



Main Roads Western Australia

Maintenance Zone Establishment - Toodyay Goomalling Road (M060), Williams Narrogin Highway (H053) and Pinjarra Williams Road (M053)
Impact Assessment of Clearing

August 2016

Executive summary

Project Information

Project Title: Toodyay to Goomalling Road (M060), Williams Narrogin Highway (H053) and Pinjarra Williams Road (M053).

Project location: The Project areas are located within the Shires of Goomalling, Toodyay, Williams and Narrogin, approximately 79 km north east of Perth (Toodyay to Goomalling Road) and approximately 160 to 190 km south east of Perth (Williams Narrogin Highway and Pinjarra Williams Road).

The Project areas are:

- Pinjarra Williams Road (M053) SLK 91.9 to 125.5
- Williams Narrogin Highway (H053) SLK 0 to 31.4
- Toodyay Goomalling Road (M060) SLK 1.2 to 48.0.

Project purpose: The three road sections have been identified as the most unsafe in the Wheatbelt. A significant safety hazard is the number of trees that are within 4 m of the road seal. Trees at this distance do not allow for driver recovery and often result in fatalities in an accident. A wider maintenance zone for the three sections of road is proposed, to reduce fatalities on these roads.

With 3.2% of the Western Australian population, the Wheatbelt contributes 2% to the total number of crashes for Western Australia (WA). However the Wheatbelt accounts for 17% of the fatalities and 7.2% of serious crashes (hospitalisation) in WA. While there is one fatality for every 228 crashes in WA, in the Wheatbelt the ratio is one fatality for every 27 crashes. A person involved in a crash in the Wheatbelt is 8.5 times more likely not to survive. Of the fatal crashes recorded, roadside vegetation contributes to 37.5% of the deaths.

Area proposed to be cleared: The Project clearing areas are:

- Pinjarra Williams Road - 50.3 ha, including 6.51 ha of native vegetation and 43.78 ha of previously cleared area and highly modified area
- Williams Narrogin Highway - 47.1 ha, including 5.25 ha of native vegetation and fauna habitat and 41.86 ha of previously cleared area and highly modified area
- Toodyay Goomalling Road - 64.80 ha, including 6.4 ha of native vegetation and fauna habitat and 58.39 ha of previously cleared area and highly modified area.

The Project areas start outside of the town sites that the roads connect

Temporary clearing required: No

The Project is to be assessed by the State Department of Environmental Regulation (DER) under the Commonwealth-State *Bilateral Agreement for Environmental Assessment of Matters of National Environmental Significance* (Bilateral Agreement).

An impact assessment of the project was undertaken and an *Impact Assessment of Clearing* report (this document) produced. The report outlines the key activities associated with the road project, the existing environment and an assessment of native vegetation clearing. This assessment provided an evaluation of the impacts and strategies used to manage them. Key impact assessment points are listed below.

Key Clearing Impact Assessment Aspects

The key impacts of native vegetation clearing associated with the Project include:

- A biological desktop assessment and field survey for the Project was completed in 2015 (GHD 2015b)
- The Clearing requirements for the Project were assessed against the Ten Clearing Principles. Clearing of 18.16 ha of native vegetation within the Project area (combined areas) is 'at variance' with Principles b, d, e and f and 'may be at variance' with Principle a)
- Terrestrial fauna – the loss of potential fauna habitats for four species of conservation significant fauna (Red-tailed Phascogale, Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo and Rainbow Bee Eater). This will result in the overall reduction of habitat for all species and potentially impact local populations of these species
- Flora and vegetation – loss of potentially *Endangered* vegetation (vegetation with less than 10% remaining in the State as defined in English and Blyth (1999). The local and regional impacts on the loss of vegetation associations have been assessed using the mapped extent of the pre-European (Beard 1979 and 1980) vegetation associations within the Project areas. The Project may result in the clearing of a portion of two *Endangered* vegetation associations (352 and 1049) which are below the 10 % threshold level for the Interim Biogeographic Region of Western Australia Bioregion and Subregion for association 1049 and the Local Government Area level for association 352. The Project also includes the clearing of one plant of the State-listed Threatened flora and Federally listed (Vulnerable) taxon, *Pultenaea pauciflora*, however, as this plant is within the maintenance zone, a Permit to Take has already been approved by the Department of Environment Regulation.

Key Environmental Management Actions

Project specific environmental management actions have been developed to manage potential clearing impacts.

Environmental Factors	Management Action
Reserves and conservation areas (vegetation clearing)	<ul style="list-style-type: none"> • No clearing is permitted within the Class C reserves, No. 31732 and No. 27865 for the Williams to Narrogin Project area.
Environmentally Sensitive Areas (ESA) (vegetation)	<ul style="list-style-type: none"> • No clearing is permitted at the buffer zone of the ESA located within the Williams to Narrogin Project area.
Flora and Vegetation Management (vegetation)	<ul style="list-style-type: none"> • Demarcate all native vegetation and fauna habitats to be retained or cleared (i.e. pegging), so that "No Go" zones are clearly delineated and noted by project workers, and any accidental loss of vegetation is avoided • Induct all staff and contractors regarding biodiversity constraints, particularly the presence of conservation significant species, and required actions regarding biodiversity values • No trees or ground vegetation outside of the approved disturbance footprint to be impacted.

Environmental Factors	Management Action
Surface Drainage (vegetation)	<ul style="list-style-type: none"> • Vegetation removal and soil disturbance will be minimised, where practicable • Disturbed areas will be stabilised soon after project activities are completed • Existing natural drainage paths and channels along the road or the vicinity of the Project area will not be unnecessarily blocked or restricted during Project activities • Vehicle and equipment wash down areas will be located away from environmentally sensitive areas • No on-site storage of fuel, oils and other contaminant materials will be permitted within 50 m of a watercourse.
Fire (vegetation and fauna)	<ul style="list-style-type: none"> • No fires shall be lit within the Project area • Machinery will be fitted with approved spark arresting exhaust systems • All vehicles, plant and equipment to be fitted with fire extinguishers and restricted to designated cleared areas • Construction personnel will extinguish and report fires occurring within the Project area.
Weed Control (vegetation)	<ul style="list-style-type: none"> • Management actions will be implemented for <i>Asparagus asparagoides</i> (Bridal Creeper), which is a Declared Pest under Section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i> and a Weed of National Significance (Australian Weeds Committee 2010) • Machinery will be maintained and cleaned to reduce the spread of weeds throughout the Project area • Weeds growing in the Project area that are likely to spread and result in environmental harm to adjacent areas of native vegetation that are in good or better condition will be removed or killed.
Fauna Management (general)	<ul style="list-style-type: none"> • Examine the habitat in the vicinity of known records of the Red-tailed Phascogale for evidence of nesting or breeding • Induct all staff and contractors regarding biodiversity constraints, particularly the presence of conservation significant species, and required actions regarding biodiversity values. • Do not permit site personnel to bring firearms, other weapons or pets on site. • If possible schedule clearing operations to avoid peak breeding times of threatened species (July to January). • If any native fauna is disturbed during clearing it should be allowed to make its own way to adjacent vegetated areas. • Any injured wildlife should be taken to a designated veterinary clinic or a DPaW nominated wildlife carer.
Species specific management actions – Red-tailed Phascogale and Carnaby's Black Cockatoo (Scenario 1 - Construction to be undertaken during the breeding season)	<ul style="list-style-type: none"> • Pre-clearing survey of the habitat area on Pinjarra Williams Road by a qualified ecologist to trap and relocate any Phascogale in the clearing area • Check two trees with hollows suitable for Black Cockatoos prior to clearing.

Environmental Factors	Management Action
<p>Species specific management actions – Red-tailed Phascogale and Carnaby’s Black Cockatoo (Scenario 2 - Construction to be undertaken outside the breeding season)</p>	<ul style="list-style-type: none"> • Clearly delineate the extent of the disturbance footprint (clearing footprint) with coloured pegs • Prior to clearing/ clearing operations the surveyor will mark out the clearing line and this will be checked by Main Roads Environment Officer to determine that it is clearly defined and compliant with permits • The extent of this clearing will be clearly communicated in documentation and accurately demarcated on-ground • All project clearing personnel will be inducted prior to the commencement of works. Information about the ‘No Go Areas’, importance and consequences of entering/disturbing these areas will be communicated the Project kick-off meeting and / or prestart meetings • Regular review of the disturbance footprint boundary to ensure ‘No Go Areas’ are clearly delineated • Restrict clearing personnel to the disturbance footprint including designated access routes, laydown and parking areas • Fauna encountered during the clearing process shall be given the chance to move on if there is no threat to the person’s safety in doing so.
<p>Aboriginal Heritage Sites</p> <p><u>Pinjarra to Williams Road</u> Axle Grease Reserve No. 500</p> <p><u>Williams to Narrogin Highway</u> Geeralying No. 15139; Geeralying No. 5888; Manaring Road No. 5826.</p> <p><u>Toodyay to Goomalling Road</u> Swan Avon River (and tributaries) No. 3536</p> <p><u>All project areas</u> in the event of unknown sites being unearthed during project process</p>	<ul style="list-style-type: none"> • Ensure on-site project personnel are aware of the location of all Aboriginal heritage sites on site and the requirement to stay within the approved impact area • Disturbance outside the approved clearing area will not be permitted • Any disturbance to the heritage sites adjacent to the Project areas (Geeralying No. 15139; Geeralying No. 5888; Manaring Road No. 5826; Swan Avon River (and tributaries) No. 3536 and Axle Grease Reserve No. 500) will be undertaken through approvals from the Department of Aboriginal Affairs (DAA). • In the event that human skeletal material is discovered, work will cease immediately and the Police will be contacted. If the skeletal remains are determined to be of Aboriginal origin, the Department of Aboriginal Affairs (DAA) will be contacted as soon as practicable • In the event that artefacts or material of Aboriginal origin is discovered, work will cease within 25 m of the material and a qualified archaeologist will investigate the item(s) and take appropriate actions (i.e. contact DAA) • Liquid spills, stormwater and runoff materials will be managed to ensure project activities and drainage do not adversely affect heritage sites or any wetland or water body including creeks, springs, swamps and soaks

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.4 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

1.1 Project description

Main Roads Western Australia (Main Roads) is planning to establish a wider maintenance zone for three roads in the Wheatbelt Region – Pinjarra Williams Road (M053), Williams Narrogin Highway (H053) and Toodyay Goomalling Road (M060) over the next 3 years. These roads have been identified as three of the most unsafe roads in the Wheatbelt, and a significant safety hazard is the number of trees that are within 4 metre (m) of the road seal. Trees at this distance do not allow for driver recovery and often result in fatalities in an accident.

With 3.2% of the Western Australian population, the Wheatbelt contributes 2% to the total number of crashes for Western Australia (WA). However, the Wheatbelt accounts for 17% of the fatalities and 7.2% of serious crashes (hospitalisation) in WA. While there is one fatality for every 228 crashes in WA, in the Wheatbelt the ratio is one fatality for every 27 crashes. A person involved in a crash in the Wheatbelt is 8.5 times more likely not to survive. Of the fatal crashes recorded, roadside vegetation contributes to 37.5% of the deaths.

The proposed Project will consist of clearing within the 4 m zone for a section of each of the three roads. It will include upgrades to culverts over the existing watercourses within the defined extent of the Project area for each of the three sections.

The locations of these sections of road are presented in Figure 1, Appendix A.

1.2 Project location

The Project areas are located within the Shires of Goomalling, Toodyay, Williams and Narrogin, approximately 79 kilometres (km) north east of Perth (Toodyay to Goomalling Project area) and approximately 160 to 190 km south east of Perth (Pinjarra to Williams and Williams to Narrogin Project areas).

The total Project area is the maximum disturbance footprint and includes the clearing area of native vegetation and fauna habitat. The proposed clearing area is 4 m from the edge of the seal of the road. The disturbance footprint calculations have been based on this Project area, however this excludes some regrowth within the maintenance zone of the road's Project area. The excluded regrowth was under 10 years of age (Regulation 5, Clause 22 of the Clearing Regulations) and within 4 m of the seal or marked road edge.

The Project areas are:

- Pinjarra Williams Road (M053) Straight Line Kilometres (SLK) 91.9 to 125.5 (herein referred to as the Pinjarra to Williams Project area) – 50.3 hectares (ha), including 6.51 ha of native vegetation and 43.78 ha of previously cleared area and highly modified area
- Williams Narrogin Highway (H053) SLK 0 to 31.4 (herein referred to as the Williams to Narrogin Project area) - 47.1 ha, including 5.25 ha of native vegetation and fauna habitat and 41.86 ha of previously cleared area and highly modified area
- Toodyay Goomalling Road (M060) SLK 1.2 to SLK 48.0 (herein referred to as the Toodyay to Goomalling Project area) - 64.80 ha, including 6.4 ha of native vegetation and fauna habitat and 58.39 ha of previously cleared area and highly modified area.

The Project area starts outside of the town sites that the Project area connects.

1.3 Project costs and benefits

The project will cost approximately \$1,500,000 (\$500,000 per Project area) and will employ approximately 24 people, many from the local area, depending on whether it is constructed over several years or all at once. The clearing within the 4 m zone will create a safer environment for road users. There will be temporary disruption for local road users but ultimately, the roads will be safer as infrangible obstructions (mainly trees) are removed from the road edge potentially reducing crash severity (reduced risk of serious and fatal crashes). There will also be an improved clear zone, to allow better chance for recovery and improved sight availability. Heavy and oversized haulage vehicles will also not be forced to travel close to the centre line of the road and will be able to avoid overhanging vegetation.

The economic benefits from this project include improved maintenance and reduced longer term maintenance costs and improved sight visibility which will improve passing opportunities (reduced travel time).

The social benefits of this project include:

- Safer roads, due to the reduced risks of fatal accidents and hospitalisation from crash impact
- Better sight visibility at intersections, property access (local farmers) and pull-over areas (e.g. for school buses and local farmers)
- Improved driving experience for all road users and local communities.

1.4 Assessment scope

The preparation of this Impact Assessment of Clearing report has included the outcomes from a biological desktop and field assessment (GHD 2016a) and an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) (GHD 2016b). These assessments were undertaken to support an application for a purpose clearing permit for the Project area.

1.5 Scope and limitations

This report has been prepared by GHD for Main Roads and may only be used and relied on by Main Roads for the purpose agreed between GHD and the Main Roads as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Main Roads arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

This IAC is based upon the Project area designed and approved by Main Roads and additional information provided by the Main Roads Project Manager, including the description of the Project.

GHD has prepared this report on the basis of information provided by Main Roads and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Methodology

This IAC report includes an assessment of the Project impacts to native vegetation clearing that were identified in the:

- Biological assessment (GHD 2015a)
- EIA and EMP (GHD 2015b).

2.1 Biological assessment

A biological assessment, including desktop assessments and field surveys for the Project, was conducted during the early design phase for the Project (GHD 2015a).

The desktop component utilised a range of information sources (detailed in GHD 2015b at Appendix B) including the EPBC Act Protected Matters Search Tool (PMST) with a 10 km buffer (Department of the Environment (DotE) 2015) and *NatureMap* search with a 10 km buffer (Department of Parks and Wildlife (DPAW) 2007-2015).

A one season vegetation and flora and fauna field survey of a broader survey area (Williams Narrogin Highway 62.84 ha, Pinjarra Williams Road 67.09 ha and Toodyay Goomalling Road 93.61 ha) was conducted on 9 - 13 November 2016. Supplementary surveys of the current Project area were conducted on the 11 - 17 February and 3 - 4 March 2016 (Williams Narrogin Highway 47.1 ha, Pinjarra Williams Road 50.3 ha and Toodyay Goomalling Road 64.80 ha).

The flora field survey was undertaken to identify vegetation units, vegetation condition and vascular species within the survey area. Field methodology involved a combination of sampling using transects and traversing the survey areas by foot. Twenty-eight transect sites were described throughout the survey areas during the survey (six within the Toodyay Goomalling survey area, ten within the Pinjarra Williams survey area and twelve within the Williams Narrogin survey area).

The fauna field survey was undertaken to identify and describe the fauna habitat types and their condition, assess habitat connectivity, identify and record fauna species within the general survey area and undertake targeted searches for conservation significant fauna taxa and their habitats. The fauna survey included a targeted Black Cockatoo habitat assessment of the survey area.

The field surveys were based upon the requirements of the Environmental Protection Agency's (EPA) Guidance for the Assessment of Environmental Factors 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (Environmental Protection Agency (EPA) 2004a) and Factors 56: *Assessment of Environmental Factors for Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004b).

GHD February 2016 – Black Cockatoo tree assessment

A supplementary Black Cockatoo assessment of the Project area was undertaken on 11 and 17 February 2016. The assessments focussed on Eucalypt trees within 4 m of the edge of the seal of the road. Trees were assessed as whether to be cleared or retained. Trees assessed to be cleared are considered in this IAC.

GHD March 2016 –vegetation and Black Cockatoo tree assessment

The field survey was undertaken on the 3 - 4 March 2016 to verify and ground truth Geographic Information Systems (GIS) mapping of vegetation units inferred to be the Critically Endangered, EPBC Act listed Threatened Ecological Community (TEC), *Eucalypt Woodlands of the Western*

Australian Wheatbelt within the Project area. Field methodology involved verifying areas within the Project area which were inferred to be the TEC, based on tree density and understorey presence, and determining the corridor width of the vegetation. The assessment also considered individual Eucalypt trees within 4 m of the edge of the seal of the road. Trees were assessed as whether to be cleared or retained. Trees assessed as to be cleared are indicated in this in this IAC report. The biological assessment aimed to identify the key biological values in the survey area (which was larger than the Project area). The proposed Project area was reduced and adjusted with consideration to the biological assessment results.

2.2 Environmental Impact Assessment and Environmental Management Plan

An EIA and EMP (GHD 2015b) were undertaken to assess the potential impacts to the environmental values associated with the Project area. The assessment considered the results from the biological assessment (GHD 2015a), GIS shapefiles, and relevant government agency managed databases with respect to the Project area and broader survey area.

3. Clearing of native vegetation

Native vegetation describes all indigenous aquatic and terrestrial vegetation (living or dead). The term does not include vegetation that was intentionally sown, planted or propagated unless it was required under a statutory condition.

3.1 Measures to avoid and minimise clearing

Justification of Project

There has been an increase in the number of deaths on roads in the Wheatbelt. The Pinjarra Williams Road (M053), Williams Narrogin Highway (H053) and Toodyay Goomalling Road (M060) have been identified as some of the most unsafe roads in the Wheatbelt, and a significant safety hazard is the number of trees that are within 4 m of the road seal. These trees need to be removed to reduce the hazard on these roads.

Avoidance of impacts

The proposed Project area (ie clearing area) has been designed with consideration of:

- The key values identified in the biological assessment (GHD 2015b)
- Minimisation of direct and indirect impacts to Black Cockatoo foraging and potential breeding trees and the TEC Eucalypt Woodlands of the Western Australian Wheatbelt
- Minimisation of impacts to major rivers and other creeks or drainage lines that cross the Project area.

During the detailed design process for the Project, Main Roads refined the design to reduce the Project area by limiting the clearing area to 4 m from the edge of the seal of the road and to consider the requirement to clear significant trees on an individual or small group basis.

One of the key strategies to avoid impacts to native vegetation, fauna and habitat during the construction phase of the Project is to strictly adhere to clearing and disturbance boundaries. The clearing area will be established by a surveyor and pegged and then checked by a member of the Main Roads' environment team before clearing is approved.

Prior to clearing, pre-clearance surveys of the two trees identified as having hollows suitable for Black Cockatoos and in the area where Red-tailed Phascogale are known to occur will be undertaken.

3.2 Existing vegetation

The vegetation in the Project areas is described in the EIA and EMP (GHD 2015b). This report is attached at Appendix B. The following summarises the vegetation impacts which will occur in the Project areas.

3.2.1 Project areas vegetation impacts

Broad scale (1:250,000) pre-European vegetation mapping of the region was completed by Beard (1979 and 1980) and the boundaries digitised by Shepherd et al. (2002). Pre-European mapping indicates that nine vegetation associations are present across the Project areas (Table 1).

Table 1 Vegetation associations within the Project areas

Project area	Vegetation Association	Description	Amount within Project areas (ha)
Pinjarra to Williams Project area	7	Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo	11.97 ha
	4	Medium woodland; marri & wandoo	38.33 ha
Williams to Narrogin Project area	7	Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo	14.32 ha
	1023	Medium woodland; York gum, wandoo and salmon gum (<i>Eucalyptus salmonophloia</i>)	26.34 ha
	947	Medium woodland; powderbark and Mallet	6.45 ha
Toodyay to Goomalling Project area	1049	Mixed woodland	28.23 ha
	352	York gum woodland	28.79 ha
	946	Wandoo woodland	5.14 ha
	988	Succulent steppe	1.1 ha
	128	Rock outcrops, bare areas	1.53 ha

N.B. Amount within Project areas is derived from tables 13 to 15 in GHD (2016a).

The extent of pre-European (as defined by Beard 1979 and 1980) vegetation associations have been determined by the State-wide vegetation remaining extent calculations maintained by Department of Parks and Wildlife (DPAW) (latest update 2015 – Government of Western Australia (GoWA) 2015).

The extents of vegetation associations within the Project areas are presented in Table 2.

Table 2 Extent of pre-European (Beard 1979 and 1980) vegetation associations within the Project areas (GoWA 2015)

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in all DPAW managed lands (%)
Pinjarra to Williams Project area					
Jarrah Forest Interim Biogeographic Region of Western Australia (IBRA) Bioregion		4,506,660.26	2,425,551.15	53.82	69.02
Northern Jarrah Forest IBRA Subregion		1,898,780.73	1,113,027.29	58.62	69.19
7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo	State: Western Australia	1,054,279.89	293,983.61	27.88	22.66
	IBRA Bioregion: - Jarrah Forest	30,999.82	6,148.02	19.83	15.13
	IBRA: Sub-region: Northern Jarrah Forest (JF1)	30,999.82	6,148.02	19.83	15.13
	Local Government Area Level (LGA): Shire of Williams	7,099.65	1,350.18	19.02	3.59
4: Medium woodland; marri & wandoo	State: Western Australia	1,054,279.89	293,983.16	27.88	22.66
	IBRA: Bioregion: - Jarrah Forest	1,022,712.70	286,905.02	28.05	22.9
	IBRA: Sub-region: Northern Jarrah Forest (JF1)	614,200.82	199,262.42	32.44	30.21
	LGA: Shire of Williams	108,949.52	19,508.89	17.91	9.47
Williams to Narrogin Project area					
Jarrah Forest IBRA Bioregion		4,506,660.26	2,425,551.15	53.82	69.02

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in all DPAW managed lands (%)
Avon Wheatbelt IBRA Bioregion		9,517,109.90	1,765,881.10	18.55	9.73
Northern Jarrah Forest IBRA Subregion		1,898,780.73	1,113,027.29	58.62	69.19
Katanning IBRA Subregion		2,992,929.36	399,288.32	13.34	11.66
7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo	State: Western Australia	1,054,279.89	293,983.61	27.88	22.66
	IBRA Bioregion: - Jarrah Forest	30,999.82	6,148.02	19.83	15.13
	IBRA Sub-region: Northern Jarrah Forest (JF1)	30,999.82	6,148.02	19.83	15.13
	LGA: Shire of Williams	7,099.65	1,350.18	19.02	3.59
1023: Medium woodland; York gum, wandoo and salmon gum (<i>Eucalyptus salmonophloia</i>)	State: Western Australia	1,601,601.59	174,096.00	10.87	10.62
	IBRA Bioregion: - Jarrah Forest	14,925.27	3,130.71	20.98	41.41
	IBRA Bioregion: - Avon Wheatbelt	1,522,676.20	166,275.88	10.92	10.13
	IBRA Sub-region: Northern Jarrah Forest (JF1)	14,715.00	3,090.28	21	41.95
	IBRA Sub-region: Avon Wheatbelt (AW2)	1,123,732.03	139,875.45	12.45	10.19
	LGA: Shire of Williams	4,783.27	766.85	16.03	39.75
	LGA: Shire of Narrogin	133,802.44	21,195.76	15.84	14.42
	LGA: Town of Narrogin	1,074.52	344.48	32.06	0

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in all DPAW managed lands (%)
947: Medium woodland; powderbark and Mallet	State: Western Australia	34,032.69	11,780.95	34.62	40.62
	IBRA Bioregion: - Avon Wheatbelt	34,016.89	11,768.99	34.6	40.56
	IBRA Sub-region: Avon Wheatbelt (AW2)	34,016.89	11,768.99	34.6	40.56
	LGA: Shire of Narrogin	7,996.28	2,731.64	34.16	21.26
	LGA: Town of Narrogin	239.57	169.78	70.87	10.1
Toodyay to Goomalling Project area					
Avon Wheatbelt IBRA Bioregion		9,517,109.90	1765881.1	18.55	9.73
Katanning IBRA Subregion		2,992,929.36	399,288.32	13.34	11.66
1049 Mixed woodland	State: Western Australia	833,384.80	56,842.20	34.6	5.76
	IBRA: Bioregion: - Avon Wheatbelt	833,384.80	56,842.20	6.82	5.76
	IBRA Sub-region- Avon Wheatbelt P2	255,402.60	20,574.30	8.06	1.34
	LGA: Shire of Goomalling	79,902.00	8,861.00	11.09	34.93
352	State: Western Australia	724,272.90	142,766.60	19.71	8.69

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in all DPAW managed lands (%)
York gum woodland	IBRA Bioregion: - Avon Wheatbelt	630,581.70	109,441.00	17.36	9.28
	IBRA Sub-region- Avon Wheatbelt P2	337,875.90	36,848.70	18.27	9.77
	LGA: Shire of Goomalling	5,250.30	419.7	7.99	0
946 Wandoo woodland	State: Western Australia	53,225.40	14,145.20	26.58	31.36
	IBRA Bioregion: - Avon Wheatbelt	43,308.90	8,426.20	19.46	8.61
	IBRA Sub-region- Avon Wheatbelt P2	37,482.60	6,847.40	18.27	9.77
	LGA: Shire of Goomalling	747	139.8	18.71	0
988 Succulent steppe	State: Western Australia	96,635.20	29,324.70	30.35	15.17
	IBRA Bioregion: - Avon Wheatbelt	94,338.30	27,553.80	29.21	13.27
	IBRA Sub-region- Avon Wheatbelt P2	27,112.20	8,712.70	32.14	3.71
	LGA: Shire of Goomalling	14,452.40	8,910	61.65	0.9
128 Rock outcrops, bare areas	State: Western Australia	329,836.20	288,743.70	87.54	23.54
	IBRA	41,967.20	22,947.10	54.61	17.24

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in all DPAW managed lands (%)
	Bioregion: - Avon Wheatbelt				
	IBRA Sub-region- Avon Wheatbelt P2	6,511.40	2,924.50	44.91	11.26
	LGA: Shire of Goomalling	2,271.50	1,160.70	57.1	0

3.2.2 Project area vegetation type and condition description

Vegetation types

The biological survey area (GHD 2016a) identified eight vegetation types within the Pinjarra to Williams Project area, ten within the Williams to Narrogin Project area and nine within the Toodyay to Goomalling Project area, as well as areas considered highly modified/cleared and planted trees.

Pinjarra to Williams Project area

The Pinjarra to Williams Project area occurs on an undulating plain that supports Wandoo (*Eucalyptus wandoo*), Marri (*Corymbia calophylla*) and York Gum (*E. loxophleba*) woodlands and Jam (*Acacia acuminata*) and Rock Sheoak (*Allocasuarina huegeliana*) shrublands on the hills and slopes with Flooded Gum (*E. rudis*) woodlands in the depressions and lower lying plains.

The Project area occurs within a road reserve and much of the road reserve has been either historically cleared or is otherwise highly modified. It includes areas that are completely cleared with no or some scattered native vegetation remaining (19.12 ha / 38 % of the Pinjarra to Williams Project area) as well as areas of existing infrastructure (23.48 ha).

Eight vegetation types were mapped and described within the Project area, as well as cleared or highly modified areas and planted trees (26.82 ha). The vegetation type extents and descriptions within the Project area are presented in Table 3.

Table 3 Vegetation Types within Pinjarra to Williams Project area

Vegetation type	Project area (ha)	Pre-European vegetation association
<i>Eucalyptus wandoo</i> open forest	1.46 ha	4: Medium woodland; marri & wandoo
<i>Eucalyptus rudis</i> open forest	1.29 ha	N/A
<i>Corymbia calophylla</i> open forest	0.54 ha	4: Medium woodland; marri & wandoo
<i>Allocasuarina huegeliana</i> closed forest	1.25 ha	N/A
<i>Acacia acuminata</i> tall open shrubland	1.65 ha	N/A
* <i>Juncus acutus</i> subsp. <i>acutus</i> sedgeland	0.03 ha	N/A
<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> open forest	0.06 ha	7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo
Scattered Natives	0.23 ha	N/A
Planted Trees	1.18 ha	N/A
Highly disturbed	19.12 ha	N/A
TOTAL	50.30 ha (23.48 ha is infrastructure areas)	

Williams to Narrogin Project area

The Williams to Narrogin Project area occurs on an undulating plain that supports Wandoo (*Eucalyptus wandoo*), Marri (*Corymbia calophylla*) and York Gum (*E. loxophleba*) woodlands and Jam (*Acacia acuminata*) and Rock Sheoak (*Allocasuarina huegeliana*) shrublands on the

hills and slopes with Flooded Gum (*E. rudis*) woodlands in the depressions and lower lying plains.

The Project area occurs within a road reserve and much of the road reserve has been either historically cleared or is otherwise highly modified. It includes areas that are completely cleared with no or some scattered native vegetation remaining (19.6 ha / 41 % of the Williams to Narrogin Project area) as well as areas of existing infrastructure (21.98 ha).

Ten vegetation types were mapped and described within the Project area, as well as cleared or highly modified areas and planted trees (25.12 ha). The vegetation type extents and descriptions within the Project area are presented in Table 4.

Table 4 Vegetation Types within Williams to Narrogin Project area

Vegetation type	Project area (ha)	Pre-European vegetation association
<i>Eucalyptus wandoo</i> open forest	0.11 ha	7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo
<i>Corymbia calophylla</i> open forest	1.64 ha	N/A
<i>Eucalyptus rudis</i> woodland	0.073 ha	N/A
<i>Allocasuarina huegeliana</i> open forest	0.086 ha	N/A
Revegetated areas	2.51 ha	N/A
<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> and <i>E. wandoo</i> regrowth	0.0019 ha	7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo
<i>Acacia acuminata</i> tall shrubland	0.36 ha	N/A
<i>Cryptandra arbutiflora</i> var. <i>arbutiflora</i> low shrubland	0.0013 ha	N/A
<i>Eucalyptus wandoo</i> open woodland over <i>Acacia acuminata</i> tall shrubland	0.44 ha	7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo
<i>Corymbia calophylla</i> and <i>Eucalyptus wandoo</i> woodland	0.03 ha	N/A
Planted Trees	0.28 ha	N/A
Highly disturbed	19.6 ha	N/A
TOTAL	47.11 ha (21.98 ha is infrastructure areas)	

Toodyay to Goomalling Project area

The Toodyay to Goomalling Project area occurs on an undulating plain that supports Wandoo (*Eucalyptus wandoo*), York Gum (*E. loxophleba*) and (*E. salmonophloia*) woodlands and Jam (*Acacia acuminata*) and Rock Sheoak (*Allocasuarina huegeliana*) shrublands on the hills and slopes with Flooded Gum (*E. rudis*) and Swamp Sheoak (*Casuarina obesa*) woodlands in the depressions and lower lying plains.

The Project area occurs within a road reserve and much of the road reserve has been either historically cleared or is otherwise highly modified. It includes areas that are completely cleared with no or some scattered native vegetation remaining (31.03 ha / 47 % of the Toodyay to Goomalling Project area) as well as areas of existing infrastructure (27.36 ha).

Nine vegetation types were mapped and described within the Project area, as well as cleared or highly modified areas (37.43 ha). The vegetation type extents and descriptions within the Project area are presented in Table 5.

Table 5 Vegetation Types within Toodyay to Goomalling Project area

Vegetation type	Project area (ha)	Pre-European vegetation association
<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> woodland	4.86 ha	352: Medium woodland; York Gum
<i>Eucalyptus rudis</i> woodland	0.54 ha	N/A
<i>Casuarina obesa</i> forest	0.36 ha	N/A
<i>Eucalyptus wandoo</i> woodland over open low shrubs	0.01 ha	946: Medium woodland; Wandoo
<i>Eucalyptus wandoo</i> open woodland over tall shrubland	0.05 ha	946: Medium woodland; Wandoo
<i>Eucalyptus salmonophloia</i> woodland	0.07 ha	1049: Medium woodland; wandoo, York gum, salmon gum, morrel & gimlet
<i>Eucalyptus wandoo</i> over scattered Acacia	0.15 ha	946: Medium woodland; Wandoo
<i>Acacia acuminata</i> / <i>Allocasuarina huegeliana</i> tall shrubland	0.20 ha	N/A
<i>Acacia acuminata</i> tall shrubland	0.16 ha	N/A
Highly disturbed	31.03 ha	N/A
TOTAL	64.79 ha (27.36 ha is infrastructure areas)	

Vegetation condition

The condition of the vegetation in the Project area was rated according to the South West and Interzone Botanical Provinces (EPA and DPAW (2015)) and is presented in Table 6.

Pinjarra to Williams Project area

The vegetation condition of the Pinjarra to Williams Project area ranged from 3 to 7 due to extensive historical clearing and subsequent weed invasion. The majority of the vegetated areas in the Project area comprised of native vegetation in condition 6. Large areas of vegetation within the Project area have been impacted by past disturbances and are now infested with weeds (38 % is cleared).

Sections of the road reserve that contained some native vegetation but which did not have all vegetation layers intact and which were dominated by weeds, were rated as in condition 4, 4-6 or 6 (7.2 ha of the Project area).

Vegetation condition within the Project area is presented in Table 6.

Table 6 Vegetation condition areas mapped within the Project area (Pinjarra to Williams)

Vegetation Condition	Areas within Pinjarra to Williams Project area (ha)
3	0.18
4	0.26
4-6	0.32
6	6.62
6-7	0.15
7	0.17

Cleared	19.12
Total	50.3 (23.48 ha is infrastructure areas)

Williams to Narrogin Project area

The vegetation condition of the Pinjarra to Williams Project area ranged from 2-3 to 7 due to extensive historical clearing and subsequent weed invasion. The majority of the Project area comprises of native vegetation in condition 4-6. Large areas of vegetation within the Project area have been impacted by past disturbances, such as clearing for the road and ongoing maintenance, and are now infested with weeds (42 % is cleared).

Sections of the road reserve that contained native vegetation but which did not have all vegetation layers intact and which were dominated by weeds, were rated as in condition 4, 4-6 or 6 (2.81 ha of the Project area).

Vegetation condition within the Project area is presented in Table 7.

Table 7 Vegetation condition areas mapped within the Project area (Williams to Narrogin)

Vegetation Condition	Areas within Williams to Narrogin Project area (ha)
2-3	0.08
3	0.53
3-4	0.30
4	1.03
4-6	1.14
6	0.64
6-7	0.11
7	1.70
Cleared	19.60
Total	47.11 (21.98 ha is infrastructure areas)

Toodyay to Goomalling Project area

The vegetation condition of the Toodyay to Goomalling Project area ranged from 2-3 to 7 due to extensive historical clearing and subsequent weed invasion. The majority of the Project area comprised of native vegetation in condition 6 to 7. Most degraded areas have been affected by previous roadside clearing and maintenance, followed by weed infestation over many years (48 % is cleared).

Sections of the road reserve that contained native vegetation but which did not have all vegetation layers intact and which were dominated by weeds, were rated as in condition 4, 4-6 or 6 (2.39 ha of the Project area).

Vegetation condition within the Project area is presented in Table 8.

Table 8 Vegetation condition areas mapped within the Project area (Toodyay to Goomalling)

Vegetation Condition	Areas within Toodyay to Goomalling Project area (ha)
2-3	0.15
3	0.18
3-4	0.21

4	0.21
4-6	0.24
6	1.94
6-7	3.10
7	0.37
Cleared	31.03
Total	64.79 (27.36 ha is infrastructure areas)

3.3 Assessment against the 10 clearing principles

In considering whether the Project is likely to have a significant impact on the environment, the Project was assessed against the Ten Clearing Principles (Environmental Protection Act 1986 Schedule 5).

For the purpose of this impact assessment, it has been assumed that the clearing will require potential permanent loss of up to 18.16 ha of native vegetation and 89.37 ha of variable fauna habitat.

The assessment determined that the project is 'at variance' with Principles b, d, e and f and 'may be at variance' with Principle a.

3.3.1 Ten clearing principles assessment

(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity.
Comments	Proposal may be at variance to this Principle
Assessment	<p><u>Vegetation and flora</u> Broad scale (1:250,000) pre-European associations mapped within the Pinjarra to Williams Project area are 7 and 4.</p> <p>Three vegetation associations are present within the Williams to Narrogin Project area: 7, 947 and 1023.</p> <p>Four vegetation associations are present within the Toodyay to Goomalling Project area: 1049, 352, 988 and 128.</p> <p>The Project area is within existing road reserves and has been impacted by clearing and edge effects from adjacent agricultural land. The project is located within an already extensively cleared landscape.</p> <p>The three Project areas are comprised of both native vegetation and areas that have already been cleared for existing local roads and paddocks (where there has been road reserve widening).</p> <p>Field survey: The native vegetation within the Pinjarra to Williams Project area consists of eight vegetation types as well as highly disturbed/cleared area and planted trees. The predominant vegetation association is <i>Acacia acuminata</i> tall open shrubland. The remnant native vegetation types, with their clearing extents, within the Project area are:</p> <ul style="list-style-type: none"> • <i>Eucalyptus wandoo</i> open forest 1.46 ha • <i>Eucalyptus rudis</i> open forest 1.29 ha • <i>Corymbia calophylla</i> open forest 0.54 ha • <i>Allocasuarina huegeliana</i> closed forest 1.25 ha • <i>Acacia acuminata</i> tall open shrubland 1.65 ha • *<i>Juncus acutus</i> subsp. <i>acutus</i> sedgeland 0.03 ha

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

- *Eucalyptus loxophleba* open forest 0.06 ha
- Scattered Natives 0.23 ha.

Within the Williams to Narrogin Project area are ten vegetation types as well as highly disturbed/cleared area and planted trees. The predominant vegetation association is revegetated areas (which includes some remnant isolated native trees such as *Eucalyptus loxophleba* and *E. wandoo*). The remnant native vegetation types, with their clearing extents, within the Project area are:

- *Eucalyptus wandoo* open forest 0.11 ha
- *Corymbia calophylla* open forest 1.64 ha
- *Eucalyptus rudis* woodland 0.073 ha
- *Allocasuarina huegeliana* open forest 0.086 ha
- Revegetated areas 2.51 ha
- *Eucalyptus loxophleba* and *E. wandoo* regrowth 0.0019 ha
- *Acacia acuminata* tall shrubland 0.36 ha
- *Cryptandra arbutiflora* var. *arbutiflora* low shrubland 0.0013 ha
- *Eucalyptus wandoo* open woodland over *Acacia acuminata* tall shrubland 0.44 ha
- *Corymbia calophylla* and *Eucalyptus wandoo* woodland 0.03 ha.

Within the Toodyay to Goomalling Project area are nine vegetation types as well as highly disturbed/cleared area and planted trees. The predominant vegetation association is *Eucalyptus loxophleba* subsp. *loxophleba* woodland. The remnant native vegetation types, with their clearing extents within the Project area are:

- *Eucalyptus loxophleba* woodland 4.86 ha
- *Eucalyptus rudis* woodland 0.54 ha
- *Casuarina obesa* forest 0.36 ha
- *Eucalyptus wandoo* woodland over open low shrubs 0.01 ha
- *Eucalyptus wandoo* open woodland over tall shrubland 0.05 ha
- *Eucalyptus salmonophloia* woodland 0.07 ha
- *Eucalyptus wandoo* over scattered *Acacia* 0.15 ha
- *Acacia acuminata/Allocasuarina huegeliana* tall shrubland 0.20 ha
- *Acacia acuminata* tall shrubland 0.16 ha.

The vegetation condition of the Pinjarra to Williams Project area ranged from 3 to 7 due to extensive historical clearing and subsequent weed invasion. The majority of the Project area comprised of native vegetation in condition 6. Large areas of vegetation within the Project area have been impacted by past disturbances and are now infested with weeds.

The vegetation condition of the Williams to Narrogin Project area ranged from 2 to 7 due to extensive historical clearing and subsequent weed invasion. The majority of the Project area comprises of native vegetation in condition 4-6.

The vegetation condition of the Toodyay to Goomalling Project area ranged from 2 to 7 due to extensive historical clearing and subsequent weed invasion. The majority of the Project area comprised of native vegetation in condition 6 to 7. Most degraded areas have been affected by previous roadside clearing and maintenance, followed by weed infestation over many years.

The TEC, *Eucalypt Woodlands of the Western Australian Wheatbelt*, listed as Critically Endangered under the EPBC Act was recorded within all three Project areas. 0.16 ha of the TEC occurs within the Pinjarra to Williams Project area; 0.10 ha of the TEC occurs within the Williams to Narrogin Project area and 0.06 ha of the TEC occurs within the Toodyay to Goomalling Project area.

Two occurrences of the Priority 1 Priority Ecological Community (PEC) *Red Morrell Woodlands of the Wheatbelt* have been recorded within 1.4 km and 3

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

km north east of the Toodyay to Goomalling Project area but no occurrences of Red Morell were recorded during the survey (GHD 2016b).

The flora and vegetation survey (GHD 2016b) identified 4.94 ha of the Priority 3 PEC, *Eucalypt woodlands of the Western Australian Wheatbelt*, in varying condition (ranging from 3 to 7) condition, within the Toodyay and Goomalling biological survey area during the flora and vegetation survey. Approximately 1.5 ha of this vegetation will be cleared.

Overall, the Project area is considered to have low floral diversity. This is likely due to historical clearing for infrastructure and agriculture within the immediate and broader area, which has resulted in the loss of native shrubs and the replacement of ground layers with introduced species. The flora diversity for the three Project areas is:

- Pinjarra to Williams: 102 flora taxa, representing 38 families and 70 genera, including 28 introduced species
- Williams to Narrogin: 129 flora taxa, representing 34 families and 79 genera, including 33 introduced species
- Toodyay to Goomalling: 146 flora taxa, representing 34 families and 70 genera, including 20 introduced species.

One plant of the EPBC Act and WC Act listed flora, *Pultenaea pauciflora* (Vulnerable and Threatened) was recorded within the Williams to Narrogin Project area during the field survey, in a previously recorded location immediately adjacent to the known population at the Narrogin golf course. No other EPBC Act and WC Act listed taxa were recorded in the Project areas. No Threatened flora species were recorded within the Pinjarra to Williams or Toodyay to Goomalling Project areas or are considered likely to occur.

One plant of the Priority 3 species, *Xanthorrhoea brevistylis*, may be impacted within the Pinjarra to Williams Project area.

Fauna

Seven broad scale fauna habitat types based on the predominant landforms, soil and vegetation structure, were recorded in the Project areas during the 2015 field survey (GHD 2016b). The habitat types are broadly described as follows:

- Wandoo woodland
- Wandoo/Allocasuarina shrubland
- Mixed Eucalyptus woodland
- Low shrubland
- Rivers, creeks and drainage lines
- Planted shrub species within road verge
- Cleared or disturbed area.

The fauna habitats present within the Project areas are mostly isolated and fragmented within a greater region of cleared habitat for agriculture. However some areas present are locally connected to larger patches of remnant vegetation including those of woodland, shrublands and riparian areas (particularly within reserves). This remaining roadside reserve habitat connects to these larger patches via thin linear corridors and is important for connectivity within the region. The rivers, creeks and drainage lines that cross the Project area also provide local connectivity between the remnants.

A search of the *NatureMap* database (DPAW 2007-2015) identified 336 fauna species that have been previously recorded within the Pinjarra to Williams study area; 263 within the Williams to Narrogin study area and 483 species within the Toodyay to Goomalling study area.

(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity.
	<p>The field survey recorded 64 fauna species along Toodyay to Goomalling Road biological survey area; 55 species along Williams to Narrogin Highway biological survey area; and 69 species along the Pinjarra to Williams Road biological survey area. Species groups for each biological survey area are listed below:</p> <ul style="list-style-type: none"> • Pinjarra to Williams: 12 mammals, seven reptiles, 49 birds and one amphibian • Williams to Narrogin: eight mammals, five reptiles and 42 birds • Toodyay to Goomalling: 13 mammals, five reptiles and 46 birds. <p>Four conservation significant fauna species were recorded in the Project areas during the field surveys, outlined below:</p> <p><i>Pinjarra to Williams Project area</i></p> <ul style="list-style-type: none"> • Red-tailed Phascogale (<i>Phascogale calura</i>) – Endangered under the EPBC Act, Schedule 6 under the WC Act • Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) – Vulnerable under the EPBC Act, Schedule 3 under the WC Act • Rainbow Bee Eater (<i>Merops ornatus</i>) – Migratory under the EPBC Act, Schedule 5 under WC Act. <p><i>Williams to Narrogin Project area</i></p> <ul style="list-style-type: none"> • Carnaby’s Black Cockatoo (<i>Calyptorhynchus latirostris</i>) – Endangered under the EPBC Act, Schedule 2 under the WC Act • Forest Red-tailed Black Cockatoo. <p><i>Toodyay to Goomalling Project area</i></p> <ul style="list-style-type: none"> • Rainbow Bee Eater. <p>The Project area occurs within a largely cleared landscape, where large-scale clearing for agriculture has occurred. The Project area contains a number of vegetation and habitat types and supports a range of flora and fauna species. The Project area is likely to have a lower level of biodiversity compared to other areas of remnant vegetation in the area, due to the large areas which are devoid of native understorey from previous disturbances. However, the Project area supports a higher level of biodiversity than the surrounding, cleared areas and includes small amounts of the <i>Eucalypt Woodlands of the Western Australian Wheatbelt</i> TEC. As such the Project may be at variance to this Principle.</p>
Methodology	<p>GHD (2016a) GHD (2016b) Beard (1979) Beard (1980) NatureMap - Accessed March 2016 (DPAW 2007–) GoWA (2015) EPA and DPAW (2015) DPAW shapefiles</p>

(b)	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.
Comments	Proposal is at variance to this Principle
Assessment	<p>The Project area is a narrow strip alongside existing roads consisting of a cleared shoulder and some narrow strips of vegetation adjacent to these cleared areas. The value of the habitat within the Project areas is generally limited by the highly fragmented, degraded and linear nature of the site.</p> <p>The fauna habitats present within the Project areas are mostly isolated and fragmented within a greater region of cleared habitat for agriculture. However some areas present are locally connected to larger patches of remnant vegetation including those of woodland, shrublands and riparian areas. This remaining roadside reserve habitat connects to these larger patches via thin linear corridors and is important for connectivity within the region. The rivers, creeks and drainage lines that cross the Project area also provide local connectivity between the remnants in the region.</p> <p>Regionally there are small patches of habitat and scattered trees which act as stepping stones, in a predominantly cleared agricultural landscape. This is typical of the Wheatbelt where much of the remnant vegetation has been cleared. The remaining small patches are critical for the survival of species within this region.</p> <p>A search of the <i>NatureMap</i> database (DPAW 2007-2015) identified 336 fauna species that have been previously recorded within the Pinjarra to Williams study area; 263 within the Williams to Narrogin study area and 483 species within the Toodyay to Goomalling study area.</p> <p>The field survey recorded 64 fauna species along Toodyay to Goomalling Road biological survey area; 55 species along Williams to Narrogin Highway biological survey area; and 69 species along the Pinjarra to Williams Road biological survey area. Species groups for each survey area are listed below:</p> <ul style="list-style-type: none"> • Pinjarra to Williams: 12 mammals, seven reptiles, 49 birds and one amphibian • Williams to Narrogin: eight mammals, five reptiles and 42 birds • Toodyay to Goomalling: 13 mammals, five reptiles and 46 birds. <p>Seven broad scale fauna habitat types based on the predominant landforms, soil and vegetation structure, were recorded in the Project areas during the 2015 field survey (GHD 2016b). These ranged from woodlands and shrublands to open, cleared areas with introduced grasses and herbs.</p> <p>Four conservation significant fauna species were recorded in the Project areas during the field surveys, outlined below:</p> <p><i>Pinjarra to Williams Project area</i></p> <ul style="list-style-type: none"> • Red-tailed Phascogale (<i>Phascogale calura</i>) – Endangered under the EPBC Act, Schedule 6 under the WC Act • Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) – Vulnerable under the EPBC Act, Schedule 3 under the WC Act • Rainbow Bee Eater (<i>Merops ornatus</i>) – Migratory under the EPBC Act, Schedule 5 under WC Act. <p><i>Williams to Narrogin Project area</i></p> <ul style="list-style-type: none"> • Carnaby's Black Cockatoo (<i>Calyptorhynchus latirostris</i>) – Endangered under the EPBC Act, Schedule 2 under the WC Act • Forest Red-tailed Black Cockatoo. <p><i>Toodyay to Goomalling Project area</i></p> <ul style="list-style-type: none"> • Rainbow Bee Eater.

(b)	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.
	<p>The results of the field survey were combined with the results of the desktop assessment to provide a Likelihood of Occurrence assessment for the 33 conservation significant fauna species identified during the desktop searches as occurring or potentially occurring within one or more of the three Project areas (GHD 2016a). Five of these species were considered likely to occur within the Project areas:</p> <ul style="list-style-type: none"> • Carnaby’s Black Cockatoo • Forest Red-tailed Black Cockatoo • Red-tailed Phascogale • Rainbow Bee Eater • Peregrine Falcon (<i>Falco peregrinus</i>) – Schedule 7 under WC Act. <p>The potential impacts to fauna as a consequence of clearing each of the Project areas are presented below:</p> <p><i>Pinjarra to Williams Project area</i></p> <p>Habitat loss – construction of the Project will require clearing of 26.81 ha of fauna habitat¹ in varying condition. This total includes 4.96 ha of fauna habitat of high value, 1.32 ha of fauna habitat with moderate to high value, 1.18 ha of fauna habitat with moderate value and 19.35 ha of fauna habitat with low value. The required clearing will result in the loss of:</p> <ul style="list-style-type: none"> • 7.46 ha of Black Cockatoo foraging habitat • 58 Black Cockatoo potential habitat trees • 7.46 ha of suitable Red-tailed Phascogale habitat. <p><i>Williams to Narrogin Project area</i></p> <p>Habitat loss – construction of the Project will require clearing of 25.12 ha of fauna habitat in varying condition. This total includes 2.67 ha of fauna habitat of high value, 0.06 ha of fauna habitat with moderate to high value, 2.79 ha of fauna habitat with moderate value and 19.60 ha of fauna habitat with low value. The required clearing will result in the loss of:</p> <ul style="list-style-type: none"> • 5.52 ha of Black Cockatoo foraging habitat • 56 Black Cockatoo potential habitat trees • 5.52 ha of suitable Red-tailed Phascogale habitat. <p><i>Toodyay to Goomalling Project area</i></p> <p>Habitat loss – construction of the Project will require clearing of 37.43 ha of fauna habitat in varying condition. This total includes 5.49 ha of fauna habitat of high value, 0.91 ha of fauna habitat with moderate to high value and 31.03 ha of fauna habitat with low value. The required clearing will result in the loss of:</p> <ul style="list-style-type: none"> • 6.41 ha of Black Cockatoo foraging habitat • 67 Black Cockatoo potential habitat trees. Of these trees, a Wandoo had one large hollow • 6.41 ha of suitable Red-tailed Phascogale habitat. <p>The native vegetation within the Project Area comprises of significant habitat for the two species of Black Cockatoos and the Red-tailed Phascogale, therefore the Project is at variance to this Principle.</p>
Methodology	GHD (2016a) GHD (2016b) NatureMap - Accessed August 2012 (DPAW 2007–)

¹ Fauna habitat includes native and non-native vegetation as well as cleared areas containing introduced grasses and herbs.

(b)	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.
	Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012)
(c)	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.
Comments	Proposal is not likely to be at variance to this Principle
Assessment	<p>Desktop searches (in GHD 2016b at Appendix B) identified the potential presence of ten Threatened flora within the Pinjarra to Williams Project area, 12 Threatened flora within the Williams to Narrogin Project area and 23 Threatened flora within the Toodyay to Goomalling Project area. The Likelihood of Occurrence assessment (based on the range, habitat requirements, previous records of the species and efficacy of survey) determined that three Threatened species are likely/possibly to occur within the Toodyay to Goomalling Project area (<i>Caladenia drakeoides</i>, <i>Gastrolobium hamulosum</i> and <i>Grevillea christineae</i>) and two Threatened species are likely/possibly to occur within each of the Pinjarra to Williams and Williams to Narrogin Project areas (<i>Caladenia hopperiana</i> and <i>Pultenaea pauciflora</i> respectively).</p> <p>No potential habitat for <i>Caladenia drakeoides</i> will be impacted within the Toodyay to Goomalling Project area. Potential habitat for <i>Gastrolobium hamulosum</i> is very limited within this Project area, being less than 0.2 ha and potential habitat for <i>Grevillea christineae</i> is less than 0.71 ha.</p> <p>The Threatened orchid, <i>Caladenia hopperiana</i> DPAW location is mapped as 840 m north east of the Pinjarra to Williams Project area. The description for this species however is 3 km east of Quindanning on the Williams/Quindanning Road, which locates this Threatened species as potentially within the Pinjarra to Williams Project area. The description of this record indicates that the habitat is 'open Whitegum woodland around low winter <i>Melaleuca</i> swamp' (DPAW 2007-2015) but vegetation mapping for the biological survey area at and around 2.5 to 3.5 km east of Quindanning does not record any <i>Eucalyptus wandoo</i> woodland or <i>Melaleuca</i> swamps. The survey was not undertaken at a time at which the species would likely have still been flowering, but, due to the lack of suitable habitat within the Project area it is considered highly unlikely that the species would be present.</p> <p>One plant of the EPBC Act and WC Act listed flora, <i>Pultenaea pauciflora</i> (Vulnerable and Threatened) was recorded within the Williams to Narrogin Project area during the field survey, in a previously recorded location immediately adjacent to the known population at the Narrogin golf course. No other EPBC Act and WC Act listed taxa were recorded in the Project areas. The Project will remove 1 plant (0.0002 %) of the 5,000 previously recorded plants of <i>Pultenaea pauciflora</i> plants (based on data available in <i>FloraBase</i>). Approximately 0.11 ha of likely habitat for this species may be impacted. Main Roads has an existing Permit to Take, approved by the Western Australian Minister for the Environment, for Threatened flora within the road maintenance zone (Appendix C). Therefore it is considered that the proposal is not at variance to this Principle as the one plant which may be cleared has already been considered in a previous approval.</p>
Methodology	GHD (2016a) GHD (2016b) DPAW shapefiles

(d)	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.
Comments	Proposal is at variance to this Principle
Assessment	<p>The TEC, <i>Eucalypt Woodlands of the Western Australian Wheatbelt</i>, listed as Critically Endangered under the EPBC Act was recorded within all three Project areas. 0.16 ha of the TEC occurs within the Pinjarra to Williams Project area; 0.10 ha of the TEC occurs within the Williams to Narrogin Project area and 0.06 ha of the TEC occurs within the Toodyay to Goomalling Project area, for a total of 0.32 ha.</p> <p>This TEC is scattered along the Project area as narrow strips of the representative trees over moderate understorey. Large areas of the TEC have been impacted by historical native vegetation clearing and road maintenance and subsequent weed invasion has occurred. This has resulted in vegetation ranging from excellent to poor condition, but including the relevant eucalypt tree species, with some native understorey remaining.</p> <p>The <i>Eucalypt Woodlands of the Western Australian Wheatbelt</i> were formerly the most common type of vegetation across the Wheatbelt landscape. The Wheatbelt region is now dominated by agricultural land uses, principally cereal cropping or grazing and has been extensively cleared of native vegetation. The local area occupied by the TEC currently exists along the road corridor. The remaining area of the TEC not impacted by the Project may be subjected to threats from localised occurrences of fire and further weed invasion. Due to the presence of the TEC within the Project area, and the highly fragmented nature of the TEC within the Project area, the Project is at variance to this Principle.</p>
Methodology	<p>GHD (2016a) GHD (2016b) DPAW shapefiles Threatened Species Scientific Committee (TSSC) (2015)</p>

(e)	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
Comments	Proposal is at variance to this Principle
Assessment	<p>The Project areas are located within the Avon Wheatbelt and the Jarrah Forest IBRA Bioregion. Broad scale (1:250,000) pre-European vegetation mapping of the Project areas (Beard 1979 and 1980). within the Pinjarra to Williams Project area includes vegetation associations:</p> <ul style="list-style-type: none"> • 7 which has less than 30 % of its pre-European extent remaining at all levels • 4 which has less than 30 % of its pre-European extent remaining at the State, IBRA region and LGA levels. <p>Three vegetation associations are present within the Williams to Narrogin Project area, these are:</p> <ul style="list-style-type: none"> • 7 which has less than 30 % of its pre-European extent remaining at all levels • 947 is present at greater than the 30 % threshold level of the pre-European extent remaining at all levels

	<ul style="list-style-type: none"> • 1023 which has less than 30 % of its pre-European extent remaining at all levels, except within the town of Narrogin, where there is 32.06 % of its pre-European extent remaining. <p>Five vegetation associations are present within the Toodyay to Goomalling Project area, these are:</p> <ul style="list-style-type: none"> • 1049 which has less than 30 % remaining of its pre-European extent at the LGA level and less than 10% remaining at the IBRA Bioregion and Subregion levels and is considered <i>Endangered</i> at those levels • 352 which has less than 30 % remaining of its pre-European extent at all levels except the LGA level, where there is less than 10% remaining and is considered <i>Endangered</i> at that level • 946 which has less than 30% remaining of its pre-European extent, at all levels • 988 which has less than 30% remaining of its pre-European extent at the IBRA region level • 128 has more than 30% of its pre-European extent remaining at all levels. <p>As the Project is located within the heavily cleared Avon Wheatbelt (18.69 % remaining) and there has been large-scale clearing of many of the vegetation associations present within the Project areas, the Project is at variance to this Principle.</p>
Methodology	<p>GHD (2016b) GoWA (2015) Beard (1979) Beard (1980) Shepherd et al. (2002) Aerial photography</p>

(f)	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
Comments	Proposal is at variance to this Principle
	<p>The EPBC Act PMST did not identify any Ramsar listed sites or Nationally Important Wetlands within 10 km of the Project areas.</p> <p>The surface waterways present within the Project area include:</p> <p><i>Pinjarra to Williams</i></p> <p>One major watercourse, the Williams River, is present within the Pinjarra to Williams Project area (Geoscience Australia 2006). Eight minor non-perennial watercourses occur within this Project area and include Marling Gully.</p> <p><i>Williams to Narrogin</i></p> <p>No major watercourses occur within the Williams to Narrogin Project area (Geoscience Australia 2006). Nine minor non-perennial watercourses occur within this Project area and include Fitts Creek, Williams River and Macdermott Brook.</p> <p><i>Toodyay to Goomalling</i></p> <p>One major drainage system is present within the Project area – the Avon River at the western end of the Project area and the Mortlock River system, which feeds into the Avon (Geoscience Australia 2006). A number of named, ephemeral, watercourses cross the Project area. These include; Boyagerring Brook, Wongamine Brook, Chitibin Brook, Bebakine Creek, Cockerding Brook and Woormening Gully.</p> <p>The Project area intersects two major rivers, as well as numerous natural and constructed drainage lines. Vegetation types that grow in association with these areas which are considered to support riparian vegetation are described below.</p>

	<p><i>Pinjarra to Williams</i></p> <ul style="list-style-type: none"> <i>Eucalyptus rudis</i> open forest – present in Williams River and lower lying areas 1.29 ha <p><i>Williams to Narrogin</i></p> <ul style="list-style-type: none"> <i>Eucalyptus rudis</i> woodland – present in lower lying areas 0.06 ha <p><i>Toodyay to Goomalling</i></p> <ul style="list-style-type: none"> <i>Casuarina obesa</i> forest – present on saline river flats 0.36 ha <i>Eucalyptus rudis</i> open forest – present as trees only (understorey all weeds, adjacent to a creekline on farmland) 0.55 ha. <p>The Project is at variance with this Principle because it would involve the removal of native vegetation growing in association with creeklines. However, the extent of native vegetation that will require clearing along these creeklines has been minimised as some of the <i>Eucalyptus rudis</i> trees will be retained and others, such as trees in the <i>Casuarina obesa</i> forest, are also likely to remain as they do not pose a safety risk.</p> <p>A Bed and Banks Permit has been approved for the Project by the Department of Water.</p>
Methodology	<p>GHD (2016a) GHD (2016b) DotE (2015) DoW (2016) Geoscience Australia 2006</p>

(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
Comments	Proposal is not likely at variance to this Principle
	<p>The Project areas are located within the road reserve, are linear in nature and have been either historically cleared or are otherwise highly modified.</p> <p>Chief soils for all three Project areas are hard neutral and acidic yellow mottled soils and red soils. Chief soils of the Toodyay to Goomalling Project area range from hard alkaline yellow mottled soils and neutral red soils to sandy, neutral, and also acidic, yellow mottled soils.</p> <p>The Natural Resource Management mapping of degradation hazards (GoWA 2012) indicates that the soils of the Pinjarra to Williams to Narrogin area range from <3 % to 30-50 % of map units with high to extreme wind erosion risk. However, in the Toodyay to Goomalling area the range from 10-30 % to 50-70 % of map units with high to extreme wind erosion risk. This mapping also indicates that the Project areas falls within an area that has <3% to 10-30 % of map units with a high to extreme water erosion risk.</p> <p>Mapping of the probability of Acid Sulfate Soils (ASS) occurring within the soil profile indicates that soils within the Project area have a 'Low Probability of Occurrence' (Very Low Confidence) and an 'Extremely low Probability' (Very Low Confidence).</p> <p>The small size and linear nature of the clearing required for this Project means this clearing is not considered likely to increase ground water recharge, surface water runoff or nutrient export.</p>

	<p>The project will require the removal of deep-rooted vegetation that may lead to land degradation in the form of local erosion and salinity, however due to the small number of trees required to be cleared, the risk is considered to be minimal.</p> <p>While parts of the Project area is within an area with a high risk for wind erosion the extent of clearing is minor and the cleared areas will be compacted. Increased water erosion through loss of vegetation close to table drains can be managed through design and construction controls. Therefore, the proposed clearing is not likely to be at variance to this Principle.</p>
Methodology	<p>GHD (2016a) Australian Soil Resource Information System (2015) Landgate (2016) - Accessed March 2016</p>

(h)	<p>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.</p>
Comments	<p>Proposal is not likely to be at variance to this Principle</p>
	<p>The majority of the area surrounding the Project area consists of private land primarily used for cropping and grazing. A small portion of the surrounding land includes State and local government reserves.</p> <p>Six areas of DPAW -managed land are located within 300 m of the Project area. Four of these areas are State Forest and the others include the Narrogin DPAW office and depot. No DPAW managed areas occur within the disturbance footprint.</p> <p>The Project will not directly or indirectly impact on any DPAW managed Nature Reserves. The DPAW managed land adjacent to the Project within the Narrogin townsite (Reserves 31732 and 27865) are not a nature reserve and it is unlikely that the removal of up to three trees in this area will cause a detrimental impact to the adjacent bushland.</p> <p>The proposed clearing is not likely to be at variance to this Principle.</p>
Methodology	<p>GHD (2016b) DPAW shapefiles</p>

(i)	<p>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.</p>
Comments	<p>Proposal is not likely to be at variance to this Principle</p>
	<p>The Project occurs within the Murray River System, a proclaimed surface water area as listed under the Rights in Water and Irrigation Act 1914. The Project is not expected to impact this system.</p> <p>The surface waterways present within the Project area include: <i>Pinjarra to Williams</i> One major watercourse, the Williams River, is present within the Pinjarra to Williams Project area (Geoscience Australia 2006). Eight minor non-perennial watercourses occur within this Project area and include Marling Gully. <i>Williams to Narrogin</i> No major watercourses occur within the Williams to Narrogin Project area (Geoscience Australia 2006). Nine minor non-perennial watercourses occur within this Project area and include Fitts Creek, Williams River and Macdermott Brook.</p>

	<p><i>Toodyay to Goomalling</i></p> <p>One major drainage system is present within the Project area – the Avon River at the western end of the Project area and the Mortlock River system, which feeds into the Avon (Geoscience Australia 2006). A number of named, ephemeral, watercourses cross the Project area. This includes; Boyagerring Brook, Wongamine Brook, Chitibin Brook, Bebakine Creek, Cockerding Brook and Woormening Gully.</p> <p>As indicated in Principle (g) the Project areas range from <3 % to 30-50 % of map units with a moderate to high salinity risk or is presently saline. Due to the small number of trees required to be cleared, the risk of increasing salinity levels in the surface or underground water is minimal</p> <p>There may be minor short term impacts on these creeklines during clearing, including potential decrease in runoff quality as well as erosion of the soil adjacent to the road during construction. However, as the clearing will occur along the existing highway the Project is not expected to clear vegetation that would significantly alter current surface water drainage in the long term. Existing road drains and other drainage (natural or constructed) will be re-constructed after completion of the Project, and therefore the Project is not expected to alter current surface water drainage in the long term.</p> <p>As indicated in Principle (g) the probability of ASS occurring ‘Low Probability of Occurrence’ (Very Low Confidence) and an ‘Extremely low Probability’ (Very Low Confidence).</p> <p>A maximum of 2.27 ha of vegetation within or immediately adjacent to riparian areas will be cleared. Many of the trees present within the mapped riparian vegetation types will not be cleared and clearing is unlikely to cause significant changes to surface runoff or quality once soil in the clearing areas has been compacted.</p> <p>The proposed clearing is not likely to be at variance to this Principle as the loss of the vegetation in long, disjunct strips is not considered likely to cause a permanent deterioration in the quality of surface or underground water.</p>
Methodology	<p>Geoscience Australia 2006</p> <p>GHD (2016b)</p> <p>DoW (2016)</p>

(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.
Comments	Proposal is not likely to be at variance to this Principle
	<p>The total extent of native vegetation required to be cleared for the Project is 18.16 ha, it is considered unlikely that clearing of vegetation associated within the Project areas would cause, or exacerbate the incidence or intensity of flooding. Increasing the road surface/compacted areas may slightly increase runoff to adjacent areas but impacts are expected to be negligible due to the linear extent of the Project area and the option for numerous points of water dissipation from the road reserves.</p> <p>The lower lying dampland and watercourse areas have a higher risk of localised, increased waterlogging. In addition, the clearing required within these areas will be minor as the extent of impact on the creeklines is low and clearing will only occur in a thin strip adjacent to the existing road.</p> <p>The proposed clearing is not likely to be at variance to this Principle.</p>
Methodology	<p>GHD (2016a)</p> <p>GHD (2016b)</p> <p>Landgate (2016) - Accessed March 2016</p>

4. Summary of biological survey

This section provides a summary of the Williams Narrogin Highway (SLK 0 to SLK 31.4), Pinjarra Williams Road (SLK 91.9 to SLK 125.5) and Toodyay Goomalling Road (SLK 1.2 to SLK 48.0) biological assessment (GHD 2015b) as shown in Table 9. This assessment included a 63.15 ha biological survey area for the Williams Narrogin Highway, a 67.31 ha biological survey area for the Pinjarra Williams Road and a 93.7 ha biological survey area for the Toodyay Goomalling Road. Desktop and field investigations of the biological survey areas were conducted in November 2015, February and March 2016 and the key results from this assessment are summarised below.

Table 9 Summary of biological aspects for the biological survey areas

Biological Aspect	Toodyay to Goomalling biological survey area	Pinjarra to Williams biological survey area	Williams to Narrogin biological survey area
Flora and Vegetation			
Vegetation Extent of pre-European vegetation associations	<p>1049: Medium woodland; wandoo, York gum, salmon gum, morrel & gimlet, is below the 30 % threshold at the LGA level and below the 10% threshold at the IBRA Bioregion, and Sub-region levels and is considered 'Endangered' at those levels.</p> <p>352: Medium woodland; York Gum, is below the 30 % threshold at the State, IBRA Bioregion and Sub-region levels and below the 10% threshold at the LGA level and is considered 'Endangered' at that level.</p> <p>946: Medium woodland; Wandoo, is below the 30 % threshold at all levels.</p> <p>988: Wand Succulent steppe with thicket; Melaleuca thyooides over samphire, is below the 30 % threshold at the IBRA Bioregion level.</p>	<p>7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo, is below the 30 % threshold at all levels.</p> <p>4: Medium woodland; marri & wandoo, which is mapped within the Pinjarra to Williams survey area, is below the 30 % threshold at the State, IBRA Bioregion and LGA levels.</p>	<p>7: Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo, is below the 30 % threshold at all levels.</p> <p>1023: Medium woodland; York gum, wandoo and salmon gum (<i>Eucalyptus salmonophloia</i>), is below the 30 % threshold at all levels, except within the town of Narrogin.</p>
Threatened Ecological Communities	8.49 ha of the EPBC Act listed, Critically Endangered TEC, <i>Eucalypt Woodlands of the Western Australian Wheatbelt</i> is present within the biological survey area.	8.85 ha of the EPBC Act listed, Critically Endangered TEC, <i>Eucalypt Woodlands of the Western Australian Wheatbelt</i> is present within the biological survey area.	2.14 ha of the EPBC Act listed, Critically Endangered TEC, <i>Eucalypt Woodlands of the Western Australian Wheatbelt</i> is present within the biological survey area.
Priority Ecological Communities	6.98 ha of the Priority 3 PEC, <i>Eucalypt woodlands of the Western Australian Wheatbelt</i> is present within the biological survey area.	Not mapped.	Not mapped.

Biological Aspect	Toodyay to Goomalling biological survey area	Pinjarra to Williams biological survey area	Williams to Narrogin biological survey area
Riparian vegetation	<ul style="list-style-type: none"> • <i>Eucalyptus rudis</i> woodland (1.39 ha) • <i>Casuarina obesa</i> forest (1.1 ha). 	<ul style="list-style-type: none"> • <i>Eucalyptus rudis</i> open forest (4.34 ha). 	<ul style="list-style-type: none"> • <i>Eucalyptus rudis</i> woodland (0.44 ha).
Threatened Flora	None present.	None present.	One plant of <i>Pultenaea pauciflora</i> was recorded growing in a highly disturbed area, adjacent to the road, approximately 1.4 km north east of Quarry Road. The <i>Pultenaea</i> was recorded in a degraded road edge adjacent to <i>Eucalyptus wandoo</i> open forest. This vegetation association would have once been the habitat for this species. Approximately 1.22 ha of this habitat occurs within the biological survey area.
Priority Flora		One plant of <i>Xanthorrhoea brevistyla</i> Priority 4 was recorded near the intersection of Cowcher Road, in vegetation association <i>Eucalyptus wandoo</i> open forest.	None present.
Flora Likelihood of Occurrence Assessment	<p>Fifteen species could possibly occur within this biological survey area and include:</p> <ul style="list-style-type: none"> • <i>Caladenia drakeoides</i> - Threatened and Endangered • <i>Gastrolobium hamulosum</i> - Threatened and Endangered • <i>Grevillea christineae</i> - Threatened and Endangered • <i>Conostylis caricina</i> subsp. <i>elachys</i> – Priority 1 • <i>Grevillea candolleana</i> – Priority 2 • <i>Calytrix oncophylla</i> – Priority 2 • <i>Guichenotia impudica</i> – Priority 3 • <i>Cryptandra beverleyensis</i> – Priority 3 	<p>One species is known to occur (<i>Xanthorrhoea brevistyla</i> Priority 4), one species is likely to occur (<i>Caladenia hopperiana</i> Threatened) and two species could possibly occur (<i>Stylidium rubricalyx</i> Priority 3 and <i>Goodenia katabudjar</i> Priority 3) within this biological survey area.</p> <p>Based on the vegetation types recorded during the biological survey it was considered that <i>Caladenia hopperiana</i> was not likely to be present.</p>	<p>One species is known to occur (<i>Pultenaea pauciflora</i> Threatened and Vulnerable) and two species could possibly occur (<i>Stylidium rubricalyx</i> Priority 3 and <i>Acacia horridula</i> Priority 3) within this biological survey area.</p>

Biological Aspect	Toodyay to Goomalling biological survey area	Pinjarra to Williams biological survey area	Williams to Narrogin biological survey area
	<ul style="list-style-type: none"> • <i>Eucalyptus sargentii</i> subsp. <i>onesia</i> – Priority 3 • <i>Tetratheca retrorsa</i> – Priority 3 • <i>Tetratheca similis</i> – Priority 3 • <i>Eucalyptus loxophleba</i> x <i>wandoo</i> – Priority 4 • <i>Caladenia integra</i> – Priority 4 • <i>Persoonia sulcata</i> – Priority 4 • <i>Hibbertia montana</i> – Priority 4. 		
Fauna and fauna habitat			
Conservation Significant Fauna Species	<ul style="list-style-type: none"> • Present - Rainbow Bee Eater (<i>Merops ornatus</i>) – Marine/Migratory under the EPBC Act, Schedule 5 under WC Act • Likely - Carnaby's Black Cockatoo (<i>Calyptorhynchus latirostris</i>) - Endangered under the EPBC Act, Schedule 2 under the WC Act • Likely - Red-tailed Phascogale (<i>Phascogale calura</i>) - Endangered under the EPBC Act, Schedule 6 under the WC Act • Likely - Peregrine Falcon (<i>Falco peregrinus</i>) - Schedule 7 under the WC Act. 	<ul style="list-style-type: none"> • Present - Red-tailed Phascogale (<i>Phascogale calura</i>) - Endangered under the EPBC Act, Schedule 6 under the WC Act • Present - Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) - Vulnerable under the EPBC Act, Schedule 3 under the WC Act • Present - Rainbow Bee Eater (<i>Merops ornatus</i>) – Marine/Migratory under the EPBC Act, Schedule 5 under WC Act • Likely - Carnaby's Black Cockatoo (<i>Calyptorhynchus latirostris</i>) - Endangered under the EPBC Act, Schedule 2 under the WC Act 	<ul style="list-style-type: none"> • Present - Carnaby's Black Cockatoo (<i>Calyptorhynchus latirostris</i>) - Endangered under the EPBC Act, Schedule 2 under the WC Act • Present - Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) - Vulnerable under the EPBC Act, Schedule 3 under the WC Act • Likely - Red-tailed Phascogale (<i>Phascogale calura</i>) - Endangered under the EPBC Act, Schedule 6 under the WC Act • Likely - Peregrine Falcon (<i>Falco peregrinus</i>) - Schedule 7 under the WC Act

Biological Aspect	Toodyay to Goomalling biological survey area	Pinjarra to Williams biological survey area	Williams to Narrogin biological survey area
		<ul style="list-style-type: none"> Likley - Peregrine Falcon (<i>Falco peregrinus</i>) - Schedule 7 under the WC Act. 	<ul style="list-style-type: none"> Likley - Rainbow Bee Eater (<i>Merops ornatus</i>) – Marine/Migratory under the EPBC Act, Schedule 5 under WC Act.
Fauna Habitat	<ul style="list-style-type: none"> Approximately 19.71 ha of foraging habitat for Carnaby's Black Cockatoo 528 trees (>300 mm and >500 mm DBH) Approximately 21.41 ha of habitat in the biological survey area for Red-tailed Phascogale. 	<ul style="list-style-type: none"> Approximately 15.42 ha of foraging habitat for Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo 614 trees (>300 mm and >500 mm DBH) Approximately 19.05 ha of habitat in the biological survey area for Red-tailed Phascogale. 	<ul style="list-style-type: none"> Approximately 13.86 ha of foraging area for Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo 800 trees (>300 mm and >500 mm DBH) Approximately 15.06 ha of habitat in the biological survey area for Red-tailed Phascogale.

5. Management actions

Management actions should be implemented to avoid, mitigate and / or manage the identified impacts to clearing. The Environmental Management Plan is provided below.

ENVIRONMENTAL MANAGEMENT PLAN

Project Component	<i>Management Action</i>	Monitoring/ Maintenance Program	Responsible Party	Completion Timeframe
Standard Record Keeping Management				
Record Keeping	<ul style="list-style-type: none"> Ensure standard record keeping requirements are completed within 3 months of completion of the project activities. 	Post-project record maintenance	Project Manager and Environment Officer	3 months after completion of Project
Key Environmental Aspects - Flora and Fauna				
Flora and Vegetation Management	<ul style="list-style-type: none"> Demarcate all native vegetation and fauna habitats to be retained or cleared (i.e. pegging), so that “No Go” zones are clearly delineated and noted by project workers, and any accidental loss of vegetation is avoided. Induct all staff and contractors regarding biodiversity constraints, particularly the presence of conservation significant species, and required actions regarding biodiversity values. No trees or ground vegetation outside of the approved disturbance footprint to be disturbed. 	Construction maintenance	Contractor/Project Manager	Duration of project period
Fauna Management	<ul style="list-style-type: none"> Examine the habitat in the vicinity of known records of the Red-tailed Phascogale for evidence of nesting or breeding Induct all staff and contractors regarding biodiversity constraints, particularly the presence of conservation significant species, and required actions regarding biodiversity values. Do not permit site personnel to bring firearms, other weapons or pets on site. If possible schedule clearing operations to avoid peak breeding times of threatened species (July to January). If any native fauna is disturbed during clearing it should be allowed to make its own way to adjacent vegetated areas. Any injured wildlife should be taken to a designated veterinary clinic or a DPaW nominated wildlife carer. 	Construction maintenance	Contractor/Project Manager	Duration of project period

Project Component	Management Action	Monitoring/ Maintenance Program	Responsible Party	Completion Timeframe
Species specific management actions – Red-tailed Phascogale and Carnaby's Black Cockatoo (Scenario 1 - Construction to be undertaken during the breeding season)	<ul style="list-style-type: none"> Survey of the habitat area on Pinjarra Williams Road by a qualified ecologist to relocate any phascogale in the clearing area. Check two trees with hollows suitable for Black Cockatoos prior to clearing. 			
Species specific management actions – Red-tailed Phascogale and Carnaby's Black Cockatoo (Scenario 2 - Construction to be undertaken outside the breeding season)	<ul style="list-style-type: none"> Clearly delineate the extent of the disturbance footprint (clearing footprint) with coloured pegs. Prior to clearing/ clearing operations the surveyor will mark out the clearing line and this will be checked by Main Roads Environment Officer to determine that it is clearly defined and compliant with permits. The extent of this clearing will be clearly communicated in documentation and accurately demarcated on-ground. All project clearing personnel will be inducted prior to the commencement of works. The induction program will include communication about the 'No Go Areas', importance and consequences of entering/disturbing these areas. Regular review of the disturbance footprint boundary to ensure 'No Go Areas' are clearly delineated Restrict clearing personnel to the disturbance footprint including designated access routes and parking areas. Fauna encountered during the clearing process shall be given the chance to move on if there is no threat to the person's safety in doing so. 			
Other Environmental Aspects				
Dieback and Weed Management	<ul style="list-style-type: none"> Clean machinery of soil and vegetation prior to entry. Restrict movement of machines and other vehicles to the limits of the areas cleared. 	Machinery checked prior to entering and exiting Project site. Demarcate areas affected/not affected by dieback.	Project Manager	Duration of project period

Project Component	Management Action	Monitoring/ Maintenance Program	Responsible Party	Completion Timeframe
<p>Weed Control</p> <p><u>Pinjarra to Williams Highway</u> *<i>Asparagus asparagoides</i> (Bridal Creeper)</p> <p><u>Williams to Narrogin Highway</u> *<i>Asparagus asparagoides</i> (Bridal Creeper)</p>	<ul style="list-style-type: none"> Management actions will be implemented for <i>Asparagus asparagoides</i> (Bridal Creeper), which is a Declared Pest under Section 22 of the Biosecurity and Agriculture Management Act 2007 and a Weed of National Significance (Australian Weeds Committee 2010) Machinery will be maintained and cleaned to reduce the spread of weeds throughout the Project area Weeds growing in the Project area that are likely to spread and result in environmental harm to adjacent areas of native vegetation that are in good or better condition will be removed or killed. 	One annual surveillance monitoring should be undertaken to manage spread of weeds.	Project Manager	Five years from commencement of clearing
<p>Reserves and conservation areas</p> <p><u>Williams to Narrogin Project area</u> Class C, No. 31732 and No. 27865</p>	<ul style="list-style-type: none"> No clearing is permitted within the Class C, No. 31732 and No. 27865 for the Williams to Narrogin Project area. 	Pre-project/project surveillance	Project Manager	Duration of project period
<p>Environmentally Sensitive Areas</p> <p><u>Williams to Narrogin Project area</u></p>	<ul style="list-style-type: none"> No clearing is permitted at the buffer zone of the ESA located within the Williams to Narrogin Project area. 	Pre-project/project surveillance	Project Manager	Duration of project period
<p>Aboriginal Heritage Sites</p> <p><u>Pinjarra to Williams Road</u> Axle Grease Reserve No. 500</p> <p><u>Williams to Narrogin Highway</u> Geeralying No. 15139; Geeralying No. 5888; Manaring Road No. 5826.</p> <p><u>Toodyay to Goomalling Road</u> Boolegin: Bolgart (Avon River crossing) No. 4045</p>	<ul style="list-style-type: none"> Ensure on-site project personnel are aware of the location of all Aboriginal heritage sites on site and the requirement to avoid impacting heritage values. Disturbance outside the approved clearing area will not be permitted Any disturbance to the heritage sites adjacent to the Project areas (Geeralying No. 15139; Geeralying No. 5888; Manaring Road No. 5826; Swan Avon River (and tributaries) No. 3536 and Axle Grease Reserve No. 500) will be undertaken through approvals from the Department of Aboriginal Affairs (DAA). 	Pre-project/project surveillance	Project Manager	Duration of project period

Project Component	Management Action	Monitoring/ Maintenance Program	Responsible Party	Completion Timeframe
All project areas in the event of unknown sites being unearthed during project process	<ul style="list-style-type: none"> In the event that human skeletal material is discovered, work will cease immediately and the Police contacted. If the skeletal remains are determined to be of Aboriginal origin, the DAA will be contacted as soon as practicable. In the event that artefacts or material of Aboriginal origin is discovered, work will cease within 25 metres of the material and a qualified archaeologist will investigate the item(s) and take appropriate actions (i.e. contact DAA). Liquid spills, stormwater and runoff materials will be managed to ensure project activities and drainage do not adversely affect heritage sites or any wetland or water body including creeks, springs, swamps and soaks. 			
Dust	<ul style="list-style-type: none"> Clear vegetation only when necessary and treat areas requiring soil stabilisation as soon as practicable. Ensure dust lift is controlled to limit exposure to nearby rural residential properties and road users through regular soil watering, road sweeping and treatment of cleared areas. Surface watering, spreading of hydromulch or similar will be used to protect loose surfaces or cleared areas, as required. Minimise or cease project activities when excessive dust is generated, when works are occurring near sensitive areas such as in the town of Narrogin, Toodyay and Williams. 	Construction and post-project maintenance	Contractor	Duration of project period
Pollution and Litter	<ul style="list-style-type: none"> All waste materials from the Project area will be removed from the site upon completion of the project and to the satisfaction of the Roadside Management Officer. 	Construction and post-project maintenance	Contractor	Duration of project period

Project Component	Management Action	Monitoring/ Maintenance Program	Responsible Party	Completion Timeframe
	<ul style="list-style-type: none"> Construction waste and other rubbish will be contained in bins with lids (where practicable) and removed regularly. 			
Noise and Vibration	<ul style="list-style-type: none"> Ensure compliance with all applicable statutory requirements and any heritage protection requirements (for vibration) if required. Adopt project techniques where possible that will minimise noise and vibration impacts to nearby sensitive receptors. Inform nearby sensitive receptors including adjoining communities of activities that may cause excessive noise and respond quickly to complaints by community members. Limit project activity to normal business hours and liaise with the Shires of Toodyay, Williams and Narrogin, if project activities are required outside of these hours. 	Construction maintenance	Contractor/Project Manager	Duration of project period
Surface Drainage	<ul style="list-style-type: none"> Vegetation removal and soil disturbance will be minimised, where practicable. Disturbed areas will be stabilised soon after project activities are completed. Existing natural drainage paths and channels along the road or the vicinity of the Project area will not be unnecessarily blocked or restricted during project. Vehicle and equipment wash down areas will be located away from environmentally sensitive areas. No on-site storage of fuel, oils and other contaminant materials will be permitted within 50 m of a watercourse. 	Pre-project/project surveillance	Contractor	Duration of project period
Groundwater	<ul style="list-style-type: none"> All spills will be contained immediately and removed within 24 hours to minimise the potential for contaminants to enter groundwater. Spills to be reported as an incident to the Environment Officer for record keeping purposes. 	Construction maintenance	Contractor/ Environment Officer	Duration of project period

Project Component	<i>Management Action</i>	Monitoring/ Maintenance Program	Responsible Party	Completion Timeframe
Hazardous Materials Proximity to Avon River, Mortlock River system, and Williams River and associated tributaries	<ul style="list-style-type: none"> Bulk fuel and hazardous material storage areas will be bunded and managed in compliance with applicable Australian Standards. Vehicle servicing will be undertaken at designated areas, at least 100 m away from watercourses. Site personnel shall be trained in the use of emergency Fire suppressant equipment. Spill trays and spill response equipment will be available near fuel storage or refuelling areas. All hazardous material spills will be reported according to statutory requirements. 	Construction maintenance	Contractor/Project Manager	Duration of project period
Fire	<ul style="list-style-type: none"> No fires shall be lit within the Project area. Machinery will be fitted with approved spark arresting exhaust systems. All vehicles, plant and equipment to be fitted with fire extinguishers and restricted to designated cleared areas. Construction personnel will extinguish and report fires occurring within the Project area. 	Construction maintenance	Contractor/Project Manager	Duration of project period
Visual Amenity	<ul style="list-style-type: none"> Cleared vegetation stockpiles and other materials will be stored in designated areas and kept in a neat and tidy condition at all times. The duration of ground disturbing activities will be limited as far as practicable. The Project area is to be kept free of litter and rubbish. 	Construction maintenance	Contractor/Project Manager	Duration of project period

6. Stakeholder consultation

6.1 Stakeholder requests

Main Roads is currently progressing heritage consultation for the Project.

Consultation with key stakeholders has been undertaken for this project in accordance with Main Roads internal processes. Letters were sent to the following stakeholders:

- Conservation Council
- Department of Parks and Wildlife Northam
- Department of Water
- Shires of Williams, Narrogin and Toodyay and Goomalling
- Roadside Conservation Committee
- Soil and Land Conservation Commission
- Wildflower Society

Approvals have been sought from the DoW and DAA, including consultation with these departments.

6.2 Stakeholder responses

Responses were provided by the Shire of Toodyay, the Shire of Williams, the Soil and Land Conservation Commission and DoW (Appendix D).

The Shire of Williams had no specific comments and had no objections to the Project proceeding due to the safety issues posed by the Pinjarra to Williams and Williams to Narrogin sections of road within their Shire.

The Shire of Toodyay stated their commitment to understanding and preserving native vegetation within their jurisdiction. The Shire questioned the vegetation condition mapping within the biological survey report and compared it to road vegetation scores provided by Western Australian Local Government Association Environmental Planning Tool, which they claim indicated a higher vegetation condition for a 4 km strip approximately 11 km east of Toodyay. However, the WALGA tool uses a reversed scale to that of Keighery (1994) which was used in the biological survey and there is potentially some confusion in comparing the two scales. The Shire also overstated the loss of vegetation from the report provided to them, believing that the entire 18.15 ha would be cleared within the Shire, when only 6.4 ha (of varying condition) will be impacted.

The Shire of Toodyay also requested that:

- the clearing management give special consideration to clearing in relation to risks to erosion
- any trees with suitable hollows be protected where possible or the hollows related for use elsewhere in the vicinity of the Project
- appropriate hygiene measures be put in place to manage and risks to weed and disease spread.

Hygiene will be managed as a standard practice and included in the EMP. Only two trees with potentially suitable hollows have been identified for removal as part of the proposed works, with one in the Shire of Toodyay.

The Commissioner of Soil and Land Conservation also raised similar concerns regarding increased soil erosion in his submission, which relates to both this project and another Main Roads project being undertaken in the area (Appendix D). A large portion of this submission relates directly to construction impacts, and refers to the other project. The points made for this project are that current drainage design is conducive to high levels of erosion. No changes to the construction of the road or the proposed drainage is expected as part of the maintenance zone establishment works, only clearing and culvert upgrades where needed. Culvert upgrades will assist with water control on the roads.

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