



Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9300/1
Permit type:	Purpose permit
Applicant name:	Shire of Ngaanyatjarraku
Application received:	24 May 2021
Application area:	60.32 hectares of native vegetation within 75.4 hectare clearing footprint
Purpose of clearing:	Construction of a new gravel road for heavy vehicles to bypass Warburton
Method of clearing:	Mechanical
Property:	Lot 10 on Deposited Plan 93163, Warburton Lot 8 on Deposited Plan 91735, Gibson Desert South
Location (LGA area/s):	Shire of Ngaanyatjarraku
Localities (suburb/s):	Gibson Desert South; Warburton

1.2. Description of clearing activities

The application is to clear up to 60.32 hectares (ha) of native vegetation within a road development envelope measuring a total of 75.4 ha. The development envelope is required to create a 15.9 kilometre (km) long road corridor that comprises of a 16 metre (m) wide road and between 15 to 17 m wide road shoulders for associated table drain and offshoot drainage located intermittently along the road. The new gravel road is proposed to be built as an alternative to the existing road (Great Central Road) that traverses the Warburton Community in the Shire of Ngaanyatjarraku. The Great Central Road has been used by heavy vehicles, posing a danger to the pedestrian and small vehicle traffic in the Warburton Community areas. The heavy vehicle traffic is expected to increase substantially with the commencement of a new mining project in the area, increasing the danger. The new road is proposed to act as a Bypass to divert the heavy vehicles traffic to improve the safety of the Community (Figure 1-A) (Shire of Ngaanyatjarraku, 2021b).

The Bypass road project is part of a priority project by the State and Commonwealth governments. Main Roads WA will be constructing the road and the applicant is working with Main Roads WA to obtain the clearing permit. Road construction needs to begin in February 2022 to receive funding from the Federal government.

1.3. Decision on application

Decision:	Granted
Decision date:	19 January 2022
Decision area:	60.32 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 one submission was received. Consideration of matters raised in the public submission is summarised in Appendix B.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix C), relevant datasets (see Appendix G.1), the findings of a flora and fauna survey (see Appendix F), the clearing principles set out in Schedule 5 of the EP Act (see 0), 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 clearing is to improve community safety by diverting the passage of heavy vehicles around the Warburton community.

In particular, the Delegated Officer has considered the following:

- Clearing will remove one of the three *Goodenia virgata* (listed as Priority 2 by the Department of Biodiversity Conservation and Attractions (DBCA)) individuals found within the application area. *G. virgata* has been recorded on vegetation types that are well represented in the area. Given the broad distribution on the species in the Region, it is highly likely that the species is under surveyed (DBCA, 2021). The removal of one individual is considered unlikely to have detrimental impact on the conservation of the flora taxon. To mitigate further impact, a flora management condition is put in place to retain and protect the two *G. virgata* individuals occurring within the application area that can be avoided.
- Clearing will remove 138 *Seringia exastia* individuals from the application area. A further 141 individuals have been found in the immediate vicinity of the application area (GHD, 2021) and more individuals have been identified in the Shire. *S. exastia* is currently listed as Threatened under the *Environment and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016* (BC Act). The species is widespread throughout the Goldfields, Midwest, Pilbara and Kimberley regions and is likely to be under surveyed. Due to no plausible significant threats to the species, a delisting has been prepared and considered by the WA Threatened Species Scientific Committee (TSSC) (DBCA 2021). Given the above, and the distribution of the species in the area, authorised removal of *S. exastia* from the application area is unlikely to be significant in the context of the entire population, and impact on the threatened species is likely to be insignificant (DBCA, 2021). However, demarcation of the clearing area is required to prevent inadvertent removal of individuals present nearby.
- Clearing may result in land degradation due to wind erosion unless appropriate land management measures are put in place. Staged clearing and commencement of road works as soon as authorised clearing has been carried out can minimise the risk of wind erosion 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.

After consideration of the available information, advice from 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.

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

- avoid, 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 to avoid inadvertent clearing of priority and threatened flora individuals
- a 10 m clearing buffer around the two locations of the Priority 2 *Goodenia virgata* that can be avoided;
- ensure that no more than 60.32 ha is to be cleared within the application area
- staged clearing and commencement of road works and associated drainage within three months of the authorised clearing to minimise wind erosion
- undertake slow, progressive one directional clearing towards adjacent native vegetation to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity.

1.5. Site maps

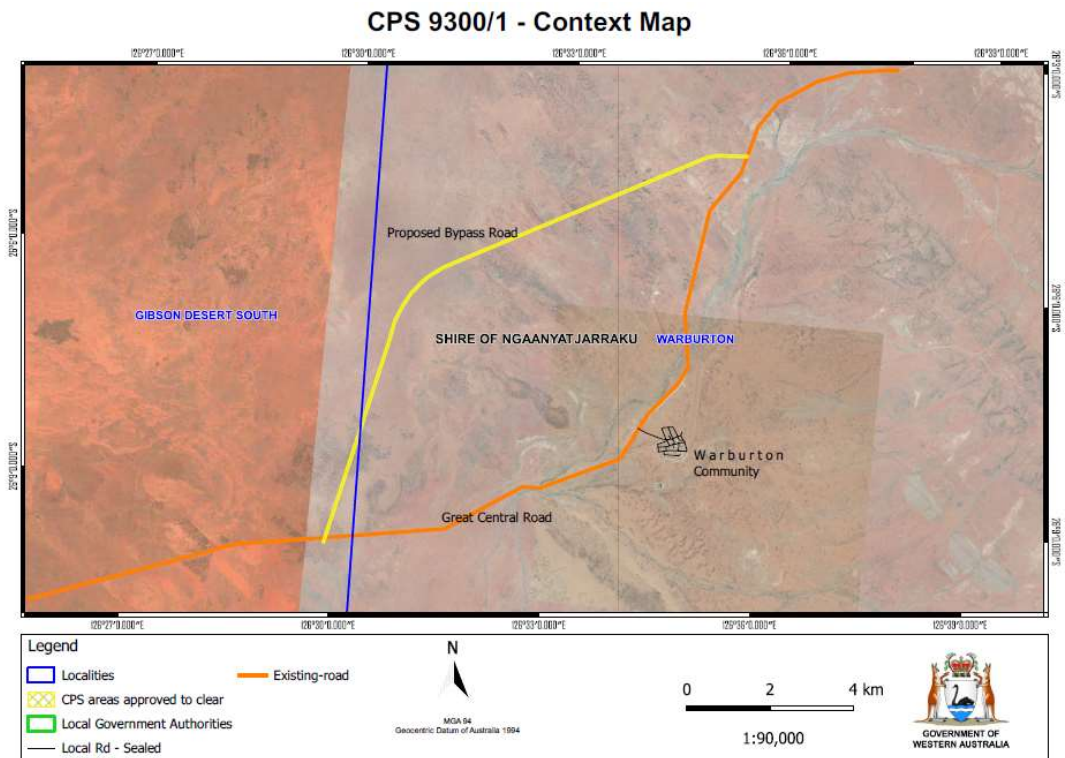


Figure 1-A. Context map of the application area

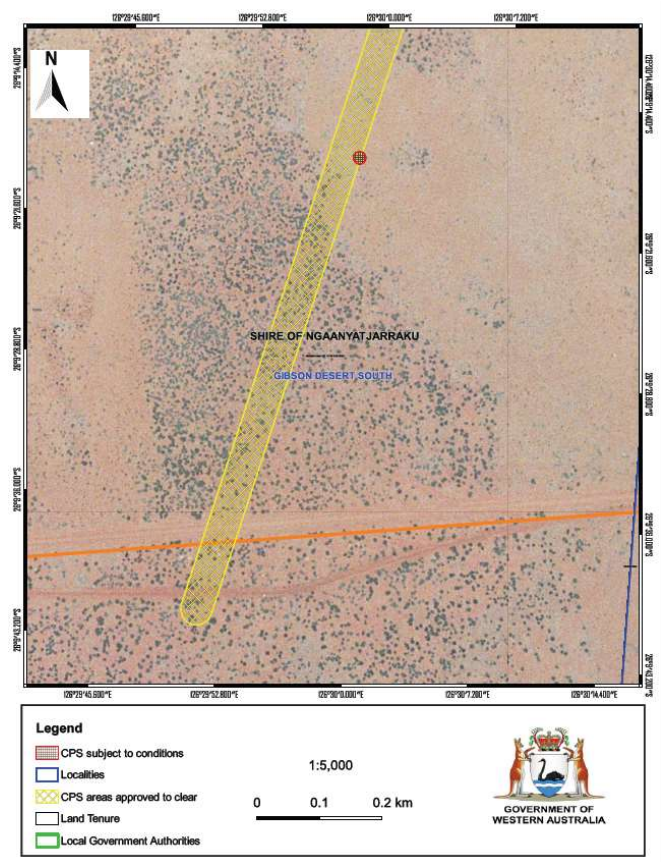


Figure 1-B Map A of the application area

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

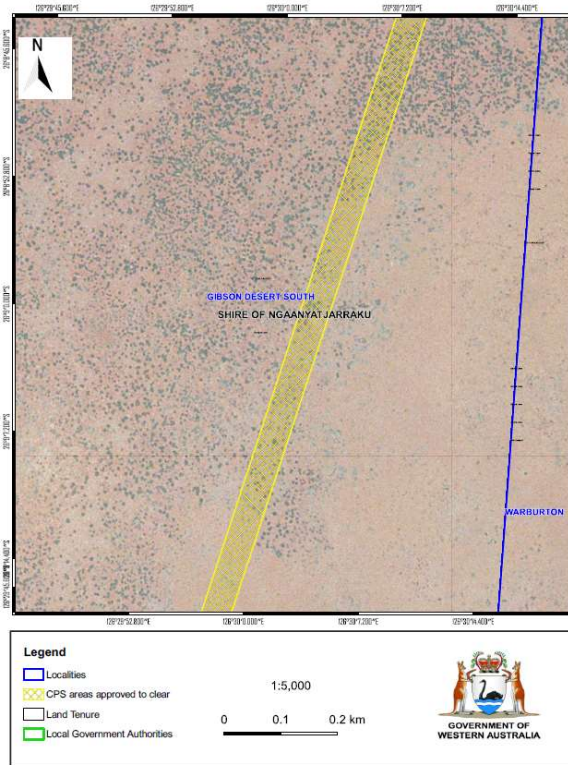


Figure 1-C Map B of the application area

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

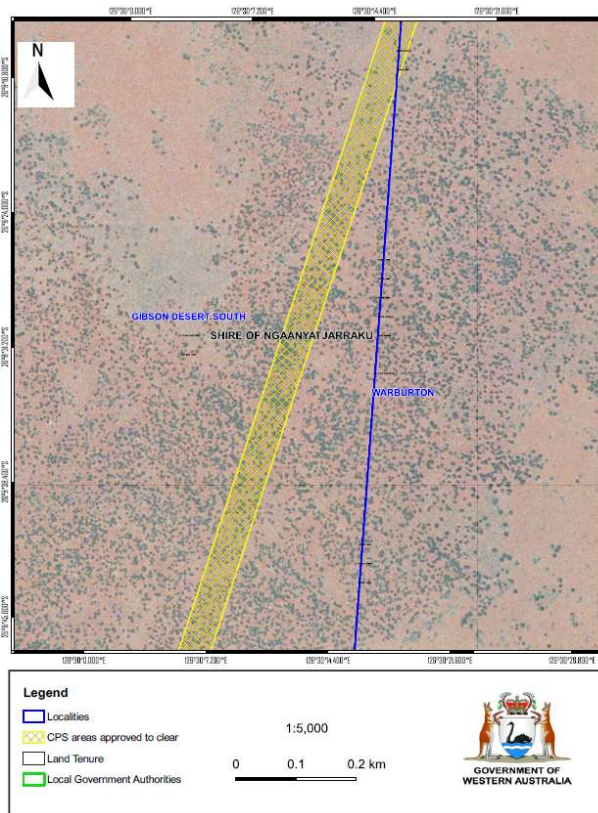


Figure 1-D Map C of the application area

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

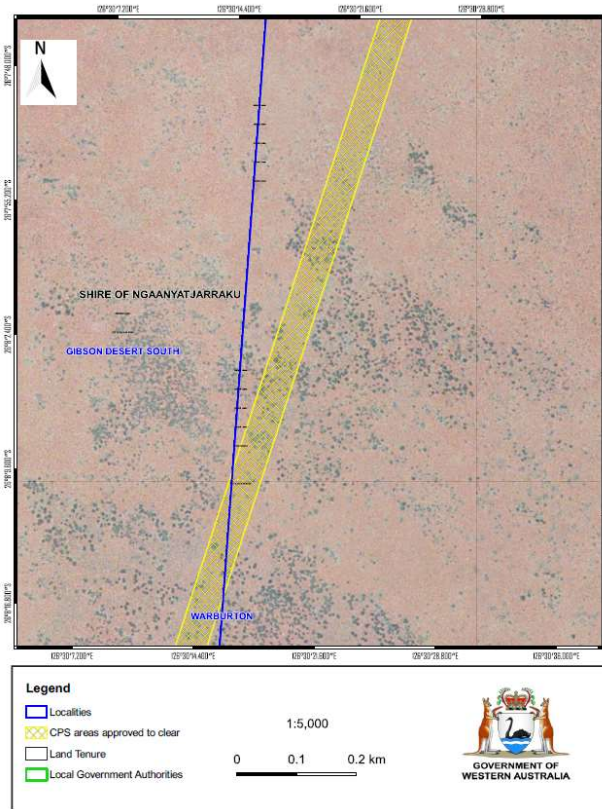


Figure 1-E Map D of the application area

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

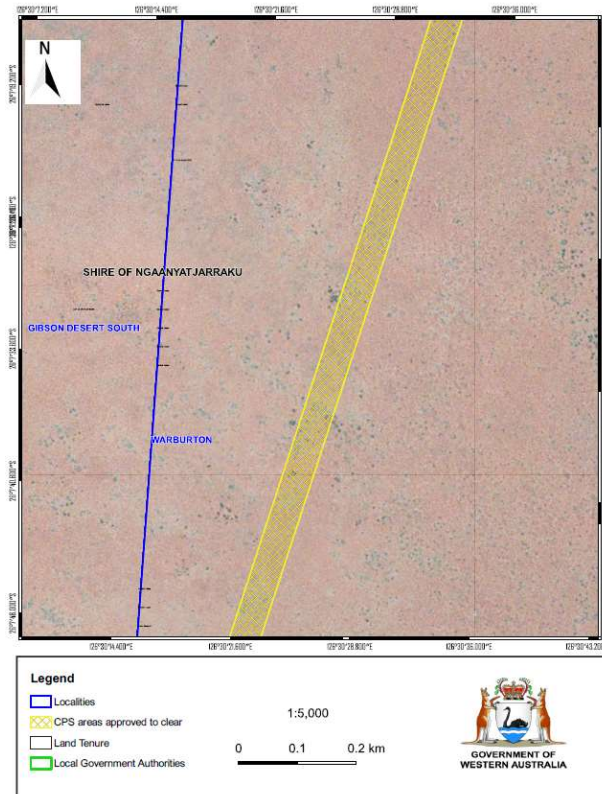


Figure 1-F Map E of the application area

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

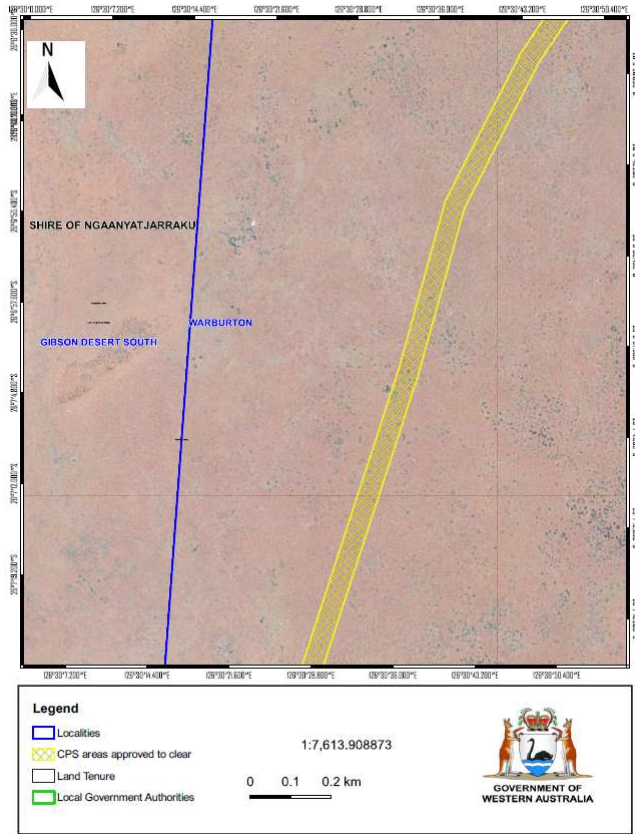


Figure 1-G Map F of the application area

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

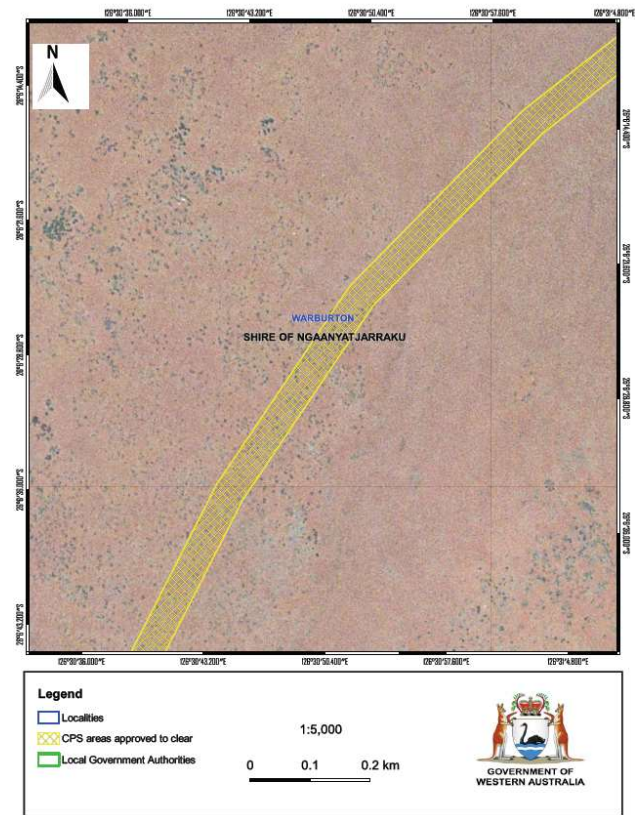


Figure 1-H Map G of the application area

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

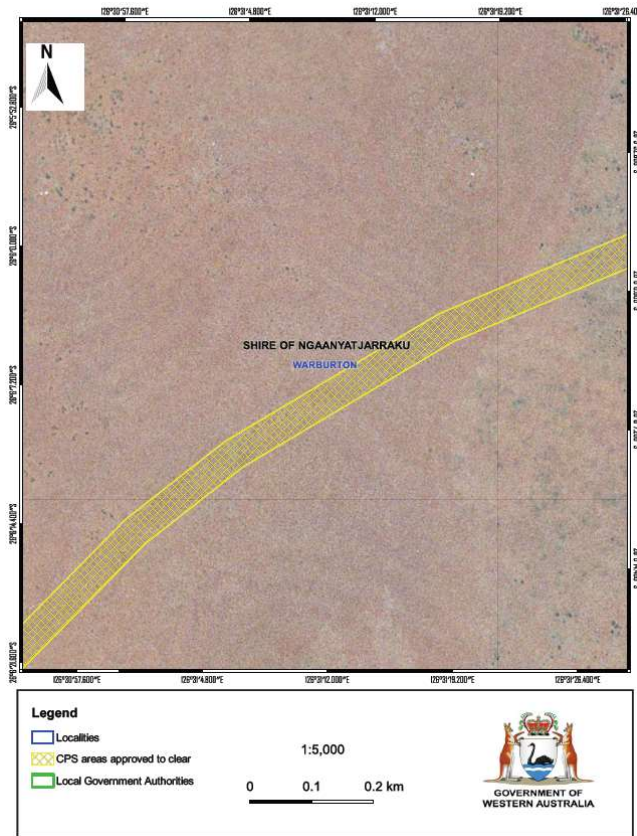


Figure 1-I Map H of the application area

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

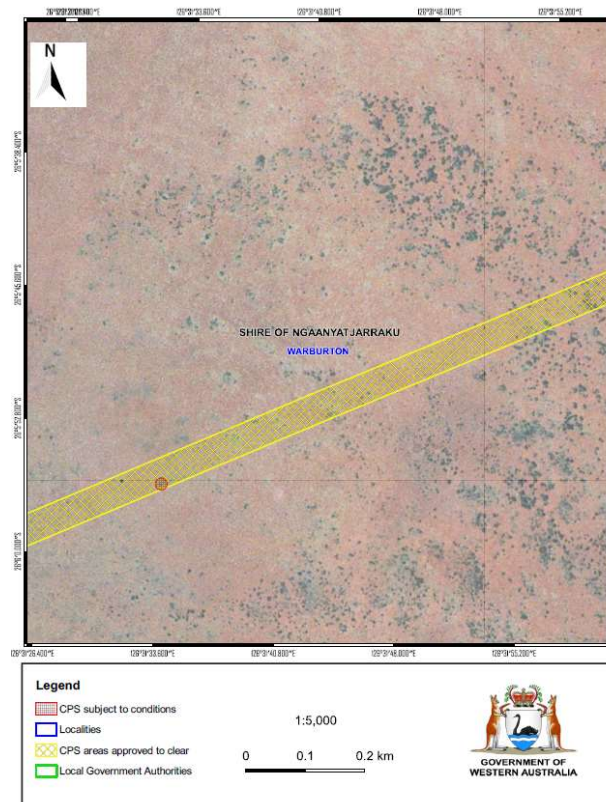


Figure 1-J Map I of the application area

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

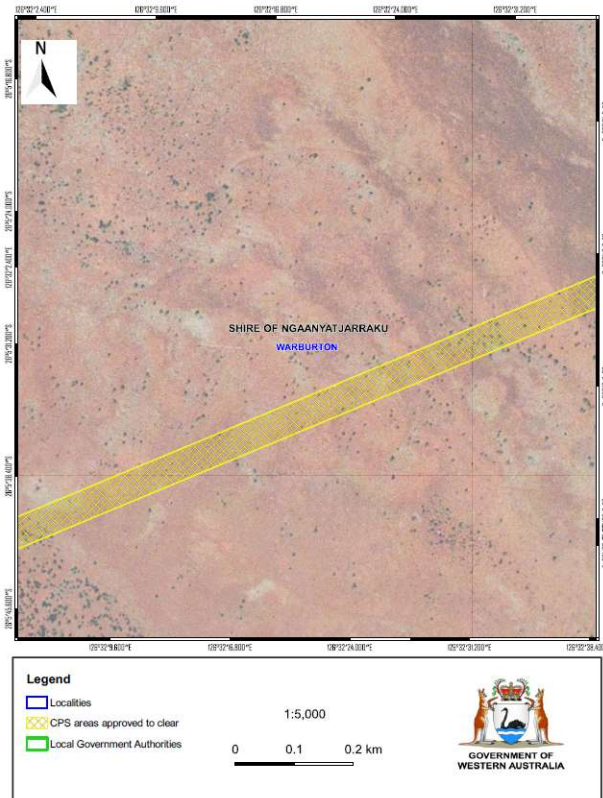


Figure 1-K Map I of the application area

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

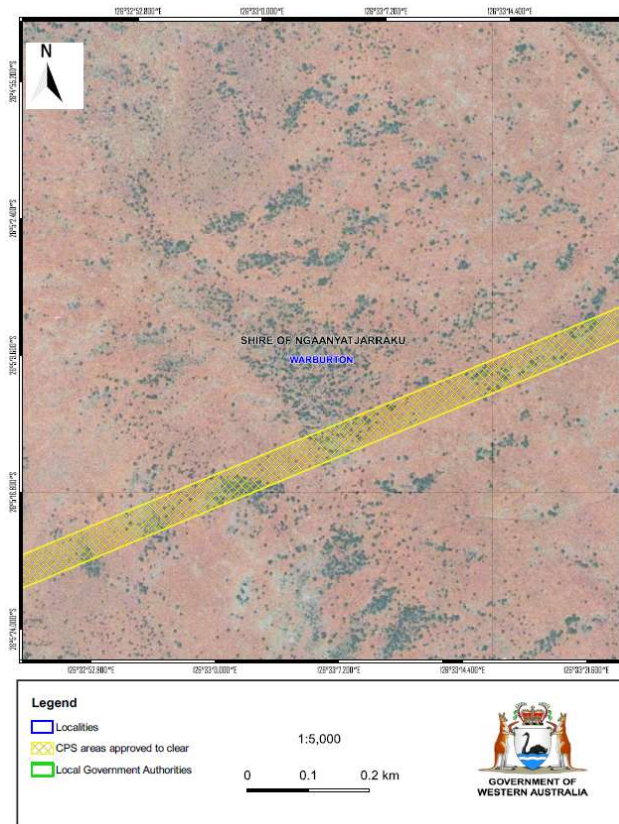


Figure 1-L Map K of the application area

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

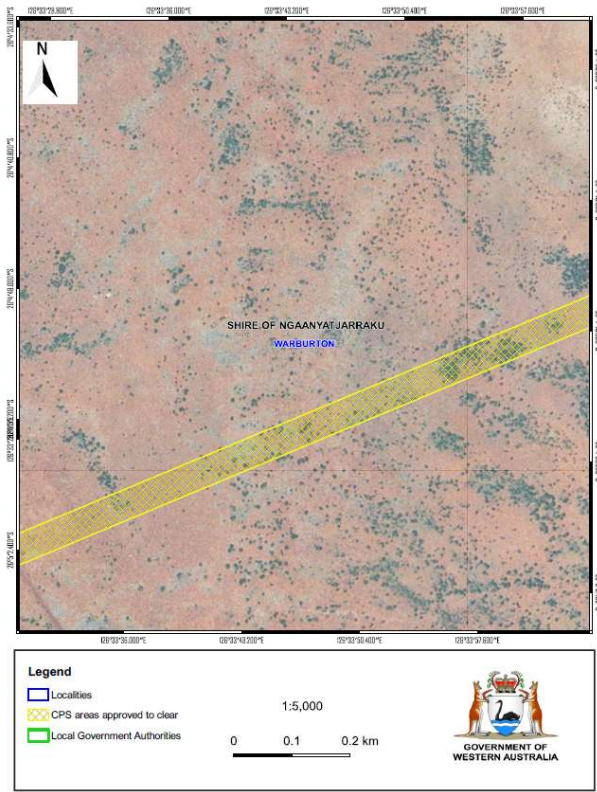


Figure 1-M Map L of the application area

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

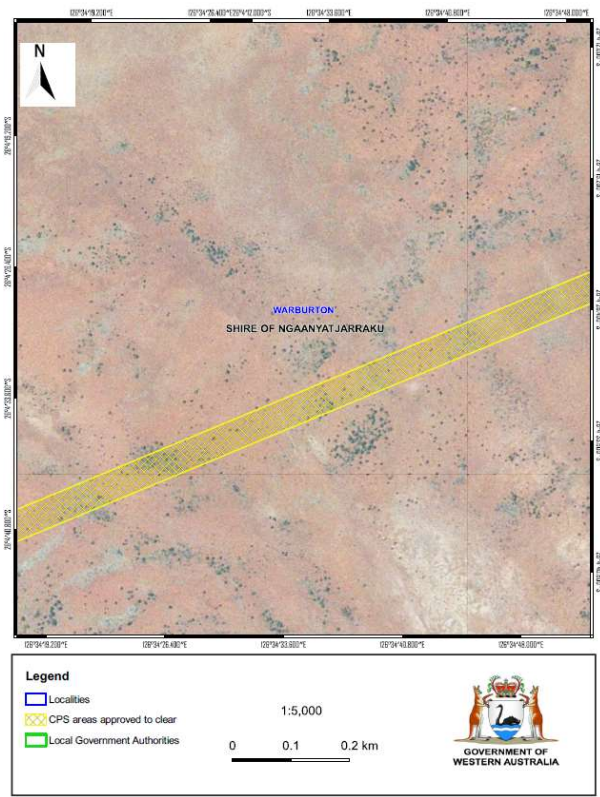


Figure 1-N Map M of the application area

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

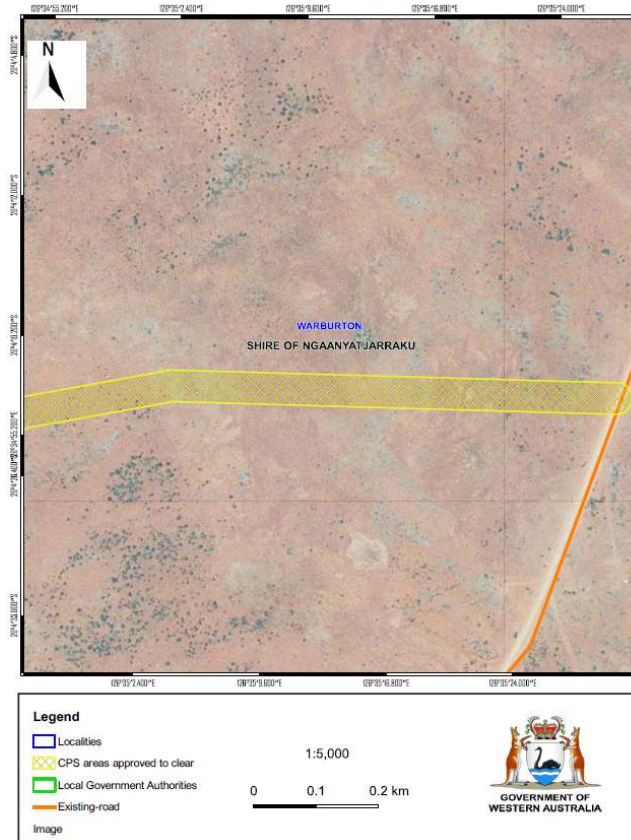


Figure 1-O Map N of the application area

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)
- *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)

Relevant policies considered during the assessment include:

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)
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

In response to DWER's preliminary assessment and request to minimise the extent and impact of clearing, the applicant provided commitment to reduce the clearing area by 20 percent (Shire of Ngaanyatjaraku, 2021b) from the original application area of 75.4 ha. Therefore, of the 75.4 ha clearing envelope proposed, only a maximum of 60.32 ha will be cleared. Noting that offshoot drainages will only be constructed intermittently along the road, further minimisation is also committed by limiting clearing for the offshoot drainages to the sites where the offshoot drainages are required. In addition, the applicant has committed to avoid clearing in areas where two Priority 2 flora individuals are located (Figure 1-B and 1-J).

Given the above, 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.

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix C) 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 **Error! Reference source not found.**) identified that the impacts of the proposed clearing present a risk to conservation significant flora and fauna and / or land and water 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. Biodiversity - Clearing Principles (a) and (b)

Assessment

Flora

Assessment of available databases indicates that the local area (20 km radius from the application area) does not contain many records of conservation significant flora and fauna. The fauna records available are mostly of historical records, and only one flora, *Seringia exastia* (Threatened under EPBC Act and BC Act), has been recorded from the local area. This indicates that the Central Ranges bioregion, or the Mann-Musgrave Block subregion, is poorly surveyed. The vegetation in the 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 has been undertaken over the application area (GHD, 2021). The survey broadly describes the dominant vegetation types as Mulga (*Acacia spp.*) woodlands, *Triodia* hummock grasslands, and *Aristida* tussock grasslands, with 174 native taxa and four introduced taxa (GHD, 2021).

Whilst the survey did not identify any threatened or priority ecological communities, it identified *Seringia exastia* and *Goodenia virgata* (listed by DBCA as Priority 2 flora) within the application area and immediate vicinity (Figure 2). Impacts of clearing on *S. exastia* is further discussed in Section 3.2.2.

G. virgata is a perennial herb, ascending to erect to 0.4 m high with yellow flowers. It flowers in July and is known to grow in association with red sandy loam near salt pans (WA Herbarium 1998-). According to Naturemap (DBCA 2007-) *G. virgata* is known from nine records in Western Australia and the Northern Territory. It has been recorded across the Arid Interior, including the Little Sandy Desert, the Great Sandy Desert, the Gibson Desert and the Gascoyne IBRA Regions. There are currently no known records from the Mann-Musgrove Block IBRA subregion where the application area is located and was therefore not targeted in the flora survey. Three *G. virgata* individuals, however, were opportunistically identified within the southern part of the proposed clearing area during the survey. One individual is located in the middle of the proposed new road alignment, and two individuals are located approximately 1.5 m and 8 m from the edge of the proposed development footprint. Clearing for the road project could remove these individuals.

Due to the lack of systematic biological surveys within the Central Ranges Region, advice from DBCA was sought in regard to the conservation values and potential impact of clearing the *G. virgata* individuals. DBCA (2021) advised that the species was recorded on vegetation types that are well represented in the area. Given the broad distribution of the species in the central regions, it is highly likely to be under surveyed, and more individuals could be present in

the area. Nevertheless, the DBCA recommended avoidance of *G. virgata* individuals, as they currently represent the only known records within the Central Ranges IBRA Region.

Given the Flora and Vegetation Survey (GHD, 2021) covered only the application area (the proposed road corridor), and that other *G. virgata* individuals may occur outside of the corridor, realignment of the proposed road corridor outside of the application area may contain a risk of inadvertent loss of additional individuals that may be present in the unsurveyed area. Minimisation of impacts can be done by avoiding clearing of as many individuals recorded as possible.

Avoidance of an individual located in the middle of the proposed road alignment will require a significant realignment, into area previously unsurveyed. Avoidance of the two individuals located within 8.5 m from the edge of the road realignment is achievable. Retention of two out of the three known individuals is considered adequate to minimise impacts to the species and will ensure records of this species remain in the bioregion. The proposed clearing of the two individuals is not likely to impact the conservation values of this Priority 2 species. Placing buffers around the retained individuals can further minimise impacts.

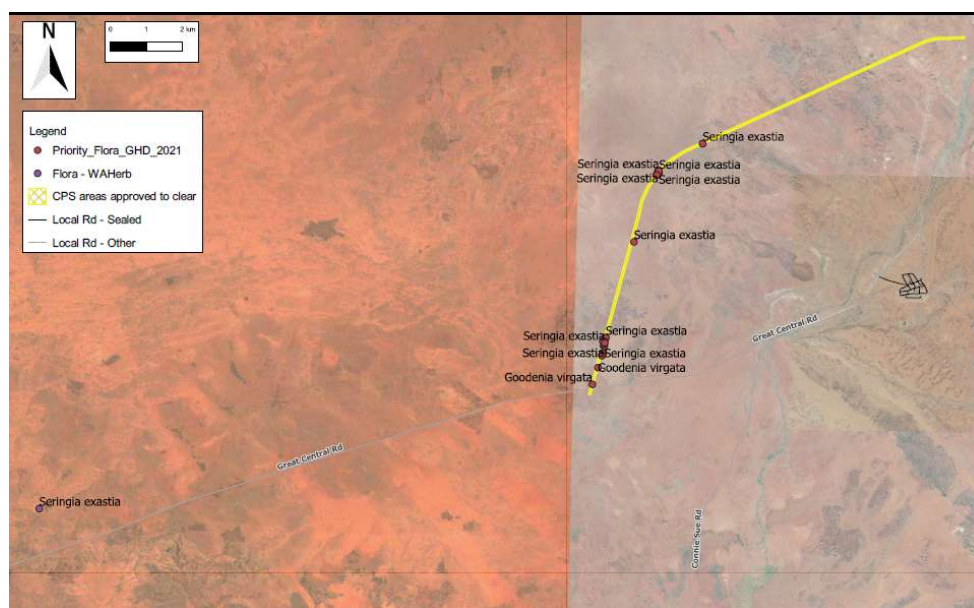


Figure 2. Priority and Threatened Flora within the application area (GHD, 2021) and the local area (WA Herb).

Clearing may introduce and spread weeds into the adjacent area, particularly given the sandy nature of the soils. The application of weed management measures may mitigate this risk.

Fauna

As mentioned above, most of the fauna records are historical (See Appendix C). In the absence of a fauna survey, however, the presence of conservation significant fauna individuals in the area cannot be ruled out. Of the recorded fauna species, the Vulnerable *Liopholis kintorei* (great desert skink) is the most likely to occur in the local area. The most recent record this species in the local area was made in 2013, approximately 6 km from the application area.

The great desert skink is a burrowing skink well known and important to Aboriginal people throughout the western deserts region of Australia for lore and as a food source (McAlpin, 2001). It is characterised by its large size (weighing up to 350 grams), blunt head, smooth scales, pale fawn to rich reddish brown dorsal colouring and its contrasting creamy or yellow ventral surface. The fauna species is vulnerable to predation by feral cats, foxes and dingoes. Its main distribution area includes the Ngaanyatjarra Indigenous Protected Area (TSS, 2016), which has the grasslands vegetation preferred by the skink. Given the above, dispersing great desert skink individuals may forage in the area. However, given the vast area of similar and uncleared vegetation surrounding the application area, it is unlikely that the application area comprises significant habitat for this species. Impact of clearing on any individuals present can be minimised by conducting the clearing in stages, slowly and in the direction toward the adjacent vegetation to allow any individual present to disperse into nearby vegetation ahead of the clearing.

Conclusion

Based on the above assessment, the proposed clearing will result in the removal of one *G. virgata* individual and may introduce and spread weeds into the adjacent vegetation. The proposed clearing, however, is unlikely to result

in significant residual impacts on the conservational values of the priority flora species or the habitat values of the nearby vegetation. The potential impacts of the proposed clearing on the remaining *G. virgata* individuals, adjacent vegetation and any fauna individuals that may be present at the time of clearing can be managed by implementing flora, fauna and weeds management practices.

Conditions

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

- Demarcation of the area within 10 m of two *G. virgata* individuals found within the application area ahead of clearing to avoid inadvertent loss of the individuals.
- Instate a clearing buffer area of 10 metres around two *G. virgata* individuals (outlined red in Figure 1-A and 1-J).
- Slow directional clearing to allow any fauna individuals present to move into adjacent vegetation ahead of the clearing activity will minimise impact to individuals
- Implement weed management measures to prevent the introduction and spread of weeds into the adjacent vegetation

3.2.2. Threatened Flora species - Clearing Principle (c)

Analysis

Available database indicates that a record of *Seringia exastia* has been known from the local area. The record was made in 2000 from approximately 14 km south-west of the southernmost part of the application area. *S. exastia* (previously known as *Keraudrenia exastia*) is an erect, compact, multi-stemmed shrub 0.7 to 0.9 meters high. The flowers are purple and appear from April and December (WA Herbarium, 1998-). The species is listed as Threatened under the BC Act and Critically Endangered under the EPBC Act. Of the *Seringia* taxa, *S. exastia* was a species only known from the Kimberley Region, whilst *S. elliptica* is common and widespread throughout the Pilbara region, central WA and the Northern Territory and extends into South Australia. A recently completed taxonomic study that assessed genomic and morphological characters in several *Seringia* taxa (Binks et al., 2020) has concluded that *S. exastia* and *S. elliptica* are the same species. The taxonomy of the genus has been revised to synonymise *S. exastia* and *S. elliptica* under the oldest valid name of *S. exastia*. Following the taxonomic revision, *S. exastia* is now considered common and widespread (DBCA, 2021). Advice from the DBCA states that a nomination to delist the species due to no plausible significant threats to the species has been prepared and considered by the WA Threatened Species Scientific Committee (TSSC).

In the Flora and Vegetation Survey (GHD, 2021), *S. exastia* was recorded in abundance in the application area and immediate vicinity. The species was observed to be a commonly occurring shrub within the *Triodia* hummock grassland sandplains. More than 300 individuals were identified from the survey, 138 of which are located within the application area. The proposed clearing, therefore, may remove the 138 individuals, or a maximum of 46 percent of known individuals. Given that the species and region are poorly surveyed, it is likely that more individuals occur outside of the surveyed areas. Removal of these individuals, therefore, is not expected to be significant within the context of the entire population. However, until changes are officially made to the threatened species list, *S. exastia* is still listed as threatened flora, and removal of individuals will still require an authorisation to take under section 40 of the BC Act (DBCA, 2021). DBCA advised that following the standard process of application made to DBCA's Species and Communities Program, there should be no impediments to granting authorisation. DBCA further advised that the standard targeted surveys are not required to be undertaken to inform the threatened flora authorisation impact assessment for *S. exastia*.

Conclusion

Based on the above analysis, an authorised removal of 138 *S. exastia* individuals is considered unlikely to significantly impact on the population, within the context of the entire population. Weed management measures will minimise impacts to the surrounding vegetation where *S. exastia* individuals remain post clearing.

Conditions

To minimise and mitigate potential impacts on the flora species, the following condition is required with the Permit.

- Implement weed management measures to prevent the introduction and spread of weeds into the adjacent vegetation

3.2.3. Land and water resources - Clearing Principles (g)

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. With limited rainfall and

high evaporation, the risk from water erosion is low. However, where rainfall is sufficient, 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).

Clearing may exacerbate the risk of land degradation due to wind erosion and sediment transport. Noting the linear nature of the proposed clearing area within the context of an extensive vegetation area which is largely uncleared, the proposed clearing is not expected to lead to significant land degradation, provided appropriate land management measures are applied during clearing and in post clearing. The table drains and associated offshoot drainages that are to be constructed alongside the road could minimise the risk associated with surface water runoff.

Conclusion

Given the above analysis, the proposed clearing is considered unlikely to result in appreciable and long-term land degradation. Appropriate land management measures can minimise and mitigate the potential impact.

Conditions

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

- Commencement of the construction of the road and associated drainages no later than two (2) months after undertaking the authorised clearing activities to reduce the potential for wind erosion.

3.3. Relevant planning instruments and other matters

Lots 8 and 10 within which the application area is located, are vested with the Department of Indigenous Affairs, 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 includes the Ngaanyatjarraku Perpetual lease M350144, and Reserves 17614 and 21471 which are proclaimed under Part III of the *Aboriginal Affairs Planning Authority Act 1972 (WA)*, has provided support for the Warburton Bypass Road works for the use and benefit of the Ngaanyatjarra people on the leased land (NgCL, 2021).

Several Aboriginal sites have been mapped within the vicinity of the application area. These sites include the Garu Parkaparka (Legacy ID W00250) and Warupuyu (Legacy ID W00247) sites located at the northern part of the application area (DPLH-001). A heritage clearance of 300 m has been included in the general planning for the road corridor. The Ngaanyatjarra Council has appointed Mr David Brooks, the principal anthropologist of the council, to perform a community consultation relevant to the heritage sites within the application area in October 2019. The consultations, involving two senior traditional owners from Warburton, has confirmed that the proposed route of the Bypass Road has heritage clearance and that there are no heritage constraints on the construction proceeding as proposed (Brooks, D., 2019).

The applicant is in the process of acquiring the authorisation to take Threatened flora species under the Section 40 of the BC Act.

Although the Shire of Ngaanyatjarraku applies for the clearing permit, construction of the proposed new Bypass road will be carried out by Main Roads Western Australia (MRWA). The project is a priority project of the State of Western Australia and funded by the Federal Government.

End

Appendix A. Additional information provided by applicant

During assessment, DWER provided the applicant with the results of a preliminary assessment on the potential impacts of the proposed clearing. Additional information was requested of the applicant to address a number of concerns arising from the preliminary assessment and a public submission (DWER, 2021). The applicant has addressed the concerns as follows

Summary of comments	Consideration of comment	Information provided by the applicant (Shire of Ngaanyatjarraka (2021b; 2021c), GHD (2021b; 2021c))
Implementation of the mitigation hierarchy is required to avoid excessive environmental impacts resulting from the proposed clearing	The amount of clearing for the road work equates to clearing width of approximately 50m, which is larger than the width typically seen for this type of gravel road (20-30 m).	<ul style="list-style-type: none"> • The application is for a purpose permit to allow for flexibility in the location of clearing approved. • The actual width of clearing is not intended to be 50 m. The actual clearing width will be less than 50 m. In most part, the clearing width would be 16 m for the road and a further 15 to 17 m from the road edge at places where offshoot drainages need to be constructed. • The original proposed clearing footprint of 75.4 ha is intended to provide the flexibility within the road corridor in the dimensions and placement of surface water offshoot drainages, and the number and locations of truck turnaround areas. • The applicant is committed to reduce the actual clearing area to a maximum of 80 percent of the original application area (60.32 ha)
Evidence of efforts taken to avoid, minimise and mitigate clearing of flora of conservation significance are required.	The Flora and Vegetation Survey performed in the area (GHD, 2021) recorded 300 individuals of threatened species <i>Seringia exastia</i> and 3 individuals of Priority 2 <i>Goodenia virgata</i> in the application area and surround. If realignment to avoid clearing of these individuals is not possible, authorisation from the Minister for Environment under section 40 of the BC Act will be required prior to a clearing permit being issued.	<ul style="list-style-type: none"> • Impacts of clearing to <i>Seringia exastia</i> are not considered significant given the recent taxonomic revision identifying this species as a common and widespread species. Based on advice provided by the DBCA, a nomination to delist the species has been prepared and waiting approval. Notwithstanding this, the authorisation to clear Threatened Flora under Section 40 of the BC Act is being applied for with DBCA. • A 50 m buffer is not possible around the Priority 2 <i>Goodenia virgata</i> individuals occurring within the road corridor. However, the Shire is committed to avoid the records where possible. In addition, the species is likely to be more common in the poorly surveyed surrounding region.

Appendix B. Details of public submissions

Summary of comments	Consideration of comment
With an average width of 47 m corridor, the proposed clearing area is excessive. Most other roads in this area are 20-30 m width including maintenance zone.	<p>The applicant was requested to provide clarification on this subject (DWER, 2021a). The applicant clarification relevant to the matters included in the information provided to DWER as presented in Appendix A, above.</p> <p>DWER considers that the applicant explanation was sufficient in addressing the reasoning behind the larger clearing envelope proposed. DWER also considers that the applicant has made sufficient efforts in avoiding, minimising and mitigating the extent of clearing and associated potential impacts, which is discussed in Section 3.1 and Appendix A above.</p>
No road design documents have been provided by the proponent that would justify such a large clearing envelope.	<p>The applicant provided comments on the matter as follows (Shire of Ngaanyatjarraka (2021b; 2021c).</p> <ul style="list-style-type: none"> • The applicant is a small, remote aboriginal Shire with very limited funding. The Shire does not have the capability or funding to have a full construction drawing or detailed plans. • Due to water scarcity in the region, the road construction would be performed in a 'dry construction' manner, that the dimension and location of the offshoot drainages are not known at the time of the application being made. The offshoot drainages in the area may trail off for another 15-17 m from the edge of the 16 m wide road. In turn, the location of truck turnaround is also yet to be decided. • The larger clearing envelope was proposed to allow for flexibility in the dimension, number and locations of the offshoot drainages and truck turnaround areas. • The actual clearing area will be smaller than the proposed clearing envelope. <p>DWER considers that the applicant explanation was sufficient in addressing the reasoning behind the larger envelope proposed and the absence of road design documentation from the supporting information with the application.</p>
It is noted that the proposed route does not approach within 3 km of any heritage locations and, often, heritage sites are much more distant than that. Therefore, there is ample scope to vary the routing of the road to avoid impacts on the conservation-significant flora which have been observed (GHD 2021).	<ul style="list-style-type: none"> • The flora of the region is poorly surveyed. The flora survey (GHD, 2021) opportunistically recorded the conservation significant flora occurring in abundance within the <i>Triodia</i> hummock grassland vegetation type, which is well represented in the area. Therefore, the flora species are likely to be common in the region. Given that the survey area was limited to the proposed road corridor and immediate vicinity, realignment of the proposed road may result in the clearing of conservation significant flora individuals outside of the surveyed area, whose taxonomy and abundance are unknown. • Avoidance of Priority 2 <i>Goodenia virgata</i> individuals is put as a condition on the Permit. Ten metre buffers around two <i>G. virgata</i> individuals are required.
The study used as evidence for delisting of <i>Seringia exastia</i> was not tested. It is possible that the (<i>Seringia exastia</i>) in the study area is substantially different to warrant the highest conservation consideration.	<p>To address the matter in relation to the delisting of <i>Seringia exastia</i>, advice from DBCA was requested (DWER, 2021b). The advice (DBCA, 2021) is as follows:</p> <ul style="list-style-type: none"> • Both <i>Seringia exastia</i> and <i>S. elliptica</i> are now considered one species following a taxonomic review in 2020 (Binks et al., 2020). Prior to this review, <i>S. elliptica</i> was a widespread species recorded throughout the Goldfield, Midwest, Pilbara and Kimberley Regions and <i>S. exastia</i> was only recorded in the

Summary of comments	Consideration of comment
	<p>Kimberley Region, approximately 900 km northwest of the application area. Due to the distance between the survey area and populations determined to be threatened flora prior to the taxonomic review, it is highly unlikely that the plants recorded within the application area represent plants identified as <i>S. exastia</i> before the taxonomic review. Regardless, both groups are now listed as the same species, and the highest conservation consideration is currently the listing of threatened.</p> <ul style="list-style-type: none"> • A nomination to delist the species due to no plausible significant threats to the species has been prepared and considered by the WA Threatened Species Scientific Committee (TSSC). DBCA anticipate that at the next TSSC meeting, recommendations will be made to the Minister to delist. Although some loss of plants is likely to have occurred and will continue to occur during mining and road works in some parts of the species' distribution, this is not expected to be significant in the context of the entire population. <p>The taxonomic identification of <i>Seringia exastia</i> specimen from the study area was performed by a GHD Senior Botanist / Taxonomist at the Western Australia Herbarium. The identification was confirmed by an Taxonomist of the Western Australia Herbarium (GHD 2021 b, c).</p>

Appendix C. Site characteristics

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

C.1. Site characteristics

Characteristic	Details
Local context	<p>The area proposed to be cleared is in the extensive land use zone of Western Australia, approximately 6 kilometres from Warburton, in the Central Ranges IBRA bioregion. It is an approximately 15-kilometre-long by 50-metre-wide corridor that bypasses to the west of the Warburton township.</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>
Ecological linkage	There are no ecological linkages mapped within this bioregion.
Conservation areas	The Gibson Desert Nature Reserve (R 34606) is located approximately 80 km north-west of Warburton.
Vegetation description	<p>Vegetation mapping of the region is that of a broad scale (1:1,000,000) and was completed at association level (Beard 1974). The mapping indicates that five vegetation associations occur across the survey area:</p> <ul style="list-style-type: none"> • Low woodland; mulga (<i>Acacia aneura</i>) (vegetation association 18) • Low woodland; mulga between sandridges (vegetation association 19) • Hummock grasslands, shrub steppe; acacia and grevillea over <i>Triodia basedowii</i> (vegetation association 95) • Shrublands; mallee scrub (Great Victoria Desert) (vegetation association 45) • Mosaic: Medium sparse woodland; desert oak between sand dunes / Hummock grasslands, grass steppe; hard spinifex, <i>Triodia basedowii</i> (vegetation association 230). <p>The current extents of vegetation associations are greater than 99 per cent of the pre-European extent at all scales (e.g. State, IBRA Sub-region and Local Government Area (LGA))</p> <p>The Flora and Vegetation survey (GHD, 2021), identified that the vegetation in the northern half of the application area is dominated by tussock grasslands / forblands on open stony claypans with isolated trees to small patches/groves of mixed <i>Acacia</i> and <i>Hakea</i> species (VT03). Vegetation cover ranged from bare patches to a moderately dense grass and herb layer. The middle section of the alignment consists of hummock grasslands dominated by <i>Triodia schinzii</i> on open loamy/sandy plains with some surface gravel (VT02). The southern section of the alignment consists of mulga woodlands over tussock/hummock open grasslands on sandy/loamy hardpans and stony plains (VT01). Dominant <i>Acacia</i> species include <i>Acacia aneura</i>, <i>A. sericophylla</i> and <i>A. minyura</i>. (GHD, 2021). These findings are consistent with the mapped vegetation types and associations explained above.</p> <p>Representative photographs of the vegetation types are presented in Appendix F.</p>
Vegetation condition	<p>Vegetation condition was assessed using the condition rating scale adapted by the EPA (2016) for the Eramaeen and Northern Botanical Province.</p> <p>GHD (2021) survey assessed the vegetation to be largely in Excellent to Very Good condition with some vehicle tracks and patches of weed species present, in particular <i>Cenchrus ciliaris</i>.</p> <p>The full Trudgen (1991) condition rating scale is provided in Appendix E. Representative photos are available in Appendix F.</p>
Climate and landform	<p>The climate of the Central Ranges bioregion is hot and arid.</p> <p>The average annual rainfall at Warburton Airfield is 243.8 mm, rainfall predominantly occurs between December and March, derived from summer storms.</p>

Characteristic	Details
	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).
Soil description	The soils and landforms within the application area are mapped (Department of Primary Industries and Regional Development, 2021) as: <ul style="list-style-type: none"> • 619My109 (northern 2/3 of application area) - Outwash plains and dissected fan and terrace formations flanking ranges of sedimentary and some metamorphic, volcanic, and granitic rocks • 192AB47 (southern 1/3 of application area) - Plains and dunes--longitudinal and ring dunes with interdune corridors and plains; occasional salt pans. The soils within the application area consist of red sandy earths, red deep sands and red loamy earths (Tille, P.J., 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 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. (GHD, 2020). There are no vegetation types within the survey areas which are considered representative of riparian vegetation (GHD, 2020).
Hydrogeography	The area proposed to be is within the East Murchison Groundwater Area proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> .
Flora	More than 300 individuals of <i>Seringia exastia</i> , listed as Threatened under EPBC and BC Acts, were identified within the application area and adjacent areas (GHD, 2021). Of these, 138 individuals are located within the application area. Three individuals of <i>Goodenia virgata</i> , listed as Priority 2 flora by DBCA, are also identified within the application area.
Ecological communities	There are no mapped threatened (TEC) or priority (PEC) ecological communities within 100km of the area proposed to be cleared. The GHD (2020) survey found no TEC or PEC within the survey areas and reported it to be unlikely that any of the vegetation communities present are restricted only to the survey area.
Fauna	There are at least 13 records of fauna of conservation significance (Appendix C.4). Many of the records were historical. None of these records were from within the application area.

C.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 - Mann-Musgrave Block subregion (Giles Botanical District)	4,701,519.37	4,700,206.00	99.97	-	-
Local area (calculation - delete if not required)					
20km radius	185,051.75	185,051.75	~100	-	-

*Government of Western Australia (2019a)

**Government of Western Australia (2019b)

C.3. Flora analysis table

Priority and threatened flora species recorded within 20 km radius from the application area and identified by the Flora and Vegetation Survey (GHD, 2021) are listed below.

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 -20 km radius (WA Herbarium)	Number of individuals (GHD, 2021)	Are surveys adequate to identify? [Y, N, N/A]
<i>Seringia exastia</i>	T	Y	Y	Y		1	300	Y
<i>Goodenia virgata</i>	P2	Y	Y	Y		0	3	Y

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

C.4. Fauna analysis table

Records of fauna from the local area (20 km) radius are provided below.

Species name	Conservation status	Distance of closest record to application area (km)	Number of records - 20 km radius	Latest record (year)	Are surveys adequate to identify? [Y, N, N/A]
<i>Actitis hypoleucos</i> (Common Sandpiper)	MI	6.81	1	2004	N/A
<i>Dasycercus blythi</i> (Brush-tailed mulgara)	P4	2.41	10	1978	N/A
<i>Dasycercus sp.</i> (Mulgara)	P4	11.02	1	-	N/A
<i>Isoodon auratus auratus</i> (Golden bandicoot (mainland), wintarru)	VU	9.74	3	1931	N/A
<i>Lagorchestes hirsutus hirsutus</i> (rufous hare-wallaby (south-western))	EX	4.02	3	1931	N/A
<i>Leipoa ocellata</i> (malleefowl)	VU	6.67	1	-	N/A
<i>Liopholis kintorei</i> (great desert skink)	VU	5.93	11	2013	N/A
<i>Macrotis lagotis</i> (Bilby, dalgyte, ninu)	VU	4.69	7	1969	N/A
<i>Myrmecobius fasciatus</i> (Numbat, walpurti)	EN	4.02	3	1948	N/A
<i>Notoryctes caurinus</i> (Northern marsupial mole, kakarratul)	P4	11.02	2	-	N/A
<i>Petrogale lateralis lateralis</i> (Black-flanked rock-wallaby, black-footed rock-wallaby)	EN	1.59	2	1961	N/A
<i>Petrogale lateralis subsp.</i> (MacDonnell Ranges) (MacDonnell Range black-footed rock-wallaby, black-footed rock-wallaby (MacDonnell Ranges), warru)	VU	1.59	2	1973	N/A

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

Appendix D. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biological values		
<p>Principle (a): <i>“Native vegetation should not be cleared if it comprises a high level of biodiversity.”</i></p> <p><u>Assessment:</u></p> <p>The biodiversity of the region is poorly surveyed. Only one conservation significant flora has been recorded from within 20 km radius of the application area. The vegetation survey performed in 2021, however, identified <i>Goodenia virgata</i>, listed as Priority 2 by DBCA in three locations within the application area (GHD, 2021).</p>	May be at variance	Yes Refer to Section 3.2.1
<p>Principle (b): <i>“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.”</i></p> <p><u>Assessment:</u></p> <p>Historical records of some conservation significant fauna have been known from the local area. No records, however, have been known from the application area. The local area is known to be within the main distribution range of the Vulnerable <i>Liopholis kintorei</i> (<i>great desert skink</i>).</p>	Not likely to be at variance	Yes Refer to Section 3.2.1
<p>Principle (c): <i>“Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.”</i></p> <p><u>Assessment:</u></p> <p>More than 300 individuals of <i>Seringia exastia</i> were identified from the application area and vicinity. <i>S exastia</i> is currently listed as threatened under the EPBC Act and BC Act. However, records show that the flora species occurs in abundance in the Region. The species is in the process of being delisted (DBCA, 2021).</p>	May be at variance	Yes Refer to Section 3.2.2
<p>Principle (d): <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>No threatened ecological community (TEC) is mapped within 20 km radius of the application area. The vegetation survey also confirmed the absence of any TEC from the application area and surround (GHD, 2021)</p>	Not likely to be at variance	No
Environmental value: significant remnant vegetation and conservation areas		
<p>Principle (e): <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></p> <p>The extent of the mapped vegetation type and the local area are consistent with the national objectives and targets for biodiversity conservation in Australia.</p>	Not likely to be at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
<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 conservation area, the proposed clearing is not likely to have an impact on the environmental values of any conservation areas.</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>No water courses or wetlands are recorded within the application area and vicinity. The proposed clearing is unlikely to impact on- or off-site hydrology and water quality. Vegetation survey also confirms that the vegetation types in the area do not indicate any riparian vegetation (GHD, 2021).</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>The soils in the application area comprise of loose sands that the land is prone to wind erosion. Soil management and practices may mitigate the impact of clearing.</p>	Not likely to be at variance	Yes Refer to Section 3.2.3
<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 / wetlands / Public Drinking Water Sources Areas are recorded within the application area, the proposed clearing is unlikely to impact surface or ground water quality.</p>	Not likely to be at variance	No
<p><u>Principle (j):</u> <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.”</i></p> <p><u>Assessment:</u></p> <p>The mapped and surveyed 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 at variance	No

Appendix E. Vegetation condition rating scale

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

Considering its location, the scale 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 F. Flora and Vegetation survey information excerpts / photographs of the vegetation (GHD, 2021a)

The Shire commissioned GHD Pty Ltd (GHD) to undertake a detailed flora and vegetation assessment of the proposed Warburton Bypass, Jameson Wanarn (Cutline) Road realignment, Blackstone realignment and eight gravel pit sites. The purpose of the assessment was to identify key flora and vegetation values within the survey areas. The results of the assessment is used to support a clearing permit application to the Department of Water and Environmental Regulation (DWER) for the proposed roadworks.

For the Warburton Bypass project, the survey area is limited to the area within the proposed road corridor, or the clearing permit application area, measuring approximately 15 km long and 75.4 ha in total area (Figure 3).

Methods of the survey include:

- Desktop assessment of the survey area
- Field survey was 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
 - 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).
 - Nomenclature used in this report follows that used by the Western Australian Herbarium as reported on *FloraBase* (WA Herbarium 1998–).

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






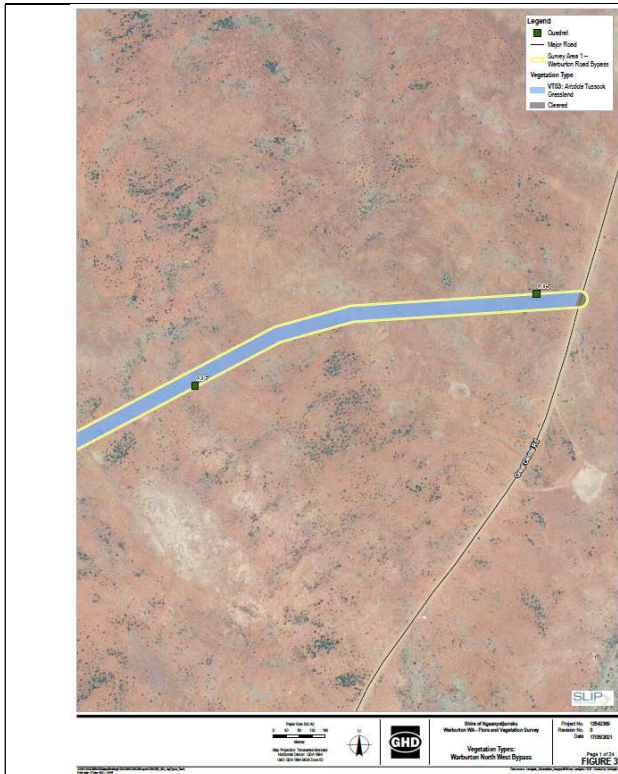
Figure 3. The Flora and Fauna Survey area (GHD, 2021a)

Results:

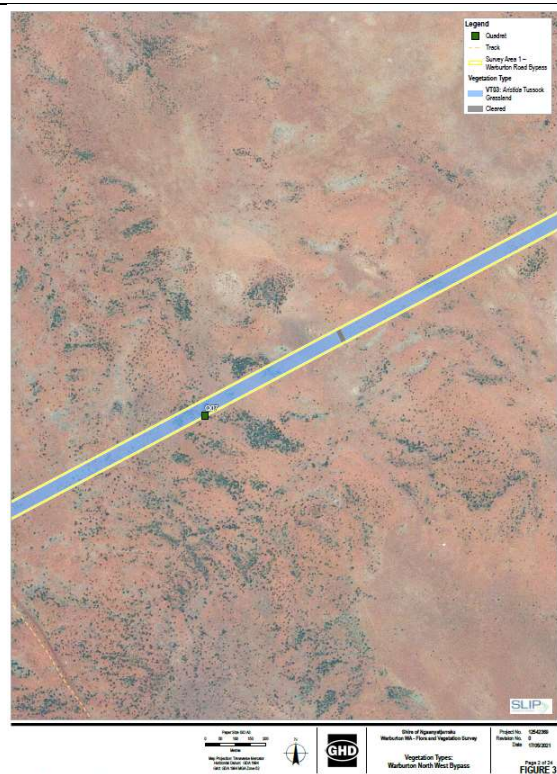
- Three vegetation types were identified and described for the Warburton Bypass Road Survey area. The dominant vegetation types mapped within the survey areas are broadly described as Mulga (*Acacia* spp.) woodlands, *Triodia* hummock grasslands and *Aristida* tussock grasslands. The topography and soils of the survey areas consisted predominantly of stony sandy/loamy plains and claypans. The map and description of the vegetation types and substrates are given in Table 1 and Figure 3 below.
- The condition of the vegetation within the survey area ranged from Good to Excellent Condition
- No threatened or priority ecological communities (TEC/PEC) were identified
- One threatened flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the *Biodiversity Conservation Act 2016* (BC Act) and one Priority flora listed by the Department of Biodiversity Conservation and Attractions (DBCAs) were recorded within the survey area:
 - o *Seringia exastia* (Threatened)
 - o *Goodenia virgata* (Priority 2)

Table 1. Description of vegetation types recorded within the application area (GHD, 2021a).

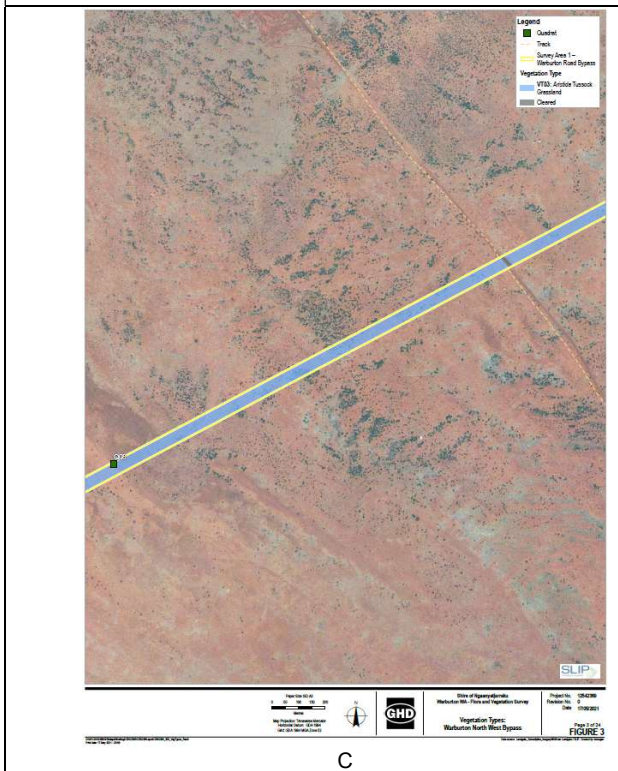
Vegetation Type	Vegetation Association	Landform / Substrate	Representative Photograph
Acacia (Mulga) Woodland (VT01)	<i>A. aneura</i> , <i>Acacia sericophylla</i> and <i>A. minyura</i> low woodland to low open woodland/shrublands over <i>Eremophila latrobei</i> subsp. <i>filiformis</i> scattered shrubs 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	
Triodia Hummock Grassland (VT02)	<i>Eremophila forrestii</i> F.Muell. subsp. <i>forrestii</i> , <i>Seringia exastia</i> and <i>Dicrastylis gilesii</i> scattered low shrubs over <i>Triodia schinzii</i> , <i>T. basedowii</i> and <i>T. scariosa</i> hummock grassland over <i>Aristida holathera</i> Domin var. <i>holathera</i> , <i>Eriachne mucronata</i> and <i>Eragrostis eriopoda</i> open tussock grassland with emergent <i>Acacia spp</i> and <i>Hakea lorea</i> tall shrubs.	Red/brown clayey sand plain, some surface gravel	
Aristida Tussock Grassland/Forbland (VT03)	Mixed Acacia species (dominant species <i>Acacia incurvaneura</i> , <i>A. sibirica</i> , <i>A. sericophylla</i> , <i>A. pruinocarpa</i> and <i>A. tetragonophylla</i>) and <i>Hakea lorea</i> open low woodland to isolated shrubs over <i>Rhagodia eremaea</i> , <i>Senna spp.</i> and <i>Eremophila spp.</i> sparse mid shrubland over <i>Ptilotus spp.</i> , <i>Sclerolaena cornishiana</i> and <i>Salsola australis</i> low shrubland over <i>Aristida holathera</i> Domin var. <i>holathera</i> , <i>Enneapogon polyphyllus</i> , <i>Eragrostis dielsii</i> and <i>Dactyloctenium radulans</i> tussock grassland to over <i>Boerhavia coccinea</i> , <i>Portulaca intraterranea</i> and <i>Tribulus occidentalis</i> forbland. A variable vegetation type with some bare patches and others with occasional patches of Mulga.	Red/brown gravelly claypans.	



A



B



C



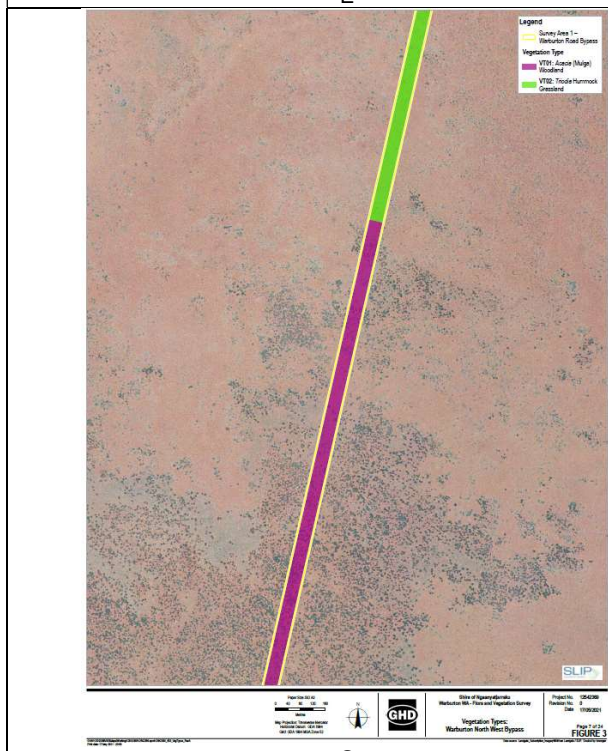
D



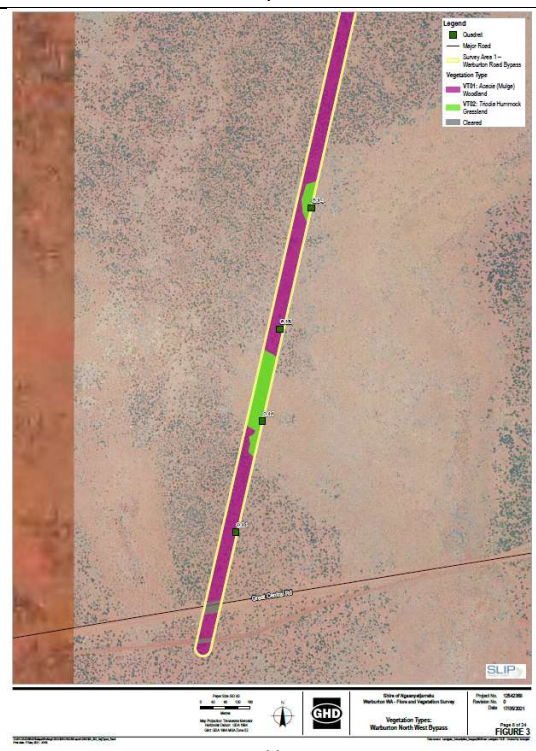
E



F



G



H

Figure 4 (A - H) Map of vegetation types within the application area (GHD, 2021a)

Appendix G. Sources of information

G.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)

G.2. References

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