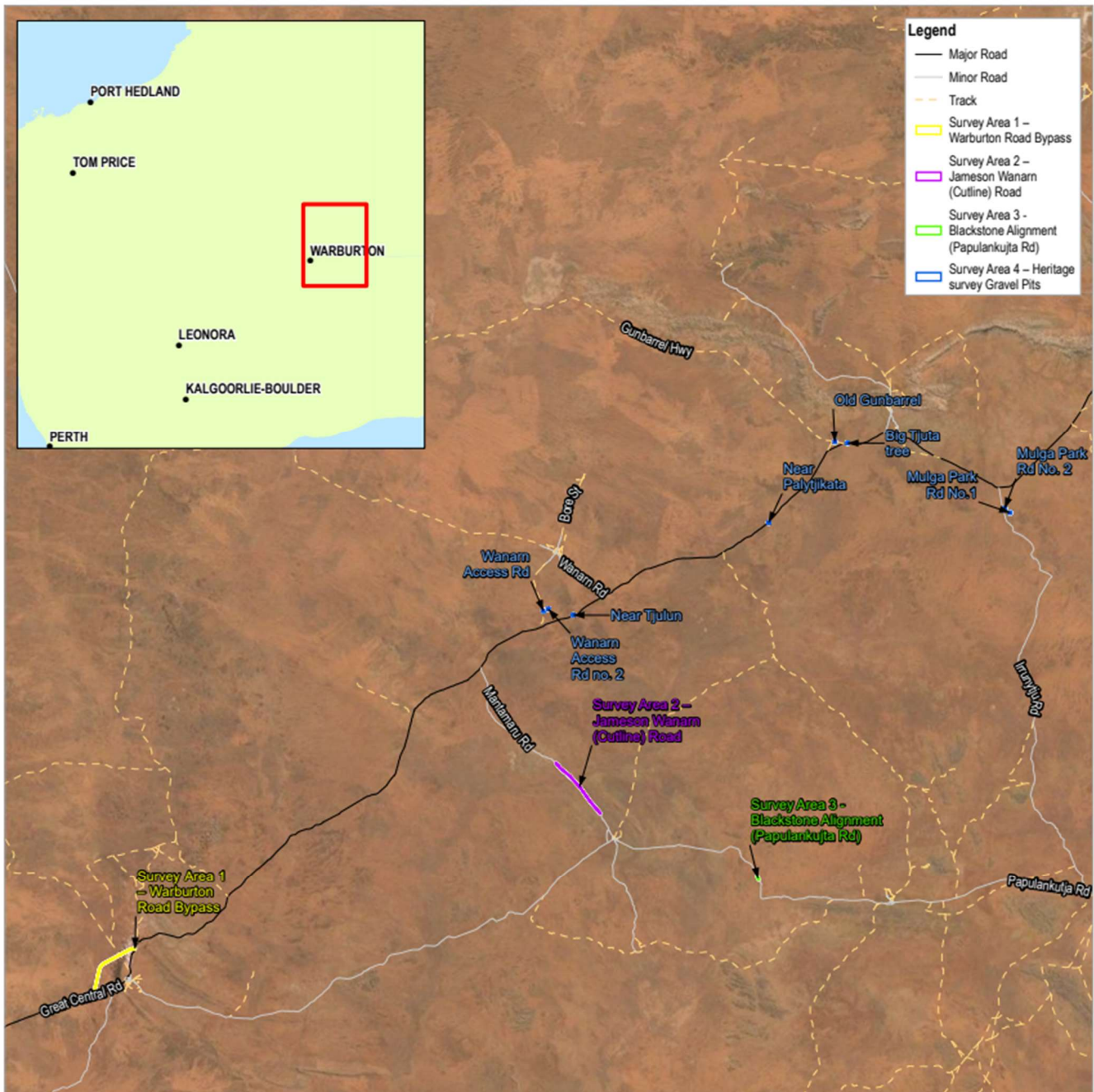


Figure 11. The flora and vegetation survey area in the Shire of Ngaanyatjaraku. The survey area for the proposed gravel pits covered by this clearing permit application is denoted in blue.

Methods of the survey include:

- Desktop assessment of the survey area
- Field survey conducted between 4 and 7 March of 2021:
 - Performed by GHD Senior Ecologist and Ecologist
 - In accordance with the Environmental Protection Authority (EPA) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)
 - Involved a combination of sampling quadrats, relevés, photographic reference points and walking traverses
 - Quadrats, measuring 50 m x 50 m each, were located within each identified vegetation unit
 - Significant flora identified in the desktop assessment were targeted
 - Identification of species well known to the Senior ecologist were identified in the field, all other species were collected, dried and processed in accordance with the WA Herbarium guideline
 - Specimens collected were identified using taxonomic literature, electronic keys, online electronic databases, comparison with herbarium specimens and consultation with taxonomic experts at the

WA Herbarium o The conservation status of all recorded flora was compared against the current lists available on FloraBase (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by DAWE (2021).

- o Nomenclature used in this report follows that used by the Western Australian Herbarium as reported on FloraBase (WA Herbarium 1998–).


- The location of the proposed gravel pit sites ranged from approximately 88 km south-west of Warakurna to 33 km south-east of Warakurna. Given the spatial distribution of the survey areas and small size of each site, there was a significant variation in species presence and dominance. Vegetation types were based largely on quadrat and releve samples and observations of surrounding vegetation, land systems and soil.




The survey effort has not been subject to any constraints, which affect the thoroughness of the assessment and the conclusions that have been formed



Results:

- The vegetation of the gravel pit sites ranged from Good to Excellent condition.
- Six vegetation types were identified and described for the eight gravel pits area. The dominant types generally consisted of various *Triodia* dominated hummock grasslands (VT05, VT06, VT07, VT08) on sandy/stony plains and *Acacia* (mulga) woodlands (VT01). A sand dune dominated by an *Aristida tussock* grassland was located along the boundary of one of the survey areas (Mulga Park Rd No.2) (VT09). A small stand of *Allocasuarina decaisneana* (Desert Oak) tall trees over *Triodia schinzii*/*T. basedowii* hummock grasslands (VT08) is present on the sandy open plains immediately adjacent to the sand dune (VT09)
- One species listed as threatened at the time of survey and two priority flora species were recorded.
- No threatened / priority ecological communities identified
- Gravel Pits (Wanarn access road No. 1 and 2 and near Tjulun): total of 82 flora taxa, comprising 81 native taxa and one introduced taxa
- Gravel Pits (Near Palytjikata, Big Tjuta Tree, Old Gunbarral): total of 305 flora taxa, comprising 303 native taxa and two introduced taxa
- Gravel Pits (Mulga Park Road No. 1 and No. 2): total of 300 flora taxa, comprising 298 native taxa and two introduced taxa
- None of the weeds recorded are listed as Declared Plants under the Biosecurity and Management Act 2007 or Weeds of National Significance

Table 1. Description of vegetation types recorded within the application area

Vegetation Type	Vegetation Association	Landform / Substrate	Representative Photograph
Acacia (Mulga) Woodland (VT01)	<i>A. aneura</i> , <i>Acacia sericophylla</i> and <i>A. minyura</i> low woodland to low open woodland/ shrublands over <i>Eremophila latrobei</i> subsp. filiformis scattered shrubs over <i>Triodia spp.</i> , <i>Aristida holathera</i> Domin var. <i>holathera</i> , and <i>Eriachne spp.</i> open hummock/tussock grassland over <i>Ptilotus xerophilus</i> , <i>Sida spp.</i> and <i>Brunonia australis</i> sparse forbland.	Sandy-loam plain/ hardpan / stony plain	

<p>Triodia Hummock Grassland (VT05)</p>	<p><i>Eucalyptus gamophylla</i>, <i>Eucalyptus</i> sp. Little Sandy Desert and <i>Acacia</i> spp. (mulga varieties) sparse mallee woodland/shrubland to isolated trees/shrubs over <i>Triodia basedowii</i>, <i>T. pungens</i> and <i>Aristida holathera</i> Domin var. <i>holathera</i> hummock grassland over <i>Haloragis odontocarpa</i>, <i>Brunonia australis</i> and <i>Euphorbia drummondii</i> sparse forbland</p>	<p>Red/brown sand plain,</p>	
<p>Triodia Hummock Grassland (VT06)</p>	<p><i>Hakea lorea</i>, <i>Eremophilla latrobei</i> subsp. <i>Filiformis</i> and <i>Dicrastylis gilesii</i> isolated shrubs over <i>Triodia scariosa</i>, <i>Aristida holathera</i> Domin var. <i>holathera</i> and <i>Amphipogon carcinus</i> F. Muell var. <i>carcinus</i> hummock grassland.</p>	<p>Stony slopes / plain</p>	
<p>Triodia Hummock Grassland (VT07)</p>	<p><i>Eucalyptus gamophylla</i>, <i>Acacia tetragonophylla</i> and <i>Hakea lorea</i> isolated trees /tall shrubs over <i>Eremophila forrestii</i> F.Muell. subsp. <i>forrestii</i>, <i>Halgania solanaceae</i> var. Mt Doreen (G.M. Chippendale 4206) and <i>Dicrastylis gilesii</i> sparse mid shrubland over <i>Triodia schinzii</i>, <i>T. scariosa</i> and <i>Aristida holathera</i> Domin var. <i>holathera</i> hummock grassland over <i>Waltheria indica</i>, <i>Bonamia erecta</i> and <i>Leptosema chambersii</i> sparse low shrubland/forbland.</p>	<p>Loamy sand plain, patchy stony surface</p>	

<p>Triodia Hummock Grassland (VT08)</p>	<p>Occasional patches of <i>Allocasuarina decaisneana</i> (Desert Oak) over <i>Hakea lorea</i>, <i>Acacia</i> spp. and <i>Grevillea eriostachya</i> sparse shrubland to isolated trees/shrubs over <i>Triodia schinzii</i>, <i>T. basedowii</i> and <i>Amphipogon caricinus</i> F. Muell. var. <i>caricinus</i> hummock grassland over <i>Sida</i> sp. Pilbara (A.A. Mitchell PRP 1543), <i>Bonamia erecta</i>, <i>Waltheria indica</i> sparse low shrubland.</p>		
<p>Aristida Tussock Grassland (VT09)</p>	<p><i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>, <i>A. coriacea</i> and <i>Grevillea juncifolia</i> Hook. subsp. <i>juncifolia</i> sparse tall shrubland over <i>Aristida holathera</i> Domin var. <i>holathera</i>, <i>Triodia schinzii</i> and <i>Setaria verticillata</i> tussock grassland over <i>Seringia exastia</i>, <i>Scaevola parvifolia</i> subsp. <i>pilbarae</i> and <i>Swainsona microphylla</i> sparse low shrubland.</p>	<p>Red/brown gravelly claypans.</p>	

Appendix F. Sources of information

F.1. 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)
- Offsets Register – Offsets (DWER-078)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Regional Parks (DBCA-026)
- Remnant Vegetation, All Areas
- 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:

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

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