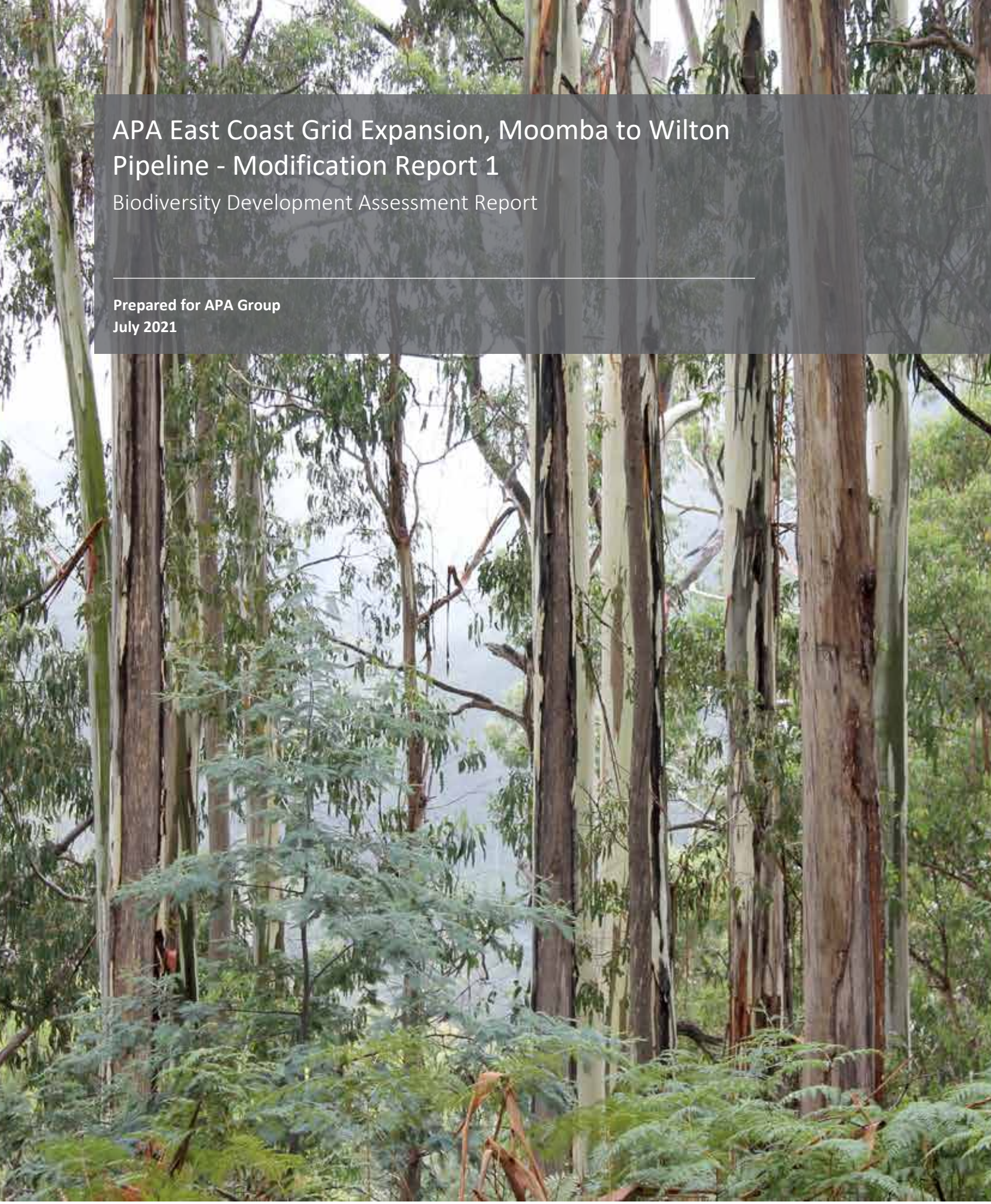
Appendix E

Biodiversity development assessment report

APA East Coast Grid Expansion, Moomba to Wilton Pipeline - Modification Report 1

Biodiversity Development Assessment Report

Prepared for APA Group
July 2021



EMM
creating opportunities

EMM
creating opportunities

Servicing projects throughout Australia and internationally

SYDNEY
Ground Floor, 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3, 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 1, 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

ADELAIDE
Level 4, 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Ground Floor, 188 Normanby Road
Southbank VIC 3006
T 03 9993 1905

PERTH
Suite 9.02, Level 9, 109 St Georges Terrace
Perth WA 6000
T 02 9339 3184

CANBERRA
PO Box 9148
Deakin ACT 2600

APA East Coast Grid Expansion, Moomba to Wilton Pipeline – Modification Report 1

Biodiversity Development Assessment Report

Report Number

J200919 RP#18

Client

APA Group

Date

12 July 2021

Version

v4 Final

Prepared by

Cassandra Kottaras
Ecologist
12 July 2021

Approved by

Nathan Garvey
Associate Director
12 July 2021

Executive Summary

ES1 Project description

East Australian Pipeline Pty Ltd, part of the APA Group (APA) currently operates an underground high pressure natural gas transmission pipeline, extending from Moomba (South Australia) to Wilton (NSW). The Moomba to Wilton Pipeline (MWP) was constructed in 1976, initially owned and operated by the Pipeline Authority, a Commonwealth agency, and generally regulated under the *Pipeline Authority Act 1973*. The MWP is now owned and operated by APA, which was gazetted as State Significant Infrastructure (SSI) on 11 December 2020 and is authorised by Pipeline Licence No. 16 (PL16).

APA is proposing an expansion of transportation capacity on the East Coast Grid, linking Queensland with southern markets, by approximately 25% through additional compression and associated works on both the South West Queensland Pipeline (SWQP) and MWP. The proposed East Coast Grid Expansion presents an optimal opportunity to maximise gas supply via existing infrastructure with minimal impact. Modification 1 includes the first two stages of the East Coast Grid Expansion which will include construction of a compressor station at two sites, MW880 (Stage 1) and MW433 (Stage 2), on the MWP.

This Biodiversity Development Assessment Report (BDAR) has been prepared to address the biodiversity impacts for Modification 1 and to accompany the Modification Report.

ES2 Landscape features

The proposed sites, MW433 and MW880, are located within western NSW, approximately 440 kilometres (km) apart. MW433 occurs within the Mulga Lands Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and White Cliffs Plateau IBRA subregion. MW880 is located on the edge of two IBRA Bioregions; the NSW South Western Slopes and Cobar Peneplain; and two IBRA subregions; the Lower Slopes and Lachlan Plains. The BioNet NSW Landscapes intersecting the proposed sites are White Cliffs Tablelands and Downs (MW433) and Bimbi Plains (MW880). Given the sites are separated across different IBRA Bioregions, an assessment was completed separately for each site, as required by the Biodiversity Assessment Method (BAM, DPIE 2020a), including separate BAM calculations. At MW880, the IBRA Bioregion and subregion in which majority of the impact area is situated within, NSW South Western Slopes and Lower Slopes, was used for the purposes of the BAM.

MW433 is considered highly connected, with the site located within private land surrounded by the Paroo National Park. A buffer of 1,500 meters around the disturbance footprint contains 864.56 hectares (ha), with 99% native vegetation cover.

MW880 is considered highly fragmented, with the site located within a highly modified landscape with agricultural land. A buffer of 1,500 metres (m) around the disturbance footprint contains 36.58 ha, 4% native vegetation cover.

There are no important geological features within the proposed sites. MW433 contains two unnamed 1st order watercourses, while MW880 does not contain any watercourses.

There are no areas of outstanding biodiversity value, as declared by the NSW Minister for Energy and Environment, within the assessment area.

ES3 Native vegetation

Preliminary vegetation mapping was undertaken by AREA Environmental Consultants & Communication Pty Ltd (AREA) in December 2020. Two PCTs were identified within the study area; PCT 72 – White Cypress Pine – Poplar Box woodland on foot slopes and peneplains mainly in the Cobar Peneplain Bioregion was mapped within MW880 and PCT 153 – Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones was mapped within MW433. Further to AREA's work, EMM undertook additional work including the refinement of vegetation mapping and additional plot data. A total of seven BAM plots were completed within the study area to inform each vegetation zones integrity score.

The modification will result in direct impacts to 3.97 ha of native vegetation, with indirect impacts to a further 3.53 ha (Table ES1).

Table ES1 Plant community types mapping within the Modification 1 impact area

Site	Plant community type	Vegetation formation	Vegetation class	Direct impacts (ha)	Indirect impacts (ha)	Total impact area (ha)
MW880	72 – White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	Semi-arid Woodlands	Western Peneplain Woodlands	0.75	0.48	1.23
	Cleared/ non-native	-	-	3.60	2.21	5.81
MW433	153 – Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Arid Shrublands (Chenopod sub-formation)	Aeolian Chenopod Shrublands	3.22	3.05	6.27
	Cleared/ non-native	-	-	0.56	0.25	0.81
TOTAL NATIVE				**3.97**	**3.53**	**7.50**
TOTAL				**8.13**	**5.99**	**14.12**

ES4 Threatened species

An assessment of the geographic and landscape constraints within the proposed sites identified the potential occurrence of 27 candidate threatened species, of which nine species required further assessment.

Two threatened fauna species; Grey-crowned Babbler (*Pomatostomus temporalis*; ecosystem credit species) and Superb Parrot (*Polytelis swainsonii*;) were recorded at MW880. Targeted surveys were completed for a single candidate species, the Koala (*Phascolarctos cinereus*) at MW880, discounting the species presence. The remaining eight candidate species were assumed present:

- MW433:
  - Stimson's Python (*Antaresia stimoni*);
  - Australian Bustard (*Ardeotis australis*);
  - a saltbush (*Atriplex infrequens*); and
  - Crowned Gecko (*Lucasium stenodactylum*);

- MW880:
    - a spear-grass (*Austrostipa metatoris*);
    - Pine Donkey Orchid (*Diuris tricolor*);
    - Superb Parrot; and
    - Silky Swainson-pea (*Swainsona sericea*).

ES5 Aquatic ecology

The aquatic ecology of Modification 1 was evaluated via desktop assessment. It was determined that no 3rd order and above waterways are present within either MW433 or MW880, and no threatened aquatic species listed under the *Fisheries Management Act 1994* (FM Act) or the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) are anticipated to occur within either MW433 or MW880. MW433 is located within the internationally-significant Paroo River Wetlands; however, no direct impacts to the wetlands will occur, and it is anticipated that implementation of the proposed mitigation measures will negate any residual indirect impacts to the wetlands. MW880 is located within the FM Act-listed Lowland Lachlan River EEC; however, there is little to no connectivity between the site and the nearest waterways linked to the EEC and it is not anticipated that any impacts will occur.

ES6 Impact avoidance, minimisation and mitigation

The modification has undergone the following steps to avoid, minimise and mitigate impacts as listed below:

- locating ancillary buildings and temporary infrastructure in areas of lower biodiversity value and the subsequent avoidance of native vegetation and threatened species habitat (where possible);
- avoidance of important breeding habitat such as hollow bearing trees and nests;
- utilisation of existing tracks to access the sites;
- prior to any vegetation clearing activities, the following areas will be temporarily fenced and signed as 'No-go zones':
    - retained native vegetation within both sites (MW433 and MW880); and
    - Paroo-Darling National Park and Paroo River Wetlands (MW433);
- tree protection zones (TPZs);
- weed hygiene control measures, including vehicle, machinery and equipment washdown, appropriate management and disposal of weed species and weed control in key areas;
- rehabilitation of the site as soon as possible following construction;
- waste management to avoid encouragement of feral animals;
- use of directional lighting to avoid indirect impacts to fauna habitat; and

- management of sediment and water through a Soil and Water Management Plan (SWMP) and Progressive Erosion and Sediment Control Plan (PESCP).

These measures will result in the minimisation of impacts, recognising the siting of MW443 within and adjacent to a National Park and the Paroo River Wetlands and associated sensitive environments.

ES7 Assessment of impacts under other relevant biodiversity legislation

The BDAR has considered impacts on species and ecological communities listed under the EPBC Act. The modification is not expected to result in significant impacts on any EPBC Act listed threatened species or the Paroo River Wetlands Ramsar site. The modification will be referred to the Commonwealth Minister for the Environment and is expected to be determined not a controlled action.

The BDAR has considered impacts on threatened aquatic species and ecological communities listed under the FM Act. The modification is not expected to result in significant impacts on any FM Act-listed species or ecological communities.

No priority weeds of the Central West or Western regions were recorded within the sites. Additionally, no weeds of national significance were recorded within the sites.

ES8 Biodiversity impacts and offsets

ES8.1 Terrestrial ecology

To compensate for residual impacts on native vegetation and threatened species habitat a total of 71 species credits will be required for MW433 and MW880. No ecosystem credits are required as native vegetation across both sites is considered degraded with a vegetation integrity score of less than 17.

APA will compensate for the residual impacts via purchase from the biodiversity credit market, establishment of site(s) to create credits, or payment to the Biodiversity Conservation Fund (BCF) to meet the credit obligation.

ES8.2 Aquatic ecology

No direct impacts to aquatic ecology are anticipated to occur as a result of construction or operation of MW433 or MW880. There is not expected to be any significant impacts to aquatic ecology, threatened aquatic species or aquatic ecological communities as a result of Modification 1.

Abbreviations

APA	East Australian Pipeline Pty Ltd
AREA	AREA Environmental Consultants & Communication Pty Ltd
AS	Australian Standards
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BCD	Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
BioNet	NSW BioNet
Biosecurity Act	NSW *Biosecurity Act 2015*
BOS	Biodiversity Offsets Scheme
CEMP	Construction Environmental Management Plan
DAWE	Commonwealth Department of Agriculture, Water and Environment
dBA	A-weighted decibels
DBH	Diameter breast height
DFSI	NSW Department of Finance, Services and Innovation
DIDO	Drive-in-drive-out
DNG	Derived Native Grassland
DPIE	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMM	EMM Consulting Pty Limited
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental planning instrument
FIFO	Fly-in-fly-out
FM Act	NSW *Fisheries Management Act 1994*
GDE	Groundwater-dependent Ecosystem
IBRA	Interim Biogeographic Regionalisation of Australia
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance

MWP	Moomba to Wilton Pipeline
MW433	Modification 1 Round Hill site (Stage 2)
MW80	Modification 1 Milne site (Stage 1)
MSP	Moomba to Sydney Pipeline
MSEP	Moomba to Sydney Ethane Pipeline
NSW	New South Wales
OEH	Office of Environment and Heritage (now BCD)
OZCAM	Online Zoological Collections of Australian Museums
PCT	Plant Community Type
PESCP	Progressive Erosion and Sediment Control Plan
PMST	Protected Matters Search Tool
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
SMPEI	Structural, mechanical, piping, electrical and instrumentation construction
sp./spp.	Species (singular and plural respectively)
SRD	State and Regional Development
SSD	State Significant Development
SSI	State Significant Infrastructure
SWMP	Soil and Water Management Plan
SWQP	South West Queensland Pipeline
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened Ecological Communities
TPZ	Tree Protection Zone
WM Act	NSW *Water Management Act 2000*
WoNS	Weed of National Significance
VIS	Vegetation Information System

Table of Contents

Executive Summary ES.1

Abbreviations I

1 Introduction 1

1.1 Background 1

1.2 Project overview and context 1

1.3 Site description and definitions 2

1.3.1 MW433 – Round Hill 2

1.3.2 MW880 – Milne 3

1.3.3 Definitions 6

1.4 Assessment requirements 6

1.5 Purpose of this report 7

1.6 Information sources 7

1.6.1 Publications and databases 7

1.6.2 Other relevant reports 8

1.6.3 Spatial data 8

2 Project description 9

2.1 Overview 9

2.2 Existing pipeline 9

2.3 Proposed modification 10

2.3.1 Construction 10

2.3.2 Operation 12

3 Legislative context 15

3.1 Commonwealth 15

3.1.1 Environmental Protection and Biodiversity Conservation Act 1999 15

3.2 New South Wales 16

3.2.1 Environmental Planning and Assessment Act 1979 16

3.2.2 Biodiversity Conservation Act 2016 16

3.2.3 Fisheries Management Act 1994 17

3.2.4 Biosecurity Act 2015 17

3.2.5 Water Management Act 2000 18

Stage 1 – Biodiversity assessment 19

4 Landscape features 20
4.1 Landscape features 20
4.1.1 Bioregions and landscapes 20
4.1.2 Rivers, streams, estuaries and wetlands 20
4.1.3 Connectivity 21
4.1.4 Areas of geological significance 21
4.1.5 Areas of outstanding biodiversity value 22
4.2 Assessment of site context 22
5 Native vegetation 25
5.1 Background review 25
5.2 Methods 25
5.2.1 Detailed vegetation mapping 25
5.2.2 Vegetation integrity assessment 26
5.2.3 Management zones 26
5.3 Results 27
5.3.1 Vegetation description 27
5.3.2 Plant community types 31
5.3.3 Vegetation zones 32
5.3.4 Vegetation integrity scores 37
5.3.5 Threatened ecological communities 37
6 Threatened species 39
6.1 Threatened species habitat assessment 39
6.2 Threatened species habitat description 39
6.2.1 MW433 39
6.2.2 MW880 41
6.3 Ecosystem credit species 42
6.4 Species credit species 44
6.4.1 Candidate species assessment 44
6.4.2 Candidate species credit species requiring further assessment 49
6.4.3 Targeted survey methods 49
6.4.4 Targeted survey results 50
6.4.5 Candidate species presence, extent and habitat quality 51
7 Aquatic ecology 55

7.1 Methods 55
7.1.1 Desktop assessment 55
7.2 Desktop assessment results and discussion 56
7.2.1 Aquatic habitat 56
7.2.2 Aquatic flora and fauna 58
Stage 2 – Impact assessment 61
8 Impact assessment 62
8.1 Potential direct, indirect, prescribed and uncertain impacts 62
8.1.1 Direct impacts 62
8.1.2 Indirect impacts 62
8.1.3 Prescribed and uncertain impacts 66
8.2 Measures to avoid, minimise and mitigate impacts 68
8.2.1 Construction 69
8.2.2 Operation 71
8.2.3 Summary of measures to avoid, minimise and mitigate impacts 72
8.3 Serious and Irreversible Impacts 78
8.4 Impacts not requiring offsets 78
8.5 Impacts requiring offset 79
9 Assessment of other relevant biodiversity legislation 82
9.1 Environment Protection and Biodiversity Conservation Act 1999 82
9.1.1 Likelihood of occurrence assessment 82
9.1.2 Significant impact assessments 97
9.2 Biosecurity Act 2015 97
9.3 Water Management Act 2000 97
10 Conclusion 99
References 101

Appendices

Appendix A Vegetation integrity assessment field datasheets
Appendix B Vegetation integrity plot data
Appendix C Targeted survey effort summary and weather conditions
Appendix D Protected Matters Search Results
Appendix E Biodiversity credit report

Appendix F EPBC Act significant impact assessments

Tables

Table ES1	Plant community types mapping within the Modification 1 impact area	2
Table 1.1	Project elements definitions	6
Table 2.1	Construction and commissioning workforce	12
Table 2.2	Construction and commissioning workforce distribution	12
Table 4.1	Bioregions and landscapes recorded within the study area	20
Table 4.2	Percentage of native vegetation cover	22
Table 5.1	Preliminary vegetation zones within the study area (AREA 2020)	25
Table 5.2	Definitions used in delineation of vegetation zones	26
Table 5.3	Vegetation management zones	27
Table 5.4	Plant community types mapping within the Modification 1 impact area	31
Table 5.5	Vegetation zones mapped within the Modification 1 impact area	32
Table 5.6	PCT 72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	32
Table 5.7	PCT 153: Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	35
Table 5.8	Vegetation zones mapped within the impact area	37
Table 6.1	Assessment of ecosystem credit species	43
Table 6.3	Candidate species credit species requiring further assessment	49
Table 6.4	Methods and survey effort – Koala	50
Table 6.5	Candidate species presence, extent and habitat quality	51
Table 7.1	Likelihood of occurrence criteria	55
Table 7.2	Threatened species with the potential to occur within, or adjacent to, MW433	58
Table 7.3	Threatened species with the potential to occur within, or adjacent to, MW880	59
Table 8.1	Assessment of prescribed and uncertain impacts	67
Table 8.2	Summary of impacts and measures to avoid, minimise and mitigate	73
Table 8.3	Summary of impacts not requiring offsets – native vegetation (MW433 & MW880)	78
Table 8.4	Summary of species credits required – MW433	79
Table 8.5	Summary of species credits required – MW880	80
Table 9.2	Likelihood of occurrence for threatened species	85
Table 9.3	Likelihood of occurrence for migratory species	94

Table B.1	Vegetation integrity data	B.1
Table C.1	Survey effort and weather conditions summary	C.1
Table F.1	Assessment of significance for *Atriplex infrequens*	F.1
Table F.2	Assessment of significance for the Grey Falcon	F.3
Table F.3	Assessment of significance for the Superb Parrot	F.5
Table F.4	Assessment of significance for the Corbens's Long-eared Bat	F.7
Table F.5	Assessment of significance for the Paroo River Wetlands	F.9

Figures

Figure 1.1	Regional location	4
Figure 2.1	The project	14
Figure 4.1	Location map	23
Figure 4.2	Site map	24
Figure 5.1	Plant community types and vegetation zone mapping, including plot locations	38
Figure 6.1	Targeted species survey locations	52
Figure 6.2	Threatened flora species polygons	53
Figure 6.3	Threatened fauna survey results and species polygons	54
Figure 7.1	Key fish habitat and aquatic ecological communities	60
Figure 8.1	Impacts requiring offsets, impacts not requiring offsets and areas not requiring assessment	81

Photographs

Photograph 1.1	Aerial photo of MW433 looking north-east	3
Photograph 1.2	Aerial photo of MW880 looking south	5
Photograph 5.1	Vegetation within the study area and existing pipeline infrastructure (MW433)	28
Photograph 5.2	Historical water retention structure with regenerating native vegetation (MW433)	28
Photograph 5.3	Vegetation within the site and existing pipeline infrastructure (MW880)	29
Photograph 5.4	Historical water retention structure with regenerating native vegetation (MW880)	30
Photograph 5.5	Derived native grassland and moderate condition vegetation (MW880)	30
Photograph 5.6	White Cypress Pine paddock tree within cropped land (MW880)	31
Photograph 5.7	PCT 72 – DNG (Plot MW880_1)	34
Photograph 5.8	PCT 153 – Disturbed (Plot MW433_3)	36
Photograph 6.1	Rocky habitat (MW433)	40

Photograph 6.2	Fallen timber (MW433)	40
Photograph 6.3	Habitat trees (MW880)	41
Photograph 6.4	Hollow bearing tree (MW880)	42
Photograph 7.1	Unnamed 1st order waterway (“Waterway 1”)	56

1 Introduction

1.1 Background

East Australian Pipeline Pty Ltd, part of the APA Group (APA) currently operates an underground high pressure natural gas transmission pipeline, extending from Moomba (South Australia) to Wilton (NSW), a distance of approximately 1,299 kilometres (km). The Moomba to Wilton Pipeline (MWP) is the mainline part of the Moomba Sydney Pipeline (MSP) and was constructed in 1976.

Initially, the pipeline was owned and operated by the Pipeline Authority, a Commonwealth agency, and generally regulated under the *Pipeline Authority Act 1973*. The MWP is now owned and operated by APA, which was gazetted as State Significant Infrastructure (SSI) on 11 December 2020 and is authorised by Pipeline Licence No. 16 (PL16).

The MWP currently operates at a forward haul capacity of approximately 489 terajoules per day (TJ/day) (AEMC 2021).

1.2 Project overview and context

NSW imports the majority of its natural gas from other states and a gas shortfall on Australia's east coast is predicted by Winter 2023, with demand for gas forecast to outstrip supply.

APA is proposing an expansion of gas transportation capacity on its East Coast Grid that links Queensland to southern markets ahead of projected potential 2023 supply risks. Expansion would be through the construction of additional compressions stations and associated works on both the South West Queensland Pipeline (SWQP) and MWP in NSW.

The expansion will be delivered in a number of stages. The first stage of expansion works includes the construction of a single site of compression on each of the SWQP and MWP and will increase Wallumbilla to Wilton capacity by 12%. The first stage is targeted for commissioning in the first quarter of 2023 ahead of forecast southern state winter supply risks identified in the 2021 Australian Energy Market Operator (AEMO) Gas Statement of Opportunities (AEMO 2021).

The second stage of expansion works (an additional site on the SWQP and on the MWP) will add a further 13% capacity and will be staged to meet customer demand.

APA is undertaking engineering and design works on a potential third stage (three additional compressor locations on the MWP) of the East Coast Grid to add a further 25% transportation capacity. All up, these proposed capacity expansions would mean that the entirety of NSW peak demand could be met by gas flowing from northern sources.

The proposed East Coast Grid Expansion is an ideal opportunity to maximise gas supply via existing infrastructure with minimal impact.

The five compressor stations for the East Coast Grid Expansion will be constructed at the following locations on the MWP:

- Modification 1:
    - Stage 1:
        - MW880 – Milne approximately 35 km south-west of Condobolin.

- Stage 2:
    - MW433 – Round Hill approximately 103 km north of Wilcannia.

- Modification 2:
    - Stage 3:
        - MW162 – Binerah Downs approximately 68 km north-west of Tibooburra.
        - MW300 – Mecoola Creek approximately 70 km south-east of Tibooburra.
        - MW733 – Gilgunnia approximately 63 km south-west of Nymagee.

This report has been prepared to address the biodiversity impacts for Stage 1 and 2 of the expansion works and to support Modification Report 1. As such, only the biodiversity impacts at MW433 and MW880 have been assessed in this report. A separate report will be prepared to support Stage 3 in Modification Report 2.

The proposed locations of compressor stations on the MWP are shown in Figure 1.1.

1.3 Site description and definitions

1.3.1 MW433 – Round Hill

MW433 is located in north-west NSW in the Paroo River catchment, approximately 103 km north of Wilcannia in Central Darling Shire Local Government Area (LGA). The site is located on private land, owned by APA, within the Paroo-Darling National Park and Paroo River Wetlands. The site is located at Lot 3/DP593787, and is zoned as RU1, primary production under the Central Darling Local Environmental Plan (LEP) (Central Darling Shire Council 2012).

The long-term annual mean rainfall at the site is less than 250 millimetres (mm), with generally a wet summer and dry winter (BOM 2020a). Site topography slopes gently from north-east to south-west at a slope of 0.5–1.5% (DTA 2021) with a small hill ("Round Hill") located immediately to the east of the site. The ephemeral Poloko Lake and Peery Lake are located approximately 5 km to the south-east and east of the site, respectively.

MW433 hosts existing infrastructure related to the construction and operation of the MWP and the Moomba to Sydney Ethane Pipeline (MSEP), including the following:

- infrastructure to remain after the modification:
    - pig catcher and launcher for the MWP;
    - pig catcher and launcher for the MSEP;
    - small amenities building with water tank;
    - 3 m high wire fencing (will be replaced with similar fencing around whole compressor station site); and
    - communications tower, approximately 100 m high of steel lattice construction, operated by Telstra;

- infrastructure to be removed during construction:
    - historical water retention structure.

Wilcannia-Wanaaring Road is an unsealed local road located 1.85 km to the south-east of the site boundary, and approximately 2.1 km from the site of the proposed compressor station.

An aerial photo of MW433 is presented in Photograph 1.1 and the layout is presented in Figure 2.1.

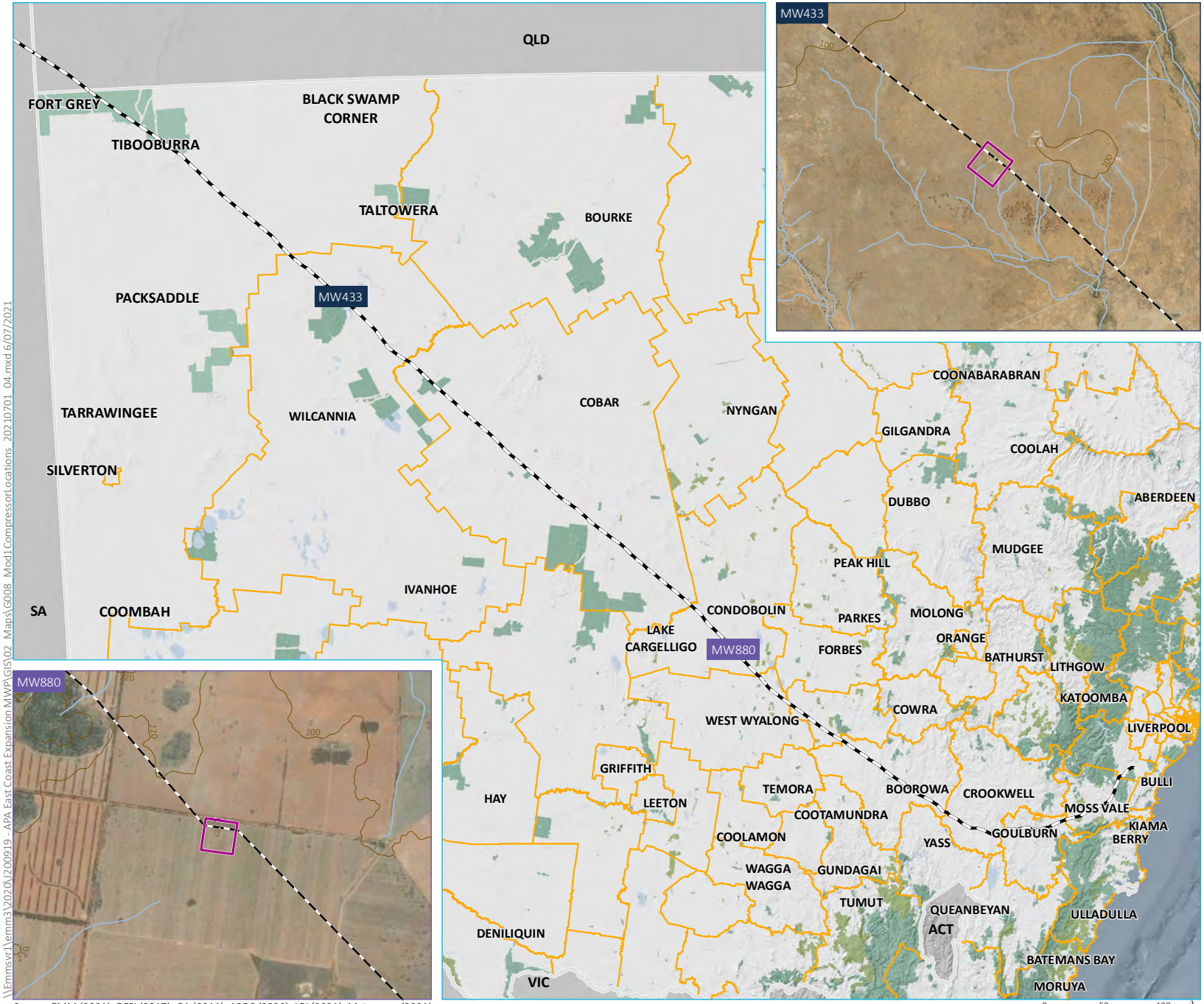
Photograph 1.1 Aerial photo of MW433 looking north-east

1.3.2 MW880 – Milne

MW880 is located in central NSW in the Lachlan River catchment, approximately 35 km south-southwest of Condobolin, in the Lachlan Shire LGA. The site, owned by APA, is located at Lot 1/DP580284, and is zoned as RU1, primary production under the Lachlan LEP (Lachlan Shire Council 2012). The southern part of the site is used by a local farmer for dryland cropping.

The long-term annual mean rainfall at the site is 450 millimetres (mm), with generally a wet summer and dry winter (BOM 2020a). Site topography slopes gently from west to east at 0.5–2%. Slopes to the north of the site can reach approximately 6% (DTA 2021).

The vegetation on site is disturbed White Cypress Pine – Poplar Box woodland, in largely derived native grassland condition (DNG). The species present on site are a mixture of natives and exotics, including one high threat exotic species. The site has previously been used for farming and to host existing MWP and MSEP infrastructure. A communications tower operated by Telstra is located in the north-eastern corner of the site boundary.



KEY

- Local government area
- State boundary
- Moomba to Wilton pipeline
- NPWS reserve
- State forest

INSET KEY

- Compressor site boundary
- Contour (10 m)
- Watercourse

Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); LPI (2021); Metromap (2021)

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02 Maps\G008 Mod1CompressorLocations 20210701 04.mxd 6/07/2021

Regional location

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 1.1

EMM creating opportunities

MW880 hosts existing infrastructure related to the construction and operation of the MWP and the MSEP, including the following:

- infrastructure to remain after the modification:
  - pig catcher and launcher for the MWP;
  - pig catcher and launcher for the MSEP;
  - small amenities building;
  - 3 m high wire fencing (will be replaced with similar fencing around whole compressor station site); and
  - communications tower, approximately 100 m high of steel lattice construction, operated by Telstra;
- infrastructure to be removed during construction:
  - historical water retention structure.

Crown Camp Road is an unsealed local road located adjacent to the northern site boundary.

An aerial photo of MW880 is presented in Photograph 1.2 and the layout is presented in Figure 2.1.

Photograph 1.2 Aerial photo of MW880 looking south

1.3.3 Definitions

Project elements referred to in this report are described in Table 1.1.

Table 1.1 Project elements definitions

Project elements	Definition
Assessment area	Includes the disturbance footprint and the area of land within the 1,500 m buffer surrounding the disturbance footprint (Figure 4.1).
Site	Cadastral lot at MW433 and MW880 (Figure 1.1).
Study area	Area which was surveyed for ecological values, with vegetation survey and threatened species surveys occurring within this area (Figure 2.1). Whilst terrestrial biodiversity surveys mostly occurred within the site, some vegetation, plot survey and particularly threatened fauna survey (to allow targeting of best quality fauna habitat in proximity to the impact area) occurred outside of this area.
Disturbance footprint	Area subject to all proposed direct impacts including construction and operation areas (Figure 2.1).
Indirect impact area	Area subject to anticipated indirect impacts, which was delineated as 20 m buffer from disturbance footprint (Figure 2.1).
Impact area (Subject land)	The area incorporating both the disturbance footprint (direct impact area) and indirect impact area (Figure 2.1). Incorporates an area subject to anticipated indirect impacts for terrestrial biodiversity values as defined under the indirect impact area above. This is the 'subject land' as defined under the Biodiversity Assessment Method (BAM; DPIE 2020a).
Construction envelope	The maximum extent within which the disturbance footprint corridor can move to allow the final siting of infrastructure through detailed design process (Figure 2.1). Further details for this are provided in Section 8.1.

1.4 Assessment requirements

This biodiversity assessment has been prepared in accordance with relevant government assessment requirements, guidelines and policies, and in consultation with the relevant government agencies. The NSW *Biodiversity Conservation Act 2016* (BC Act) requires that an SSI modification must be accompanied by a Biodiversity Development Assessment Report (BDAR). EMM prepared a scoping letter noting a BDAR will be prepared covering MW433 and MW880 in accordance with the BAM (DPIE 2020) and will include strategies to offset any residual impacts in accordance with the rules of the Biodiversity Offsets Scheme (BOS).

The BAM 2020 and version 1.3.0.00 of the BAM calculator have been used to assess the biodiversity impacts for modification 1. The BAM accredited assessor who has submitted the Biodiversity Offsets and Agreement Management System (BOAMS) case is Nathan Garvey.

A response was provided by NSW Department of Planning, Industry and Environment (DPIE) on 18 March 2021 confirming their satisfaction with the proposed matters to be addressed in the modification report. The department noted if the proposals are likely to have a significant impact on matters of National Environmental Significant (MNES), it will require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.5 Purpose of this report

The specific objectives of this assessment are to:

- describe biodiversity values of the study area;
- assess the likelihood that threatened species, populations, habitats and communities (threatened biodiversity) listed under the BC Act, NSW *Fisheries Management Act 1994* (FM Act) and/or EPBC Act could occur within, or adjacent to, the study area;
- document the strategies implemented to avoid and/or minimise impacts of the modification on threatened biodiversity;
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented; and
- provide environmental safeguards to mitigate threatened biodiversity impacts during construction and operation.

1.6 Information sources

1.6.1 Publications and databases

In order to provide context for the modification, information about flora and fauna species, populations, communities and habitats from the locality (generally within 10 km) was obtained from the following databases:

- NSW BioNet for:
  - Atlas of NSW Wildlife for threatened species records;
  - threatened species profiles; and
  - Vegetation Classification database for information on Plant Community Types (PCTs);
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) for MNES likely to occur within the study area;
- Groundwater Dependent Ecosystems Atlas;
- New South Wales Flora Online (PlantNET);
- Australian Ramsar Wetlands: Internationally Important Wetlands (DAWE);
- Directory of Important Wetlands: Nationally Important Wetlands (DAWE);
- Fish stocking (NSW Department of Primary Industries (DPI)Fisheries);
- Freshwater threatened species distribution maps (DPI Fisheries);
- Key fish habitat maps (DPI Fisheries);

- Threatened biodiversity profile search (DPIE);
- Threatened species lists (DPI Fisheries);
- Provisional list of animals requiring urgent management intervention (DAWE); and
- NSW Fish Passage Database.

1.6.2 Other relevant reports

This biodiversity assessment has been prepared with reference to other technical reports that were prepared as part of the modification. The other relevant reports referenced in this biodiversity assessment are listed below.

- Surface Water Assessment (EMM 2021a) – Appended to the Modification 1 report;
- Noise Impact Assessment (EMM 2021b) – Appended to the Modification 1 report;
- Soil and Erosion Hazard Assessment (EMM 2021c) – Appended to the Modification 1 report; and
- Traffic Impact Assessment (EMM 2021d) – Appended to the Modification 1 report.

1.6.3 Spatial data

Spatial data encompassing the study area was obtained from APA. Base map data was obtained from Department of Finance, Services and Innovation (DFSI) NSW databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from DPI.

The following spatial datasets were utilised during the development of this report:

- State Vegetation Type Map: Western Region Version v1.0 - VIS_ID 4492 (DPIE 2020b);
- State Vegetation Type Map: Central West Lachlan Region Version 1.4. VIS_ID 4468 (OEH 2016a);
- Mitchell Landscapes Version V3.1 (OEH 2016b);
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DAWE 2017);
- Fisheries NSW Spatial Data Portal (Department of Primary Industries, 2021); and
- Stream order classification (Department of Primary Industries, 2013).

Mapping undertaken during the site assessment was conducted by AREA Environmental Consultants & Communication Pty Ltd (AREA). This mapping was later refined by EMM following further field surveys using a Geographic Information System (GIS; ArcGIS 10.5) and aerial photo interpretation. Targeted surveys conducted by EMM were completed using a hand-held GPS unit and mobile tablet computers running Collector for ArcGIS™ and Survey123 for ArcGIS™. Further information regarding how vegetation mapping was refined is in Section 5.2.1.

Spatial data relevant to this BDAR was provided to the DPIE following lodgement of the BDAR.

2 Project description

2.1 Overview

The East Coast Grid Expansion in NSW will be facilitated by the construction of five compressor stations along the length of the MWP. This BDAR addresses the biodiversity impacts of the construction and operation of two compressor stations; Stage 1 (MW880) and Stage 2 (MW433).

Each compressor station will include:

- an enclosed gas turbine driven compressor unit;
- microturbine;
- compressor inlet / scrubber;
- a control equipment room;
- two fuel gas skids;
- air compressors and receivers;
- associated piping, electrical equipment, instrumentation, and controls;
- a station vent; and
- small accommodation and maintenance buildings for operations.

All facilities will be installed on driven piles or supported on structural steel skids, with the exception of the accommodation and maintenance buildings which will likely be constructed on a concrete slab.

Both of the proposed sites for the compressor stations are on land owned by APA, with MW433 being approximately 380 m x 400 m with an area of 15.5 hectares (ha), and MW880 being approximately 400 m x 400 m with an area of 16 ha. The compressor station will have a final footprint of approximately 1.5 ha.

An indicative schematic of the proposed compressor station layout is shown in Figure 2.1.

2.2 Existing pipeline

The MWP is the mainline part of the MSP and was constructed in 1976 to link the Cooper Basin gas fields near Moomba in South Australia to gas distribution systems in Sydney, Newcastle, Wollongong, Canberra and some NSW regional centres. The MWP can also transport gas sourced from Queensland's Bowen-Surat Basin (APGA 2021).

Initially, the pipeline was owned and operated by the Pipeline Authority, a Commonwealth Agency, and generally regulated under the *Pipeline Authority Act 1973* (Cth). The MWP is now owned and operated by APA and was authorised by Pipeline Licence No. 16 (PL16) in 1997 under the *Pipelines Act 1967* (NSW) and the *Pipelines Regulation 1993* (NSW). The MWP was gazetted as SSI on 11 December 2020 (SSI-15548591).

The conditions of PL16 require that APA must operate and maintain the pipeline in accordance with recognised standards and practices and must meet the requirements of the *Pipelines Act 1967*, the *Pipelines Regulation 1993*, and Australian Standard (AS) 2885: Pipelines – Gas and liquid petroleum.

The MSEP was constructed in 1996, and is located adjacent to the MWP, and shares the easement for most of its length. The MSEP transports ethane from Moomba to a petrochemical facility in Botany Bay.

2.3 Proposed modification

2.3.1 Construction

Each compressor station will require a construction footprint of approximately 3.5 ha, which will be reduced to approximately 1.5 ha for operations.

At MW433, the temporary construction workforce required to build the compressor station will be accommodated in a temporary accommodation camp, with mobilisation and demobilisation of the workforce to and from Broken Hill airport for each roster. The temporary accommodation camp will measure approximately 100 m x 100 m, with an additional 100 m x 100 m for wastewater treatment. A smaller accommodation unit for operations will be included within the operational footprint on the compressor station.

At MW880, there are two options for the accommodation of the construction workforce:

- house the workforce in short-term accommodation in Condobolin (42 km by road from the site), with potential overflow accommodation in West Wyalong (85 km by road from the site). Workers will be driven to and from to site each day, with between one and four buses and between five and eight cars required per day, depending on workforce numbers; or

- use a temporary accommodation camp on site (as per MW433), where mobilisation and demobilisation of the workforce will be to and from Dubbo airport for each roster.

Wastewater from the construction camp within both sites (MW433 and MW880) will be treated by a suitably designed, manufactured, installed, commissioned and operated aerated wastewater treatment system, pre-approved by the NSW Department of Health in order to satisfy the requirements of Section 68 of the NSW Local Government Act 1993 and Australian Standard (AS) 1547: On-site domestic wastewater management. Once the treatment is constructed, local government will provide an approval to operate. The wastewater treatment system will use sedimentation and anaerobic digestion to separate biomass from wastewater effluent. The biomass will be periodically pumped out for disposal by an authorised waste contractor. The effluent will be disinfected to remove any residual pathogens then pumped to the irrigation spray field on site for disposal.

Construction materials and supplies (including food and services for the temporary accommodation camps) will be sourced from relevant suppliers and transported to site. APA will use local suppliers where practicable.

At MW880, water will likely be purchased under a commercial arrangement from Lachlan Shire Council, or another local provider and transported to site by 25-kilolitre (kL) water truck. At MW433, there are two options for water supply – accessing groundwater on site, and/or purchasing water under a commercial arrangement from a local water provider and transporting it to site by 25-kL water truck. APA is investigating options to access groundwater under the relevant water sharing plans and regulations. If accessing groundwater at MW433 is feasible, then all regulatory requirements for water licences will be met, and any further assessments and approvals will be undertaken and applied for prior to water abstraction. If accessing groundwater is not feasible for all or part of the project, then the commercial purchase and transport will become the default water supply option.

This assessment has been prepared with the assumption the project will not require access to groundwater; and therefore, no impacts to groundwater or groundwater-dependent ecosystems (GDEs) will occur as part of Modification 1. If the project accesses groundwater at a later date, this will be assessed separately.

The construction of each compressor station will take approximately nine months, followed by the commissioning stage, which will take approximately three months at each site. Construction will take place sequentially. The majority of construction activities will take place between 7:00 am and 6:00 pm, seven days per week; however, for the final two weeks commissioning activities will be 24-hours per day.

i Activities

Construction of the compressor stations will include:

- mobilisation of construction equipment;
- establishment of access (where required);
- establishment of construction camp accommodation and associated facilities;
- establishment of access to water supply;
- site bulk earthworks including build up to match existing levels;
- installation of steel piles;
- installation of all equipment items, skids and buildings;
- installation of associated steel structures, prefabricated piping, electrical equipment, instrumentation and controls;
- supply and install communication and controls infrastructure;
- treatment and spray irrigation of wastewater from the construction camp;
- demobilisation of construction equipment;
- rehabilitation of temporary disturbance areas; and
- pre-commissioning and commissioning of compressor station.

ii Workforce

The construction of the compressor stations will require an average workforce of 40 with a peak of 80 personnel over the 12-month period (including commissioning). All roles are likely to be drive-in-drive-out (DIDO) or fly-in-fly-out (FIFO) and based at either a construction camp on site, or in Condobolin. The anticipated roster is three weeks on followed by one week off.

There are expected to be five contracts put out to tender for the construction and commissioning of the compressor stations:

- earthworks and civil works;
- establishment of the construction camp and associated wastewater treatment system;

- piling;
- structural, mechanical, piping, electrical and instrumentation construction (SMPEI); and
- compressor station pre-commissioning and commissioning.

In addition to the contractor workforce, APA will have a project team on site to manage the works.

The anticipated workforce associated with each contract is outlined in Table 2.1 below.

Table 2.1 Construction and commissioning workforce

Entity	Average workforce	Peak workforce
APA Project Team	4	10
Earthworks	10	15
Piling	6	6
SMPEI Construction	30	50
Construction Camp	8	16
Pre-commissioning and Commissioning	10	14

The anticipated workforce distribution over the 12-month construction and commissioning program is presented in Table 2.2.

Table 2.2 Construction and commissioning workforce distribution

Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
20	28	28	37	47	65	68	59	49	39	18	18

2.3.2 Operation

i Activities

The compressor stations are designed to operate remotely without onsite staff for most of their working life. They will be operated remotely from APA's control centre in Brisbane, and can operate up to 24 hours per day, seven days per week.

Typical operations activities will involve minor maintenance, calibrations, inspections, equipment performance checks, or equipment repair if needed. Operation activities will be typically carried out during daylight hours, unless an emergency requires urgent works at night. Site personnel will carry out inspections ranging from daily inspections to more rigorous inspections that may vary from one month to 4 years apart, dependent on the works. Detailed maintenance plans will be prepared for all sites.

Regulatory compliance checks will be carried out on different equipment as prescribed in applicable standards but will typically vary from one to four-year intervals subject to the equipment types. Compliance checks may include emissions testing, hazardous area compliance assessments, pressure vessel inspections, and electrical safety checks.

Major services and engine overhauls will be carried out at five-to-ten-year intervals subject to equipment condition, manufacturer's recommendations and run hours.

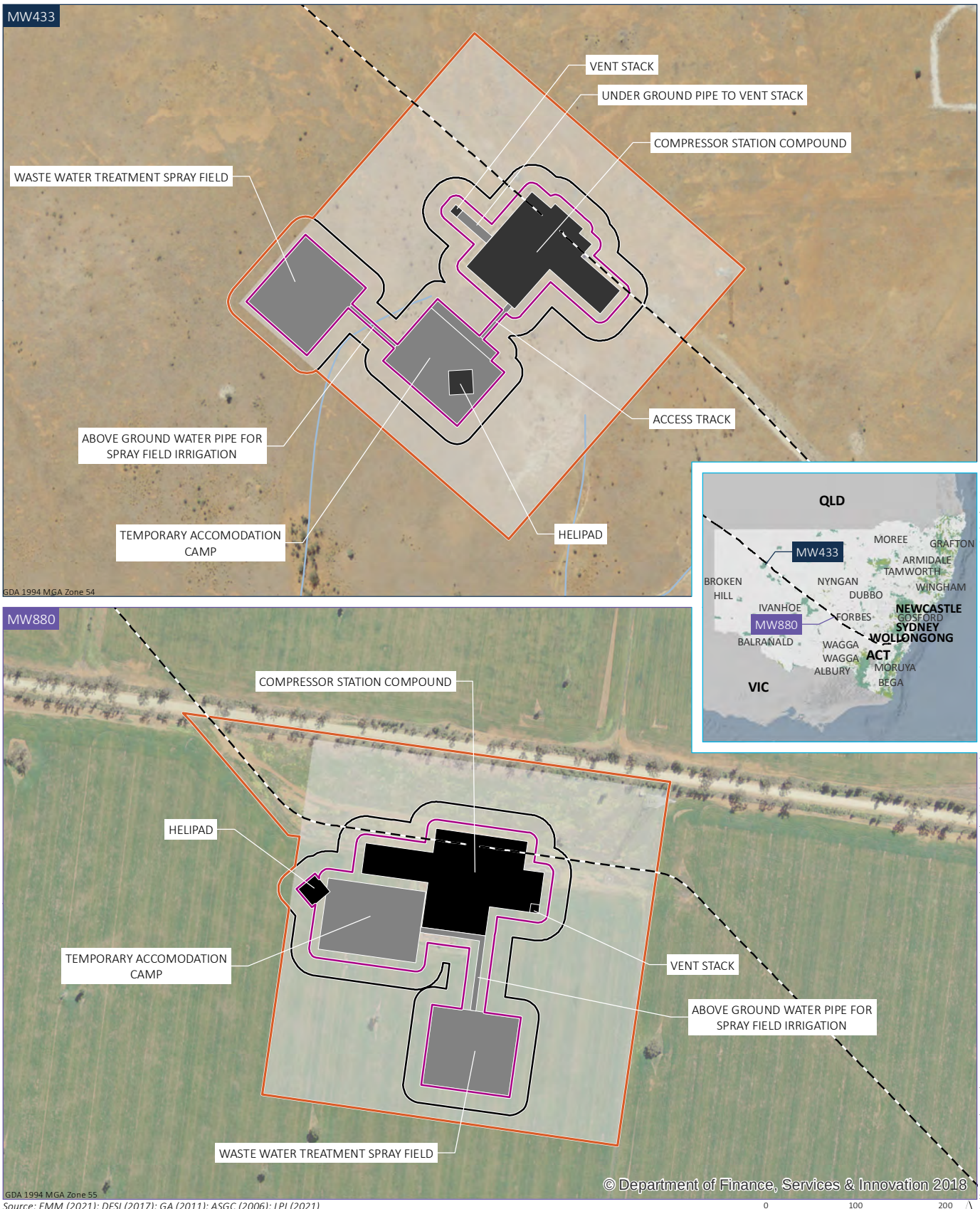
Once complete, the compressor stations will have an average design life of approximately 25 years. APA will continue to monitor the condition of equipment up to and beyond the end of life to ensure equipment is sound and fit for further service. Continued operation beyond the nominal design life will be subject to specific equipment condition and plant fitness assessments. The compressor station will be decommissioned when there is no further economic potential to continued use.

ii Workforce

The compressor stations are designed to operate as unmanned facilities. The typical site workforce for operation activities is expected to be one to two people.

Larger groups of up to five people associated with major services or overhauls will be required to minimise the time the compressor station is offline.

The operations workforce will comprise existing APA employees, who are unlikely to be resident locally. Additional specialist servicing will be carried out by a mix of local contractors and interstate/international based depending on the complexity of the task.



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); LPI (2021)

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR008_ProjectElements_20210706_03.mxd 6/07/2021

KEY

- Disturbance footprint
- Indirect impact area
- Study area
- Site boundary/construction envelope
- Moomba to Wilton pipeline
- Waterbody

Proposed site infrastructure

- Permanent
- Temporary

The project

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 2.1

EMM creating opportunities

3 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

3.1 Commonwealth

3.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as MNES under the EPBC Act. These are:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to DAWE for determination as to whether or not it is a controlled action. If deemed a controlled action the modification is assessed under the EPBC Act, and a decision made as to whether or not to grant approval.

Of the nine MNES that are regulated by the EPBC Act, the following have the potential to be associated with the modification, and this report aims to evaluate as to whether these MNES are applicable:

- wetlands of international importance; and
- nationally threatened flora and fauna species.

Assessment guidelines to determine whether a significant impact is expected are detailed in Matters of National Environmental Significance: Significant impact guidelines 1.1 (Commonwealth of Australia, 2013).

In addition to the above, the DAWE (2020) released a provisional list of animal species identified as requiring urgent management intervention following the 2019/2020 bushfire season in southern and eastern Australia (20 March 2020). Most of the species have potentially had at least 30% of their range burnt. The list includes a number of bird, mammal, reptile, frog, invertebrate, crayfish and fish species. The priority animals were identified based on the extent to which their range has potentially been burnt, their conservation status prior to the fires, and the physical, behavioural and ecological traits which influence their vulnerability to fire. While the list primarily comprises species already listed under the EPBC Act, it also includes species which are not currently listed as threatened under the FM Act or EPBC Act but have more than 30% of their range within burnt areas.

The modification will be referred to the Commonwealth Minister for the Environment and is expected to be determined not a controlled action.

An assessment of the project against the EPBC Act is provided in Section 9.1.

3.2 New South Wales

3.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by DPIE.

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments (EPIs) including State Environmental Planning Policies (SEPPs). EPIs relevant to the natural environment are outlined further below.

i State Environmental Planning Policy (State and Regional Development) 2011

On 11 December 2020, the Project was declared to be SSI by the NSW Minister for Planning under the provisions of the EP&A Act and is defined in Schedule of the State and Regional Development (SRD) SEPP.

ii State Environmental Planning Policy (Koala Habitat Protection) 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP 2021) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. It applies to development applications on land which is >1 ha on its own, or together with adjoining land in the same ownership, whether or not the development application applies to only part of the land, and which are within council areas listed in Schedule 1 of Koala SEPP 2021.

The Project is not a development application and does not require approval from Council, and thus consideration of the Koala Habitat Protection SEPP is not triggered under Part 2 of the SEPP. Nonetheless, consideration has been given to the potential occurrence and impacts upon the koala within Section 6.

3.2.2 Biodiversity Conservation Act 2016

The BC Act is the legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations, and ecological communities. The BC Act, together with the Biodiversity Conservation Regulation 2017 (BC Regulation), established the BOS.

The BOS includes establishment of the BAM, DPIE 2020 for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats and determine offset requirements. For major projects, use of the BAM is mandatory, unless a BDAR waiver is granted.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land in order to:

- identify the biodiversity values on land subject to proposed development area;
- determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts; and
- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

This biodiversity assessment has been undertaken in accordance with the requirements of the BAM (DPIE 2020a), as set out in this report.

3.2.3 Fisheries Management Act 1994

The FM Act contains provisions for the conservation of fish stocks, key fish habitat, biodiversity, threatened species, populations and ecological communities. It regulates the conservation of fish, vegetation and some aquatic macroinvertebrates and the development and sharing of the fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities, key threatening processes (KTPs) and declared critical habitat. Assessment guidelines to determine whether a significant impact is expected are detailed in section 220ZZ and 220ZZA of the FM Act.

Another objective of the FM Act is to conserve key fish habitat (KFH). These are defined as aquatic habitats that are important to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. KFH is defined in Section 3.2.1 and 3.2.2 of the Policy and Guidelines for Fish Conservation and Management (DPI 2013).

The impact of the modification on threatened aquatic species, populations, communities and habitats have been assessed and are presented in Section 7 of this report.

3.2.4 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) has superseded the *Noxious Weeds Act 1993*, which has now been repealed.

The primary objective of the Biosecurity Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The Biosecurity Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about;
- applies to all land within NSW and all waters within the limits of the State; and

- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The provisions of the Biosecurity Act are discussed further in Section 3.2.2.

3.2.5 Water Management Act 2000

The NSW *Water Management Act 2000* (WM Act), administered by the DPIE Water, governs the sustainable and integrated management of NSW's water for the benefit of both present and future generations. In the context of aquatic ecology, the WM Act provides the physical definition of a waterway, and other waterbodies, pertinent to this assessment:

> 'watercourse means a river, creek or other natural stream of water (whether modified or not) flowing in a defined channel, or between banks, notwithstanding that the flow may be intermittent or seasonal or the banks not clearly or sharply defined, and includes –
>
> (a) a dam that collects water flowing in any such stream; and
>
> (b) a lake through which water flows; and
>
> (c) a channel into which the water of any such stream has been diverted; and
>
> (d) part of any such stream; and
>
> (e) the floodplain of any such stream –…'

The WM Act also provides guidance on controlled actions undertaken within the riparian zone of a waterway, with assessment of the potential impact of any controlled activity to be undertaken to ensure that minimal impacts will occur to "waterfront land". However, as the Project has been declared as SSI, approval under the WM Act is not required (s 5.23 of the EP&A Act).

Division 6 of the WM Act requires consideration of aquifer interference activities. The NSW Aquifer Interference Policy (DPI 2012a) requires an assessment of potential impacts on water dependent assets, including GDEs. In addition, specific guidance relating to the assessment of GDEs is provided within The NSW State Groundwater Dependent Ecosystems Policy (Department of Land & Water Conservation 2002) and Risk assessment guidelines for groundwater dependent ecosystems: Volume 1 – The conceptual framework (DPI 2012b).

Impacts on riparian land and GDEs are considered in Section 9.3 of this report.

Stage 1 – Biodiversity assessment

4 Landscape features

4.1 Landscape features

The landscape features described in the following sections are shown on Figure 4.1 and Figure 4.2.

4.1.1 Bioregions and landscapes

The study area occurs across three IBRA regions, three IBRA subregions and three BioNet NSW Landscapes (formerly Mitchell Landscapes, Table 4.1). Bioregions and ecological landscapes are illustrated within Figure 4.1. At MW880, the IBRA Bioregion and subregion which majority of the impact area is situated within was used for the purposes of the BAM.

Table 4.1 Bioregions and landscapes recorded within the study area

Site	IBRA region	IBRA subregion	BioNet NSW Landscapes
MW433	Mulga Lands	White Cliffs Plateau	White Cliffs Tablelands and Downs
MW880	NSW South Western Slopes[1]	Lower Slopes[1]	Bimbi Plains[1]
	Cobar Peneplain	Lachlan Plains	Goobothery Hills and Footslopes

Notes: 1. Majority of the impact area is situated within these regions and therefore have been used within the BAMC.

Given the sites are separated across different IBRA Bioregions, separate assessments were completed separately for each site as required by the BAM (DPIE 2020a). Therefore, two separate BAM calculator cases were used to assess each site.

4.1.2 Rivers, streams, estuaries and wetlands

i MW433

MW433 is located within the Paroo River catchment, which covers approximately 74,000 km^2, of which 40,600 km^2 is located in NSW (DPIE Water 2021). The site is located at the headwaters of two mapped unnamed 1st order watercourses (Figure 4.2). These drain to the south then southeast along 3rd order and 6th order waterways into Peery Lake, which then flows into the Paroo River during major flood events. The Paroo River joins the Darling River upstream of Wilcannia, more than 70 km downstream of Peery Lake. All local drainage features are ephemeral in nature and generally only flow for short periods following substantial rainfall.

The assessment area for MW433 is located within the Paroo River Wetlands, listed as wetlands of international significance (#65) (DAWE, 2019). However, it should be noted that the MW433 site has been excised from the mapped Paroo River Wetlands boundary, with the official wetlands area surrounding the site on the north-western, south-western and part of the south-eastern sides (Figure 4.1).

ii MW880

MW880 is located within the Lachlan River catchment, which covers approximately 86,500 km^2 of central NSW (DPI, 2021). The nearest mapped watercourse to the site is an unnamed 3rd order watercourse to the south of the site (Figure 4.1). Based on available terrain and Geofabric data this unnamed watercourse, and the site itself, drains generally to the north-east towards Humbug Creek (Figure 7.1). Drainage between the site and Humbug Creek has been heavily modified to suit the surrounding agricultural development. Humbug Creek flows north-northwest into Banar Lake, which flows into Wallaroi Creek, Wallamundry Creek and ultimately the Lachlan River further to the north during major flood events. Local drainage features tend to be intermittent/ephemeral to semi-permanent, dependant on the degree of land modification (ie agriculture).

4.1.3 Connectivity

i MW433

MW433 is located within private land surrounded by the Paroo National Park, which is largely vegetated across its 178,053 ha extent, with intact vegetation extending across the broader landscape. The area consists of arid shrubland, woody shrubland and floodplains. The extent of vegetation across the Paroo National Park provides a high degree of connectivity.

The two first-order watercourses mapped within the study area are unlikely to provide valuable connectivity for aquatic and semi-aquatic species given the watercourses are ephemeral and only flow following substantial rainfall.

i MW880

MW880 is situated within a highly modified agricultural landscape. The surrounding area consists of cleared agricultural land with scattered native vegetation. Vegetation within the site is consistent with the locality, with the majority of the site consisting of cropped land and cleared native grassland. A narrow strip of woodland is located along the edge of the road, extending west and east. Limited connectivity within the site is likely to provide connectivity for highly mobile arboreal fauna only, predominantly birds.

4.1.4 Areas of geological significance

i MW433

MW433 is located within the Mulga Lands IBRA region. This bioregion is dominated by a hot and arid environment, characterised by sand plains and dunes, with limited areas of exposed Palaeozoic bedrock. Geologies are predominantly sandstone, silcrete and quartz along ranges and hills. The White Cliffs subregion is characterised by stony plateaus, dissected tablelands with escarpments and stony slopes that extend to gravelly alluvial plains and flood plains of local creeks (NPWS 2003).

MW433 features scattered rocky habitat including outcropping silcrete. The surrounding areas do not contain karst, caves, crevices, cliffs. Lake Peery Mound Springs are the nearest significant geological site, located approximately 4 km south of the study area.

ii MW880

MW880 is predominantly located in the NSW South Western Slopes IBRA region. Geologies within this bioregion are dominated by chert, mudstone, siltstone and sandstone. Soils within plains landforms within this unit typically comprise shallow, well-drained stony red brown texture-contrast soils and brown clays.

MW880 is characterised by alluvial plains surrounded by elevated, incised ridges and rises. Sandstone, siltstone and mudstone are the dominant geology of these landforms. The assessment area does not contain karst, caves, crevices, cliffs, rocks or other areas of geological significance.

4.1.5 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as declared by the NSW Minister for Energy and Environment, within the assessment area.

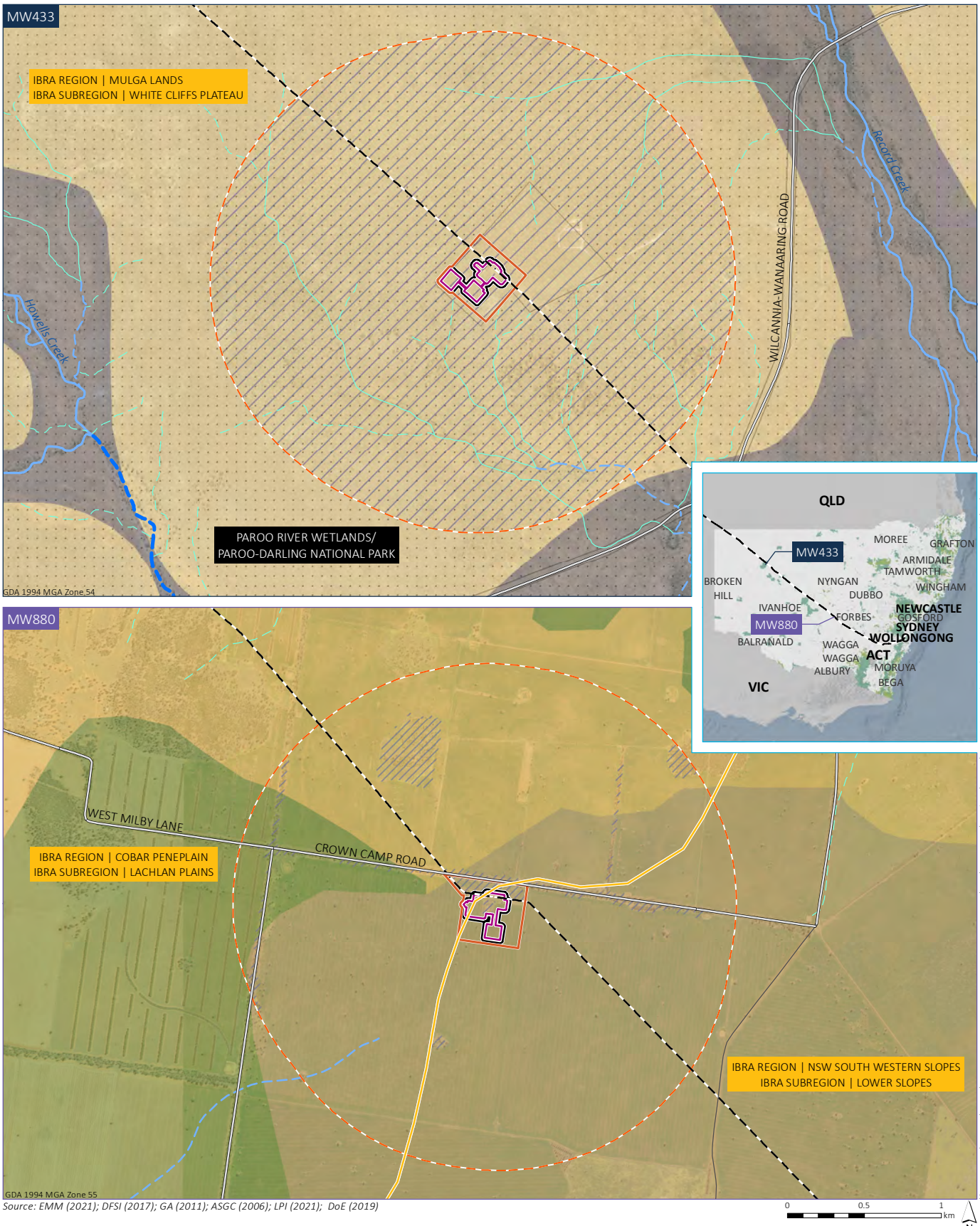
4.2 Assessment of site context

To calculate the native vegetation cover and patch size, a 1,500 m buffer was applied to the disturbance footprint, consistent with the requirements of the BAM (DPIE 2020a). Mapping of native vegetation within the assessment area was undertaken using State Vegetation Type Map: Western (VIS 4492; DPIE 2020b) and State Vegetation Type Map: Central West Lachlan (VIS 4468; OEH 2016a) and refined through comparison with aerial imagery.

Native vegetation within the assessment area is shown in Figure 4.1. The area of native vegetation within the buffer, the percent of native vegetation within the assessment area and patch size is shown in Table 4.2.

Table 4.2 Percentage of native vegetation cover

Site	Native vegetation in assessment area (ha)	Assessment area (ha)	Percentage of native vegetation in assessment area	Patch size (ha)
MW433	864.56	866.11	99%	101
MW880	36.58	851.47	4%	12



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); LPI (2021); DoE (2019)

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR001_EcologicalOverview_20210706_03.mxd 6/07/2021

KEY

- Disturbance footprint
- Indirect impact area
- Study area
- BDAR 1500 m buffer
- Moomba to Wilton pipeline
- Major road
- Minor road

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

- IBRA subregion
- Native vegetation cover
- RAMSAR wetland/NPWS reserve

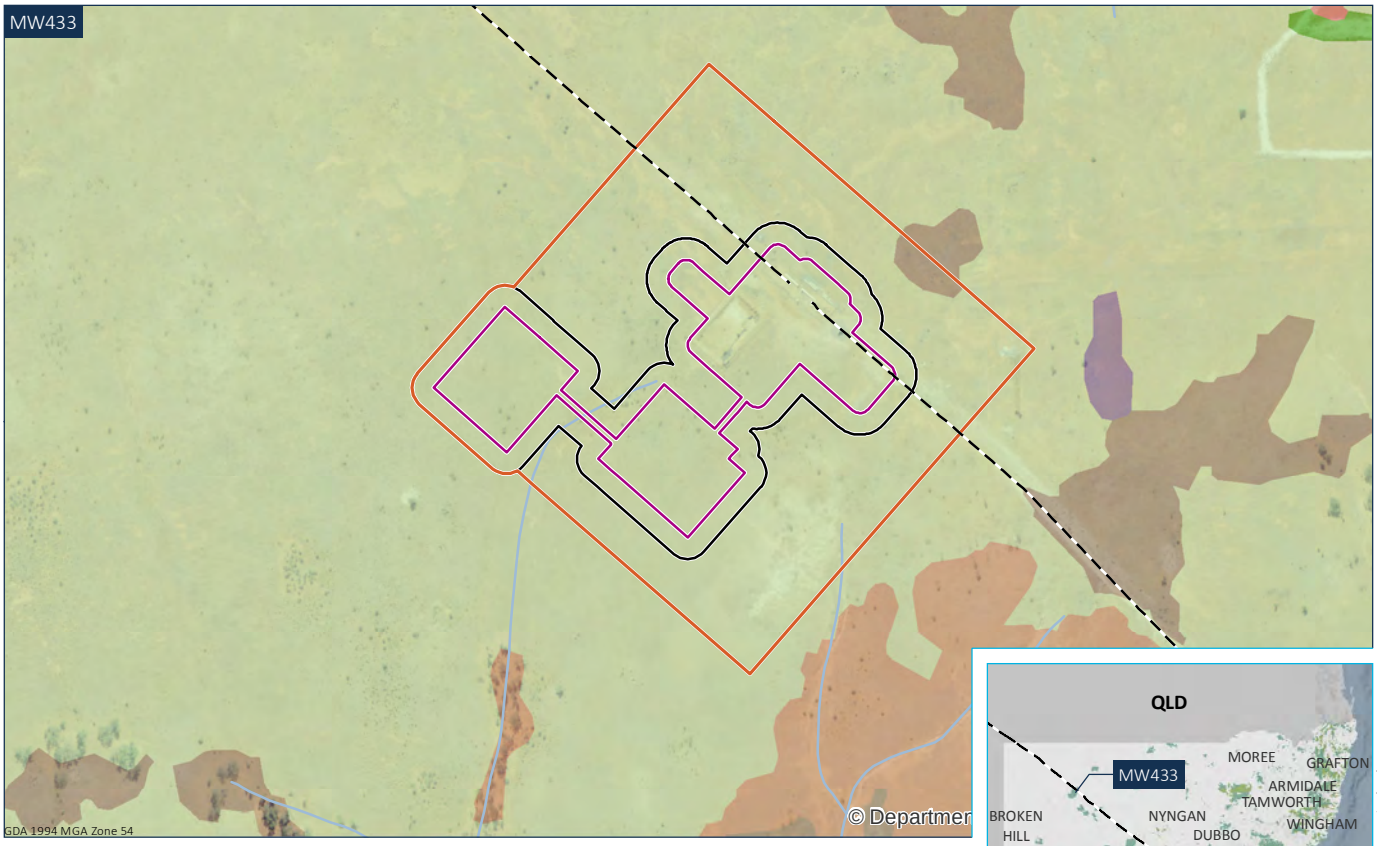
BioNet NSW landscapes (Mitchell landscapes)

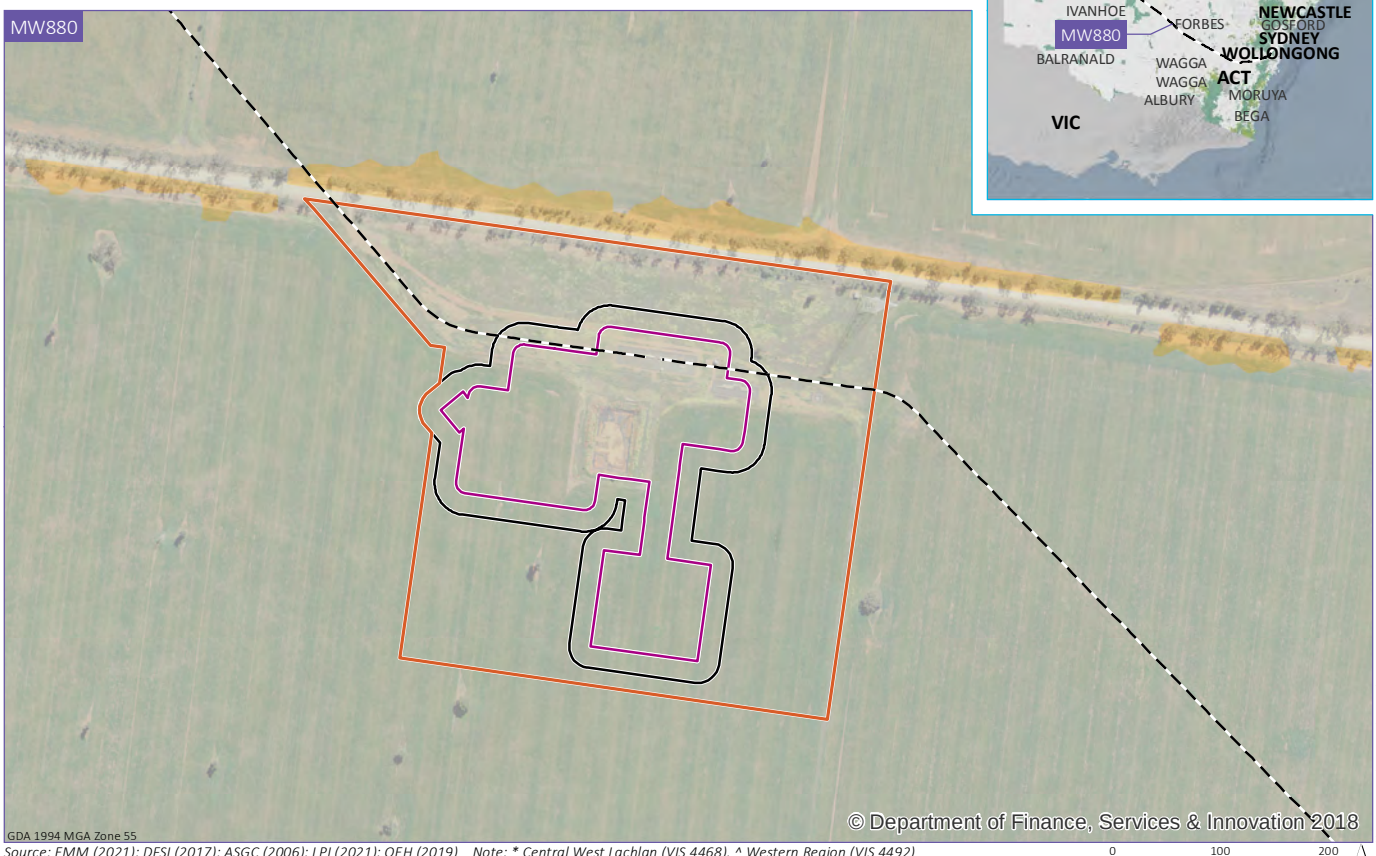
- Bimbi Plains
- Goobothery Hills and Footslopes
- Manitoba Hills and Footslopes
- White Cliffs Alluvial Plains
- White Cliffs Tablelands and Downs

Location map

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 4.1

EMM
creating opportunities





*Source: EMM (2021); DFSI (2017); ASGC (2006); LPI (2021); OEH (2019) Note: * Central West Lachlan (VIS 4468), ^ Western Region (VIS 4492)*

0 100 200 m

N

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR002_SiteMap_20210706_03.mxd 6/07/2021

KEY

- Disturbance footprint
- Indirect impact area
- Study area
- Moomba to Wilton pipeline
- Watercourse

State vegetation type *^

- Cleared/non-native
- 59 | Belah/Black Oak - Western Rosewood - Leopardwood low open woodland on sandplain and sandy flats in semi arid (hot) and arid climate zones
- 72 | White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion
- 132 | Mulga - Rock Fuchsia-bush sparse shrubland of silcrete scarps and mesas of the Channel Country Bioregion
- 152 | Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion
- 153 | Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones
- 155 | Bluebush shrubland on stony rises and downs in the arid and semi-arid zones
- 166 | Disturbed annual saltbush forbland on clay plains and inundation zones mainly of south-western NSW

Site map

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 4.2

EMM
creating opportunities

5 Native vegetation

5.1 Background review

Preliminary vegetation mapping was undertaken by AREA in December 2020 to assist in preparation of project scoping (AREA 2020). This mapping was undertaken within the study area and included the identification of Plant Community Types (PCTs) and stratification of PCTs into vegetation zones based on broad condition state. BAM plots were undertaken using the methods outlined in Section 5.2.2 to inform vegetation integrity assessment.

Preliminary vegetation mapping identified two PCTs present within the study area (Table 5.1). Vegetation zones were delineated by the presence/absence of canopy/shrub and condition of vegetation.

Table 5.1 Preliminary vegetation zones within the study area (AREA 2020)

Site	PCT ID	PCT name	Vegetation zone (as initially described by AREA)
MW433	153	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Shrub layer present
MW880	72	White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	Canopy present
			Derived grassland

5.2 Methods

5.2.1 Detailed vegetation mapping

Building on AREA's work, EMM undertook the following additional tasks to inform preparation of this BDAR:

- refinement of vegetation mapping;
- collection of additional plot data at MW880 to inform quality of vegetation; and
- marking hollow bearing trees and paddock trees.

Native vegetation and threatened species habitat at MW880 were assessed in the field during May 2021. The study area was traversed on foot, with vegetation mapped and aligned with NSW PCTs. Aerial imagery, site photos and plot data collected by AREA were used to refine and confirm mapping at MW433.

PCTs were stratified into vegetation zones based on broad condition state using the definitions in Table 5.2.

Table 5.2 Definitions used in delineation of vegetation zones

Condition class	Description
Moderate	Tree stratum and shrub stratum present, but understorey vegetation degraded due to weeds or other disturbance.
Disturbed	Tree stratum and/or shrub stratum sparsely present. Moderate disturbance present due to grazing and/or human impacts such as historical clearing.
Derived native grassland (DNG)	Tree stratum and shrub stratum missing. Native vegetation restricted to groundcover

5.2.2 Vegetation integrity assessment

Native vegetation integrity was assessed using data obtained via a series of plots, as per the methodology outlined in Section 4.2.1, 4.3.3 and 4.3.4 of the BAM (DPIE 2020a). Plot data was collected by AREA within the study area between 8 and 10 December 2021. At each plot location the following was undertaken:

- one 20 x 20 m plot, for assessment of composition and structure; and
- one 20 x 50 m plots for assessment of function, including a series of five 1 x 1 m plots to assess average leaf litter cover.

The assessment of composition and structure, based on a 20 x 20 m plot, recorded species name, stratum, growth form, cover and abundance rating for each species present within the plot. Cover (foliage cover) was estimated for all species rooted in or overhanging the plot, and recorded using decimals (if less than 1%, rounded to whole number (1%-5%) or estimated to the nearest 5% (5%-100%). Abundance was counted (up to 20) and estimated above 20, and recorded using the following intervals: 1, 2, 3, 4, 5, 10, 20, 50, 100, 500, 1,000, 1,500, 2,000, etc.

The assessment of function recorded the number of large trees, the presence of tree stem size class, tree regeneration, number of trees with hollows and length of fallen logs, as well as leaf litter cover within the 20 x 50 m plot and five 1 x 1 m subplots. The minimum number of plots and transects per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). A total of seven plots were undertaken within the study area. Datasheets are provided in Appendix A while compiled plot data is provided in Appendix B.

Initial biodiversity surveys were completed under AREA's Scientific Licence. Surveys for flora and vegetation communities were completed under the authority of Scientific License (SL100409). A list of flora species was compiled for each plot and PCT. Records of all flora species will be submitted to BCD for incorporation into the Atlas of NSW Wildlife.

5.2.3 Management zones

Delineation of a proposed development into different management zones allows for direct impacts (ie total loss of native vegetation and fauna habitat in a given area) and indirect impacts (eg decreasing condition in retained native vegetation and fauna habitats adjacent to direct impacts) to be quantified and offset.

The following sections describe how management zones have been defined to quantify direct and indirect impacts and allow for offsetting. Notwithstanding, measures have been provided in Section 8.2 to manage these indirect impacts.

The impact area has been delineated into a direct impact area, in which it has been assumed all vegetation will be removed, and an indirect impact area, in which it has been assumed vegetation will result in a reduction of vegetation integrity score. The indirect impact area has been defined as a 20 m buffer around the direct impact area in which indirect impacts, including edge effects and inadvertent transport of weeds in this area, may occur.

Four management zones have been applied across the impact areas (Table 5.3).

Table 5.3 Vegetation management zones

Site	Vegetation zone	Management zone	Impact
MW880	72_DNG	Direct	Assumed to be cleared.
	72_DNG	Indirect	Indirect impacts could potentially occur within 20 m of disturbance footprint.
MW433	153_Disturbed	Direct	Assumed to be cleared.
	153_Disturbed	Indirect	Indirect impacts could potentially occur within 20 m of disturbance footprint.

The following changes to future vegetation integrity scores were applied within the indirect management zone (where relevant):

- the composition and structure scores for 'grass', 'forbs', 'ferns' and 'other' growth forms were reduced by 10%, leaving scores for all other growth forms at the current score; and
- litter cover score will be reduced by 5% of the current value within the vegetation zone.

5.3 Results

5.3.1 Vegetation description

The study area is situated within moderate to heavily disturbed landscapes. Further descriptions of vegetation recorded within the study area is provided below.

i MW433

Vegetation within MW433 consists of Chenopod Shrublands, characterised by patchy ground cover species, a sparse mid-layer, and no canopy species. While no weeds were detected within the study area, there is evidence of widespread historic surface disturbance that has resulted in sparse vegetation cover. Most of the study area has been modified through past disturbances associated with historical land use practices such as the construction of the MWP and MSEP infrastructure. Additionally, the land is considered degraded due to intense grazing by the feral Goat (*Capra hircus*). The Goat was observed within the locality during surveys.

Photograph 5.1 **Vegetation within the study area and existing pipeline infrastructure (MW433)**

Photograph 5.2 **Historical water retention structure with regenerating native vegetation (MW433)**

ii MW880

The study area is within a highly modified agricultural landscape, with majority of MW880 currently used for dryland cropping. Remnant vegetation, including DNG, is present in the northern section of the study area. Areas of DNG contained a relatively high diversity of both native and exotic grasses, forbs, and a few shrubs. A narrow strip of semi-arid woodland was recorded along the road verge. A single paddock tree, White Cypress Pine (*Callitris glaucophylla*), was recorded within the cropped land.

Photograph 5.3 Vegetation within the site and existing pipeline infrastructure (MW880)

Photograph 5.4 **Historical water retention structure with regenerating native vegetation (MW880)**

Photograph 5.5 **Derived native grassland and moderate condition vegetation (MW880)**

Photograph 5.6 White Cypress Pine paddock tree within cropped land (MW880)

5.3.2 Plant community types

Site investigations, including determination of vegetation communities using the methods described in Section 5.2.1, identified the presence of two PCTs within the Modification 1 impact area. The PCTs mapped within the impact area, including vegetation formation and vegetation class (Keith 2004), are described within Table 5.4 and shown in Figure 5.1.

Table 5.4 Plant community types mapping within the Modification 1 impact area

Site	Plant community type	Vegetation formation	Vegetation class	Direct impacts (ha)	Indirect impacts (ha)	Total impact area (ha)
MW880	72 – White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	Semi-arid Woodlands	Western Peneplain Woodlands	0.75	0.48	1.23
	Cleared/non-native	-	-	3.60	2.21	5.81
MW433	153 – Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Arid Shrublands (Chenopod sub-formation)	Aeolian Chenopod Shrublands	3.22	3.05	6.27
	Cleared/non-native	-	-	0.56	0.25	0.81
TOTAL NATIVE				**3.97**	**3.53**	**7.50**
TOTAL				**8.13**	**5.99**	**14.12**

5.3.3 Vegetation zones

Each of the two PCTs identified within the impact area were stratified into vegetation zones based on broader condition state, as per the method outlined in 5.2.1. This process identified two vegetation zones within the impact area (Figure 5.1). A list of vegetation zones in the impact area, including separate calculations for direct and indirect impacts, is provided in Table 5.5.

Table 5.5 Vegetation zones mapped within the Modification 1 impact area

PCT ID	PCT name	Condition	Direct impacts (ha)	Indirect impacts (ha)	Total impact area (ha)
72	White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	DNG	0.75	0.48	1.23
153	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Disturbed	3.22	3.05	6.27
TOTAL			**3.97**	**3.53**	**7.50**

Detailed descriptions of each PCT and conditions are provided in the following sections (Table 5.6 and Table 5.7).

i PCT 72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion

Table 5.6 PCT 72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion

PCT ID	72					
Common name	White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion					
Condition class, extent within study area, patch size and hollow-bearing trees	**Vegetation zone**	**Condition class**	**Direct impact area (ha)**	**Indirect impact area (ha)**	**Patch size (ha)**	**Hollow-bearing trees**
	Vegetation zone 1	DNG	0.75	0.48	12	Absent
	Vegetation zone 2[1]	Moderate	0	0	-	Present

Notes: 1. Vegetation zone 2 was mapped within the study area but is located outside the impact area. It has been included for context of the study area.

Table 5.6 PCT 72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion

Description	This PCT was identified in the northern part of MW880. Where present (along the roadside), tree cover included Poplar Box (*Eucalyptus populnea*), White Cypress Pine, Western Grey Box (*Eucalyptus microcarpa*) and Silver Wattle *(Acacia dealbata*). The shrub layer is dominated by Grey Copperburr (*Sclerolaena diacantha*), saltbush (*Atriplex* spp.), Old Man Saltbush (*Atriplex nummularia*), *Senna artemisioides* subsp. *zygophylla* and Black Rolypoly (*Sclerolaena muricata*). Other midstratum species included *Sida petrophial*, Budda (*Eremophila mitchellii*), and Small-leaf Bluebush (*Maireana microphylla*). Native groundcover species included Bunch Wiregrass (*Aristida behriana*), Purple Wiregrass (*Aristida ramosa*), Speargrass (*Austrostipa scrabra*), Small-flowered Wallaby-grass (*Rytidosperma setaceum*), Slender Bamboo Grass (*Austrostipa verticillata*), Common Everlasting (*Chrysocephalum apiculatum*), Climbing Saltbush (*Einadia nutans subsp. nutans*), Pink Bindweed (*Convolvulus erubescens*), Purple Burr-Daisy (*Calotis cuneifolia*), Caustic weed (*Chamaesyce drummondii*), Cotton Panic Grass (*Digitaria brownii*), Silky Glycine (*Glycine canescens*), Cut-leaf Goodenia (*Goodenia cycloptera*), Smooth Goodenia (*Goodenia glabra*), *Minuria leptophylla,* Scrambled Eggs (*Goodenia pinnatifida*), Wingless Fissure-weed (*Maireana enchylaenoides*), Two-colour Panic (*Panicum simile*), Fairy Fan-flower (*Scaevola aemula*), Corrugated Sida (*Sida corrugata*), Quena (*Solanum esuriale*), Fuzzweed (*Vittadinia cuneata* var. *cunea*ta), Windmill Grass (*Chloris truncata*), Curly Windmill Grass (*Enteropogon acicularis*), Kidney Weed (*Dichondra repens*),Ridge Sida (*Sida cunninghamii*) and Tall Bluebell (*Wahlenbergia stricta*). A number of exotic species were recorded within the study area including oat (*Avena* spp.), Saffron Thistle (*Carthamus lanatus*), Field Bindweed (*Convolvulus arvensis*), Patterson's Curse (*Echium plantagineum*), Red-flowered Mallow (*Modiola caroliniana*), Vervain (*Salvia verbenaca*), Common Sowthistle (*Sonchus oleraceus*), and Haresfoot Clover (*Trifolium arvense*).
Survey effort	Four plots were completed within the study area: • Vegetation zone 1 – DNG: 3 (MW880_1, MW880_2, MW880_3); and • Vegetation zone 2 – Moderate: 1 (MW880_4)
Condition description	<u>Vegetation zone 1 – DNG</u> The majority of native vegetation within MW880 is mapped as DNG. These areas lack canopy and midstorey species as a result of historical clearing for agricultural land uses. Groundcover is co-dominated by native and exotic species. <u>Vegetation zone 2 – Moderate</u> This zone was recorded in the northern section of MW880, along the road edge. The zone consists of a canopy and shrub layer with a mixed native and exotic understorey. The zone is outside the impact area and therefore no direct or indirect impacts will occur.
Characteristic species used for identification of PCT	According to the NSW VIS Classification Version 2.1, the species recorded within this community that align with the dominant species listed as characteristic of this PCT include: • Canopy – Poplar Box, White Cypress Pine and Western Grey Box; • Middle stratum – Budda; and • Ground stratum – Rough Speargrass, Ridge Sida, Purple Burr-Daisy, Climbing Saltbush, Wingless Fissure-weed, Fuzzweed, Grey Copperburr, Small-flowered Wallaby-grass, Curly Windmill Grass.
Justification of evidence used to identify the PCT	Areas were ascribed to PCT 72 for the following reasons: • All canopy species are consistent with PCT 72. • Most of the dominant middle and ground stratum species are consistent with PCT 72. • The community is located within the IBRA subregions Lachlan Plains and Lower Slopes. • The vegetation is situated on largely flat landscape, consistent with the landform elements of PCT 72.

Table 5.6 PCT 72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion

Status	PCT 72 is not associated with any Threatened Ecological Communities (TECs) listed under the BC Act or EPBC Act. The EPBC listed TEC, Poplar Box Grassy Woodland on Alluvial Plains is known to occur within the NSW South Western Slopes IBRA bioregion. However, given the site is not situated within alluvial plains and is not considered part of currently defined floodplains, PCT 72 mapped within MW880 is not considered to meet the conditions of Poplar Box Grassy Woodland on Alluvial Plains.
Estimate of percent cleared value of PCT	40%

Photograph 5.7 PCT 72 – DNG (Plot MW880_1)

ii PCT 153: Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones

Table 5.7 PCT 153: Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones

PCT ID	153					
Common name	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones					
Condition class, extent within impact area, patch size and hollow-bearing trees	**Vegetation zone**	**Condition class**	**Direct impact area (ha)**	**Indirect impact area (ha)**	**Patch size (ha)**	**Hollow-bearing trees**
	Vegetation zone 1	Disturbed	3.22	3.05	101	Absent
Description	This PCT was identified within MW433. All plants recorded in this PCT were native. No canopy species were recorded within the PCT. The shrub layer is dominated by Green Copperburr, Tangled Copperburr (*Sclerolaena divaricata*), *Sclerolaena constricta*, *Sclerolaena longicuspis*, Emubush (*Eremophila longifolia*) and Slender-fruit Saltbush (*Atriplex leptocarpa*). Other shrub species recorded include Black Bluebush (*Maireana pyramidata*), Dead Finish (*Acacia tetragonophylla*), and Thorny Saltbush (*Rhagodia spinescens*). Species recorded within the ground layer include *Hyalosperma semisterile*, Common White Sunray (*Rhodanthe floribunda*), Ringed Wallaby Grass (*Rytidosperma caespitosum*), *Austrostipa nodosa*, Quena and Common Sunray (*Triptilodiscus pygmaeus*). Historic land use has resulted in the disturbance of this community.					
Survey effort	Three plots were completed within the survey area: • Vegetation zone 1 – Disturbed: 3 (MW433_1, MW433_2, MW433_3).					
Condition description	Vegetation zone 1 – Disturbed A single vegetation zone was mapped within MW433. This vegetation zone comprised of no canopy cover, with sparse shrubs and native understorey. The vegetation zone has been subject to widespread surface disturbance, including grazing and degradation by pest species.					
Characteristic species used for identification of PCT	According to the NSW VIS Classification Version 2.1, the species recorded within this community that align with the dominant species listed as characteristic of this PCT include: • Middle stratum – Black Bluebush, Thorny Saltbush; and • Ground stratum – *Austrostipa nodosa*, Common White Sunray, Tangled Copperburr, Ringed Wallaby Grass.					
Justification of evidence used to identify the PCT	Areas were ascribed to PCT 153 for the following reasons: • Most of the dominant middle and ground stratum species are consistent with PCT 153. • The community is located within the White Cliffs Plateau IBRA subregion. • The vegetation landscape is consistent with the landform elements of PCT 153 including red-brown duplex soils.					
Status	PCT 153 is partly associated with the BC Act listed endangered ecological community (EEC) *Acacia loderi Shrublands*. This EEC is described as a community dominated by Nelia (*Acacia loderi*). Nelia was not recorded within the survey area, therefore the EEC was considered absent.					
Estimate of percent cleared value of PCT	40%					

Table 5.7 **PCT 153: Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones**

Photograph 5.8 **PCT 153 – Disturbed (Plot MW433_3)**

5.3.4 Vegetation integrity scores

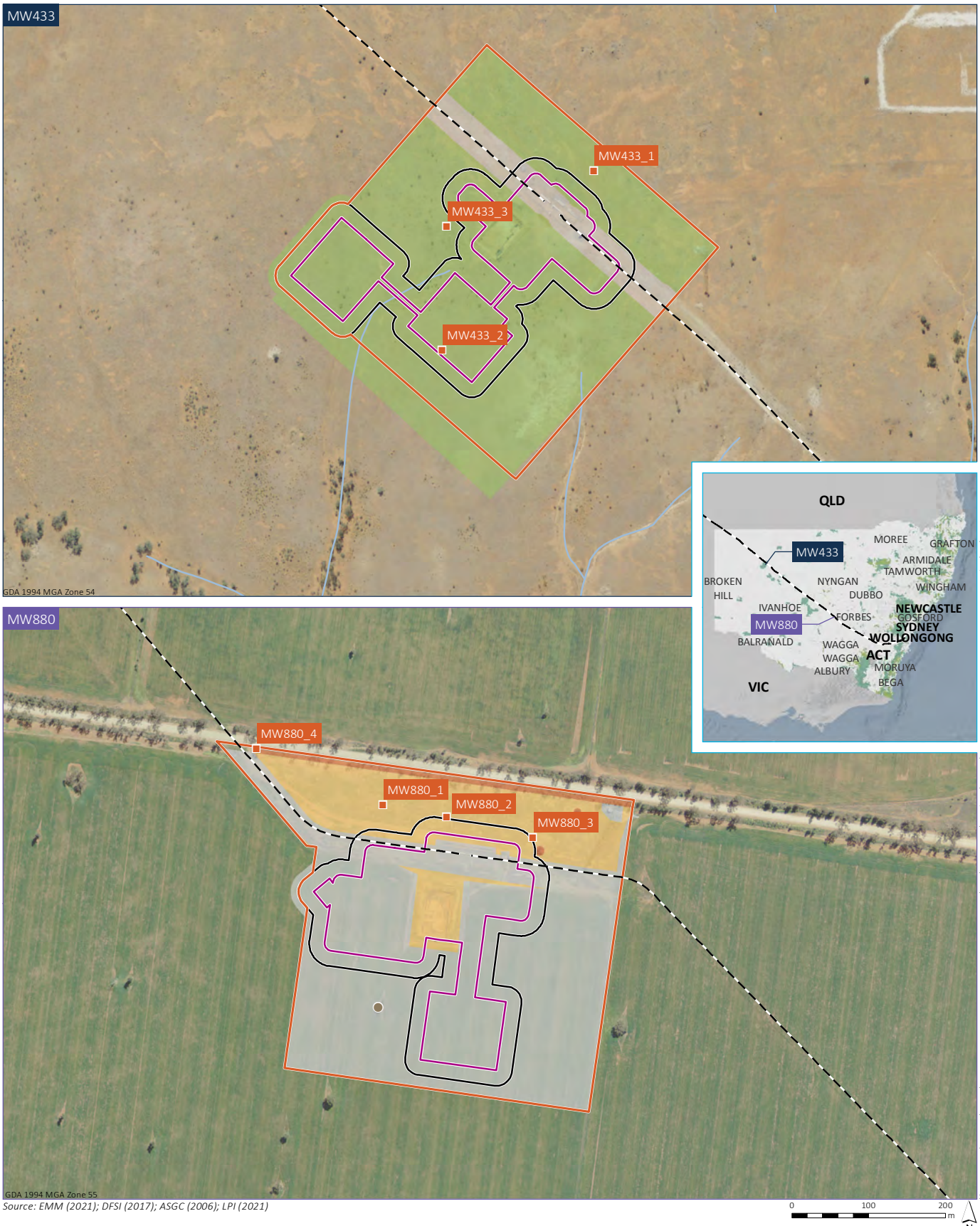
Two PCTs occur within the study area, with two vegetation zones mapped within the disturbance footprint entered into the credit calculator to determine vegetation integrity scores. A summary of the vegetation integrity score for each vegetation zone is provided in Table 5.8. The vegetation integrity score is based on the transect data which is compared with benchmark values for each vegetation type.

Table 5.8 Vegetation zones mapped within the impact area

PCT ID	PCT name	Condition	Total impact area (ha)	Vegetation integrity score (out of 100)
72	White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	DNG	1.23	12.3
153	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Disturbed	6.27	8

5.3.5 Threatened ecological communities

Based on the information outlined in Table 5.6 to Table 5.7 above, no EPBC Act or BC Act listed TECs have been recorded within the impact area. Further justification has been provided for EPBC Act listed TECs in Section 9.1.1i.



Source: EMM (2021); DFSI (2017); ASGC (2006); LPI (2021)

0 100 200 m

N

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR003_EMMPCTs_20210706_03.mxd 6/07/2021

KEY

- Disturbance footprint
- Indirect impact area
- Study area
- Moomba to Wilton pipeline
- Watercourse
- BAM plot
- Paddock tree – White Cypress Pine

Vegetation mapping (EMM, 2021)

- Cleared/not native
- 72 | White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion
- Derived native grassland
- Moderate
- 153 | Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones
- Disturbed

Plant community types and vegetation zone mapping, including plot locations

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 5.1

EMM creating opportunities

6 Threatened species

6.1 Threatened species habitat assessment

Concurrent with the vegetation mapping, a habitat assessment was undertaken seeking to identify the following fauna habitat features within the study area:

- habitat trees including hollow-bearing trees;
- nests with evidence of occupancy;
- availability of flowering shrubs and feed tree species;
- waterway condition;
- quantity of ground litter and logs;
- rocky habitats suitable to support reptile species;
- suitable ground cover habitat such as native tussocky grass that provide microhabitats for reptiles;
- Koala feed tree presence and evidence of Koalas; and
- searches for indirect evidence.

6.2 Threatened species habitat description

The habitat assessment identified that the study area has been subjected to a moderate to high level of disturbance from previous and current land uses. Further descriptions of threatened species habitat within the study area is provided below.

6.2.1 MW433

MW433 has been subject to previous disturbance relating to the existing MWP, and MSEP as well as grazing by pest species.

Vegetation within MW433 consists of PCT 153 in disturbed condition. A canopy layer is absent throughout MW433. The shrub layer and groundcover consist of a patchy cover of native species, lacking suitable shrubby and grassy coverage for a number for threatened fauna species.

Two unnamed watercourses intersect the study area; however, these offer little habitat value due to absence of water and vegetation. A historical water retention structure (now empty) is present and contains regenerating native vegetation. Scattered rocky habitat (Photograph 6.1) and fallen timber of small size (Photograph 6.2) is present. A communications tower operated by Telstra is located within the north-east corner the site boundary. No nests were observed within the tower.

Photograph 6.1 Rocky habitat (MW433)

Photograph 6.2 Fallen timber (MW433)

6.2.2 MW880

MW880 is located within a highly modified landscape which includes areas currently used for dryland cropping. PCT 72 is mapped within MW880 in two conditions, DNG and moderate.

Areas of DNG provide understorey foraging resources and potential habitat for some threatened flora species.

Areas of moderate condition along the road edge contain tree species such as White Cypress Pine, Poplar Box and Western Grey Box. A number of these trees were observed to contain small to medium sized hollows. These hollow bearing trees provide potential roosting and/or breeding habitat for a number of hollow dependent species. A single paddock tree, White Cypress Pine, was recorded within the south of the site in cropped land. No hollows were observed within the White Cypress Pine.

A communications tower is located in the north-eastern corner of the site boundary. No nests were observed within the tower.

Photograph 6.3 Habitat trees (MW880)

Photograph 6.4 Hollow bearing tree (MW880)

6.3 Ecosystem credit species

Ecosystem credits species are threatened species that can be reliably predicted to use an area of land based on habitat surrogates. For the purposes of the BAM (DPIE 2020a), ecosystem credit species are deemed to be offset through the habitat surrogates (PCTs) in which they occur.

A list of ecosystem credit species predicted to occur within the study area, based on the PCTs present and generated by the calculator associated within the BAM (DPIE 2020a) is provided in Table 6.1. The potential for these species to occur within the study area was assessed in accordance with Section 5.2.2 of the BAM (DPIE 2020a).

Table 6.1 Assessment of ecosystem credit species

Scientific name	Common name	Justification for exclusion	
		MW433	MW880
Antechinomys laniger	Kultarr	Not excluded.	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Not excluded.	Not excluded.
Aspidites ramsayi	Woma	Not excluded.	-
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	-	Excluded from cleared vegetation zones (condition class DNG) as no foraging resources (feed trees) are present.
Certhionyx variegatus	Pied Honeyeater	Not excluded.	-
Chalinolobus picatus	Little Pied Bat	Not excluded.	-
Chthonicola sagittata	Speckled Warbler	-	Excluded from cleared vegetation zones (condition class DNG) as no woodland habitat present.
Circus assimilis	Spotted Harrier	Not excluded.	-
Epthianura albifrons	White-fronted Chat	Not excluded.	-
Falco hypoleucos	Grey Falcon	Not excluded.	Not excluded.
Falco subniger	Black Falcon	Not excluded.	Not excluded.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	-	Excluded from all vegetation zones as there is no water within 1 km of the impact area.
Hamirostra melanosternon	Black-breasted Buzzard (Foraging)	Not excluded.	Not excluded.
Hieraaetus morphnoides	Little Eagle (Foraging)	Not excluded.	-
Leggadina forresti	Forrest's Mouse	Not excluded.	-
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Foraging)	Not excluded.	Not excluded.
Lophoictinia isura	Square-tailed Kite (Foraging)	Not excluded.	-
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	Excluded from cleared vegetation zones (condition class DNG) as no woodland habitat present.
Phaps histrionica	Flock Bronzewing	Not excluded.	-
Phascolarctos cinereus	Koala (Foraging)	-	Excluded from all vegetation zones as the species is rare in this area and no evidence was observed during targeted surveys.
Polytelis swainsonii	Superb Parrot (Foraging)	-	Not excluded.
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	-	Excluded from cleared vegetation zones (condition class DNG) as no woodland habitat present.
Pseudomys hermannsburgensis	Sandy Inland Mouse	Not excluded.	-

Table 6.1 Assessment of ecosystem credit species

Scientific name	Common name	Justification for exclusion	
		MW433	MW880
Pyrrholaemus brunneus	Redthroat	Not excluded.	-
Simoselaps fasciolatus	Narrow-banded Snake	Not excluded.	-
Sminthopsis macroura	Stripe-faced Dunnart	Not excluded.	-
Stagonopleura guttata	Diamond Firetail	-	Not excluded.

6.4 Species credit species

6.4.1 Candidate species assessment

In accordance with Step 3 (Section 5.2.3 of BAM; DPIE 2020a), a field assessment of habitat constraints and microhabitats was undertaken in the field to determine the suitability of habitat within the study area for:

- predicted species (ecosystem credit species associated with recorded PCTs, predicted by the Biodiversity Assessment Method Calculator (BAMC);
- candidate species (species credit species associated with specific geographic and landscape feature constraints); and
- species predicted to occur by the EPBC Act Protected Matters Search Tool.

Candidate species predicted by the BAMC are shown in Table 6.2. An assessment of the geographic and landscape constraints has been provided for each species, with a justification provided where species have been excluded, in accordance with Steps 1 to 3 (Section 5.2.1 to 5.2.3) of the BAM (DPIE 2020a).

Table 6.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment	
Scientific name	**Common name**	**Habitat/ geographic constraints**	**Constraint present?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**	
					MW433	**MW880**
Flora						
Atriplex infrequens	A saltbush	-	-	-	Yes. The species is associated with broad drainage tracts, clay flats and possibly occasionally inundated habitats. Little is known about the species habitat preference.	-
Austrostipa metatoris	A spear-grass	-	-	-	-	Yes. The species is known to occur in a range of habitats including sandhills, sandridges, undulating plains and flat open mallee. It is often associated with Poplar Box, *E. intertexta*, White Cypress Pine, *Casuarina cristata*, *Santalum acuminatum* and *Dodonaea viscosa*. Two of these species, Poplar Box and White Cypress Pine were recorded within the study area.
Diuris tricolor	Pine Donkey Orchid	-	-	-	-	Yes. The species is usually recorded from disturbed habitats and is associated with White Cypress Pine, Poplar Box, *E. intertexta*, Ironbark and Acacia shrubland. Understorey is often grassy with herbaceous plants. The study area contains Poplar Box and White Cypress Pine with a shrubby and grassy understorey.
Swainsona sericea	Silky Swainson-pea	-	-	-	-	Yes. The species is found in Box-Gum Woodland in the Southern Tablelands and Southwest Slopes. It is sometimes found in associated with *Callitris* spp.. Given the study area consists of Box spp. and White Cypress Pine, the species has been considered a candidate species.

Table 6.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment	
Scientific name	**Common name**	**Habitat/ geographic constraints**	**Constraint present?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**	
					MW433	**MW880**
Fauna						
Amytornis modestus obscurior	Thick-billed Grasswren (north-west NSW subspecies)	-	-	No	No. Habitat within the study area is considered degraded; lacking suitable dense understorey for the species.	-
Antaresia stimsoni	Stimson's Python	Rocky areas, or areas within 500 m of rocks or gibber.	Yes	No	Yes. The species inhabits a wide range of arid and semi-arid environments including rock outcrops, sandy plains and dunefields where it is associated with larger trees and termite mounds. The study area contains suitable rocky areas within shrubland habitat.	-
Ardeotis australis	Australian Bustard	-	-	No	Yes. The species is known to inhabit tussock and hummock grasslands, as well as low shrublands and low open grassy woodlands. The study area contains open shrubland and grasses suitable for the species.	-
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Hollow bearing trees or living or dead trees with hollows greater than 15 cm diameter and greater than 8 m above ground.	No	-	-	No. The study area contains a number of hollow bearing trees with small hollows. However, hollow bearing trees recorded were not considered suitable for Glossy Black-Cockatoo.

Table 6.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment	
Scientific name	**Common name**	**Habitat/ geographic constraints**	**Constraint present?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**	
					MW433	**MW880**
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Living or dead mature trees within suitable vegetation within 1 km of a river, lake, large dam, creek, wetland and/or coastline.	No	No	-	No. The study area is not located within 1 km of a suitable waterbody. Additionally, no raptor nests were recorded within the study area. The historical water retention structure was observed dry and is not considered to contain suitable habitat for this species.
Hamirostra melanosternon	Black-breasted Buzzard (Breeding)	Waterbodies and living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground.	No	No	No. No raptor nests were recorded within the study area. No waterbodies were recorded within the study area.	No. No raptor nests were recorded within the study area. No waterbodies were recorded within the study area.
Hieraaetus morphnoides	Little Eagle (Breeding)	Nest trees – live (occasionally dead large old trees within vegetation).	No	No	No. No raptor nests were recorded within the study area.	-
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Breeding)	Hollow bearing trees or living or dead tree with hollows greater than 10 cm diameter.	No	No	No. No hollow bearing trees were recorded within the study area.	No. The study area contains a number of hollow bearing trees with small hollows. However, hollow bearing trees recorded were not considered suitable for Major Mitchell's Cockatoo.
Lophoictinia isura	Square-tailed Kite (Breeding)	Nest trees.			No. No raptor nests were recorded within the study area.	-

Table 6.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment	
Scientific name	**Common name**	**Habitat/ geographic constraints**	**Constraint present?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**	
					MW433	**MW880**
Lucasium stenodactylum	Crowned Gecko	-	-	No	Yes. Species habitat preferences are largely unknown. The species has been recorded within red sand habitats and savannah woodland and stony areas with shrubs. Therefore, the species was included based on suitable habitat.	-
Phascolarctos cinereus	Koala	Important habitat (however, this is not a mapped important habitat area), defined by the density of koalas and quality of habitat determined by on-site survey	No	Yes	-	Yes. A single Eucalyptus species, Western Grey Box, is listed under the Koala Habitat Protection SEPP 2021 as a Koala use tree species within the Central and Southern Tablelands. There are no records in proximity to the study area, with the nearest recent record is approximately 70 km north of the study area. However, as suitable habitat exists, the species was retained as a candidate species.
Polytelis swainsonii	Superb Parrot	Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30 cm.	Yes	No	-	Yes. The Superb Parrot breeds in Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. Tree species typically selected for nesting on the slopes and tablelands comprise River Red Gum (*E. camaldulensis*), Blakely's Red Gum, Apple Box (*E. bridgesiana*), Western Grey Box, White Box and Red Box (*E. polyanthemos*). Of the species described above, Grey Box was recorded on the edge of the study area. Suitable hollow bearing trees were recorded along the road edge.

6.4.2 Candidate species credit species requiring further assessment

Candidate species for further assessment were identified in accordance with Step 1 to 2 (Section 5.2.1 to 5.2.2) of BAM (DPIE 2020a). A list of species requiring further assessment is provided in Table 6.3.

Table 6.3 Candidate species credit species requiring further assessment

Scientific name	Common name	EPBC Act	BC Act
MW433			
Antaresia stimsoni	Stimson's Python	-	Vulnerable
Ardeotis australis	Australian Bustard	-	Endangered
Atriplex infrequens	A saltbush	Vulnerable	Vulnerable
Lucasium stenodactylum	Crowned Gecko	-	Vulnerable
MW880			
Austrostipa metatoris	A spear-grass	Vulnerable	Vulnerable
Diuris tricolor	Pine Donkey Orchid	-	Vulnerable
Phascolarctos cinereus	Koala	Vulnerable	Vulnerable
Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable
Swainsona sericea	Silky Swainson-pea	-	Vulnerable

6.4.3 Targeted survey methods

i Targeted flora surveys

Targeted flora surveys were undertaken by AREA over two days between 8 and 10 December 2020. Surveys were not completed in accordance with NSW (EES 2020) guidelines, with transects spaced between 25 m and 70 m (Figure 6.1). The EES guidelines (2020) state the minimum spaced distance required to survey for grasses, forbs and herbs within open vegetation is 10 m.

ii Targeted fauna surveys

Targeted surveys for the Koala were undertaken on 24 May 2021 by EMM. Methods and survey effort have been developed in accordance with DEC (2004), DSEWPaC (2011a), and Phillips and Callaghan (2011) for the Koala. Methods and survey effort is outlined in Table 6.4. Survey locations are illustrated in Figure 6.1.

Table 6.4 Methods and survey effort – Koala

Method	Survey description	Survey effort
Spot Assessment Technique (SAT)	At each SAT site the following was undertaken (Phillips and Callaghan 2011): • Centre tree was located and marked with flagging tape. • The 29 nearest trees to the centre tree were also identified and marked. • Koala faecal pellets were searched for beneath each of the 30 trees within a distance of 100 cm. Initial inspections were checked in undisturbed ground surface, followed by a more thorough inspection involving disturbance of leaf litter and ground cover (if no faecal pellets were initially detected). • An average of approximately two person minutes per tree were dedicated to the faecal pellet search. • Activity levels can be interpreted using Table 2 from Phillips and Callaghan (2011).	A single SAT site was surveyed along the road edge at MW880. Thirty trees were marked and surveyed within the single SAT site (Figure 6.1).

6.4.4 Targeted survey results

i Targeted flora surveys

Given the surveys were conducted outside the flowering period for some species and spaced larger than 10 m (maximum distance for grasses, forbs and herbs within open vegetation) candidate flora species have been assumed present. Species polygons have been established based on suitable habitat and are illustrated in Figure 6.2.

ii Targeted fauna surveys

Two threatened fauna species were recorded during field surveys at MW880:

- Grey-crowned Babbler (*Pomatostomus temporalis*) (ecosystem credit species); and
- Superb Parrot (*Polytelis swainsonii*).

a Koala

No Koalas or Koala faecal pellets were detected during the Koala SAT searches. The Koala is considered to have a low likelihood of occurrence within the impact area following targeted surveys, especially as the vegetation zone impacted is DNG.

b Superb Parrot

The habitat assessment outlined in Section 6.1 identified fourteen hollow bearing trees within the study area (MW880). Two trees were considered to provide suitable breeding hollows for the Superb Parrot (Figure 6.3). The Superb Parrot nests within large tress (dead and alive) with deep hollows or hollow limbs.

Given the suitability of the hollow bearing trees and record of one individual the species has been assumed present and breeding within the potentially suitable hollow bearing trees. The Threatened Biodiversity Data Collection (TBDC) outlines where a breeding site has been identified a circular buffer with a 100 m radius should be established around the nest tree. This data was used to determine the species polygons (Figure 6.2, Figure 6.3).

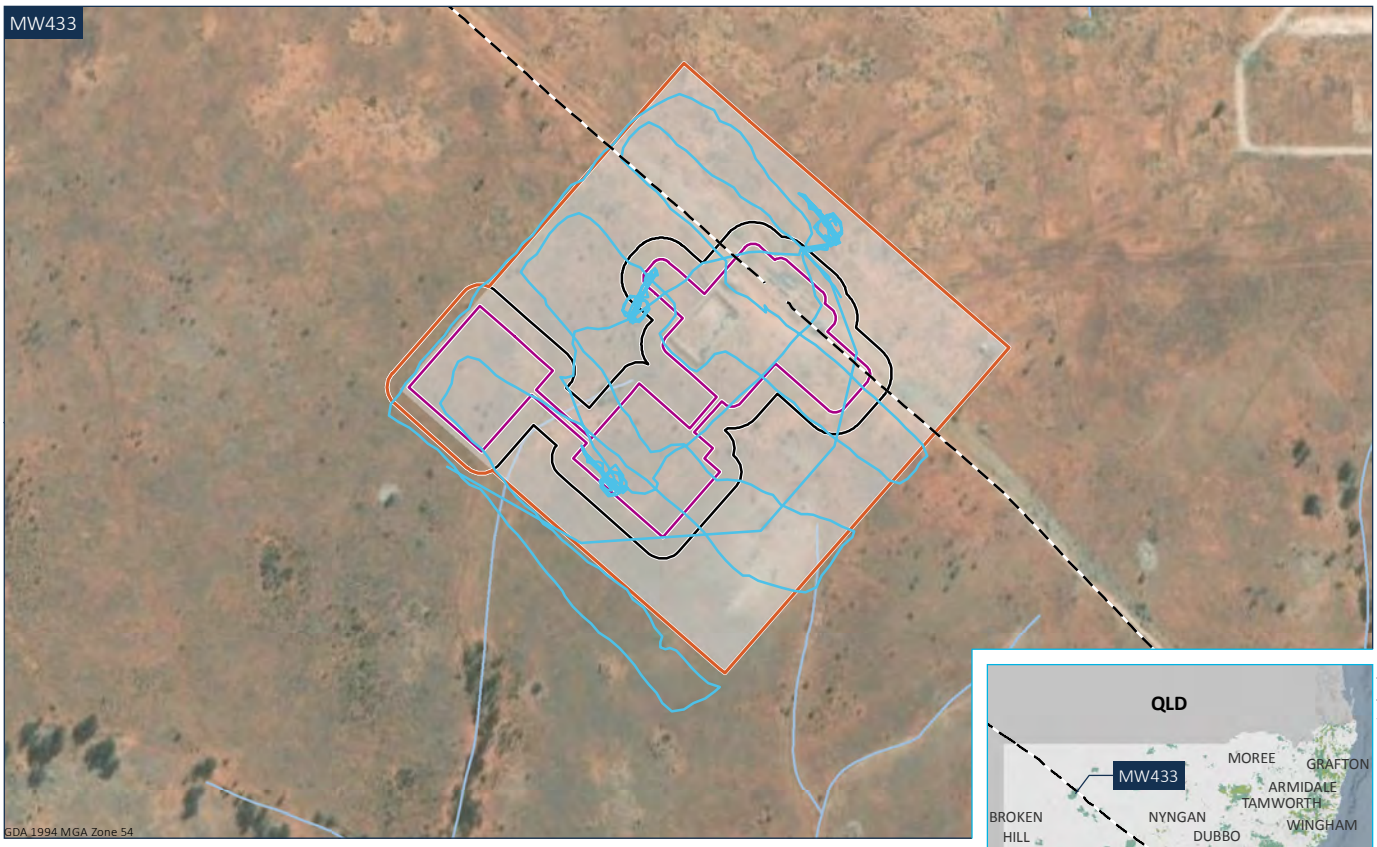
6.4.5 Candidate species presence, extent and habitat quality

Table 6.5 defines the presence (or absence) of candidate species within the study area and habitat quality. The area of habitat has been used to define the species polygon for area-based species, in accordance with Step 4 to 6 of the BAM (Section 5.2.4 to 5.2.6).

Some species have been assumed to be present if they could not be completely discounted, and species polygons have been identified within potential habitat.

Table 6.5 Candidate species presence, extent and habitat quality

Scientific name	Common name	Step 4 – Determine candidate species presence/ absence	Step 5 - Determine the area or count, and location of suitable habitat for a species credit species		Step 6 - Determine the habitat condition within the species polygon for species assessed by area	
			Direct area impacted (ha)	Indirect area impacts (ha)	Vegetation zone/s	Vegetation integrity score
MW433						
Antaresia stimsoni	Stimson's Python	Assumed present	3.22	3.05	153_Disturbed	8
Ardeotis australis	Australian Bustard	Assumed present	3.22	3.05	153_Disturbed	8
Atriplex infrequens	A saltbush	Assumed present	3.22	3.05	153_Disturbed	8
Lucasium stenodactylum	Crowned Gecko	Assumed present	3.22	3.05	153_Disturbed	8
MW880						
Austrostipa metatoris	A spear-grass	Assumed present	0.75	0.48	72_DNG	12.3
Diuris tricolor	Pine Donkey Orchid	Assumed present	0.75	0.48	72_DNG	12.3
Phascolarctos cinereus	Koala	Not recorded during targeted survey	-	-	-	-
Polytelis swainsonii	Superb Parrot	Assumed present (within 100m buffer to potential hollow bearing trees suitable for the species)	0.06	0.21	72_DNG	12.3
Swainsona sericea	Silky Swainson-pea	Assumed present	0.75	0.48	72_DNG	12.3



Source: EMM (2021); DFSI (2017); ASGC (2006); LPI (2021); APA (2020)

0 100 200 m

N

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR004_TargetedSpeciesSurvey_20210706_03.mxd 6/07/2021

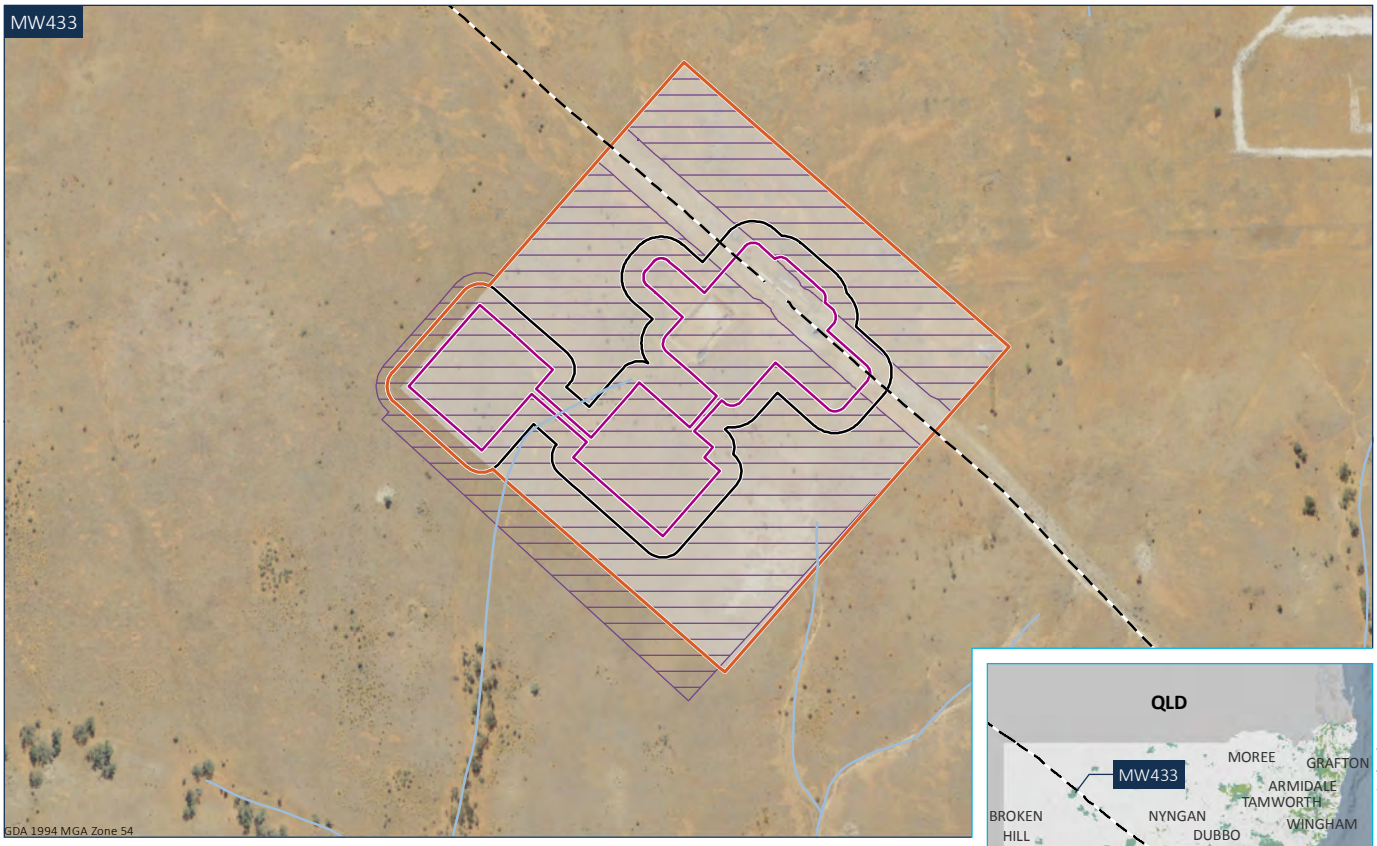
KEY

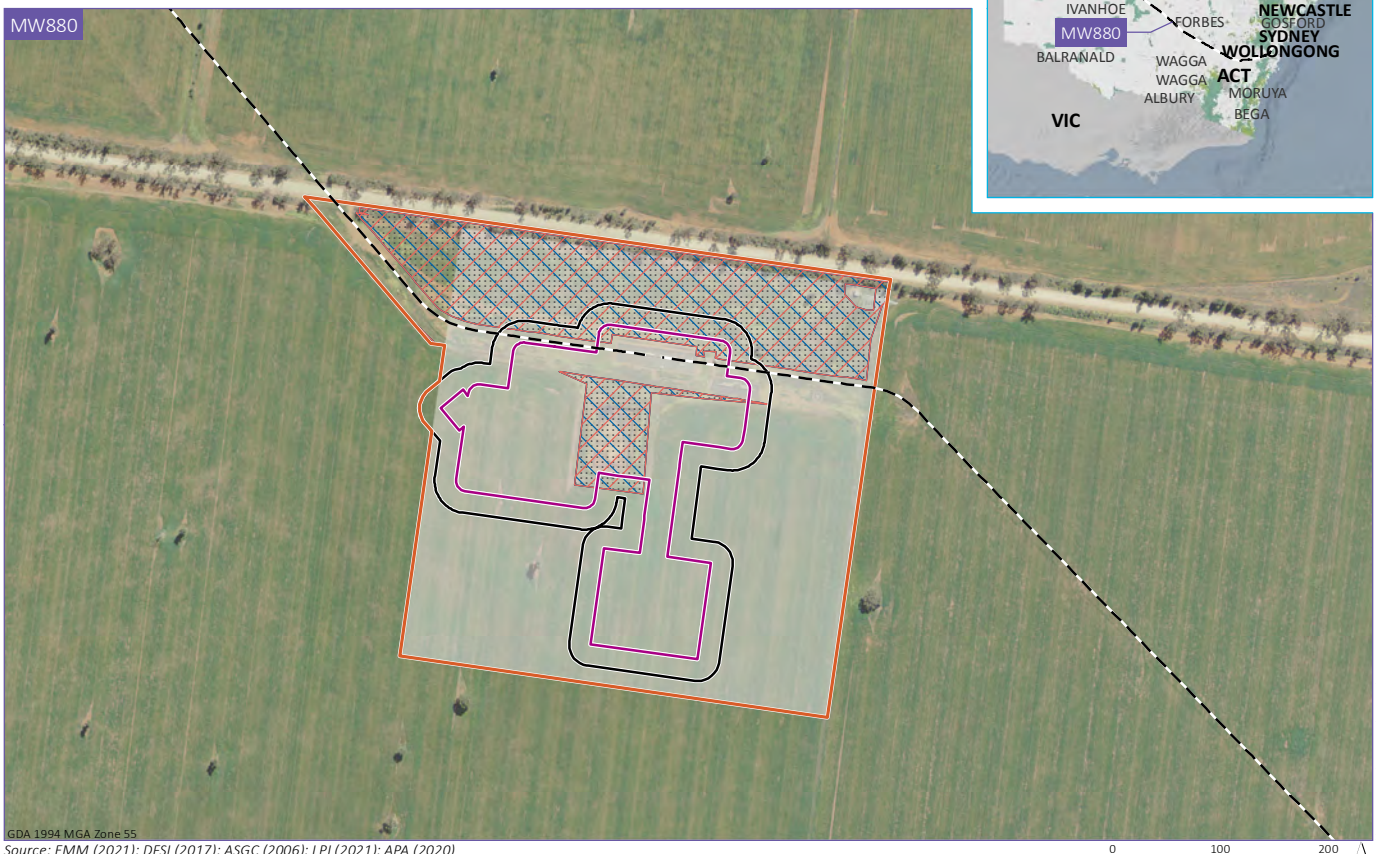
- Disturbance footprint
- Indirect impact area
- Study area
- Site boundary/construction envelope
- Moomba to Wilton pipeline
- Watercourse
- Flora transect completed by AREA
- Koala SAT

Targeted species survey locations

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 6.1

EMM creating opportunities





Source: EMM (2021); DFSI (2017); ASGC (2006); LPI (2021); APA (2020)

0 100 200 m

N

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR009_FloraSurvey_20210706_02.mxd 6/07/2021

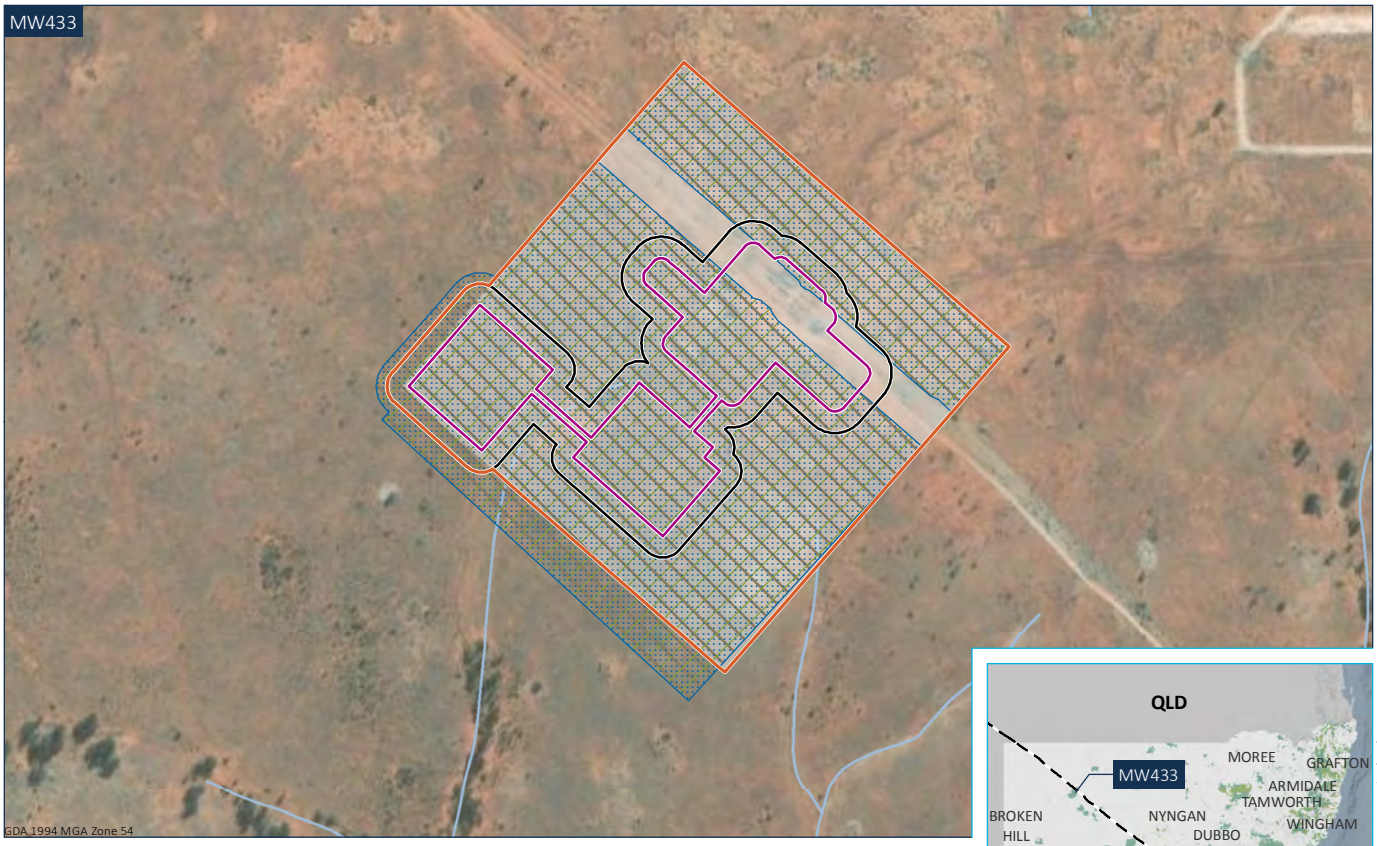
KEY

- Disturbance footprint
- Indirect impact area
- Study area
- Site boundary/construction envelope
- Moomba to Wilton pipeline
- Watercourse
- A Spear-grass species polygon
- Pine Donkey Orchid species polygon
- Silky Swainson-pea species polygon
- A Saltbush species polygon

Threatened flora species polygons

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 6.2

EMM creating opportunities



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); LPI (2021); APA (2020)

0 100 200 m

N

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR005_FaunaSurvey_20210706_03.mxd 6/07/2021

KEY

- Disturbance footprint
- Indirect impact area
- Study area
- Site boundary/construction envelope
- Moomba to Wilton pipeline
- Waterbody
- Hollow bearing tree
- Superb Parrot hollow bearing tree
- Grey-crowned Babbler
- Superb Parrot
- Superb Parrot species polygon
- Stimson's Python species polygon
- Australian Bustard species polygon
- Crowned Gecko species polygon

Threatened fauna survey results and species polygons

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 6.3

EMM creating opportunities

7 Aquatic ecology

7.1 Methods

7.1.1 Desktop assessment

As part of the aquatic ecology assessment, databases were interrogated to compile background information and to assess the likelihood of occurrence of threatened aquatic species, habitat, populations or communities, relative to the MW433 site. Databases that were accessed comprised State and Commonwealth resources and are listed in Section 1.6. A review of relevant information sources and a literature search of relevant publicly available information and reports was also undertaken.

i Likelihood of occurrence assessment

The criteria for assessing the likelihood of occurrence of threatened species and/or populations listed in Section 7.2.2ia is summarised in Table 7.1. Species that had the potential to occur within 50 km of the MW433 site were included; however, it should be noted that while Commonwealth and State data sources indicate 'possible' presence of species and habitats, local conditions should be considered when determining their actual likelihood of occurrence. Threatened habitats and/or communities that have the potential to be indirectly impacted by downstream effects are included in the assessment, as are threatened species and/or populations that have the potential to occur within the Paroo River catchment.

Table 7.1 Likelihood of occurrence criteria

Likelihood	Description	Further assessment conducted?
Negligible	• The potential for the species to occur is considered so unlikely as to not be worth considering.	No
Low	• Based on data collected during the field survey, it was considered that the species was unlikely to occur in, or use habitats within, the project footprint. A species may utilise identified habitat on rare occasions.	No
Moderate	• The species is known to occur in the catchment/sub-catchment/waterway and the field survey identified some habitat value for the species. Habitat values are somewhat degraded and considered suboptimal.	Yes
Likely	• The species is known to occur in the catchment/sub-catchment/waterway and the field survey identified optimal habitat features for the species.	Yes
Recorded	• The species was recorded during the field survey. • The species has been recorded in the catchment/sub-catchment/waterway previously and there has not been any change in habitat values since this time.	Yes

ii Key fish habitat

As no aquatic ecology field survey was undertaken, a formal assessment of key fish habitat was not completed. However, existing, key fish habitat maps were consulted. Waterways examined as part of the desktop assessment had previously been ranked by the DPI according to the Strahler (1952) method of waterway ordering, noting that only waterways 3rd order and above are considered to be key fish habitat.

7.2 Desktop assessment results and discussion

7.2.1 Aquatic habitat

i MW433

Overall, the Paroo River catchment is considered to be in "good" hydrological condition and "good" physical form condition (Murray–Darling Basin Authority, 2010). Riparian vegetation within the catchment was also considered to be "good". Relative to the MW433 site, two unnamed 1st order waterways are present within the area, and both are located within the impact area and may be directly impacted by the construction works (westernmost waterway depicted in Photograph 7.1). Both waterways are characterised by a lack of incised channel and/or defined banks. As the MW433 site is located within the broader floodplain of the Paroo River, there is a lack of typical riparian vegetation, with flora species characterised by saltbush, bluebush and a number of other terrestrial species (Table 5.7); however, it is noted that riverine vegetation within the Paroo River catchment is considered to be in "near reference condition" (Murray–Darling Basin Authority, 2010). Existing impacts to aquatic ecology within the Paroo River catchment are relatively limited due to the remote location of the site and include agriculture industries (beef grazing and sheep for wool production), minor crop irrigation, and mining activities (Murray–Darling Basin Authority, 2010).

Photograph 7.1 Unnamed 1st order waterway ("Waterway 1")

a Key fish habitat

Two 1st order waterways are located within the MW433 site (Figure 4.2). 1st and 2nd order waterways are not considered to contain suitable key fish habitat; therefore, site MW433 does not contain key fish habitat, as supported by DPI Fisheries data (Figure 7.1).

b Threatened communities and habitats

A number of significant wetlands are located within the Mulga Lands bioregion; however, these systems are located more than 400 km from the MW433 site. The exception is the internationally significant Paroo River Wetlands, in which the site is located (Figure 7.1). Part of the aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River ("Lowland Darling River endangered ecological community (EEC)") occurs within the Paroo River catchment; however, it doesn't include the Paroo River Wetlands (Figure 7.1).

Peery Lake is located approximately 5 km downstream of MW433 and, together with Nocoleche Nature Reserve (120 km to the north) and Poloko Lake (~2 km to the east), forms the main components of the Paroo River Wetlands, listed as wetlands of international significance (#65) (DAWE 2019). The Paroo River Wetlands are located on the floodplain of the Paroo River and comprise large overflow lakes, tree-lined creeks and waterholes, lignum and canegrass swamps (DAWE 2019). The wetlands complex also contains one of the rarest wetland features in Australia, the Peery Lake artesian mound springs. The Paroo River Wetlands are one of the most important wetland systems for waterbirds in eastern Australia, supports several threatened plants and animals, is a significant refuge for biological diversity (particularly during drought), and supports one of the healthiest native fish communities in the Murray-Darling Basin (DAWE, 2019).

ii MW880

Overall, the Lachlan River catchment is considered to be in "moderate" hydrological condition and "good" physical form condition (Murray–Darling Basin Authority, 2010). Riparian vegetation within the catchment was considered to be "poor". Relative to the MW880 site, the closest waterways include a 1st order waterway approximately 9 km to the east (Humbug Creek) and a 3rd order waterway approximately 1 km to the southwest (Figure 7.1). Neither waterway intersects the proposed disturbance footprint (Photograph 1.2). The area immediately adjacent to the proposed disturbance footprint comprises highly modified agricultural land, meaning that any impacts occurring within the proposed disturbance footprint are highly unlikely to indirectly impact on these waterways. As the MW880 site is located within highly modified agricultural land and away from any waterways, no riparian vegetation is present, and riverine vegetation within the Lachlan River catchment is considered to be "poor" (Murray–Darling Basin Authority, 2010). Existing impacts to aquatic ecology within the Lachlan River catchment are extensive and include agricultural practises, invasive exotic species, habitat modification and river regulation.

a Key fish habitat

One 1st order waterway and one 3rd order waterway are located to within 10 km of the MW880 site. 1st and 2nd order waterways are not considered to contain suitable key fish habitat, and the 3rd order waterway does not intersect the MW880 site; therefore, site MW880 does not contain key fish habitat, as supported by DPI Fisheries data (Figure 7.1).

b Threatened communities and habitats

A number of significant wetlands are located within the NSW South Western Slopes/Cobar Peneplain bioregions; however, these systems are located more than 400 km from the MW880 site. The assessment area for MW880 is located within the aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River ("Lowland Lachlan River endangered ecological community (EEC)") (Figure 7.1). No other wetlands of international, national or local importance are located within, or adjacent to the site.

The Lowland Lachlan River EEC which includes the Lachlan River and its tributaries, downstream of the Wyangala Dam (Department of Primary Industries, 2006), terminating at the confluence of the Lachlan River with the Murrumbidgee River. The majority of the lowland Lachlan River catchment comprises riverine environments characterised by meandering channels, floodplains, anabranches and effluent creeks (Department of Primary Industries, 2006). The hydrology of waterways and waterbodies is highly variable, comprising periods of high flow and low flow, resulting in the reliance of native aquatic fauna on changing water level for triggering spawning (Department of Primary Industries, 2006). The Lowland Lachlan River EEC is comprised of a number of different habitat types, including permanent and temporary wetlands, pools, run/riffle complexes, backwaters, in-stream woody habitat and aquatic plants. The aquatic ecological community encompassed by the listing includes "…*all native fish and aquatic invertebrates within all natural rivers, creeks, streams and associated lagoons, billabongs, lakes, wetlands, paleochannels, flood-runners, floodplains and effluent streams of the Lachlan River.*". At least 19 fish, 10 crustacean, eight mollusc and two sponge species have been recorded, as well as numerous insects comprising resident and transient representatives (Department of Primary Industries, 2006).

7.2.2 Aquatic flora and fauna

i MW433

No aquatic flora, aquatic invertebrate, or riparian vegetation communities listed under the FM Act or the EPBC Act were identified during database searches. No information on aquatic flora, aquatic invertebrates, or riparian vegetation was available, relevant to the two 1st order waterways within the MW433 site. Given the dry nature of waterways within MW433 it is unlikely any will occur.

a Threatened aquatic fauna

The results of the database searches indicate that a total of three threatened aquatic species have the potential to occur within 50 km of the MW433 site (Table 7.2). Of these species, it was considered that none have the potential to occur within, or adjacent to, the MW433 site based on an assessment of other datasets and literature. DPI Fisheries provided threatened aquatic species distribution mapping indicates that the Silver Perch and the Darling River Snail have the potential to occur within the Paroo River, more than 20 km downstream and separated by the ephemeral Peery Lake. This, in conjunction within the ephemeral nature of the minor order waterways and a lack of suitable habitat features, indicates that it is unlikely that either species would use the waterways that intersect the MW433 site.

Table 7.2 Threatened species with the potential to occur within, or adjacent to, MW433

Common Name	Scientific Name	Data source			Conservation status		Likelihood of occurrence
		DPI	BioNet	PMST	FM Act	EBPC Act	
Fish							
Silver Perch	*Bidyanus bidyanus*	✓	-	-	V	CE	Negligible
Darling River Snail	*Notopala sublineata*	✓	-	-	CE	-	Negligible
Murray Cod	*Maccullochella peelii*	-	-	✓	-	V	Negligible

Note CE = Critically Endangered, V = Vulnerable.

ii MW880

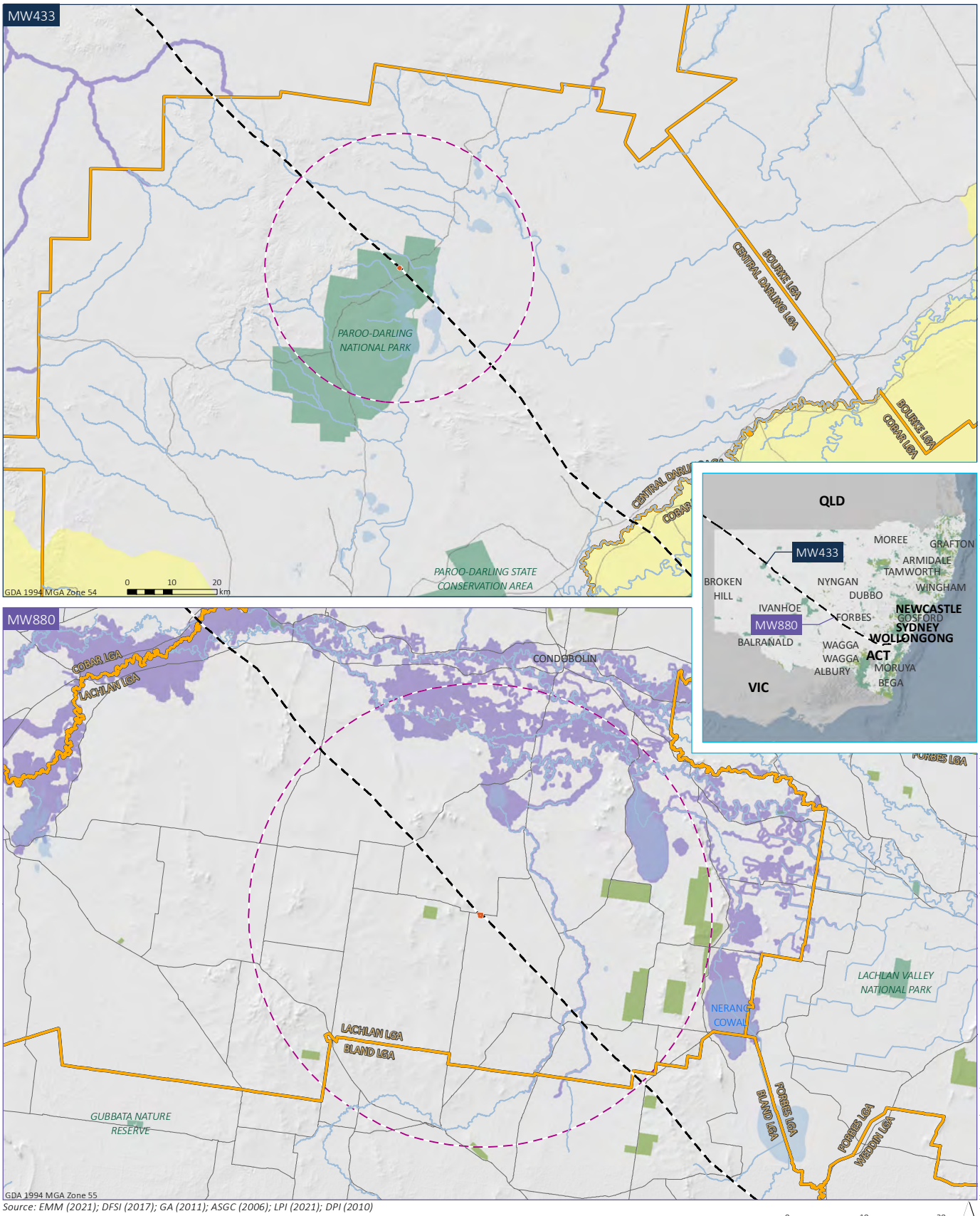
No aquatic flora, aquatic invertebrate, or riparian vegetation communities listed under the FM Act or the EPBC Act were identified during database searches. No information on aquatic flora, aquatic invertebrates, or riparian vegetation was available, relevant to the nearby 1st and 3rd order waterways. It is noted that the Lachlan River catchment was ranked as "very poor" in terms of overall ecosystem health, "extremely poor" in terms of fish diversity/abundance, "moderate" in terms of macroinvertebrate diversity/abundance and "poor" in terms of riparian vegetation (Murray–Darling Basin Authority, 2010).

a Threatened aquatic fauna

The results of the database searches indicate that a total of nine threatened aquatic species have the potential to occur within 50 km of the MW880 site (Table 7.3). Of these species, it was considered that none have the potential to occur within, or adjacent to, the MW880 site based on an assessment of other datasets and literature. DPI Fisheries provided threatened aquatic species distribution mapping indicates that the Silver Perch, Hanleys River Snail, Murray-Darling Basin population of Eel tailed Catfish, and Western population of Olive Perchlet have the potential to occur within the Lachlan River, approximately 20 km downstream and separated by highly modified agricultural land. The Flathead Galaxias and the Southern Purple-spotted Gudgeon occur within 10 km and 40 km, respectively, of the MW880 site and the Murray Cod is known from the catchment; however, the site is separated from Humbug Creek (nearest 3rd order or above waterway) by agricultural land. DPI Fisheries provided threatened aquatic species distribution mapping indicates that the Trout Cod and Macquarie Perch are unlikely to occur within the Lachlan River catchment. Overall, it is considered unlikely that any of the nine species would use the 1st or 3rd order waterways adjacent to the MW880 site. It is also considered unlikely that the effects of any indirect impacts that occur as a result of the project would occur downstream due to the highly modified nature of the area between the site and the waterways.

Table 7.3 Threatened species with the potential to occur within, or adjacent to, MW880

Common Name	Scientific Name	Data source		Conservation status		Likelihood of occurrence
		DPI	PMST	FM Act	EBPC Act	
Fish						
Flathead Galaxias	*Galaxias rostratus*	✓	✓	CE	CE	Negligible
Silver Perch	*Bidyanus bidyanus*	✓	-	V	CE	Negligible
Trout Cod	*Maccullochella macquariensis*	-	✓	E	E	Negligible
Macquarie Perch	*Macquaria australasica*	-	✓	E	E	Negligible
Southern Purple-spotted Gudgeon	*Mogurnda adspersa*	✓	-	E	-	Negligible
Western population of Olive Perchlet	*Ambassis agassizii*	✓	-	EP	-	Negligible
Hanleys River Snail	*Notopala hanleyi*	✓	-	CE	-	Negligible
Murray Cod	*Maccullochella peelii*	-	✓	-	V	Negligible
Murray-Darling Basin population of Eel tailed Catfish	*Tandanus tandanus*	✓	-	EP	-	Negligible



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); LPI (2021); DPI (2010)

0 10 20 km

N

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR007_KeyFishHabitat_20210706_03.mxd 6/07/2021

KEY

- Study area
- Study area 30 km buffer
- Moomba to Wilton pipeline
- Major road
- Watercourse
- Local government area
- Waterbody
- NPWS reserve
- State forest
- Key fish habitat
- Lowland Darling River endangered ecological community

Key fish habitat and the distribution of the Lowland Darling River aquatic ecological community

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 7.1

EMM creating opportunities

Stage 2 – Impact assessment

8 Impact assessment

This chapter identifies the potential impacts of the modification on the biodiversity values. Measures taken to date to avoid and minimise impacts are summarised and recommendations to assist in the design development that further avoids, minimises and mitigates impacts are provided.

8.1 Potential direct, indirect, prescribed and uncertain impacts

Without any measures to avoid, minimise or mitigate impacts, the modification has the potential to result in direct, indirect, prescribed and uncertain impacts. The following sections include details of these potential impacts.

8.1.1 Direct impacts

The main direct impacts of the modification will be associated with the clearing of native vegetation and threatened species habitat for construction. Land clearance is listed as a Key Threatening Process (KTP) under the BC Act and EPBC Act.

APA has established a construction envelope, which includes all of the site boundary, to assist with final design and account for potential design changes. This allows siting of the disturbance footprint within the construction envelope with the following limitations:

- direct impacts to native vegetation at MW433 will not exceed 3.22ha, as stated in the report;
- direct impacts to native vegetation at MW880 will not exceed 0.75ha, as stated in the report;
- direct impacts will be restricted to the following vegetation zones offset, as stated in the report;
    - MW433 – PCT 153 disturbed condition; and
    - MW880 – PCT 72 DNG;
- no mature trees (with a DBH of ≥5 cm) are to be removed at MW880.

8.1.2 Indirect impacts

In addition to the direct impacts, potential indirect impacts that could arise as a result of the proposed construction and operation of Modification 1 include:

- during construction:
    - increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour);
    - lighting for night works, resulting in disturbance to fauna species and changes in occupancy or behaviour;
    - increase in weeds and pathogens, resulting in degradation of retained native vegetation and habitat;
    - increase in predatory and pest animal species, resulting in increased predation and competition and a consequent reduction in populations;
    - potential inadvertent disturbance of retained habitats;

- removal of habitat resources for threatened fauna;
- displacement of threatened fauna;
- runoff, scouring, erosion and sedimentation impacts to retained native vegetation and threatened species habitat;
- runoff, scouring, erosion and sedimentation impacts to the internationally-significant Paroo River Wetlands; and
- changes to water quality and volume within the internationally-significant Paroo River Wetlands from spray irrigation of wastewater;

- during operation:
  - increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour);
  - lighting for night works, resulting in disturbance to fauna species and changes in occupancy or behaviour;
  - increase in weeds and pathogens, resulting in degradation of retained native vegetation and habitat; and
  - runoff, scouring, erosion and sedimentation impacts to retained native vegetation and threatened species habitat.

Site MW433 is situated immediately adjacent to the Paroo National Park. In addition to construction and ongoing operational works being conducted in close proximity to a National Park, access to the site will be via the existing APA pipeline easement which runs through the Paroo National Park. The following potential indirect impacts have been considered not only within each site, but in addition to the Paroo National Park:

- erosion and sedimentation;
- stormwater runoff;
- weeds and pest species; and
- noise, vibration and lighting.

Measures to avoid, minimise and mitigate impacts described in Section 8.2 were considered in conjunction with the guidelines (NPWS 2020).

i Weeds, pathogens and feral animals

Increased movement of vehicles and people into the area has the potential to transport weeds and pathogens into the study area and/or into adjacent properties. Weeds have the potential to result in degradation of retained vegetation and fauna habitat. A number of weed species were identified within the MW880 study area, these are not key weed species identified within regional weed management plans or considered as a weed of national significance (Section 9.2):

- Oats (*Avena* spp.);
- Saffron Thistle (*Carthamus lanatus*);

- Field Bindweed (*Convolvulus arvensis*);
- Patterson's Curse (*Echium plantagineum*);
- Haresfoot Clover (*Trifolium arvense*);
- Red-flowered Mallow (*Modiola caroliniana*);
- Vervain (*Salvia verbenaca*);
- Common Sowthistle (*Sonchus oleraceus*);
- Flaxleaf Fleabane (*Conyza bonariensis*); and
- *Oxalis incarnata*.

No exotic species were recorded within MW433; however, as listed in the Western Regional Strategic Weed Management Plan (WLLS 2017), there are a number of priority weeds within the region. Access to MW433 during construction and operation will be via the existing pipeline easement. The pipeline easement runs through the Paroo National Park and Paroo River Wetlands. Therefore, there is potential for the modification to not only result in introduced species to the site but surrounding areas. Mitigations will be implemented to ensure the modification does not result in the introduction of new weed species or spread of existing weeds into retained vegetation.

Infection of native plants by *Phytophthora cinnamomi* is listed as a KTP under the BC Act and EPBC Act. *P. cinnamomi* can lead to death of trees and shrubs, resulting in devastation of native ecosystems (DoEE 2018 and DoE 2014). Infection of susceptible communities with *P. cinnamomi* leads to:

- inability of infected plants to develop new shoots, flowers, fruit and seed;
- extinction of populations of some flora species;
- a dramatic modification of the native plant community's structure and composition;
- a significant reduction in primary productivity and functionality;
- habitat loss and degradation for dependent flora and fauna; to date these have been irreversible;
- local extirpation and a significant loss of genetic diversity; and
- major declines in some animal species due to the loss of shelter and nesting sites or food sources (DoEE 2018b).

Increased human activity also has the potential to attract feral animals. Evidence of feral animals at MW433 identified the presence of the Goat and the Red Fox (*Vulpes vulpes*). Evidence of feral animals at MW880 identified the presence of the Wild Dog (*Canis familiaris*) and the Red Fox.

Of key concern is an increase in Red Fox, Wild Dog and Goat activity and consequent impacts on native animals. Predation by Red Foxes are listed as KTPs under the BC Act and EPBC Act (NPWS 2001, DEWHA 2008). Introduced predators are also considered a threat to the Australian Bustard, Crowned Gecko and Stimpson's Python. Other feral animals known to impact native vegetation quality and subsequently foraging resources for threatened species includes the Goat.

ii Noise, vibration, lighting and dust

Construction activities may result in increased levels of noise and vibration. Noise has been observed to modify animal behaviour, including calling behaviour in frog species (Hoskin and Goosem 2010) and bird species. There will be ongoing noise associated with the compressor stations, estimated at 116dBA (A-weighted decibels) at MW880 and 124dBA at MW433. It is unlikely the noise impacts will be significant on threatened species at MW433 given the availability of connected habitat for species to move into. Given the noise levels predicted at MW880 there is potential for birds to partially avoid the area, however they may become climatised over time, move through the site, and most likely not utilise the site given the noise levels predicted.

These activities may also result in increased dust levels, covering adjacent vegetation and inhibiting growth. Lighting for night works also has the potential to result in light spill into adjacent habitat areas, and ongoing disturbance to fauna species, with the potential for species to abandon habitat due to these impacts (Davies et al. 2014, Schroer et al. 2016).

iii Erosion, runoff and sedimentation

Unmitigated, it is likely that erosion, runoff and sedimentation would occur as a result of construction. This has the potential to impact adjacent vegetation, reduce the quality of aquatic habitat available for use by threatened species.

The overall erosion hazard of the compressor stations and associated facilities at MW433 and MW880 is generally low due to the flat gradient of the proposed construction areas and volume and intensity of rainfall. Erosion risk will be greatest when soils are exposed to wind and rain during the clearing and early construction phases of the project.

Site MW433 has a slightly higher erosion hazard due to the potential presence of dispersive subsoils and lower annual average rainfall making it more challenging to establish vegetation to provide short- and long-term soil surface cover. This can be managed through mitigation measures (EMM 2021c).

iv Changes to water quality and volume

During the construction phase, wastewater will be produced at the construction camp and associated facilities/amenities at each site. The workforce at each site will reach a peak of 80 people, and average 40 people over an estimated 12-month construction period (including commissioning).

The indicative wastewater load at each site will be 13.6 kL per day (kL/day) during peak periods, and on average 5.1 kL/day.

Wastewater produced by each accommodation camp will be managed by a two-stage process involving secondary treatment followed by effluent disposal at surface via spray irrigation. Treatment will be via aerated wastewater treatment system involving staged processes of sedimentation, anaerobic digestion, biological treatment, clarification and disinfection. Treated effluent will be pumped to the surface for spray irrigation.

The proposed application area for the spray irrigation system will be contained within the disturbance footprint of each site (see Figure 2.1). A preliminary spray field sizing of 0.9 ha for each site has been identified, which is in the order of 5-6% of the total area of each site.

The onsite wastewater management system for each site is subject to further design development and will:

- consider and confirm the most appropriate system for each site based on the preferred site layout, site conditions and constraints; and
- be designed, constructed, operated, maintained and decommissioned in accordance with best practise and relevant guidelines (including WaterNSW 2019), applicable standards (including AS/NZS 1547:2012 On-site domestic wastewater management) and local Council requirements.

Following completion of construction activities, all temporary wastewater management infrastructure will be decommissioned and removed from each site. Disturbed areas, including effluent spray fields where infrastructure is removed, will be appropriately stabilised and rehabilitated.

Whilst the spraying field within each site has assumed total direct impacts to native vegetation, there is potential for the proposed works to result in indirect impacts to water quality and quantity within MW433. MW433 is located on private land within the Paroo-Darling National Park, the Paroo River Wetlands and contains two 1st order watercourses. Indirect impacts associated with the release of wastewater are expected to be minor on the basis that:

- sites are not located close to any major watercourses, and are therefore not expected to be subject to mainstream flooding;
- any potential local catchment flooding within the sites is expected to occur primarily as broad, shallow overland flow given the lack of relief, poorly defined drainage features and lack of significant upstream catchment for each site (EMM 2021a);
- wastewater will be treated by a wastewater treatment system, pre-approved by the NSW Department of Health; and
- estimated wastewater load at each site will be 13.6 kL/day during peak periods, and on average 5.1 kL/day released by spray irrigation with the intention of evaporation.

During the operations phase, personnel presence will be minimal and infrequent. However, permanent amenities including ablutions will be maintained on each site.

Wastewater produced by permanent facilities at each site will be managed using a septic leach system. Septic leach systems involve directing wastewater to an underground septic tank. In a septic tank, solid waste settles to the bottom of the tank and is broken down through biological processes under anaerobic conditions, where it forms a sludge. Effluent (ie partially treated liquid waste) is pumped to a below-ground leach drain (ie absorption trench), where it gradually seeps into the surrounding soil.

The proposed application area for the absorption system will be contained within the footprint of each site.

Similar to construction phase arrangements, the permanent onsite wastewater management system for each site is subject to further design development and will:

- consider and confirm the most appropriate system for each site based on the preferred site layout, site conditions and constraints; and
- be designed, constructed, operated, maintained and decommissioned in accordance with best practise and relevant guidelines, applicable standards (including AS/NZS 1547:2012 On-site domestic wastewater management) and local Council requirements (EMM 2021a).

The operations phase will also include routine and unplanned maintenance of infrastructure, as well as washdown activities. Washdown of the gas compressor clears away any dust, aerosols or water which may be deposited on the compressor blades to maintain efficient operation. A Vermeer trailer-mounted vacuum (or equivalent) will be available on each site during maintenance to contain and remove any contaminated water produced during washdown. Captured water will be appropriately disposed off-site.

8.1.3 Prescribed and uncertain impacts

An assessment of prescribed and uncertain impacts is provided in Table 8.1.

Table 8.1 Assessment of prescribed and uncertain impacts

Prescribed/uncertain impact	MW433- Round Hill	MW880- Milne
Impacts of development on the habitat of threatened species or ecological communities associated with:		
• karst, caves, crevices, cliffs and other geological features of significance; • rocks; or • human-made structures; or • non-native vegetation.	The study area does not contain karst, caves, crevices, cliffs or other geological features of significance. The impact area contains scattered rocky habitat. Existing human-made structures include external pipe connections to the main pipeline, a communications tower and small amenities buildings. The communications tower has potential to provide suitable habitat for some raptors. However, no nests were recorded during surveys. Man-made structures will not be impacted and are not considered to support threatened species habitat. There is no non-native vegetation within the study area.	The impact area does not contain geologically significant features or rocky areas. Existing human-made structures are limited to external pipe connections to the main pipeline, a communications tower and small amenities buildings. The communications tower has potential to provide suitable habitat for some raptors. However, no nests were recorded during surveys. Man-made structures will not be impacted and are not considered to support habitat for threatened species. The non-native vegetation within the study area contains cropped land. This land is regularly disturbed and used for agriculture and is not predicted to support threatened species habitat.
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Native vegetation and threatened fauna habitat within the study area are relatively sparse as an open chenopod shrubland with no trees. The study area is located within the Paroo River Wetlands and Paroo-Darling National Park. Ecosystem and species credit species predicted to occur in the study area predominantly comprise highly mobile birds, and small mammals therefore most species will not be impacted by fragmentation. Species dependent on the retention of vegetation in the study area for mobilisation (Crowned Gecko and Stimson's Python) may be impacted by fragmentation. However, given the study area has existing infrastructure and majority of the modification elements will be removed post construction no significant changes to fragmentation are predicted to occur.	Native vegetation and threatened fauna habitat within the study area are limited to moderate condition White Cypress Pine - Poplar Box woodland and DNG. This occurs within a highly fragmented agricultural landscape. The impact area is located adjacent to roadside vegetation which may act as a corridor for fauna species; however, impacts to this vegetated corridor will be avoided. Ecosystem and species credit species predicted to occur in the study area predominantly comprise species dependent on the vegetated corridor (Superb Parrot) and as impacts to the corridor will be avoided, most species will not be impacted by fragmentation.
Impacts of development on movement of threatened species that maintains their life cycle	Species dependent on the retention of vegetated corridors (Crowned Gecko and Stimson's Python) may depend upon maintenance of connectivity during the breeding season to mate.	The Superb Parrot is a mobile species which is known to occur within fragmented, cleared land. Given this and no direct impacts will occur to suitable breeding habitat along the road edge the modification is unlikely to impact on the species life cycle.

Table 8.1 Assessment of prescribed and uncertain impacts

Prescribed/uncertain impact	MW433- Round Hill	MW880- Milne
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)	Groundwater interception during the construction and operational phase of the modification is not anticipated. Works are expected to be restricted to 2 m depth; therefore, the modification does not represent an aquifer interference activity or assessment of potential impacts on GDEs. Whilst there are considerations of constructing a groundwater bore at MW433 to access water, this would require an exemption for the project and changes to regulations under the WM Act. GDE impacts have not been addressed for the potential of a groundwater bore, and therefore if the bore is required impacts will be assessed separately including impacts on GDEs. Two unnamed watercourses and an historical water retention structure are located within MW433. These were observed dry during field surveys and are not likely to sustain threatened species or ecological communities. The modification has the potential to result in indirect impacts to water quality and volume within the internationally-significant Paroo River Wetlands from spray irrigation of wastewater. The proposed spray irrigation will be limited to 0.9 ha at each site. All wastewater will be treated by a suitably designed wastewater treatment system pre-approved by the NSW Department of Health.	MW880 does not intersect any watercourses or watercourse corridors and groundwater interception during the works are not expected. No potential impacts to GDEs, threatened species or ecological communities are expected. The project area is located within the Lowland Lachlan River EEC; however, significant impacts to the EEC as a result of the project are not anticipated. Accordingly, management of this prescribed impact is not required.
Impacts of wind turbine strikes on protected animals	The modification does not include wind turbines; therefore this prescribed impact is not relevant to the modification. Accordingly, management of this prescribed impact is not required.	
Impacts of vehicle strikes or on animals that are part of a threatened ecological community	The traffic impact assessment (EMM 2021d) predicted a negligible increase in traffic on the local road network as a result of the modification. Associated traffic movements will predominantly take place in daylight hours between 7:00 am and 6:00 pm, excluding the final two weeks of construction in which activities will be 24-hours per day. Additionally, temporary accommodation will be constructed on site at MW433 and potentially at MW880. Vehicle strike has the potential to occur to native fauna species during construction and operation. However, given the minor increase in traffic movement due to restriction of traffic movements to daylight hours for most of construction and accommodation will be constructed on site, the modification is not predicted to significantly increase animal vehicle strikes. Accordingly, management of this prescribed impact is not required.	

8.2 Measures to avoid, minimise and mitigate impacts

APA, in consultation with EMM and the design team, have identified steps to avoid, minimise and mitigate impacts from the modification. The focus on the project design has been to minimise and mitigate impacts on biodiversity values identified during field surveys. The process below was implemented to avoid and minimise to the greatest extent possible:

- identification of biodiversity values through biodiversity surveys;

- communication of identified values to the project team, including APA;
- consultation with key government stakeholders, including DPIE, BCD and DAWE to seek inputs; and
- finalisation of measure to avoid, minimise and mitigate impacts.

Key avoidance measures that have been implemented by the modification comprise:

- locating ancillary buildings and temporary infrastructure in areas of lower biodiversity value, particularly at MW880, and the subsequent avoidance of native vegetation and threatened species habitat (where possible); and
- micrositing of infrastructure to avoid impacts to important breeding habitat such as hollow bearing trees and nests.

Measures undertaken to avoid, minimise and mitigate impacts that have arisen during the process outline above are discussed below.

A summary of the impacts arising from the construction and operation, as well as measures to avoid, minimise and mitigate these impacts, are provided in Table 8.2.

8.2.1 Construction

i Retention of vegetation and pre-clearance works

A Construction Environmental Management Plan (CEMP) will be prepared to enable implementation of measures to avoid, minimise and mitigate biodiversity impacts that may arise during the construction phase of the project.

Site preparation works will require clearing of native vegetation and fauna habitat. These works have the potential to have an impact on fauna species including an indirect impact on the retained vegetation and fauna habitat. To help avoid this occurring and minimise impacts to vegetation and fauna species the following controls are to be implemented:

- native vegetation and fauna habitat are to be retained wherever possible, with clearing minimised to the extent required to construct and maintain the modification;
- final design of the disturbance footprint will take into consideration native vegetation and where feasible avoid or reduce impacts to native vegetation;
- prior to any vegetation clearing activities, the following areas will be temporarily fenced and signed as 'No-go zones':
  - retained native vegetation within both sites (MW433 and MW880);
  - Paroo-Darling National Park and Paroo River Wetlands (MW433); and
  - tree protection zones (TPZs) in accordance with the Australian Standard AS 4970-2009 Protection of trees on development sites (Standards Australia Committee 2009) established around all trees to be retained within and immediately adjacent to the impact area;
- prior to undertaking vegetation clearing, pre-clearance inspections are to be undertaken by suitably qualified ecologists. The pre-clearing inspections will:
  - confirm the biodiversity values identified in this report;

- check for the evidence of the presence of flora and fauna species;
- flag key habitat features, including (but not limited to) nests or hollow logs;
- relocation of nests and/or hollow logs to adjacent habitat;
- identify nearby habitat suitable for the release of any species that may be encountered during the clearing works; and
- contact a wildlife carer or veterinarian to inform them of the vegetation clearing works that is to occur.

Cleared native vegetation will be retained and reused for on-site rehabilitation. These measures will be incorporated into the biodiversity section of the CEMP.

ii Weed and pathogen control

Indirect impacts could occur due to the introduction and/or spread of weeds into the site boundary. These impacts could be significant for a number of flora and fauna species if they occur.

To prevent the introduction and/or spread of weeds on site, the following controls will be implemented:

- weed control in key areas prior to construction works, to minimise the impacts of weeds during construction and to minimise the requirements for disposal and management of weeds on-site;
- appropriate identification, management and disposal of weed species during clearing works, in accordance with the CEMP;
- active and intensive weed control in areas where significant weeds are known to occur to reduce the cover of weeds adjacent to the construction activities, preventing the spread of weeds into other areas;
- all vehicles, plant and equipment will be cleaned down (wash/blow down) and certified weed free prior to initial entry to site; all vehicles, plant and equipment will strictly adhere to the approved roads, tracks, easements and work areas to minimise contact with vegetation;
- all vehicles, plant and equipment breaching protocol and travelling outside of approved areas will be re-certified as weed free;
- biosecurity certifications will be kept with the vehicle and plant at all times;
- a weed and pathogen monitoring program will be implemented, with a weed control program to be implemented if weeds are identified within the site boundary; and
- rehabilitation of cleared areas as quickly as possible following construction works in an area.

iii Noise, vibration and lighting

Impacts from noise and vibration are expected to be primarily limited to the construction period; however, there will be ongoing noise during the operation of the compressor stations. The Noise Impact Assessment (EMM 2020c) predicts the noise impacts to be low. Whilst some indirect impacts to fauna species may result particularly birds, impacts are likely to it is expected to be limited given the availability of habitat within the region for species to move into. No impact mitigation measures are required.

Light spill from night works has the potential to reduce the suitability of retained habitat for some fauna species. To minimise this, directional lighting will be used, minimising light spill as much as possible. In addition, night works

will be restricted to the last two weeks of commissioning. Lighting will be in accordance with the Australian Standard 4282 (AS4282) Control of Obtrusive Effects of Outdoor Lighting.

iv Feral animal control

There is potential for increased human activity to result in increased activity of feral animals, particularly feral Goats, the Red Fox, the Pig, the Cat and Wild Dogs, which will increase pressure on native fauna and reduce quality of vegetation.

To minimise the risk of increased predator activity, the following controls will be implemented during construction:

- waste materials generated during construction and operations will be reused or recycled where practicable, or collected and transported by licenced contractors for disposal at appropriately licenced facilities;
- refuse containers will be located at each worksite to enable collection of waste, with regular removal from worksites to designated areas; and
- refuse containers will be lidded to mitigate fauna access. No waste will be left outside in open areas accessible to feral animals.

It is considered that these controls will avoid and minimise impacts from the modification.

v Erosion and sediment control

The highest erosion risk for the modification is during construction and rehabilitation phases when soils are stripped, and any dispersive subsoils are exposed. Major land disturbing works will be scheduled to avoid the high rainfall erosivity periods and the highest wind velocity periods where practical. If these works are carried out during periods of higher rainfall or higher wind velocity, soil and erosion control measures will be adjusted to ensure appropriate management of erosion and sediment. A principal aim of site rehabilitation will be to stabilise disturbed areas and minimise the potential for ongoing soil erosion and subsequent mobilisation/transport downstream of each site. Where necessary, soil stabilising polymers will be applied to exposed soils to protect them from rain drop splash erosion and sheet flows. Further recommended rehabilitation principles and approaches are described in the Soil and Erosion Impact Assessment (EMM 2021c).

An overarching soil and water management plan (SWMP) will be prepared for the modification, underpinned by progressive erosion and sediment control plans (PESCPs) for all discrete disturbance areas.

vi Spray irrigation control

The proposed application area for the spray irrigation system will be limited to the footprint of each site. A preliminary spray field sizing of 0.9 ha for each site has been identified, which is in the order of 5 - 6% of the total area of each site. Following completion of construction activities, all temporary wastewater management infrastructure will be decommissioned and removed from each site. Disturbed areas, including effluent spray fields where infrastructure is removed, will be appropriately stabilised and rehabilitated (EMM 2021a).

8.2.2 Operation

Following completion of construction, impacts arising from the operation of Modification 1 will be limited to key areas of ongoing operation. Potential operational impacts are expected to include:

- indirect impacts from noise, vibration and lighting;
- indirect impacts to retained habitat due to weeds and pathogens;
- indirect impacts to native vegetation and fauna species as a result of predatory and pest animal species;

- indirect impact to water quality and volume within the internationally-significant Paroo River Wetlands from wastewater produced by permanent facilities; and
- prescribed impacts to fauna species due to vehicle strike.

Mitigation measures for these potential impacts are addressed in the sections above.

Where feasible monthly site inspections will be made by helicopter, minimising on ground impacts associated with access to site via vehicles. Regulatory compliance checks will be limited to one to four year intervals, minimising associated indirect impacts.

Maintenance service would be conducted once every four years, any potential indirect impacts are considered minimal associated with erosion and sedimentation from water usage. Water would be brought to site and contained within the permanent infrastructure to avoid any indirect impacts to adjacent vegetation within the site.

8.2.3 Summary of measures to avoid, minimise and mitigate impacts

A summary of impacts arising from the modification, including measures to avoid, minimise and mitigate these impacts are provided in Table 8.2.

Table 8.2 Summary of impacts and measures to avoid, minimise and mitigate

Impact	Impact avoidance	Impact minimisation	Impact mitigation
Removal of native vegetation and threatened species habitat. **Type:** direct impact. **Frequency:** once, during construction. **Intensity:** removal of 3.97 ha of native vegetation, including habitat for 8 threatened species. **Duration:** initial stages of construction. **Consequence:** permanent removal of native vegetation and threatened species habitat. **Responsibility:** APA	• Use of existing tracks to access MW880 to avoid impacts to mature trees (DBH ≥5 cm) and breeding habitat for the Superb Parrot. • Siting of some infrastructure in areas of existing disturbance such as cropped land (MW880) or cleared land. • No direct impacts will occur to mature trees (DBH ≥5 cm).	• Use of the existing pipeline easement for access to the site (BI-03). • Use of the existing approved clearing areas along the pipeline (BI-03). • Detailed design of the modification, resulting in further minimisation of impacts to native vegetation (BI-03).	• Establishment of no-go zones around retained vegetation and Paroo-Darling National Park and Paroo River Wetlands (MW433) area near the construction envelope, including temporary fencing and signage (BI-04 & GE-01). • Where feasible at MW880, TPZ will be installed around trees (BI-06). • Pre-clearing surveys conducted prior to clearing, to be undertaken by appropriately qualified ecologists (BI-07). • Retention of fauna habitat such as hollow logs and timber for placement within the retained vegetation wherever possible (BI–02). • Rehabilitation will commence progressively during and post construction, and will be undertaken as soon as practicable (BI-09). • Following removal of temporary infrastructure, the waste water spray field at MW433 will be appropriately rehabilitated (WS-05).
Increase in weeds and pathogens. **Type:** indirect impact. **Frequency:** ongoing during construction and operation. **Intensity:** the reduction in habitat quality for 3.53 ha of native vegetation, including habitat for 8 threatened species **Duration:** ongoing through construction and operational phase. **Consequence:** potential to impact on threatened species habitat, resulting in decline in habitat quality. In particular indirect impacts to retained	• Not required.	• Weed control in key areas prior to construction works, to minimise the impacts of weeds during construction and to minimise the requirements for disposal and management of weeds on-site (BI-09). • Entry and exit points to site minimised by utilising exiting tracks (BI-03). • All vehicles, plant and equipment to strictly adhere to the approved roads, tracks, ROW and work areas to minimise contact with vegetation (BI-09).	• A biodiversity chapter within the CEMP will be prepared to enable implementation of measures to avoid, minimise and mitigate impacts that may arise during the construction phase of the project (BI-01). • Appropriate identified, management and disposal of weed species during clearing works, in accordance with the CEMP (at MW880) (BI-08). • Active and intensive weed control in areas where significant weeds are known to occur to reduce the cover of weeds adjacent to the

Table 8.2 Summary of impacts and measures to avoid, minimise and mitigate

Impact	Impact avoidance	Impact minimisation	Impact mitigation
vegetation within the Paroo-Darling National Park. **Responsibility:** APA and contractor.		• All vehicles, machinery and equipment (eg boots) to be cleaned and certified weed free prior to initial entry to site (BI-08). • Rehabilitation of cleared areas as quickly as possible following construction (BI-09). • Contractors to be briefed on maintenance, checking, and cleaning of PPE to minimise spread of biosecurity items. • No stockpiling of machinery or materials on retained vegetation (BI-05).	construction activities, preventing the spread of weeds into other areas (BI-09). • Vegetation will be stockpiled away from watercourses (BI-08). • A weed pathogen monitoring program will be implemented, with a weed control program to be implemented if weeds are identified within the site (BI-09). • Vehicles, plant and equipment breaching protocol and travelling off the approved access roads will be subject to re-certification (BI-09). • Biosecurity certifications will be kept with the vehicle/plant at all times (BI-09).
Increase in predatory and pest species. **Type:** indirect impact. **Frequency:** ongoing during construction and operation. **Intensity:** significant increases in the number of predators and pest species. **Duration:** construction and operation. **Consequence:** increased predation and competition and a consequent reduction in populations. **Responsibility:** APA and contractor.	• Not applicable.	• Waste materials generated during construction and operations will be reused or recycled where practicable, or appropriately stored, collected and transported by licenced contractors for disposal at appropriately licenced facilities (WA-01). • Waste containers will be lidded to mitigate fauna access. No waste will be left outside in open areas accessible to feral animals (WA-02).	• Not applicable.
Light, vibration and noise pollution during night works. **Type:** indirect impact. **Frequency:** ongoing during construction. **Intensity:** Noise: 116dBA. Light: Construction – final commission will be 24 hour construction. Operational – only emergency related current works. **Duration:** ongoing during construction and operational.	• Not applicable.	• Siting of construction areas in disturbed areas wherever feasible (BI-04). • Use of directional lighting to retain lighting within works areas as much as possible (VI-02).	•

Table 8.2 Summary of impacts and measures to avoid, minimise and mitigate

Impact	Impact avoidance	Impact minimisation	Impact mitigation
Consequence: potential to result in noise impacts to retained vegetation and light spill into adjacent habitat areas, impacting on occupancy for some species. **Responsibility:** APA and contractor.			
Changes to runoff regimes and sedimentation. **Type:** prescribed impact. **Frequency:** ongoing during construction and operation. **Intensity:** potential to mobilise small amounts of sediment into watercourses (MW433) and Paroo River Wetlands which may impact key fish habitat and aquatic flora and fauna. **Duration:** initial stages of construction and ongoing through the operational stage. **Consequence:** impact water quality including indirect impacts to the Paroo River Wetlands, erosion and sedimentation in the area. **Responsibility**: APA and contractor	• Sitting of spray field away from sensitive receiving environments such as unnamed watercourses (MW433).	• Any required cut and fill will employ slope design rules and stabilisation measures guided by material erosion and agronomic characterisation of the site soils (WS-02). • Major land disturbance works will be scheduled to avoid periods of high wind, where practicable. Soil and erosion control measures will be adjusted to ensure appropriate management of erosion and sediment during adverse weather (WS-03). • Site drainage will be designed to maximise sheet flow where possible. Construction of diversion drains, channels and table drains will be minimised to the maximum possible extent where practicable (WS-04). • Minimise disturbance to the existing watercourses at MW433 and avoid the use of excavated drains where dispersive soils are expected to be present. Constructed landforms will be located to utilise the natural drainage features to the maximum practicable extent (WS-06). • Priority will be given to the prevention or minimisation of soil erosion rather than allowing erosion to occur and relying on sediment control measures to trap and contain sediment and turbid runoff (WS-07). • All reasonable and practicable measures needed to protect downstream waters and adjacent properties from the adverse effects of sediment	• A soil and water management plan (SWMP) will be prepared for the project and underpinned by primary erosion and sediment control plans (PESCPs) for each site (WS-01). • Following removal of temporary infrastructure, the waste water spray field at MW433 will be appropriately rehabilitated (WS-05). • Organic and woody wastes to be considered for soil erosion protection purposes on stockpiles and rehabilitated areas. This is especially important at MW433, where annual rainfall is less than 300 to 350 mm/y and vegetation cannot be relied on for short- or long-term erosional stability. (WS-09). • Site areas containing potential contaminants (such as fuel, oil, grease and chemicals) will be covered and/or bunded in accordance with Australian Standard AS1940: The storage and handling of flammable and combustible liquids to prevent contamination of stormwater runoff, with offsite disposal of captured water/contaminants (WS-11). • Temporary and permanent onsite wastewater management systems for each site will: – be appropriate for each site based on consideration of the site layout, site conditions and relevant environmental constraints; and – be designed, constructed, operated, maintained and decommissioned in

Table 8.2 Summary of impacts and measures to avoid, minimise and mitigate

Impact	Impact avoidance	Impact minimisation	Impact mitigation
		and turbid water discharge will be implemented (WS-10). • Stabilisation of exposed soils will be undertaken as soon as practicable , and dust suppression undertaken as required using water sprays, water extension agents, soil stabilising polymers or other media on: – unpaved work areas subject to traffic or wind; – exposed soil; – main haulage routes, as required; – sand, spoil and aggregate stockpiles; and – during the loading and unloading of dust generating materials. When water is used for dust suppression, it will not be applied in a way that causes ponding or runoff (AQ-01) .	accordance with best practise and relevant guidelines (including WaterNSW 2019), applicable standards (including AS/NZS 1547:2012 On-site domestic wastewater management) and local Council requirements (WS-12). • Rehabilitation will commence progressively during and post construction, and will be undertaken as soon as practicable (GE-03).
Fauna vehicle strike **Type:** prescribed impact. **Frequency:** potential for daily impacts if unmitigated. **Intensity:** unknown. **Duration:** ongoing through construction and operational. **Consequence:** potential to significantly impact local populations of threatened species. **Responsibility:** APA and contractor	• Not applicable.	• Reduced speed limit along existing roads and maintenance tracks during night (TT-02).	• Monitoring of fauna strike incidences through internal reporting.

Table 8.2 Summary of impacts and measures to avoid, minimise and mitigate

Impact	Impact avoidance	Impact minimisation	Impact mitigation
Fragmentation, resulting in reduction in connectivity. **Type:** prescribed impact. **Frequency:** during construction and operation. **Intensity:** construction of temporary and permanent infrastructure. **Duration:** construction and operation. **Consequence:** permanent removal of native vegetation and threatened species habitat. Loss of connectivity. **Responsibility:** APA	• No direct impacts will occur to mature trees (DBH ≥5 cm).	• Use of the existing pipeline easement for access to the site (BI-03).	• Rehabilitation of temporary disturbance areas (GE-03).
Impacts to water quality within the Paroo River Wetlands (MW433) **Type:** indirect impact. **Frequency:** during construction and operation. **Intensity:** construction of temporary and permanent infrastructure. **Duration:** construction and operation. **Consequence:** Degraded surface water entering the Paroo River Wetlands, during surface flow events, as a result of construction and operations maintenance activities (runoff, sedimentation, erosion, etc). Degraded water entering the Paroo River Wetlands as a result of spray irrigation (elevated salts, nutrients, metals, etc). **Responsibility:** APA	• Not applicable.	• Use of an area with existing infrastructure and highly disturbed landscape (BI-04). • Utilisation of existing roads and pipeline easement for access to the site (BI-03). • Where works are carried out during periods of higher rainfall or wind velocity, soil and erosion control measures will be adjusted to ensure appropriate management of erosion and sediment (WS-01). • Site drainage will be designed to maximise sheet flow and avoid longitudinal drainage where practicable (WS-04). • Site areas containing potential contaminants (such as fuel, oil, grease and chemicals) will be covered and/or bunded in accordance with Australian Standard AS1940: The storage and handling of flammable and combustible liquids to prevent contamination of stormwater runoff, with offsite disposal of captured water/contaminants. (WS-11).	• A soil and water management plan (SWMP) will be prepared for the project and underpinned by primary erosion and sediment control plans (PESCPs) for each site (WS-01). • All reasonable and practicable measures needed to protect downstream waters and adjacent properties from the adverse effects of sediment and turbid water discharge will be implemented (WS-10).

Notes: Mitigation and control measures included within this table have been assigned an ID, reflective of those listed within the main report.

8.3 Serious and Irreversible Impacts

Section 9.1.1 of BAM (DPIE 2020A) requires additional impact assessment for threatened species and ecological communities that are also listed as candidate entities for Serious and Irreversible Impacts (SAII).

No threatened species entities that are SAII candidate species were identified within the study area. No threatened community entities were identified as occurring within the study area, and thus there are no SAII candidate entities for threatened ecological communities.

8.4 Impacts not requiring offsets

In accordance with Section 9.2.1 of BAM (DPIE 2020a), impacts on vegetation zones and threatened species habitat do not require offsets where:

- a vegetation zone representative of a critically endangered or endangered ecological community has a vegetation integrity score less than 15; and/or
- a vegetation zone representative of a vulnerable ecological community and/or threatened species habitat has a vegetation integrity score less than 17; and/or
- a vegetation zone that is not listed as a TEC has a vegetation integrity score less than 20.

In addition, areas not requiring assessment in accordance with Section 9.3 of BAM (DPIE 2020A) include:

- existing roads;
- cleared and highly disturbed land, particularly associated with past mining activities (eg mullock heaps); and
- watercourses.

Table 8.3 provides a summary of the vegetation zones that do not require offsets.

Table 8.3 Summary of impacts not requiring offsets – native vegetation (MW433 & MW880)

Vegetation zone	PCT	Name	Area	Vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score[1]	Credits required
1	153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones (MW433)	153_Disturbed	6.27	8	3.1	-4.9	0
1	72 - White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion (MW880)	72_DNG	1.23	12.3	4.6	-7.7	0

Notes: 1. The total change in vegetation integrity score for each vegetation zone is calculated based on the weighted area of the two management zones (direct and indirect) as described in Section 5.2.3.

As a result, no ecosystem credits are required for either site.

8.5 Impacts requiring offset

This section provides an assessment of the impacts requiring offsetting in accordance with Section 9.2 of BAM (DPIE 2020A).

All impacts to native vegetation do not require offset and have been addressed in Section 8.4.

Impacts to threatened species habitat requiring offsets include:

- impacts on 6.27 ha of habitat for *Atriplex infrequens*;
- impacts on 1.23 ha of habitat for *Austrostipa metatoris*;
- impacts on 6.27 ha of habitat for the Australian Bustard;
- impacts on 6.27 ha of habitat for the Crowned Gecko
- impacts on 6.27 ha of habitat for the Pine Donkey Orchid;
- impacts on 1.23 ha of habitat for the Silky Swainson-pea;
- impacts on 6.27 ha of habitat for the Stimson's Python; and
- impacts on 0.27 ha of breeding habitat for the Superb Parrot.

A summary of the species credits required for all vegetation zones occupied by the threatened species, including changes in vegetation integrity score, are provided in Table 8.4 and Table 8.5. A total of 71 species credits are required to offset the residual impacts of the modification. A credit report is provided in Appendix E. Offsets will be provided in accordance with the biodiversity offset scheme.

Table 8.4 Summary of species credits required – MW433

Species	Vegetation zone name	Area (ha)	Habitat condition	Future habitat condition	Loss of habitat condition[1]	Candidate SAII	Species credits
Antaresia stimsoni Stimson's Python	153_Disturbed	6.27	8	3.1	-4.9	No	14
Ardeotis australis Australian Bustard	153_Disturbed	6.27	8	3.1	-4.9	No	14
Atriplex infrequens A saltbush	153_Disturbed	6.27	8	3.1	-4.9	No	14
Lucasium stenodactylum Crowned Gecko	153_Disturbed	6.27	8	3.1	-4.9	No	14

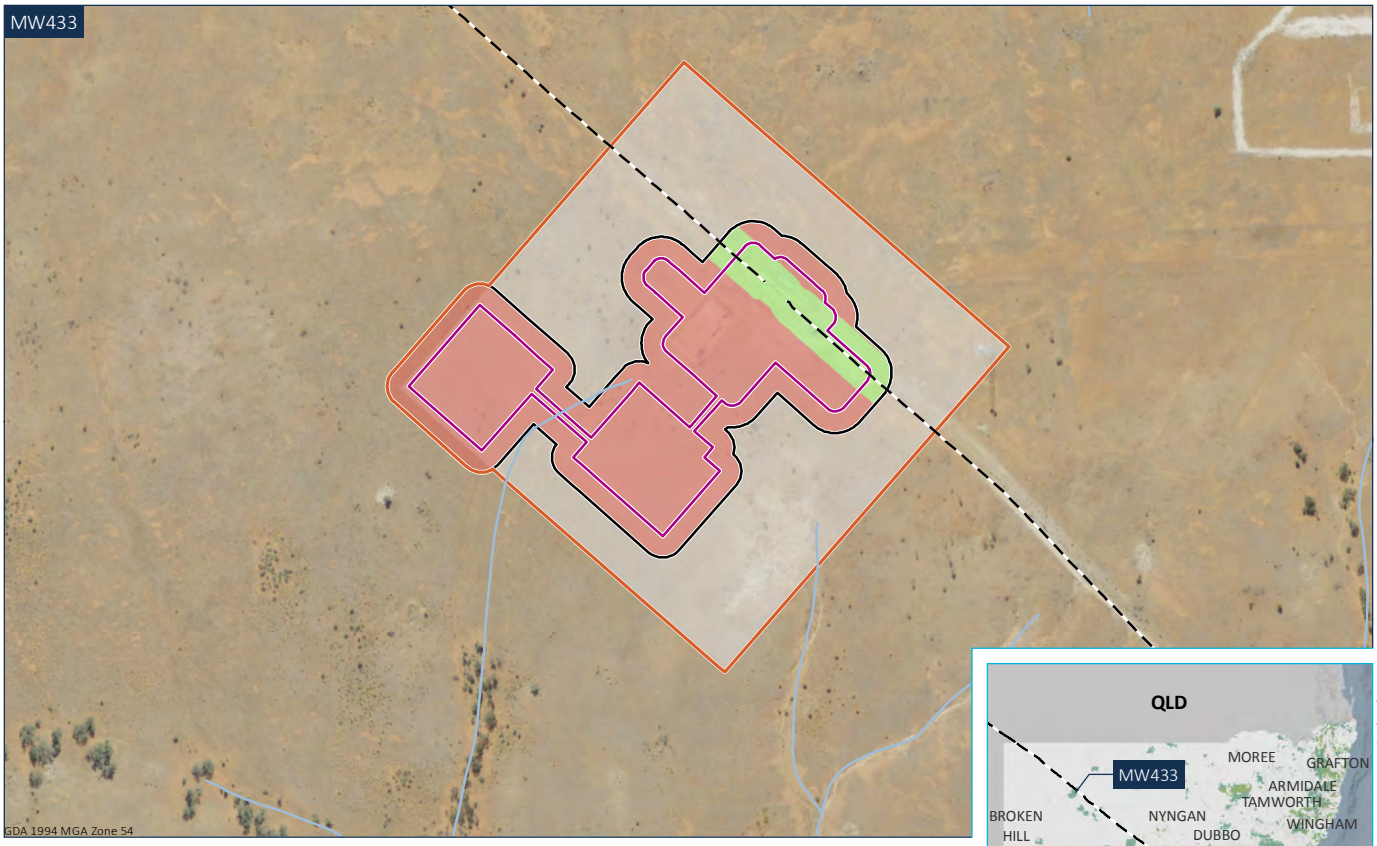
Notes: 1. The loss of habitat condition for each vegetation zone is calculated based on the weighted area of the two management zones (direct and indirect) as described in Section 5.2.3.

Table 8.5 Summary of species credits required – MW880

Species	Vegetation zone name	Area (ha)	Habitat condition	Future habitat condition	Loss of habitat condition[1]	Candidate SAII	Species credits
Austrostipa metatoris A spear-grass	72_DNG	1.23	12.3	4.6	-7.7	No	5
Diuris tricolor Pine Donkey Orchid	72_DNG	1.23	12.3	4.6	-7.7	No	4
Polytelis swainsonii Superb Parrot	72_DNG	0.27	12.3	4.6	-7.7	No	1
Swainsona sericea Silky Swainson-pea	72_DNG	1.23	12.3	4.6	-7.7	No	5

Notes: 1. The loss of habitat condition for each vegetation zone is calculated based on the weighted area of the two management zones (direct and indirect) as described in Section 5.2.3.

With regard to aquatic ecology, aquatic offsets are not required as neither site provides key fish habitat.



\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02_Maps\Ecology\BDAR\BDAR006_OffsetRequirement_20210706_03.mxd 6/07/2021

Source: EMM (2021); DFSI (2017); ASGC (2006); LPI (2021); APA (2020)

0 100 200 m

N

KEY

- Disturbance footprint
- Indirect impact area
- Study area
- Site boundary/construction envelope
- Moomba to Wilton pipeline
- Watercourse

Impact area

- Areas not requiring assessment
- Impacts requiring offsets (species credits only)

Impacts requiring offsets, impacts not requiring offsets and areas not requiring assessment

APA - East Coast Grid Expansion
Biodiversity development assessment report
Modification report 1
Figure 8.1

EMM creating opportunities

9 Assessment of other relevant biodiversity legislation

9.1 Environment Protection and Biodiversity Conservation Act 1999

This chapter provides an assessment of impacts specific to species and communities listed under the EPBC Act. A likelihood of occurrence assessment for protected matters is presented in Section 9.1.1.

9.1.1 Likelihood of occurrence assessment

i Threatened ecological communities

Four PCTs were identified as potentially occurring within the study area by the PMST:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia;
- Poplar Box Grassy Woodland on Alluvial Plains;
- Weeping Myall Woodlands; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Table 9.1 assesses the likelihood of these TECs occurring in the study area. No PCTs recorded within the study area are consistent with the TECs predicted to occur. Therefore, no further impact assessment has been conducted for the following TECs.

Table 9.1 Likelihood of occurrence for listed ecological communities

Ecological community	EPBC Act Status	Habitat requirements	Likelihood of occurrence	
			MW433	MW880
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	E	Occurs in two forms: grassy woodland derived native grassland. The grassy woodland form has a tree canopy that is dominated or co-dominated by Western Grey Box. The derived native grassland form has almost no tree canopy and mid layer. Widespread shrubs include wattles (*Acacia* species), Sweet Bursaria (*Bursaria spinosa*), *Cassinia* species, hop bushes (*Dodonaea* spp.), emu bushes (*Eremophila* spp.) and blue bushes (*Maireana* spp.).	-	Negligible. Does not occur – this community is not consistent with any of the PCTs identified during the field surveys.
Poplar Box Grassy Woodland on Alluvial Plains	E	Characterised by native grassy eucalypt woodland where poplar/bimble box is the main tree canopy species present. Other tree species may occasionally occur depending on the characteristics of the site, these include White Cypress Pine,Belah (*Casuarina cristata*), Coolibah (*Eucalyptus coolabah*), Black Box (*Eucalyptus largiflorens*), Silver-leaved Ironbark (*Eucalyptus melanophloia*), Western Grey Box and Narrow-leaved Grey Box (*Eucalyptus pilligaensis*).	-	Negligible. Does not occur – this community is not consistent with any of the PCTs identified during the field surveys. PCT 72 White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion was mapped within the study area. MW880 is not situated within alluvial plains and is not considered part of currently defined floodplains. Therefore, the TEC is not considered to have potential to occur within MW880.
Weeping Myall Woodlands	E	Occurs in a range from open woodlands to woodlands, generally 4-12 m high, in which Weeping Myall (*Acacia pendula*) trees are the sole or dominant overstorey species. Other vegetation that may occur in the ecological community, though not as dominant, includes Western Rosewood (*Alectryon oleifolius* subsp. *elongatus*), Poplar Box, or Black Box (*Eucalyptus largiflorens*).	-	Negligible. Does not occur – this community is not consistent with any of the PCTs identified during the field surveys.
White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grasslands	CE	Characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. Tree-cover is generally discontinuous and consists of widely spaced trees of medium height in which the canopies are clearly separated.	-	Negligible. Does not occur – this community is not consistent with any of the PCTs identified during the field surveys.

ii Threatened species

The PMST and/or BAMC predicted that 16 fauna species and 6 flora species listed under the EPBC Act could occur within the study area. The likelihood of occurrence for these species is assessed in Table 9.2, with the exception of threatened aquatic species which have been assessed in Section 7.2.2.

One threatened flora species and three threatened fauna species were considered to have a moderate to high likelihood of occurring within the study area:

- *Atriplex infrequens*;
- Grey Falcon;
- Superb Parrot; and
- Corben's Long-eared Bat.

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Plants					
Atriplex infrequens	-	V	Confined to the NSW far western plains. North western records recorded from east of Tibooburra, south east of Brewarrina and near Wilcannia with isolated collections from the Pooncarie area in the south. Also recorded in 1917 in South Australia. *Atriplex infrequens* is associated with broad drainage tracts, clay flats and possibly occasionally inundated habitats. Very little ecological information is available for this species so is critical habitat components can only be speculated as relatively undisturbed and ungrazed drainage lines and flats.	Moderate. No records within the locality; however, the study area landscape is characteristic of clay flats associated with the species. The study area is also located within the species known range.	-
Austrostipa wakoolica	-	E	This species is confined to the floodplains of the Murray River tributaries of central-western and south-western NSW. This species grows in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Flowering occurs between October to December.	-	Low. The study area lacks suitable floodplain habitat for this species. Including lignum swamp with box and mallee and open Cypress Pine forest on low sandy range. The nearest records are located approximately 15 km from the study area within floodplain woodland.
Frankenia plicata	-	E	*Frankenia plicata* occurs in South Australia, from north of Port Augusta along the Stuart Highway to the Northern Territory border and from Port Augusta north-east to Maree. There are a total of 41 records of this species. It is likely that the species has been under reported due to difficulty of identification of Frankenia spp. *Frankenia plicata* grows in a range of habitats, including on small hillside channels, which take the first run-off after rain (Leigh et al., 1985). In the Simpson Desert, the species has been found predominantly from swales of loamy sands to clay. This species is found in a wide range of vegetation communities that have good drainage. This species occurs within the South Australian Arid Lands Natural Resource Management Region.	Low. No records in locality. The study area is located on the edge of the species predicted range only, not known range. Site landscape characteristic of floodplains, which is unlikely to provide good drainage.	-

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Lepidium monoplocoides	Winged Pepper-cress	E	Winged Pepper-cress occurs predominantly in mallee scrub in semi-arid areas (Leigh et al. 1984). Sites are seasonally moist to water-logged with heavy, fertile soils and a mean annual rainfall of around 300 to 500 mm. The predominant vegetation is usually an open-woodland dominated by *Allocasuarina leuhmannii* and/or eucalypts, particularly *Eucalyptus largiflorens* (Black Box) or Poplar Box. The field layer of the surrounding woodland is dominated by tussock grasses (notably *Danthonia* spp. and *Stipa* spp.), but the seasonally waterlogged sites preferred by Winged Pepper-cress also support a number of moisture dependent herbs, such as *Marsilea* spp. (Nardoo). Also known from riparian woodland (eg Gunbower Is.) (MEL collection records).	-	Low. The study area is not characteristic of water-logged soils. Preferred vegetation absent within the study area. No previous records within the locality.
Swainsona murrayana	Slender Darling-pea	V	The Slender Darling-pea often grows in heavy soils, especially depressions, and is also found on grey and red to brown clay and clay-loam soils in *Atriplex vesicaria* (Bladder Saltbush) herbland, *Eucalyptus largiflorens* (Black Box) woodland and grassland communities and is frequently associated with Maireana species.	-	Low. Sub-optimal habitat present within the study area. The study area is highly disturbed. The site landscape position does not occur within a depression. No previous records within the locality.
Tylophora linearis	-	E	The majority of records of this species occur in the central western region. Records are from Goonoo, Pillaga West, Pillaga East, Bibblewindi, Cumbil and Eura State Forests, Coolbaggie NR, Goobang NP and Beni SCA. The species grows in dry scrub and open forest. It has been recorded from low-altitude sedimentary flats in dry woodlands of Red Ironbark (Eucalyptus fibrosa), Mugga Ironbark, White Box, Black Cypress Pine (Callitris endlicheri), White Cypress Pine and Bull Oak.	-	Low. The study area is situated on the edge of the species distribution and there are no records of the species within 20 km of the study area. The study area lacks suitable dry scrub and open forest associated with this species.

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Birds					
Amytornis modestus	Thick-billed Grasswren	V	Generally thought to be extinct in NSW until located in the Packsaddle area in 2008. May still occur at other locations in Upper Western Region. The species is sedentary, usually inhabiting dense, low saltbush, cottonbush, bluebush and nitre-bush areas on sandy plains or depressions in gibber; also occurs along watercourses in clumps of Canegrass. When disturbed, individuals take refuge in any available cover, including piles of old flood debris along dry sandy watercourses and down rabbit burrows. In NSW, preferred habitat appears to be shrubland dominated by Blackbush (*Maireana pyramidata*) that is higher and denser than surrounding areas.	Low. Habitat within the study area is considered degraded and lacking suitable dense understorey for the species. No records within the locality.	-
Botaurus poiciloptilus	Australasian Bittern	E	The Australasian Bittern is widespread and found over most of NSW except for far north-west. Preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds or cutting grass (*Gahnia* sp.) growing over a muddy or peaty substrate.	-	Low. No wetland habitat occurs within the study area. No previous records within the locality.
Calidris ferruginea	Curlew Sandpiper	CE, Mi	Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Low. No coastal or aquatic habitat within the study area. No previous records within the locality. Likely associated with Paroo-Darling National Park located directly adjacent to the study area. However, the vegetation within and immediately adjacent to the study area lacks suitable aquatic habitat.	Low. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat.

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Falco hypoleucos	Grey Falcon	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The species is usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	Moderate. Potential foraging habitat present within the study area. Proximity of Paroo-Darling National Park may encourage the species to flyover the study area.	Moderate. Potential foraging and nesting habitat present within the study area. The study area occurs within the species range.
Grantiella picta	Painted Honeyeater	V	The species is sparsely distributed from south-eastern Australia to north-western Queensland, with its greatest concentrations and breeding locations occurring on the inland slopes of the Great Dividing Range in NSW. It inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box (*E. largiflorens*) and River Red Gum (E. *camaldulensis*), Box-Ironbark-Yellow Gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarina, Callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips although it breeds in quite narrow roadside strips if ample mistletoe fruit is available.	-	Low. The species is known to inhabit eucalypt forests/woodlands with mature trees, and mistletoe species as well as trees on farmland. Although the study area contains a number of mature box eucalyptus along the road edge, no direct impacts will occur to the suitable vegetation. The modification will only impact areas of DNG which do not provide suitable nesting, breeding or foraging habitat for this species. Therefore, the species is considered unlikely to utilise any impacted habitat and no further consideration is required.
Hirundapus caudacutus	White-throated Needletail	V, Mi	The White-throated Needletail is widespread in eastern and south-eastern Australia. In NSW, this species extends inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	-	Low. Species almost exclusively aerial and usually recorded over wooded areas. The study area only contains scattered habitat. No previous records within the locality.

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Leipoa ocellata	Malleefowl	V	Malleefowl predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 – 450 mm mean annual rainfall) areas. The species utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. The species is less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.	-	Low. The study area lacks suitable mallee habitat for this species with a shrub understorey.
Numenius madagascariensis	Eastern Curlew	CE, Mi	During non-breeding this species is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms.	-	Low. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat.
Pedionomus torquatus	Plains-wanderer	CE	Plains wanderers inhabit sparse native grasslands and are often absent from areas where grass becomes too dense or too sparse. They nest amongst native grasses and herbs, or sometimes amongst crops, feeding on a mixture of seeds, invertebrates and leaves.	-	Low. The study area is located on the edge of the species known range. No previous records within the locality. The study area lacks suitable native grassland and is highly degraded due to agricultural land uses.
Pezoporus occidentalis	Night Parrot	E	The Night Parrot is known to occur within Spinifex grasslands in stony or sandy areas and samphire and chenopod associations on floodplains, salt lakes and clay pans. Suitable habitat is characterized by the presence of large and dense clumps of Spinifex, and it may prefer mature spinifex that is long and unburnt. The Night Parrot is a nocturnal bird that forages on the ground, becoming active during dusk and, generally flies to water to drink prior to foraging. During the day it rests within clumps of spinifex.	Low. Habitat within the study area is considered degraded; lacking suitable dense understorey for the species. No previous records within the locality.	-

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Polytelis swainsonii	Superb Parrot	V	The Superb Parrot is found throughout eastern inland NSW. This species inhabits forests and woodlands dominated by eucalypts, especially River Red Gums and box eucalypts such as Yellow Box or Inland Grey Box. Superb Parrots breed in either River Red Gum forests and woodlands or box woodlands (DoEE 2018).	-	Recorded. The study area contains suitable woodland habitat with potential breeding trees along the northern section. The species was recorded foraging during surveys.
Rostratula australis	Australian Painted Snipe	E	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. The species also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (OEH 2018).	Low. No previous records within the locality. The historically historical water retention structure is dry and not likely to provide optimal habitat for the species. Although the study area is situated immediately adjacent to the mapped area of the Paroo River Wetlands there is no suitable wetland habitat. The study area was observed dry and degraded and unlikely to support suitable waterlogged habitat for the Australian Painted Snipe.	Low. No suitable wetland habitat within the study area. The historically historical water retention structure is dry and not likely to provide optimal habitat for the species. No previous records within the locality.

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Mammals					
Nyctophilus corbeni	Corben's Long-eared Bat	V	Inhabits a variety of vegetation types, including mallee, Bull Oak and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Roosts in tree hollows, crevices, and under loose bark. A slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground. The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches, suggesting its home range is probably large. The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer.	Low. No suitable woodland or dense understorey habitat within the study area. No previous records within the locality.	Moderate. Potential foraging and breeding woodland habitat within the study area. The study area is located within the species known range.
Phascolarctos cinereus	Koala	V	The Koala inhabits eucalypt woodlands and forests and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Large populations of koalas occur on the western slopes and plains, in particular the Pilliga region and in Gunnedah and Walgett LGAs (J. Callaghan, Australian Koala Foundation, pers. comm.). Primary feed trees within the Western Slopes and Plains Koala Management Area (KMA) are River Red Gum (E. camalduensis) and Coolabah (E. coolabah).	-	Low. A single Eucalyptus species, Western Grey Box, is listed under the Koala Habitat Protection SEPP 2021 as a Koala use tree species within the Central and Southern Tablelands. There are no records in proximity to the study area, with the nearest recent record is approximately 70 km north of the study area. However, as suitable habitat exists, the species was retained as a candidate species. Targeted surveys confirmed the species is not present within the study area.

Table 9.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Pteropus poliocephalus	Grey-headed Flying-fox	V	Grey-headed Flying foxes occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	-	Low. No Grey-headed Flying-fox camps are within the study area; with the nearest camp being recorded approximately 200 km from the study area in Wellington. Scattered habitat within the study area; however, no previous records within the locality. The study area is located on the edge of the species distribution.

iii Migratory species

Seven species listed as migratory under the EPBC Act were predicted to occur within the study area based on database searches undertaken. Table 9.3 provides an assessment of the likelihood of these species utilising habitat within the study area.

No species listed as migratory under the EPBC Act were considered likely to occur within the study area.

Table 9.3 Likelihood of occurrence for migratory species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Actitis hypoleucos	Common Sandpiper	Mi	In Australia, the Common Sandpiper is found along all coastlines. The species is also widespread inland in small numbers. In Australia, the population is concentrated in Northern and Western Australia. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	Low. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat. Although the study area is situated immediately adjacent to the mapped area of the Paroo River Wetlands there is no suitable wetland habitat. The study area was observed dry and degraded and unlikely to support suitable waterlogged habitat for the Common Sandpiper.	Negligible. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat.
Apus pacificus	Fork-tailed Swift	Mi	In Australia, the Fork-tailed Swift is almost exclusively aerial, mostly occurring over inland plains but sometimes above foothills or in coastal areas. This species can also occur over cliffs, beaches, treeless grassland and plains covered with spinifex, open farmland and inland and coastal sand-dunes. The species breeds in Asia but migrates to Australia from September to April. Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 m high.	Low. The Fork-tailed Swift is a coastal marine species. The study area does not contain any suitable habitat for this species.	Low. The Fork-tailed Swift is a coastal marine species. The study area does not contain any suitable habitat for this species.

Table 9.3 Likelihood of occurrence for migratory species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Calidris acuminata	Sharp-tailed Sandpiper	Mi	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season	Low. Records within 20 km are near large watercourses and floodplain areas. Although the study area is situated immediately adjacent to the mapped area of the Paroo River Wetlands there is no suitable wetland habitat. The study area was observed dry and degraded and unlikely to support suitable mudflats or floodplain habitat for the Sharp-tailed Sandpiper.	Negligible. No mudflats or wetlands present within the study area.
Calidris melanotos	Pectoral Sandpiper	Mi	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	Low. Although the study area is situated immediately adjacent to the mapped area of the Paroo River Wetlands there is no suitable wetland habitat. The study area was observed dry and degraded and unlikely to support suitable mudflats or floodplain habitat for the Pectoral Sandpiper.	Negligible. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat.

Table 9.3 Likelihood of occurrence for migratory species

Scientific Name	Common Name	EPBC Status	Habitat requirements	Likelihood of occurrence	
				MW433	MW880
Gallinago hardwickii	Latham's Snipe	Mi	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	Low. Although the study area is situated immediately adjacent to the mapped area of the Paroo River Wetlands there is no suitable wetland habitat. The study area was observed dry and degraded and unlikely to support suitable wetland habitat with dense vegetation for the Latham's Snipe.	Negligible. No permanent or ephemeral wetlands within proposal area. No aquatic habitats.
Motacilla flava	Yellow Wagtail	Mi	This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra (Birdlife International 2017).	Low. Although the study area is situated immediately adjacent to the mapped area of the Paroo River Wetlands there is no suitable wetland habitat. The study area was observed dry and degraded and unlikely to support suitable damp or wet habitat for the Yellow Wagtail.	Negligible. No damp or wet habitats within the study area.
Myiagra cyanoleuca	Satin Flycatcher	Mi	The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand (Blakers et al. 1984; Coates 1990). Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	-	Negligible. The study area lacks heavily vegetated areas including gullies; therefore, the species is unlikely to occur.

9.1.2 Significant impact assessments

To support a determination as to whether the modification is likely to have a 'significant impact' on threatened species the Matters of National Environmental Significance – Significance Impact Guidelines 1.1 (DoE 2013) have been applied.

A 'significant impact' is defined as "an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts" (DoE 2013).

Consideration has been given to all threatened species and wetlands of national importance with potential to occur within the study area, with reference to DoE (2013). Significant impact assessments have been completed for one threatened flora species, three threatened fauna species and one wetland of national importance, considered to have potential to be impacted by the modification following the process outlined in this assessment report:

- *Atriplex infrequens*;
- Grey Falcon;
- Superb Parrot;
- Corben's Long-eared Bat; and
- the Paroo River Wetlands.

Significant impact assessments for the above community and species are provided in Appendix F.

These assessments concluded that the modification is unlikely to result in a significant impact to MNES.

9.2 Biosecurity Act 2015

The following regional strategic weed management plans were reviewed to assess the weeds within each site:

- Central West Regional Strategic Weed Management Plan 2017-2022 (CWLLS 2017); and
- Western Regional Strategic Weed Management Plan 2017-2022 (WLLS 2017).

No priority weeds of the Central West or Western regions were recorded within the sites. Additionally, no weeds of national significance were recorded within the sites.

9.3 Water Management Act 2000

A mapped watercourse is located within MW433. For the purposes of the WM Act, waterfront land is defined as the bed and bank of any river, lake or estuary and all land within 40 m of the highest bank of the river, lake or estuary mean high water mark. Under provisions within the EP&A Act, approved SSI projects are exempt from requiring a controlled activity approval to permit works on waterfront land.

Regardless, all proposed works on waterfront land would be undertaken in accordance with relevant guidelines, including NRAR (2018). Where practical, disturbance to waterfront land will be avoided through considered design and construction practices.

As described in Section 2.3.1 APA is currently considering water supply options for the construction phase of the modification. Further requirements for water approvals will be confirmed as an outcome of this exercise.

It is noted that a similar exemption under the EP&A act for approved SSI projects also applies to a water supply work approval that would otherwise be required under the WM Act.

10 Conclusion

APA proposes to construct and operate compressor stations to increase the available gas to NSW and Victorian markets as part of the project. The modification 1 will include the construction and operation at two sites, MW433 and MW880. These sites are currently owned and operated by APA as part of the existing APA pipeline.

Biodiversity surveys were conducted by AREA and EMM to identify biodiversity constraints within the two sites. Surveys conducted identified the presence of two PCTs within the study area; PCT 72 – White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion in DNG and PCT 153 – Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones in Disturbed condition.

Candidate species assessment identified 16 threatened potential species credit species. In accordance with Steps 1 to 3 (Section 5.2.1 to 5.2.3) of the BAM with consideration of habitat/geographic constraints, assessment of habitat features in the site, and whether the species may be vagrant, this list was reduced to nine species across the two sites:

- Stimson's Python;
- Australian Bustard;
- A saltbush;
- Crowned Gecko;
- A spear-grass;
- Pine Donkey Orchid;
- Koala;
- Superb Parrot; and
- Silky Swainson-pea.

Targeted surveys were conducted by AREA for threatened flora species. However, since the surveys were not conducted in accordance with survey guidelines (EES 2020) a precautionary approach was utilised to assume presence of candidate flora species. Targeted surveys were conducted by EMM for the Koala, which did not detect the species. Thus, it is considered this species is unlikely to occur within the impact area. The remaining eight species credit species were assumed present, and species polygons were produced.

The modification requires 71 species credits to compensate for impacts on threatened species habitat and species credit species. No ecosystem credits are required due to habitat degradation, in accordance with Section 9.2.1 of the BAM (DPIE 2020a).

The BDAR has also considered impacts on species and ecological communities listed under the EPBC Act. The modification is not expected to result in significant impacts on *Atriplex infrequens*, Grey Falcon, Superb Parrot, Corben's Long-eared Bat or the Paroo River Wetlands.

The aquatic ecology of Modification 1 was evaluated via desktop assessment. It was determined that no 3rd order and above waterways are present within either MW433 or MW880, and no threatened aquatic species listed under the FM Act or the EPBC Act are anticipated to occur within either MW433 or MW880 during dry conditions. MW433 is located within private land within the internationally-significant Paroo River Wetlands; however, it is anticipated that implementation of the proposed mitigation measures will negate any residual indirect impacts to the wetlands. MW880 is located within the FM Act-listed Lowland Lachlan River EEC; however, there is little to no connectivity between the site and the nearest waterways linked to the EEC. No direct impacts to aquatic ecology area anticipated to occur as a result of construction or operation within MW433 or MW880. There is not expected to be any significant impacts to aquatic ecology as a result of Modification 1.

References

AEMC 2021, Australian Energy Market Commission, viewed 15 June 2021, https://www.aemc.gov.au/energy-rules/national-gas-rules/gas-scheme-register/nsw-moomba-sydney-pipeline

AEMO (Australian Energy Market Operator) 2021, *Gas statement of opportunities: For eastern and south-eastern Australia*, report prepared by the Australian Energy Market Operator retrieved 29 April 2021 from https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/gsoo/2021/2021-gas-statement-of-opportunities.pdf?la=en.

APGA 2021, Moomba to Sydney Pipeline, viewed 15 June 2021, https://www.apga.org.au/moomba-sydney-pipeline

AREA 2020, Scoping Report – East Coast Expansion. Ecology Assessment of five study areas (SSD under the NSW EP&A Act). Prepared by AREA Environmental Consultants & Communication Pty Ltd on behalf of APT Pipelines (NSW) Pty Ltd.

Baker-Gabb 2011, National Recovery Plan for the Superb Parrot *Polytelis swainsonii*, State of Victoria Department of Sustainability and Environment.

BOM 2020a, *Bureau of Meteorology*, viewed 14 June 20201, http://www.bom.gov.au/

BOM 2020b, *Groundwater Dependent Ecosystems Atlas*, viewed 14 June 2021, http://www.bom.gov.au/water/groundwater/gde/index.shtml

Central Darling Shire Council 2012, *Central Darling Local Environmental Plan.* Department of Planning, Industry and Environment.

Commonwealth of Australia, 2013. *Matters of National Environmental Significance: Significant impact guidelines 1.1*, Canberra: Commonwealth of Australia.

Davies TW, Duffy J, Bennie J, Gaston KJ 2014, Marine light pollution: nature, extent and ecological implications, *Frontiers Ecol Environ 12*, pp. 347–355.

DAWE 2005, Directory of Important Wetlands, Department of Agriculture, Water and the Environment.

DAWE 2017, Interim Biogeographic Regionalisation of Australia (IBRA) Version 7, Department of Agriculture, Water and the Environment.

DAWE, (2019). *Ramsar wetlands: Paroo River Weltands*. Retrieved from Australian Wetlands Database: https://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=65

DAWE, 2020. *Wildlife and threatened species bushfire recovery research and resources*. [Online]

Available at: https://www.environment.gov.au/biodiversity/bushfire-recovery/research-and-resources

DAWE 2021, *PMST Protected Matters Search Tool for Matters of National Significance (MNES),* viewed 14 June 2021, https://www.environment.gov.au/epbc/protected-matters-search-tool.

DEC 2004, Threatened Biodiversity Survey and Assessment: Guidelines for Development and Activities, Department of the Environment and Conservation.

DEWHA 2008, *Threat Abatement Plan for Predation by the European Red Fox.* Department of the Environment, Water, Heritage and the Arts, Canberra.

DoE 2013, Matter of National Environmental Significance. Significant Impact Guidelines 1.1, Department of the Environment, Canberra.

DoE 2014, *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi*. Department of the Environment, Canberra.

DoEE 2018, *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi*, Department of Energy an Environment, Canberra http://www.environment.gov.au/system/files/resources/ee1f3b9f-6e2e-4a01-86f3-6abb167fb443/files/tap-phytophthora-cinnamomi-2018-background.pdf

DoE 2013, *Matters of National Environmental Significance Significant Impact guidelines 1.1 EPBC Act 1999,* Department of the Environment.

DPI, 2006. *PrimeFact 145: Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River*, Port Stephens: NSW Department of Primary Industries.

DPI 2007, Primefacts, Endangered ecological communities in NSW Lowland Darling River aquatic ecological community, NSW Department of Primary Industries, Canberra.

DPI 2012a, *NSW Aquifer Interference Policy*, NSW Department of Primary Industries.

DPI 2012b, *Risk Assessment guidelines for groundwater dependent ecosystems*. NSW Department of Primary Industries.

DPI 2013, *Policy and Guidelines for Fish Conservation and Management*, NSW Department of Primary Industries.

DPI 2021, *Lachlan Catchment*, viewed 14 June 2021, https://www.dpi.nsw.gov.au/fishing/habitat/your-catchment/lachlan#:~:text=The%20Lachlan%20catchment%20covers%20an,Boorowa%2C%20Belubula%20and%20Crookwell%20Rivers.

DPIE 2021, Paroo, *NSW Department of Planning, Industry and Environment*, accessed July 14 2021 https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/paroo.

DPIE 2020a, *Biodiversity Assessment Method, Department of Planning*, Industry and Environment

DPIE 2020b, State Vegetation Type Map: Western Region Version v1.0 - VIS_ID 4492, NSW Office of Environment and Heritage, Sydney.

DPIE Water, 2021. *Water in New South Wales: Paroo Catchment*. https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/paroo. June 2021.

DSEWPaC 2011, Survey Guidelines for Australia's Threatened Mammals, Department of Sustainability, Environment, Water, Population and Communities.

DTA 2021, *NationalMap – Slope (percent)*, Digital Transformation Agency (DTA), Department of Communications and Arts, and CSIRO Data 61 2014-2021. Available: https://nationalmap.gov.au/.

EES 2020, Surveying threatened plants and their habitats, Environment, Energy and Science group of the Department of Planning, Industry and Environment

EMM 2021a, APA East Coast Grid Expansion, Moomba to Wilton Pipeline - Modification Report 1 Surface Water Assessment. Prepared by EMM Consulting Pty Ltd on behalf of APT Pipelines (NSW) Pty Ltd.

EMM 2021b, APA East Coast Grid Expansion, Moomba to Wilton Pipeline - Modification Report 1 Noise Impact Assessment. Prepared by EMM Consulting Pty Ltd on behalf of APT Pipelines (NSW) Pty Ltd.

EMM 2021c, APA East Coast Grid Expansion, Moomba to Wilton Pipeline - Modification Report 1 Soil and Erosion Hazard Assessment. Prepared by EMM Consulting Pty Ltd on behalf of APT Pipelines (NSW) Pty Ltd.

EMM 2021d, APA East Coast Grid Expansion, Moomba to Wilton Pipeline - Modification Report 1 Traffic Impact Assessment. Prepared by EMM Consulting Pty Ltd on behalf of APT Pipelines (NSW) Pty Ltd.

Garnett ST, Szabo JK and Dutson G 2011, *The Action Plain for Australian Birds 2010*. CSIRO Publishing.

Hoskin CJ & Goosem MW 2010, Road Impacts on Abundance, Call Traits, and Body Size of Rainforest Frogs in Northeast Australia, *Ecology and Society*, 15(3), pp. 15.

Keith D 2004, Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT. NSW Office of Environment and Heritage, Sydney.

Lachlan Shire Council 2021, *Lachlan Local Environmental Plan.* Department of Planning, Industry and Environment.

Murray–Darling Basin Authority, 2010. *Sustainable Rivers Audit 2: The ecological health of rivers in the Murray–Darling Basin at the end of the Millennium Drought (2008–2010): Volume 1*, Canberra: The Sustainable Rivers Audit Program.

Murray–Darling Basin Authority, 2021. *Paroo Catchment*. https://www.mdba.gov.au/water-management/catchments/paroo. June 2021.

NOW 2012, NSW Aquifer Interference Policy. Department of Primary Industries.

NPWS 2001, *Approved NSW Threat Abatement Plan. Predation by the red fox (Vulpes vulpes)*. NSW National Parks and Wildlife Service, Hurstville.

NPWS 2003, The Bioregions of New South Wales – their biodiversity, conservation and history. Published by the National Parks and Wildlife Service (NSW).

NPWS 2020, Developments adjacent to National Parks and Wildlife Service lands – Guidelines for consent and planning authorities. National Parks and Wildlife Service, Department of Planning Industry and Environment, Sydney.

NRAR 2018. *Guidelines for controlled activities on waterfront land.* Natural Resources Access Regulator, NSW Department of Industry.

OEH 2010, NSW Wetlands, NSW Office of Environment and Heritage, Sydney.

OEH 2016a, State Vegetation Type Map: Central West / Lachlan Region Version 1.4. VIS_ID 4468

OEH 2016b, Mitchell Landscapes Version V3.1, NSW Office of Environment and Heritage, Sydney.

Phillips S and Callaghan J 2011, The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas Phascolarctos cinereus, *Australian Zoologist 35 (3):* 774-780.

Schroer S & Hölker F 2016, Impact of Lighting on Flora and Fauna. In: Karlicek R, Sun CC, Zissis G & Ma R (eds), Handbook of Advanced Lighting Technology, Springer, Cham.

Standards Australia Committee 2009*, Australian Standard AS 4970-2009 Protection of trees on development sites*.

Strahler, A., 1952. *Dynamic Basis of Geomorphology*. Geological Society of America Bulletin, Volume 63, pp. 923-938.

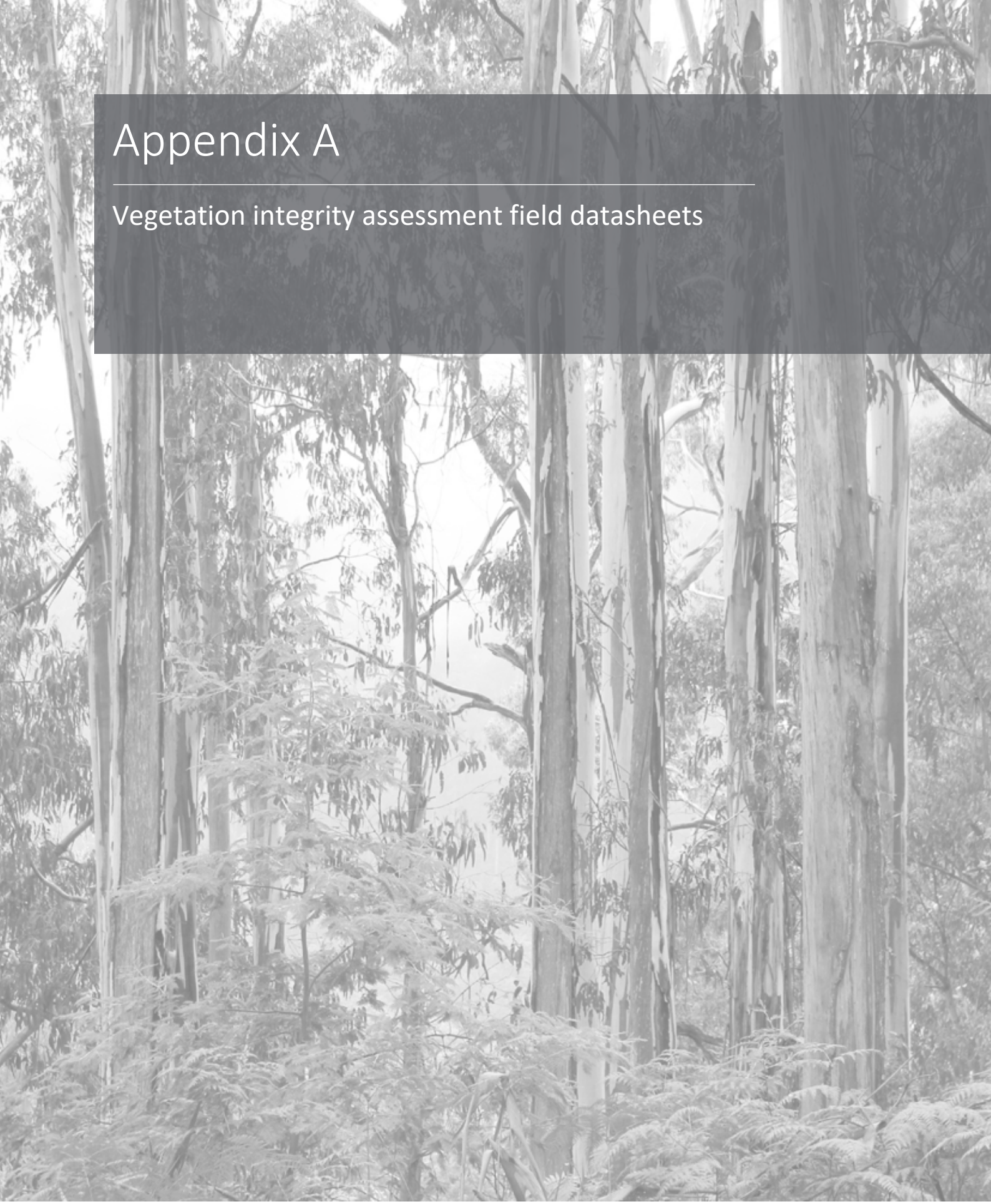
TSSC 2008, *Atriplex infrequens* Conservation Advice, Threatened Species Scientific Committee.

TSSC 2015a, Nyctophilus corbeni (South-eastern long-eared bat) Conservation Advice, Threatened Species Scientific Committee.

TSSC 2016, *Polytelis swainsonii* (Superb Parrot) Conservation Advice, Threatened Species Scientific Committee.

TSSC 2020, Falco hypoleucos (Grey Falcon) Conservation Advice, Threatened Species Scientific Committee.

WLLS 2017, Western Regional Strategic Weed Management Plan 2017-2022. Western Local Land Services, Balranald.



Appendix A

Vegetation integrity assessment field datasheets

BAM Site – Field Survey Form

Plot ID:	MW433_1	**Date:**	10/12/20	**Project number:**	J200919	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	746,970	**Recorders:**	Phil Cameron		
Zone:	54	**Northing:**	6,606,377	**IBRA region:**		**Midline bearing:**	315
Plant Community Type:		153: Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion		**Condition class:**	Disturbed	**PCT confidence:**	high
Vegetation Class:		Aeolian Chenopod Shrublands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	5
	Grasses etc.:	1
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.32
	Grasses etc.:	0.01
	Forbs:	1.2
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	0	1	0	2	2
Average litter cover (%):	1				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

All lot and DP (excluding tracks and disturbed areas) are the one zone. Widespsread historic surface disturbance having an intermittent/patchy effect to A/B horizon

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J200919				
Recorders:	Phil Cameron	**Plot ID:**	MW433_1	**Date:**	10/12/20

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Atriplex leptocarpa (Slender-fruit Saltbush)*	0.01	1		N
Forb (FG)	*Hyalosperma semisterile*	0.1	100		N
Shrub (SG)	*Maireana pyramidata (Black Bluebush)*	0.01	10		N
Forb (FG)	*Rhodanthe floribunda (Common White Sunray)*	1	100		N
Grass & grasslike (GG)	*Rytidosperma caespitosum (Ringed Wallaby Grass)*	0.01	1		N
Shrub (SG)	*Sclerolaena constricta*	0.1	10		N
Shrub (SG)	*Sclerolaena decurrens (Green Copperburr)*	0.1	100		N
Shrub (SG)	*Sclerolaena divaricata (Tangled Copperburr)*	0.1	100		N
Forb (FG)	*Triptilodiscus pygmaeus (Common Sunray)*	0.1	100		N

BAM Site – Field Survey Form

Plot ID:	MW433_2	**Date:**	10/12/20	**Project number:**	J200919	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	746,773	**Recorders:**	Phil Cameron		
Zone:	54	**Northing:**	6,606,144	**IBRA region:**		**Midline bearing:**	314
Plant Community Type:		153: Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion		**Condition class:**	Disturbed	**PCT confidence:**	high
Vegetation Class:		Aeolian Chenopod Shrublands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	6
	Grasses etc.:	1
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	2.22
	Grasses etc.:	0.01
	Forbs:	2.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	
80 + cm:			
50 – 79 cm:			
30 – 49 cm:			
20 – 29 cm:		Tree hollow count	
10 – 19 cm:			
5 – 9 cm:			
< 5 cm:			

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	0	2	5	1	5
Average litter cover (%):	2.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Less general surface disturbance than plot 1. Plot is representative of variation across the zone.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J200919				
Recorders:	Phil Cameron	**Plot ID:**	MW433_2	**Date:**	10/12/20

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Atriplex leptocarpa (Slender-fruit Saltbush)*	0.1	200		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	0.01	10		N
Forb (FG)	*Hyalosperma semisterile*	1	500		N
Shrub (SG)	*Maireana pyramidata (Black Bluebush)*	0.01	1		N
Forb (FG)	*Rhodanthe floribunda (Common White Sunray)*	1	1000		N
Shrub (SG)	*Sclerolaena constricta*	0.1	100		N
Shrub (SG)	*Sclerolaena decurrens (Green Copperburr)*	1	100		N
Shrub (SG)	*Sclerolaena divaricata (Tangled Copperburr)*	1	100		N
Shrub (SG)	*Sclerolaena longicuspis*	0.01	10		N
Forb (FG)	*Solanum esuriale (Quena)*	0.1	150		N

BAM Site – Field Survey Form

Plot ID:	MW433_3	**Date:**	10/12/20	**Project number:**	J200919	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	746,780	**Recorders:**	Phil Cameron		
Zone:	54	**Northing:**	6,606,305	**IBRA region:**		**Midline bearing:**	5
Plant Community Type:		153: Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion		**Condition class:**	Disturbed	**PCT confidence:**	high
Vegetation Class:		Aeolian Chenopod Shrublands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	8
	Grasses etc.:	0
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	2.43
	Grasses etc.:	0
	Forbs:	0.21
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	1	3	5	3
Average litter cover (%):	2.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

See plots 1 and 2 for general comments. This plot selected as it had woody shrubs. Representative of this variation in the PCT in the lot and DP

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J200919				
Recorders:	Phil Cameron	**Plot ID:**	MW433_3	**Date:**	10/12/20

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Acacia tetragonophylla (Dead Finish)*	0.1	1		N
Shrub (SG)	*Atriplex leptocarpa (Slender-fruit Saltbush)*	0.01	100		N
Shrub (SG)	*Eremophila longifolia (Emubush)*	2	60		N
Forb (FG)	*Hyalosperma semisterile*	0.1	1000		N
Shrub (SG)	*Rhagodia spinescens (Thorny Saltbush)*	0.1	10		N
Forb (FG)	*Rhodanthe floribunda (Common White Sunray)*	0.1	1000		N
Shrub (SG)	*Sclerolaena constricta*	0.1	500		N
Shrub (SG)	*Sclerolaena decurrens (Green Copperburr)*	0.01	10		N
Shrub (SG)	*Sclerolaena divaricata (Tangled Copperburr)*	0.1	200		N
Shrub (SG)	*Sclerolaena longicuspis*	0.01	20		N
Forb (FG)	*Solanum esuriale (Quena)*	0.01	10		N

BAM Site – Field Survey Form

Plot ID:	MW880_1	**Date:**	08/12/20	**Project number:**	J200919	**Plot dimensions:**	20x50m
Datum:	GDA94	**Easting:**	502,881	**Recorders:**	Phil Cameron		
Zone:	55	**Northing:**	6,305,660	**IBRA region:**		**Midline bearing:**	70
Plant Community Type:		72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion		**Condition class:**	Derived grassland	**PCT confidence:**	high
Vegetation Class:		Western Peneplain Woodlands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	1
	Grasses etc.:	5
	Forbs:	10
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.1
	Grasses etc.:	16.5
	Forbs:	6.01
	Ferns:	0
	Other:	0
High Threat Weed cover:		5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	3	5	5	5
Average litter cover (%):	4.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Representative of area assessed

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J200919				
Recorders:	Phil Cameron	**Plot ID:**	MW880_1	**Date:**	08/12/20

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Aristida behriana (Bunch Wiregrass)*	5	600	no	N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	5	400	no	N
Grass & grasslike (GG)	*Austrostipa scabra (Speargrass)*	5	400	no	N
	Avena spp. (Oats)	2	500	no	E
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	1	200	no	N
	Carthamus lanatus (Saffron Thistle)	5	400	no	HTE
Forb (FG)	*Chamaesyce drummondii (Caustic Weed)*	0.1	100	no	N
Forb (FG)	*Chamaesyce drummondii (Caustic Weed)*	0.1	200	no	N
	Convolvulus arvensis (Field Bindweed)	15	3000	no	E
Grass & grasslike (GG)	*Digitaria brownii (Cotton Panic Grass)*	0.5	200	no	N
	Echium plantagineum (Patterson's Curse)	3	200	no	E
Forb (FG)	*Goodenia pinnatifida (Scrambles Eggs)*	0.5	400	no	N
Forb (FG)	*Maireana enchylaenoides (Wingless Fissure-weed)*	0.01	2	no	N
Grass & grasslike (GG)	*Panicum simile (Two-colour Panic)*	1	200	no	N
Forb (FG)	*Scaevola aemula (Fairy Fan-flower)*	0.1	100	no	N
Shrub (SG)	*Sclerolaena diacantha (Grey Copperburr)*	0.1	100	no	N
Forb (FG)	*Sida corrugata (Corrugated Sida)*	3	300	no	N
Forb (FG)	*Solanum esuriale (Quena)*	0.1	100	no	N
	Trifolium arvense (Haresfoot Clover)	3	500		E
Forb (FG)	*Vittadinia cuneata var. cuneata (A Fuzzweed)*	1	400	no	N
Forb (FG)	*Wahlenbergia stricta (Tall Bluebell)*	0.1	200	no	N

BAM Site – Field Survey Form

Plot ID:	MW880_2	**Date:**	08/12/20	**Project number:**	J200919	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	502,964	**Recorders:**	Phil Cameron		
Zone:	55	**Northing:**	6,305,644	**IBRA region:**		**Midline bearing:**	75
Plant Community Type:		72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion		**Condition class:**	Derived grassland	**PCT confidence:**	high
Vegetation Class:		Western Peneplain Woodlands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	7
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	14.8
	Forbs:	14.5
	Ferns:	0
	Other:	0
High Threat Weed cover:		15

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	5	5	8	5	3
Average litter cover (%):	5.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Representative of area. Randonly selected

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J200919				
Recorders:	Phil Cameron	**Plot ID:**	MW880_2	**Date:**	08/12/20

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Aristida behriana (Bunch Wiregrass)*	5	600	no	N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	1	200	no	N
Grass & grasslike (GG)	*Austrostipa scabra (Speargrass)*	5	400	no	N
	Avena spp. (Oats)	2	300	no	E
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	1	200	no	N
	Carthamus lanatus (Saffron Thistle)	15	1000	no	HTE
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	1	250	no	N
	Convolvulus arvensis (Field Bindweed)	15	5000	no	E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	20	no	N
Grass & grasslike (GG)	*Digitaria brownii (Cotton Panic Grass)*	2	300	no	N
	Echium plantagineum (Patterson's Curse)	0.1	50	no	E
	Modiola caroliniana (Red-flowered Mallow)	0.1	30	no	E
Grass & grasslike (GG)	*Panicum simile (Two-colour Panic)*	0.8	200	no	N
	Salvia verbenaca (Vervain)	0.1	50	no	E
Forb (FG)	*Scaevola aemula (Fairy Fan-flower)*	0.3	200	no	N
Forb (FG)	*Sida corrugata (Corrugated Sida)*	3	400	no	N
Forb (FG)	*Solanum esuriale (Quena)*	5	1000	no	N
	Sonchus oleraceus (Common Sowthistle)	0.1	20	no	E
	Trifolium arvense (Haresfoot Clover)	5	400	no	E
Forb (FG)	*Vittadinia cuneata var. cuneata (A Fuzzweed)*	5	1000	no	N
Forb (FG)	*Wahlenbergia stricta (Tall Bluebell)*	0.1	50	no	N

BAM Site – Field Survey Form

Plot ID:	MW880_3	**Date:**	08/12/20	**Project number:**	J200919	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	503,077	**Recorders:**	Phil Cameron		
Zone:	55	**Northing:**	6,305,617	**IBRA region:**		**Midline bearing:**	10
Plant Community Type:		72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion		**Condition class:**	Derived grassland	**PCT confidence:**	high
Vegetation Class:		Western Peneplain Woodlands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	3
	Grasses etc.:	5
	Forbs:	7
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.03
	Grasses etc.:	43
	Forbs:	11.62
	Ferns:	0
	Other:	0
High Threat Weed cover:		5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	7	20	5	10	10
Average litter cover (%):	10.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Representative of area affected. Randomly selected.

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J200919				
Recorders:	Phil Cameron	**Plot ID:**	MW880_3	**Date:**	08/12/20

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Aristida behriana (Bunch Wiregrass)*	5	400	no	N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	1	200	no	N
Shrub (SG)	*Atriplex spp. (A Saltbush)*	0.01	20	no	N
Grass & grasslike (GG)	*Austrostipa scabra (Speargrass)*	10	1000	no	N
	Avena spp. (Oats)	2	400	no	E
	Carthamus lanatus (Saffron Thistle)	5	400	no	HTE
Forb (FG)	*Chamaesyce drummondii (Caustic Weed)*	0.5	200		N
	Convolvulus arvensis (Field Bindweed)	10	1000	no	E
	Echium plantagineum (Patterson's Curse)	0.1	50	no	E
Grass & grasslike (GG)	*Enteropogon acicularis (Curly Windmill Grass)*	2	400	no	N
Forb (FG)	*Goodenia pinnatifida (Scrambles Eggs)*	0.01	80	no	N
Shrub (SG)	*Maireana microphylla (Small-leaf Bluebush)*	0.01	1		N
Grass & grasslike (GG)	*Panicum simile (Two-colour Panic)*	25	5000	no	N
	Salvia verbenaca (Vervain)	0.1	200	no	E
Shrub (SG)	*Sclerolaena muricata (Black Rolypoly)*	0.01	10	no	N
Forb (FG)	*Sida corrugata (Corrugated Sida)*	1	200	no	N
Forb (FG)	*Sida cunninghamii (Ridge Sida)*	5	1000	no	N
Forb (FG)	*Solanum esuriale (Quena)*	0.1	200	no	N
	Trifolium arvense (Haresfoot Clover)	5	1000		E
Forb (FG)	*Vittadinia cuneata (A Fuzzweed)*	5	1000	no	N
Forb (FG)	*Wahlenbergia stricta (Tall Bluebell)*	0.01	50		N

BAM Site – Field Survey Form

Plot ID:	MW880_4	**Date:**	24/05/21	**Project number:**	J200919	**Plot dimensions:**	10x100
Datum:	GDA94	**Easting:**	502,717	**Recorders:**	JB CK		
Zone:	55	**Northing:**	6,305,732	**IBRA region:**		**Midline bearing:**	100
Plant Community Type:		72: White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion		**Condition class:**	Moderate	**PCT confidence:**	high
Vegetation Class:		Western Peneplain Woodlands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	5
	Grasses etc.:	6
	Forbs:	9
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	2
	Shrubs:	16.2
	Grasses etc.:	0.65
	Forbs:	10.4
	Ferns:	0
	Other:	0.02
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	3
80 + cm:	0		
50 – 79 cm:	3		
30 – 49 cm:	5		
20 – 29 cm:	2	**Tree hollow count**	3
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	40	10	5	20	5
Average litter cover (%):	16				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Road side verge

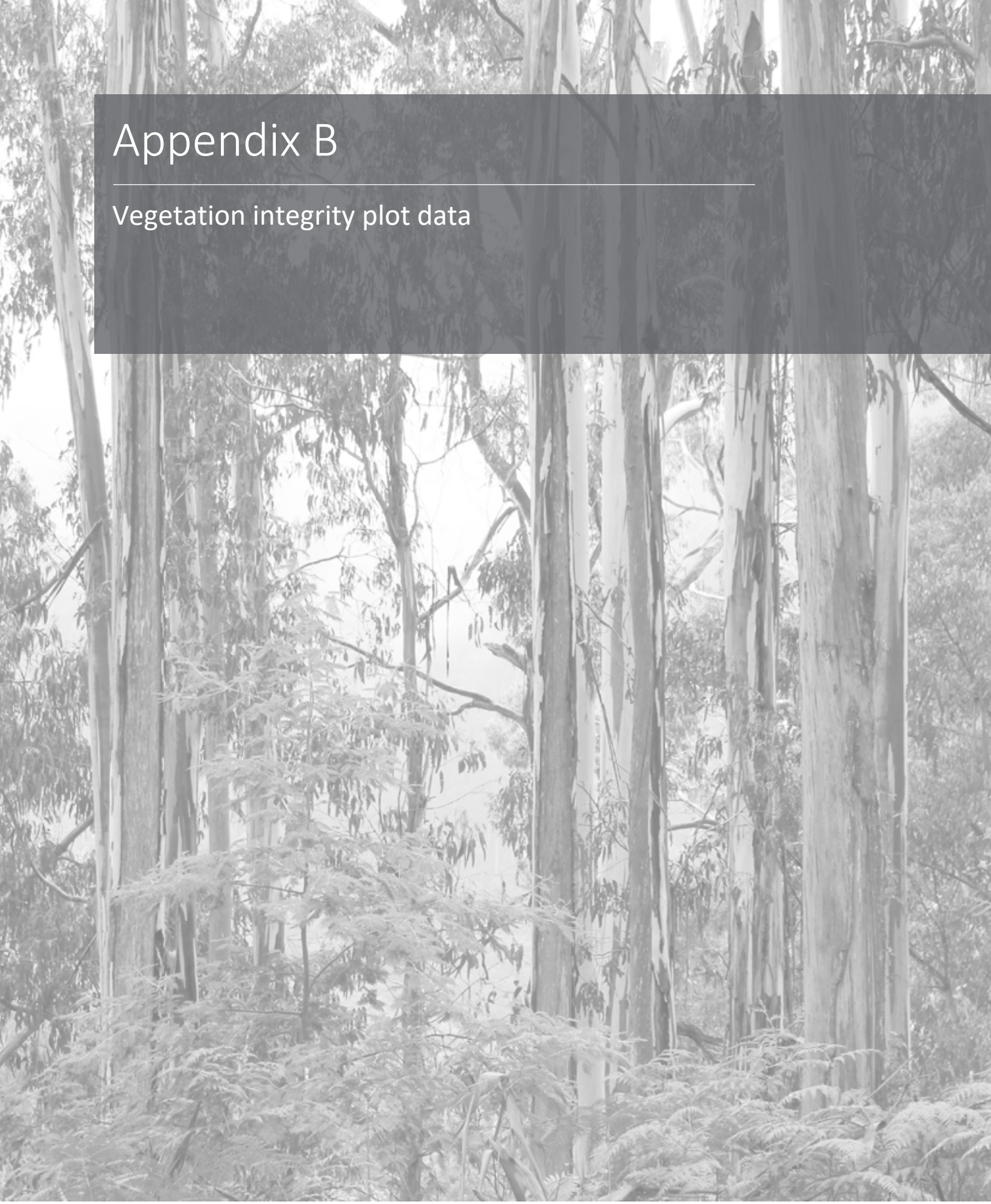
Plot Disturbance

Road side edge effect

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J200919				
Recorders:	JB CK	**Plot ID:**	MW880_4	**Date:**	24/05/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Acacia dealbata (Silver Wattle)*	1	10		N
Shrub (SG)	*Atriplex nummularia (Old Man Saltbush)*	0.5	300		N
Grass & grasslike (GG)	*Austrostipa scabra (Speargrass)*	0.05	50		N
Grass & grasslike (GG)	*Austrostipa verticillata (Slender Bamboo Grass)*	0.05	50		N
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	5	200		N
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	0.01	10		N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	5	300		N
Other (OG)	*Convolvulus erubescens (Pink Bindweed)*	0.01	10		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.01	10		E
Grass & grasslike (GG)	*Digitaria brownii (Cotton Panic Grass)*	0.01	10		N
Forb (FG)	*Einadia nutans subsp. nutans (Climbing Saltbush)*	0.1	10		N
Shrub (SG)	*Eremophila mitchellii (Budda)*	0.1	3		N
Tree (TG)	*Eucalyptus microcarpa (Western Grey Box)*	1	1		N
Other (OG)	*Glycine canescens (Silky Glycine)*	0.01	10		N
Forb (FG)	*Goodenia cycloptera (Cut-leaf Goodenia)*	0.01	10		N
Forb (FG)	*Goodenia glabra (Smooth Goodenia)*	0.05	50		N
Forb (FG)	*Goodenia pinnatifida (Scrambles Eggs)*	0.01	10		N
Forb (FG)	*Minuria leptophylla*	0.1	50		N
	Modiola caroliniana (Red-flowered Mallow)	0.05	100		E
	Oxalis incarnata	0.1	500		E
Grass & grasslike (GG)	*Panicum simile (Two-colour Panic)*	0.5	500		N
Grass & grasslike (GG)	*Rytidosperma setaceum (Small-flowered Wallaby-grass)*	0.03	50		N
Shrub (SG)	*Sclerolaena diacantha (Grey Copperburr)*	0.5	300		N
Shrub (SG)	*Senna artemisioides <--> zygophylla*	15	30		N
Forb (FG)	*Sida cunninghamii (Ridge Sida)*	0.03	200		N
Shrub (SG)	*Sida petrophila*	0.1	200		N
Forb (FG)	*Vittadinia cuneata (A Fuzzweed)*	0.1	50		N

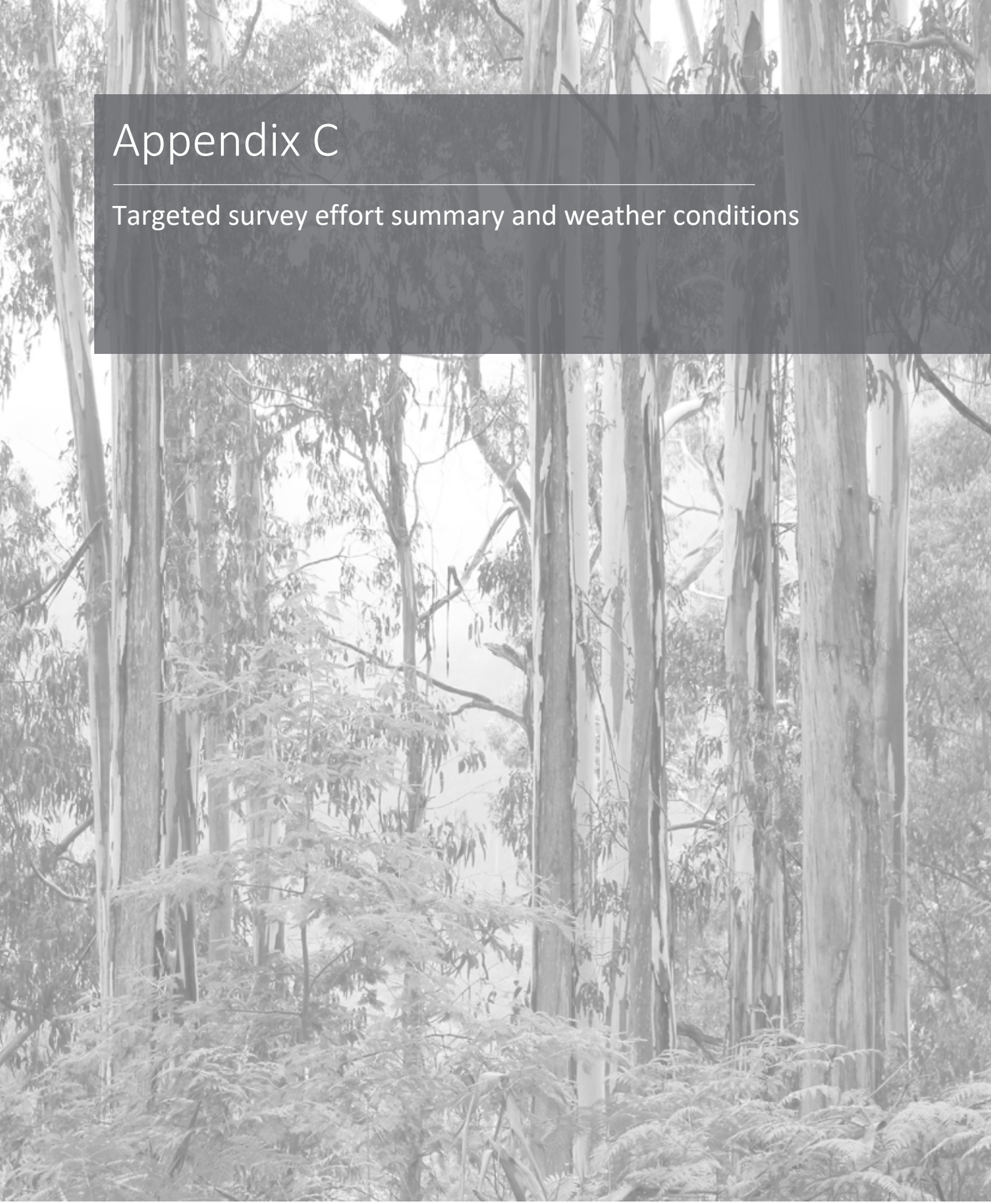


Appendix B

Vegetation integrity plot data

Table B.1 Vegetation integrity data

plot	zone	easting	northing	bearing	Comp Tree	Comp Shrub	Comp Grass	Comp Forbs	Comp Ferns	Comp Other	Struc Tree	Struc Shrub	Struc Grass	Struc Forbs	Struc Ferns	Struc Other	Fun Large Trees	Fun Hollow trees	Fun Litter Cover	Fun Len Fallen Logs	Fun Tree Stem 5 to 9	Fun Tree Stem 10 to 19	Fun Tree Stem 20 to 29	Fun Tree Stem 30 to 49	Fun Tree Stem 50 to 79	Fun Tree Regen	Fun High Threat Exotic
MW433_1	54	746970	6606377	315	0	5	1	3	0	0	0.0	0.3	0.0	1.2	0.0	0.0	0	0	1.0	0.0	0	0	0	0	0	0	0.0
MW433_3	54	746780	6606305	5	0	8	0	3	0	0	0.0	2.4	0.0	0.2	0.0	0.0	0	0	2.8	0.0	0	0	0	0	0	0	0.0
MW433_2	54	746773	6606144	314	0	6	1	3	0	0	0.0	2.2	0.0	2.1	0.0	0.0	0	0	2.6	0.0	0	0	0	0	0	0	0.0
MW880_1	55	502881	6305660	70	0	1	5	10	0	0	0.0	0.1	16.5	6.0	0.0	0.0	0	0	4.6	0.0	0	0	0	0	0	0	5.0
MW880_2	55	502964	6305644	75	0	0	6	7	0	0	0.0	0.0	14.8	14.5	0.0	0.0	0	0	5.2	0.0	0	0	0	0	0	0	15.0
MW880_3	55	503077	6305617	10	0	3	5	7	0	0	0.0	0.0	43.0	11.6	0.0	0.0	0	0	10.4	0.0	0	0	0	0	0	0	5.0
MW880_4	55	502,717	6305732	100	2	5	6	9	0	2	2.0	16.2	0.7	10.4	0.0	0.0	8	3	16.0	3.0	0	0	1	1	1	0	0.0

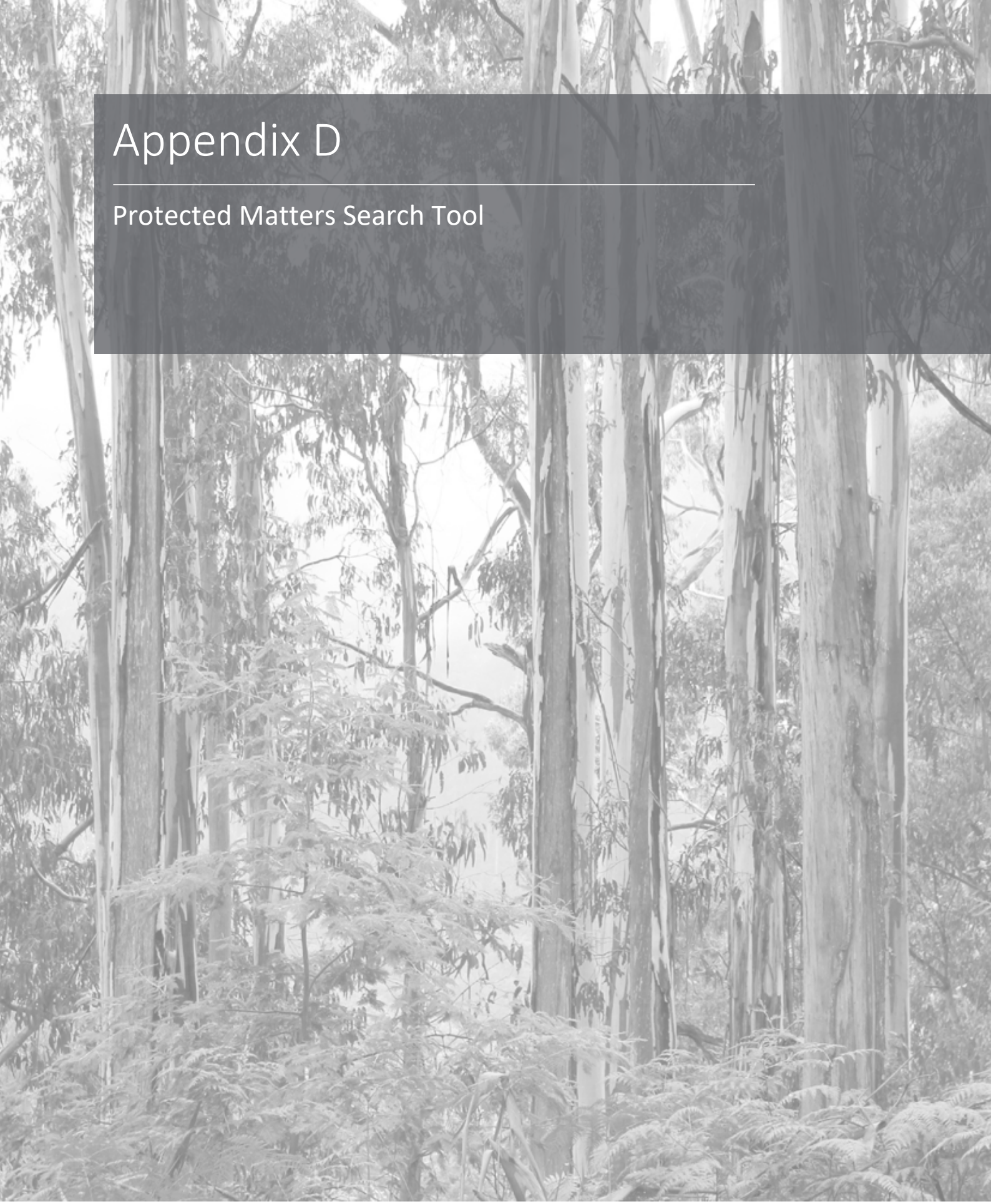


Appendix C

Targeted survey effort summary and weather conditions

Table C.1 Survey effort and weather conditions summary

Survey type	Site	Surveyors	Date	Min Temp (°C)	Max Temp (°C)	Rain (mm)	Max wind direction	Max wind speed (km/hr)
Koala SAT	MW880	Cassandra Kottaras, Jason Brown	24/05/2021	2.4	22.6	0	NE	28
Flora transects	MW433	Phil Cameron	10/12/2020	18.0	34.1	0	-	-
Flora transects	MW880	Phil Cameron	8/12/2020	8.0	24.5	0	SW	44



Appendix D

Protected Matters Search Tool

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

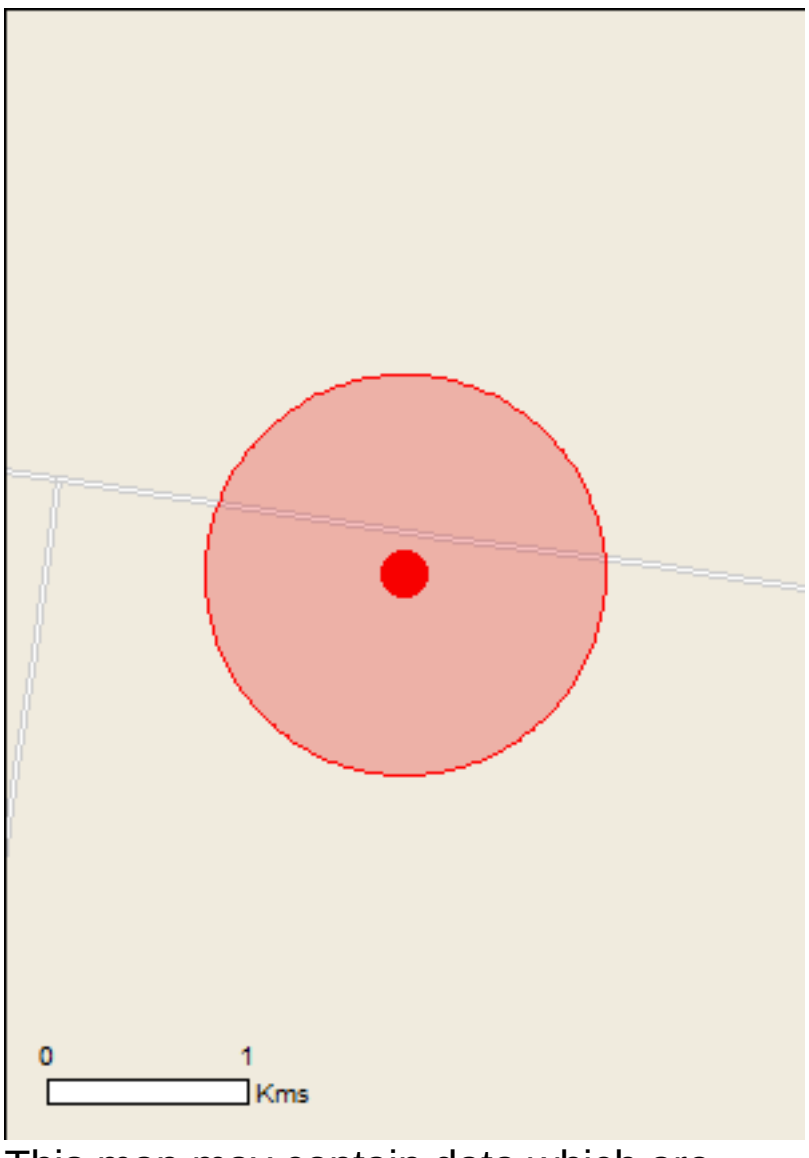
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/06/21 09:51:31

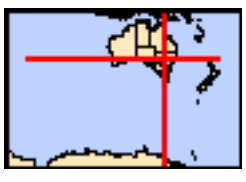
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	8
Listed Threatened Species:	18
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	12
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	600 - 700km upstream
Hattah-kulkyne lakes	400 - 500km upstream
Riverland	500 - 600km upstream
The coorong, and lakes alexandrina and albert wetland	700 - 800km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pedionomus torquatus		
Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Austrostipa wakoolica		
[66623]	Endangered	Species or species habitat likely to occur within area
Lepidium monoplocoides		
Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Tylophora linearis		
[55231]	Endangered	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans		
Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.38963 147.03225

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

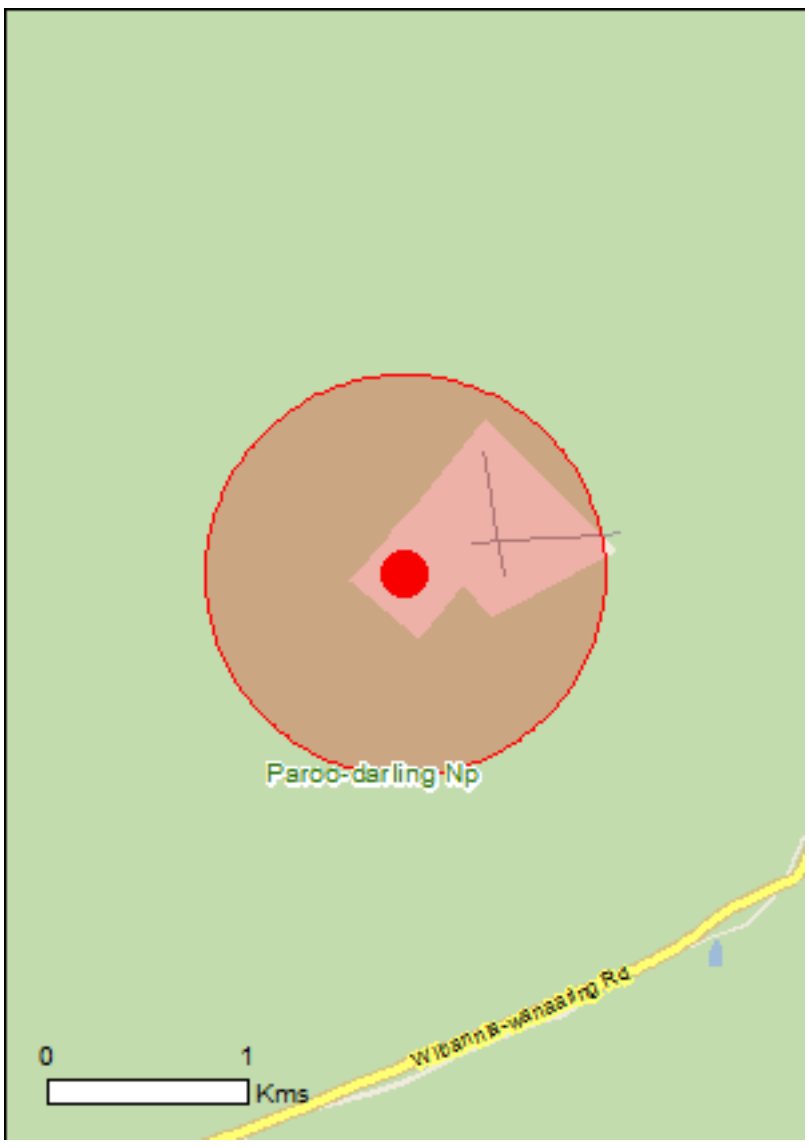
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/06/21 09:41:46

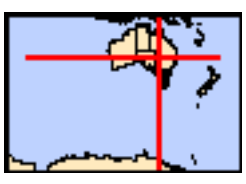
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	8
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	12
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	10
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	400 - 500km upstream
Paroo river wetlands	Within Ramsar site
Riverland	400 - 500km upstream
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Amytornis modestus Thick-billed Grasswren [84121]	Vulnerable	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Plants		
Atriplex infrequens [4143]	Vulnerable	Species or species habitat may occur within area
Frankenia plicata [4225]	Endangered	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		

Name	Threatened	Type of Presence
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian & Overseas Telecommunications Corporation

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans		
Black-eared Cuckoo [705]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Paroo-Darling	NSW

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-30.6512 143.57536

Acknowledgements

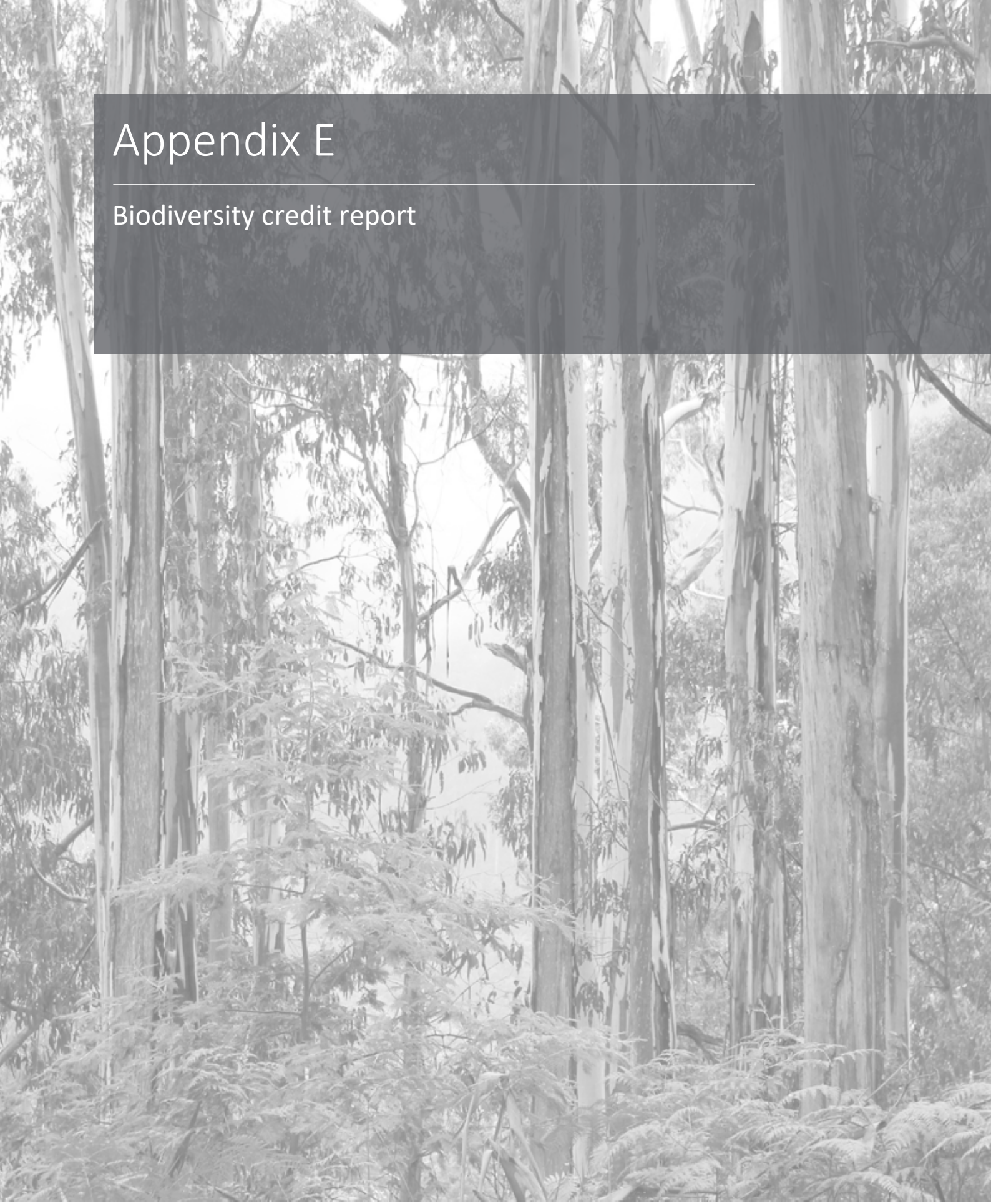
This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111



Appendix E

Biodiversity credit report

BAM Credit Summary Report

Proposal Details

Assessment Id
00026165/BAAS17037/21/00026166

Proposal Name
APA East Coast Grid Expansion Mod 1 - MW433

BAM data last updated *
10/06/2021

Assessor Name
Nathan Garvey

Report Created
18/06/2021

BAM Data version *
45

Assessor Number
BAAS17037

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones											
1	153_Disturbed	Not a TEC	8	4.4	6.3			High Sensitivity to Potential Gain	1.50		0
										Subtotal	**0**
										Total	**0**

BAM Credit Summary Report

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Antaresia stimsoni / Stimson's Python (Fauna)								
153_Disturbed	4.4	4.4	6.3	Vulnerable	Not Listed	2	False	14
							Subtotal	**14**
Ardeotis australis / Australian Bustard (Fauna)								
153_Disturbed	4.4	4.4	6.3	Endangered	Not Listed	2	False	14
							Subtotal	**14**
Atriplex infrequens / A saltbush (Flora)								
153_Disturbed	4.4	4.4	6.3	Vulnerable	Vulnerable	2	False	14
							Subtotal	**14**
Lucasium stenodactylum / Crowned Gecko (Fauna)								
153_Disturbed	4.4	4.4	6.3	Vulnerable	Not Listed	2	False	14
							Subtotal	**14**

BAM Credit Summary Report

Proposal Details

Assessment Id
00026165/BAAS17037/21/00026176

Proposal Name
APA East Coast Grid Expansion Mod 1 - MW880

BAM data last updated *
10/06/2021

Assessor Name
Nathan Garvey

Report Created
18/06/2021

BAM Data version *
45

Assessor Number
BAAS17037

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

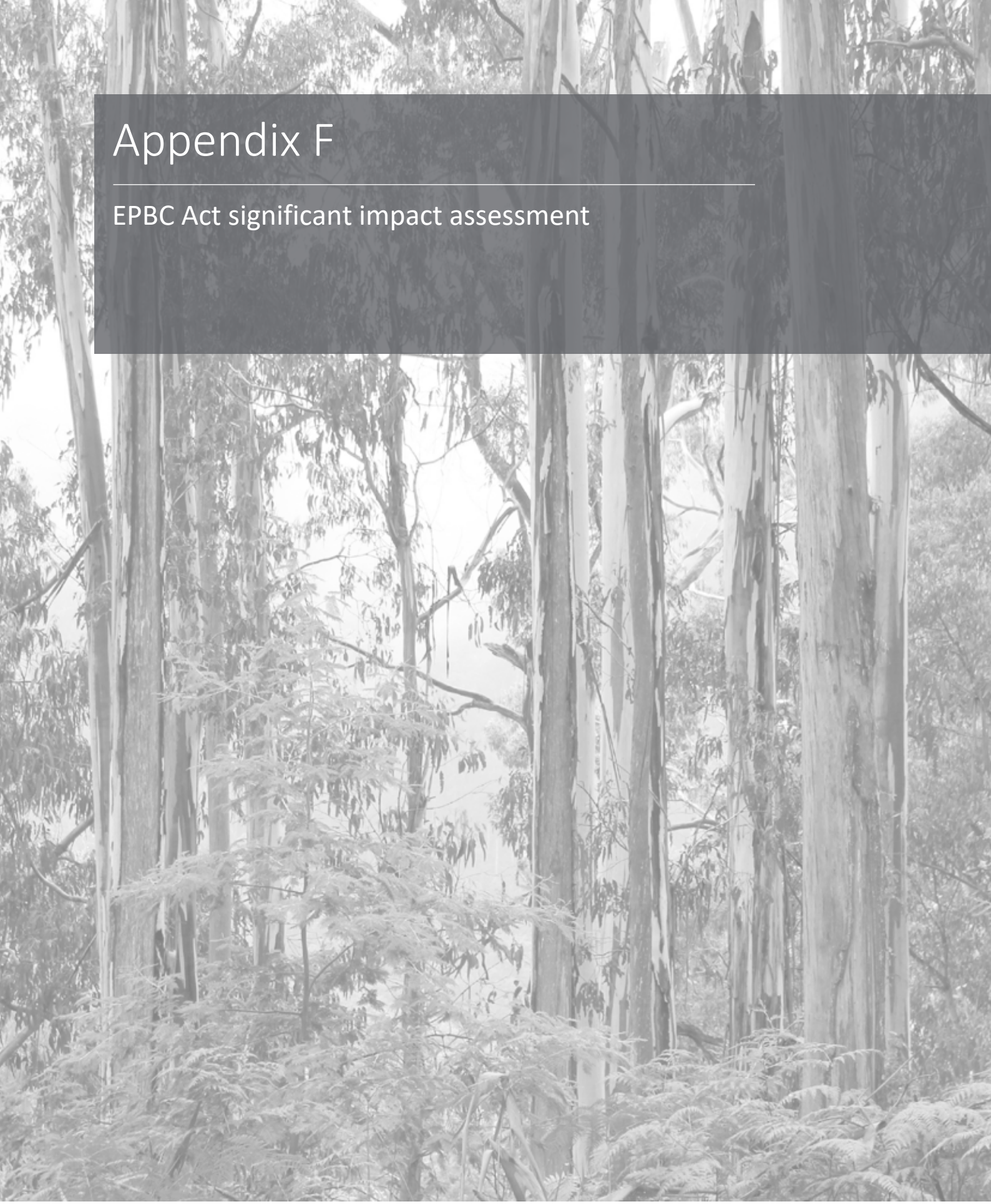
Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion											
1	72_DNG	Not a TEC	12.3	7.9	1.2			Moderate Sensitivity to Potential Gain	1.25		0
										Subtotal	**0**
										Total	**0**

BAM Credit Summary Report

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Austrostipa metatoris / A spear-grass (Flora)								
72_DNG	7.7	7.7	1.2	Vulnerable	Vulnerable	2	False	5
							Subtotal	**5**
Diuris tricolor / Pine Donkey Orchid (Flora)								
72_DNG	7.7	7.7	1.2	Vulnerable	Not Listed	1.5	False	4
							Subtotal	**4**
Polytelis swainsonii / Superb Parrot (Fauna)								
72_DNG	7.7	7.7	0.27	Vulnerable	Vulnerable	2	False	1
							Subtotal	**1**
Swainsona sericea / Silky Swainson-pea (Flora)								
72_DNG	7.7	7.7	1.2	Vulnerable	Not Listed	2	False	5
							Subtotal	**5**



Appendix F

EPBC Act significant impact assessment

F.1 Atriplex infrequens

EPBC Act – vulnerable; BC Act – vulnerable.

The Commonwealth Conservation Advice for *Atriplex infrequens* (TSSC 2008) describes the conservation status, distribution, habitat, and threats to the survival of *A. infrequens*. This species occurs within the northern and southern far western plains regions of western NSW.

A. infrequens is associated with broad drainage tracts, clay flats, and potentially occasionally inundated habitats. Due to a lack of ecological information about this species, critical habitat components are broadly assumed to be relatively undisturbed and ungrazed drainage lines and flats.

The main threats to *A. infrequens* include broad-scale habitat clearing, increasing fragmentation, loss of remnant vegetation, disturbance from rabbits, and overgrazing.

While this species was not observed during field surveys, it is associated with PCT 153 (Black Bluebush low open shrubland of the alluvial plains and sandplains). Therefore, potential habitat exists for this species at MW433.

Table F.1 provides an assessment of significance for the removal of up to 3.22 ha of predicted *A. infrequens* habitat within MW433, in accordance with the assessment criteria for vulnerable species (Department of the Environment (DoE) 2013).

Table F.1 Assessment of significance for *Atriplex infrequens*

Criteria	Discussion
1. Long-term decrease of an important population	A recovery plan has not been developed for *A. infrequens* and important populations have not been defined. As described in DoE (2013) an important population can include populations that are near the limit of the species range. The species was assumed present within MW433, located within the species predicted distribution range within the region. *Atriplex infrequens* has been recorded further north west, east of Tibooburra on the NSW border. Given the species has been assumed present within sub-optimal habitat and is located within a predicted distribution range it is unlikely the predicted population is considered an important population.
2. Reduce occupancy area for important population	As per above, the predicted population of *A. infrequens* is not considered an important population. The modification will result in the removal of 3.22 ha of habitat for the species. The disturbance footprint is located within a large landscape of similar vegetation. Given the vegetation to be impacted is considered sub-optimal and the remaining habitat within the locality it is unlikely the modification will result in a significant reduction of habitat for *A. infrequens*.
3. Fragment an important population	As per above, the predicted population of *A. infrequens* is not considered an important population. MW433 is located within a highly disturbed landscape with existing infrastructure from the APA pipeline. The modification will include the construction of temporary infrastructure such as a wastewater treatment spray field and temporary accommodation camp, as well as permanent infrastructure such as compressor station compound and vent stack. Temporary infrastructure will be decommissioned, and areas rehabilitated. Given this it is unlikely the modification will result in significant fragmentation of the species habitat.
4. Adversely affect habitat critical to survival	Habitat critical to the survival of this species has been outlined in the Approved Conservation Advice (TSSC 2008) as relatively undisturbed and ungrazed drainage lines and flats. Assumed habitat *for A. infrequens* at MW433 is all of PCT 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones. This vegetation was mapped as 'disturbed' condition, having experience historical clearing for the APA pipeline and grazing pressures from pest species such as the Goat and the Rabbit. Vegetation within MW433 is considered sub-optimal for the species and therefore is not considered habitat critical to the survival of the species.

Table F.1 Assessment of significance for *Atriplex infrequens*

Criteria	Discussion
5. Disrupt breeding cycle of an important population	As per above, the predicted population of *A. infrequens* is not considered an important population. Little information is known about the ecology of *A. infrequens* including how the species pollinates.
6. Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The modification will involve the removal of up to 3.22 ha of potential habitat for this species. The modification has the potential to result in indirect impacts to retained habitat including weed invasion and/or increase in abundance of pest species such as the Goat, the Pig and the Rabbit. Controls have been implemented to minimise these impacts. Considering the extent of habitat adjacent to remain within the locality it is unlikely the modification will result in a significant decrease of availability of habitat to the extent that the species is likely to decline.
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The modification has the potential to result in the introduction of weed species. Similarly, the modification may also result in an increase of pest species such as the Goat, the Rabbit and/or the Pig. These species cause degradation to habitat and high grazing pressures to native vegetation. Known threats to *A. infrequens* include weed invasion by *Prosopis* spp. and disturbance and grazing from rabbits (TSSC 2008). Prior to construction, it is proposed weed controls will be implemented where possible. During the clearing works appropriate disposal and management of weeds will be implemented to stop the spread of existing weed species. Wash down stations will be constructed at suitable locations to stop the spread of weeds and introduction of new species. In addition, mitigation measures such as appropriate storing of waste will be implemented to reduce the risk of increased pest species. Based on the proposed mitigation measures it is not expected the modification will result in a significant increase of invasive species.
8. Introduce disease	There are no known diseases associated with *A. infrequens*. Hygiene protocols such as washdown of all vehicles, machinery and equipment prior to entering the site will be implemented to minimise the potential for introduction or spread of pathogens.
9. Interfere with recovery	No recovery plan has been developed for this species. The Approved Conservation Advice (TSSC 2008) lists a variety of priority actions for recovery and threat abatement. Local priority actions include minimising habitat loss, disturbance, and modification, and weed, pest and stock management. Detailed design has focused on reducing impacts to native vegetation where possible. Although the modification has the potential to result in indirect impacts causing soil disturbance and introduction of weeds and pests, mitigation measures listed in Table 8.2 will be implemented. Therefore, the modification is not expected to interfere with species recovery.
Conclusion	The modification will not have a significant impact on *A. infrequens* as: • direct impacts will occur to 3.22 ha of predicted habitat for the *A. infrequens*; • important populations will not be adversely affected; • the works are not likely to have a significant impact on important populations size, area or increase isolation of these species; and • mitigation measures to control weeds and pests are proposed.

F.2 Grey Falcon

EPBC Act – vulnerable; BC Act – vulnerable.

The Commonwealth Conservation Advice for the Grey Falcon (TSSC 2020) describes the conservation status, distribution, biology/ecology and threats to the survival of the Grey Falcon.

The Grey Falcon is an elusive species that occurs in arid and semi-arid Australia, mainly where annual rainfall is less than 500 mm. The species prefers timbered lowland plains, particularly acacia shrublands crossed by tree-lined watercourses. It has also been observed hunting in treeless areas, tussock grassland and open woodland, particularly in winter (TSSC 2020).

The Grey Falcon preys on birds, reptiles and mammals. The species is known to utilise old nests of other birds of prey and ravens, usually high in a living Eucalypt near water or a watercourse. The species usually lays two or three eggs during late winter and early spring (TSSC 2020).

The study area contains grassland and open shrubland suitable for foraging.

Table F.2 provides an assessment of significance for the removal of up to 3.97 ha of foraging habitat for the Grey Falcon, in accordance with the assessment criteria for vulnerable species (DoE 2013).

Table F.2 Assessment of significance for the Grey Falcon

Criteria	Discussion
1. Long-term decrease of an important population	A recovery plan has not been developed for the Grey Falcon and therefore important populations have not been defined. As described in DoE (2013) an important population can include populations that are near the limit of the species range. The species was assumed present within MW433 and MW880 and located within the species known distribution range. The Grey Falcon is sparsely distributed in NSW, occurring in arid and semi-arid Australia, including Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. Given the species has been assumed present within sub-optimal habitat and is not located on the edge of the species range it is unlikely the predicted population is an important population.
2. Reduce occupancy area for an important population	As per above, the predicted population of the Grey Falcon is not considered an important population. The modification will result in the removal of 3.97 ha of foraging habitat for the species. The disturbance footprint is located within a large landscape of similar vegetation. Given the vegetation to be impacted is considered sub-optimal and the remaining foraging habitat within the locality it is unlikely the modification will result in a significant reduction of foraging habitat for the Grey Falcon.
3. Fragment an important population	As per above, the predicted population of the Grey Falcon is not considered an important population. The study areas are located within a highly disturbed landscape with existing infrastructure from the APA pipeline. The modification will include the construction of temporary infrastructure such as a wastewater treatment spray field and temporary accommodation camp, as well as permanent infrastructure such as compressor station compound and vent stack. Temporary infrastructure will be decommissioned, and areas rehabilitated. Given the species can fly across the site it is unlikely the modification will result in significant fragmentation of the species habitat.
4. Adversely affect habitat critical to survival	Habitat critical to the survival of the Grey Falcon has not been described. The impact area contains suitable foraging habitat for the species. No breeding habitat is present. Given the extent of remaining habitat withing the locality and no nests being removed, it is unlikely the modification results in adverse effects of the Grey Falcon critical to its survival.
5. Disrupt breeding cycle of an important population	This species lays eggs in old nests of other birds, usually in the tallest trees along watercourses, but also sometimes telecommunication towers. No suitable breeding habitat is present within the study area. Therefore, the modification will not disrupt the breeding cycle of this species.
6. Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The modification will remove up to 3.97 ha of potential foraging habitat for Grey Falcon. The study area does not contain suitable breeding habitat. The species has a widespread distribution across mainland Australia including, but not limited to, the Murray-Darling Basin, Eyre Basin, central Australia, and Western Australia. The removal of foraging habitat will not substantially reduce the national extent of this species.

Table F.2 Assessment of significance for the Grey Falcon

Criteria	Discussion
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Threats impacting the Grey Falcon include predation by the Cat and grazing by exotic herbivores leading to the degradation of habitat, preventing regeneration of suitable nest trees and reducing prey abundance (TSSC 2020). The modification has the potential to result in an increase and/or introduction of pest species such as the Goat, the Rabbit, the Pig, the Cat and the Red Fox. Exotic herbivore species cause degradation to habitat and high grazing pressures to native vegetation. Predator species such as the Cat may predate on chicks of the Grey Falcon. Mitigation measures such as appropriate storing of waste will be implemented to reduce the risk of increased pest species.
8. Introduce disease	There are no known diseases associated with the Grey Falcon. Hygiene protocols such as washdown of all vehicles, machinery and equipment to be undertaken, appropriate management and disposal of weed species during clearing works and weed control in key areas prior to construction works will be implemented to minimise the potential for introduction or spread of pathogens.
9. Interfere with recovery	There is no specific Recovery Plan for this species; however, the Approved Conservation Advice states that it describes sufficient key priority actions and mitigation measures against threats to enable recovery of this species. Priorities include continued research and survey, supporting habitat management, cat and camel control, improved fire and grazing management, protection of known nesting trees, establishment of replacement nesting trees, and retaining nest/potential nest sites. As the study area does not contain any suitable nesting habitat and appropriate mitigation measure will be in place to reduce potential impacts of increase in predator species, the modification is unlikely to interfere with recovery of this species.
Conclusion	The modification will not have a significant impact on the Grey Falcon as: • direct impacts will occur to 3.97 ha of foraging habitat; • no impacts will occur to breeding habitat; • important populations will not be adversely affected; • the works are not likely to have a significant impact on important populations size, area or increase isolation of these species; and • mitigation measures to control pests are proposed.

F.3 Superb Parrot

EPBC Act – vulnerable; BC Act – vulnerable.

The Commonwealth Conservation Advice for the Superb Parrot (TSSC 2016) describes the conservation status, distribution, biology/ecology and threats to the survival of the Superb Parrot. The Superb Parrot occurs west of the Great Dividing Range, in Canberra, Goulburn and west to Nyngan and Swan Hill. The Superb Parrot nests in large, living or dead trees with many hollow branches, typically near watercourses. Following breeding, Superb Parrots disperse and forage on a variety woodland and other habitat types. Threats to the survival of the species comprise the loss and degradation of habitat, competition for nest hollows, roadkill, illegal collection of wild birds, Psittacine beak and feather disease and climate change.

The National Recovery Plan for the Superb Parrot (Baker-Gabb 2011) details the species biology, ecology, distribution, populations, habitat and threats. The recovery plan describes the species as nomadic, resident, dispersive and migratory, making regular seasonal movements between breeding and non-breeding areas, in response to changes in food availability. When foraging locally, the species usually travels through wooded corridors, rarely crossing large areas of open ground.

The breeding range of the Superb Parrot is concentrated on the NSW South Western Slopes and Riverina bioregions. The three main breeding areas comprise:

- the area bounded by Molong, Rye Park, Yass, Coolac, Cootamundra and Young;
- along the Murrumbidgee River between Wagga Wagga and Toganmain Station to Goolgowi; and
- along the Murray and Edward Rivers, east of Barmah and Millewa State Forest to south of Taylors Bridge.

The total population of the Superb Parrot has been estimated at 5,000 to 8,000 birds, 6,500 of which comprise adults.

The recovery plan (Baker-Gabb 2011) defines habitat critical to the survival of the Superb Parrot as breeding habitat that comprises riverine forests in the Riverina and Box-Gum Woodlands on the tablelands and slopes. Tree species typically selected for nesting on the slopes and tablelands comprise River Red Gum (*E. camaldulensis*), Blakely's Red Gum, Apple Box, Western Grey Box, White Box and Red Box (*E. polyanthemos*). Of the species described above, Grey Box occurs in within the MW880 study area. Two hollow bearing trees with suitable hollows for breeding are present along the edge of the road (MW880) and will not be removed. MW880 does not occur within the three main breeding areas for the species, and vegetation type present is not considered critical breeding habitat.

Foraging habitat critical to the survival of the species is defined by the recovery plan (Baker-Gabb 2011) as Boree Woodlands between the Murrumbidgee and Murray Rivers, River Red Gum Forest, Box-Pine Woodland and White Cypress Pine Woodland. PCT 72 (White Cypress Pine – Poplar Box Woodland) occurs within the study area (MW880) and therefore considered foraging habitat critical to the survival of the species.

One Superb Parrot was recorded by EMM within the study area (MW880) flying over and sitting in a tree along the road edge, outside the impact area. Potential habitat within the impact area consists of PCT 72 DNG.

Table F.3 provides an assessment of significance for the removal of up to 0.75 ha of foraging habitat for the Superb Parrot, in accordance with the assessment criteria for vulnerable species (DoE 2013).

Table F.3 Assessment of significance for the Superb Parrot

Criteria	Discussion
1. Long-term decrease of an important population	Important populations have not been defined in the recovery plan for the Superb Parrot (Baker-Gabb 2011). As described in DoE (2013) an important population can include populations that are near the limit of the species range. The Superb Parrot is known to occur throughout eastern inland NSW, spanning from the top of the NSW and QLD border near Moree, to the NSW and Victorian border near Albury. Given MW880 occurs within the middle of the species distribution, the population within the study area is not considered an important population.
2. Reduce occupancy area for an important population	As per above, the population of the Superb Parrot is not considered an important population. The modification will result in the removal of 0.75 ha of foraging habitat for the species. The disturbance footprint is located within a highlight modified agricultural landscape with similar vegetation. Given the vegetation to be impacted is considered sub-optimal and the remaining foraging habitat within the locality it is unlikely the modification will result in a significant reduction of foraging habitat for the Superb Parrot.
3. Fragment an important population	As per above, the predicted population of the Superb Parrot is not considered an important population. The study areas are located within a highly disturbed landscape with existing infrastructure from the APA pipeline. The modification will include the construction of temporary infrastructure such as a wastewater treatment spray field and temporary accommodation camp, as well as permanent infrastructure such as compressor station compound and vent stack. Temporary infrastructure will be decommissioned, and areas rehabilitated. Given the species can fly across the site the modification will not result in significant fragmentation of the species habitat.

Table F.3 Assessment of significance for the Superb Parrot

Criteria	Discussion
4. Adversely affect habitat critical to survival	Habitat critical to the survival of the species has been defined by the recovery plan (Baker-Gabb 2011) as breeding habitat that comprises riverine forests in the Riverina and Box Gum Woodlands on the tablelands and slopes and foraging habitat comprising Boree Woodlands between the Murrumbidgee and Murray Rivers, River Red Gum Forest, Box-Pine Woodland and White Cypress Pine Woodland. While habitat within MW880 is not considered critical breeding habitat as it falls outside the species core breeding areas and is not a described vegetation type, it does contain critical foraging habitat (White Cypress Pine – Poplar Box Woodland). However, the modification will result in the removal of up to 0.75 ha of DNG. Areas of DNG are cleared and do not contain woodland, therefore the disturbance footprint will not impact foraging habitat critical to the survival of Superb Parrot. The modification has the potential to result in indirect impacts to retained critical foraging habitat. Introduction of weeds and pest species will be mitigated to ensure no impacts occur to retained vegetation.
5. Disrupt breeding cycle of an important population	The Superb Parrot nests within large eucalyptus with hollow branches. Two suitable hollow bearing trees were recorded along the edge of the study area. The proposed modification will not remove these hollow bearing trees. Therefore, the modification will not disrupt the species breeding cycle.
6. Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The modification will remove 0.75 ha of potential foraging habitat for the Superb Parrot. The study area is outside the species breeding range, and therefore the species is considered to be a vagrant in the region. At a national scale, the species occurs in Tasmania and between Bendigo, Victoria and north-western NSW. The removal of this potential foraging habitat in which the species is vagrant will not substantially reduce the national extent.
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Known threats to the Superb Parrot include overgrazing by rabbits and predation by the Cat and the Red Fox (Baker-Gabb 2011). The modification has the potential to result in an increase and/or introduction of pest species such as the Goat, the Rabbit, the Pig, the Cat and the Red Fox. Exotic herbivore species cause degradation to habitat and high grazing pressures to native vegetation. Mitigation measures such as appropriate storing of waste will be implemented to reduce the risk of increased pest species.
8. Introduce disease	Superb Parrots may be susceptible to beak and feather disease. Disease outbreaks usually occur in wild animal populations where significant stresses arise. The clearance of potential foraging habitat within an existing disturbed environment is unlikely to cause significant stress such that a disease outbreak would occur.
9. Interfere with recovery	Recovery actions for the Superb Parrot aim to determine population trends, increase knowledge of the species ecological requirements, develop and implement threat abatement strategies and increase community involvement and awareness of the recovery program (Baker-Gabb 2011). As recovery actions are focused on increasing knowledge of the species, the modification will not interfere with recovery.
Conclusion	The modification will not have a significant impact on the Superb Parrot as: • direct impacts will occur to 0.75 ha of foraging habitat; • no direct impacts will occur to breeding habitat; • important populations will not be adversely affected; • the works are not likely to have a significant impact on important populations size, area or increase isolation of these species; and • mitigation measures to control pests are proposed.

F.4 Corben's Long-eared Bat

EPBC Act – vulnerable; BC Act – vulnerable.

The Commonwealth Conservation Advice for the Corben's Long-eared Bat (TSSC 2015a) describes the conservation status, distribution, biology/ecology and threats to the survival of the species. The Corben's Long-eared Bat occurs within a patchy distribution within southern central Queensland, central western NSW, north western Victoria and eastern South Australia. At least 50% of the species' known distribution occurs within NSW (Parnaby et al. 2011), primarily within the Pilliga scrub region. The Corben's Long-eared Bat has a large home range and is found in a wide range of inland woodland vegetation types; however, is more common in box-ironbark/cypress pine vegetation in NSW. The species requires patches of woodland for foraging, and dead trees, dead spouts of live trees or fissures for roosting and breeding. The conservation advice (TSSC 2015a) suggests that old-growth vegetation is a critical habitat component in the Victorian distribution; however, does not state what would be considered habitat critical to the survival of the Corben's Long-eared Bat.

Threats to the survival of the species comprise of habitat loss and fragmentation, fire, reduction in hollow availability, exposure to agrichemicals, grazing, predation by feral animals. There is no adopted or made Recovery Plan for the Corben's Long-eared Bat.

No previous records of Corben's Long-eared Bat occur within the locality. Potential habitat within the study area includes PCT 72- White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion. Moderate condition of this vegetation is situated within the norther edge of the study area. This area contains canopy species such as Poplar Box, Western Grey Box and White Cypress Pine. A number of hollow bearing trees suitable for microbat roosting were recorded along the road. The modification will not result in any direct impacts to these trees. Direct impacts are restricted to areas of DNG adjacent to cropped land, providing sub-optimal foraging habitat for the species.

Table F.4 provides an assessment of significance for the removal of up to 0.75 ha of foraging habitat for the Corben's Long-eared Bat, in accordance with the assessment criteria for vulnerable species (DoE 2013).

Table F.4 Assessment of significance for the Corbens's Long-eared Bat

Criteria	Discussion
1. Long-term decrease of an important population	A recovery plan has not been developed for the Corben's Long-eared Bat and therefore an important population has not been defined for the species. As described in DoE (2013) an important population can include populations that are near the limit of the species range. The Corben's Long-eared Bat has a large home range which extends across the majority of NSW, suggesting that the site is not located on the edge of the species range. For this reason, any potential occurrence of the species within the site is not considered to be an important population.
2. Reduce occupancy area for an important population	As per above, the predicted population of the Corben's Long-eared Bat is not considered an important population. The modification will result in the removal of 0.75 ha of foraging habitat for the species. The disturbance footprint is located within a large landscape of similar vegetation. Given the vegetation to be impacted is considered sub-optimal and the remaining foraging habitat within the locality it is unlikely the modification will result in a significant reduction of foraging habitat for the Corben's Long-eared Bat.
3. Fragment an important population	As per above, the predicted population of the Corben's Long-eared Bat is not considered an important population. The study area is located within a highly disturbed landscape with existing infrastructure from the APA pipeline. The modification will include the construction of temporary infrastructure such as a wastewater treatment spray field and temporary accommodation camp, as well as permanent

Table F.4 Assessment of significance for the Corbens's Long-eared Bat

Criteria	Discussion
	infrastructure such as compressor station compound and vent stack. Temporary infrastructure will be decommissioned, and areas rehabilitated. Given the species can fly across the site it is unlikely the modification will result in significant fragmentation of the species habitat.
4. Adversely affect habitat critical to survival	Habitat critical to the survival of the species has not been defined. The conservation advice (TSSC 2015) suggests that old-growth vegetation is a critical habitat component in the Victorian distribution; however, does not state what would be considered habitat critical to the survival of the Corben's Long-eared Bat. The impact guidelines state that habitat critical to the survival of the species may refer to habitat essential for foraging, breeding, roosting, dispersal or maintaining genetic diversity, and the maintenance or recovery of the species. Hollow-bearing trees occur adjacent to the development footprint, along the road edge. Hollow-bearing trees will be retained and therefore no impacts to roosting or maternity habitat are expected to occur. The modification will result in the removal of up to 0.75 ha of foraging habitat for the species. Given the modification will remove sub-optimal foraging habitat and moderate woodland habitat will be retained it is unlikely the works will adversely affect habitat critical to the species survival.
5. Disrupt breeding cycle of an important population	Studies within NSW found maternity colonies, consisting of 10-20 individuals, roosting in dead trees. A number of live and dead trees with small hollows are located along the edge of the road, adjacent to the development footprint. The modification will not remove any hollow-bearing trees.
6. Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The modification will remove 0.75 ha of potential foraging habitat for the Corben's Long-eared Bat. The species has a widespread distribution across eastern Australia. The modification has the potential to result in indirect impacts such as light spill, noise and vibration, increase/spread of weeds and increase of pest species. Mitigation measures outline in Table 8.2 will be implemented to ensure the works do not result in indirect impacts to retained threatened species habitat. Therefore, it is considered unlikely the modification will substantially reduce the national extent of this species.
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Threats impacting the Corben's Long-eared Bat include grazing resulting in habitat degradation and predation by feral animals such as the Cat or the Red Fox. The modification has the potential to result in an increase and/or introduction of pest species such as the Goat, the Rabbit, the Pig, the Cat and the Red Fox. Exotic herbivore species cause degradation to habitat and high grazing pressures to native vegetation. Predator species such as the Cat and the Red Fox have the potential to predate on the species. Weed control procedures will be implemented to minimise indirect impacts on potential foraging, roosting and breeding habitat. Similarly, mitigation measures such as appropriate storing of waste will be implemented to reduce the risk of increased pest species.
8. Introduce disease	Bats are known to carry the Australian bat lyssavirus (ABLV) which has the potential to spread through populations. The clearance of potential foraging habitat is unlikely to cause significant stress such that a disease outbreak would occur.
9. Interfere with recovery	No recovery plan exists for the Corben's Long-eared Bat. The conservation advice lists conservation and management actions which are associated with reducing the impact of the threats listed above. Two management actions are relevant to the modification and include: • protect known and potential habitat of key populations, including within conservation reserves, from habitat loss and fragmentation; and • retain hollow-bearing trees and provide for hollow tree recruitment where possible. The modification will remove 0.75 ha of potential foraging habitat and will not remove any hollow-bearing trees. As such, the modification is unlikely to interfere substantially with the recovery of the Corben's Long-eared Bat.
Conclusion	The modification will not have a significant impact on the Corben's Long-eared Bat as: • direct impacts will occur to 0.75 ha of foraging habitat; • no direct impacts will occur to roost and breeding habitat;

Table F.4 Assessment of significance for the Corbens's Long-eared Bat

Criteria	Discussion
	• important populations will not be adversely affected; • the works are not likely to have a significant impact on important populations size, area or increase isolation of these species; and • mitigation measures to control pests are proposed.

F.5 Paroo River Wetlands

Table F.5 Assessment of significance for the Paroo River Wetlands

Criteria	Discussion
An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in: **• areas of the wetland being destroyed or substantially modified,**	The MW433 site is located with an area that has been excised from the Paroo River Wetlands area; therefore, direct impacts will not occur to the wetlands. It is possible that indirect impacts from spray irrigation and/or erosion/runoff/sedimentation may affect the wetland; however, following implementation of mitigation, it is unlikely that this will occur. Regardless, any indirect impacts are considered to be negligible and would not result in areas of the Paroo River Wetlands being destroyed or substantially modified. Mitigation measures are outlined within Table 8.2 and includes the following as a minimum: • GE-01: The approved construction footprint, including vegetation clearing extent and environmental or heritage features within the construction footprint, will be clearly demarcated and identified during the construction stage with survey pegs and at some locations with flagging, bunting, barrier mesh or similar. No go zones will be clearly marked and communicated as such. • WS-01: A soil and water management plan (SWMP) will be prepared for the project and underpinned by primary erosion and sediment control plans (PESCPs) for each site, which will include soil characterisation, surface water and runoff management, and drainage, erosion and sediment control measures. • WS-02: Cut and fill will employ slope design rules and stabilisation measures (where required), guided by material erosion and agronomic characterisation of the site soils. • WS-03: Major land disturbance works will be scheduled to avoid periods of high wind, where practicable. Soil and erosion control measures will be adjusted to ensure appropriate management of erosion and sediment during adverse weather. • WS-04: Site drainage will be designed to maximise sheet flow and avoid longitudinal drainage where practicable.WS-05 Following removal of temporary infrastructure, the wastewater spray field will be rehabilitated and vegetated with drought tolerant species. • WS-07: Priority will be given to the prevention or minimisation of soil erosion rather than allowing erosion to occur and relying on sediment control measures to trap and contain sediment and turbid runoff. • WS-10: All reasonable and practicable measures needed to protect downstream waters and adjacent properties from the adverse effects of sediment and turbid water discharge should be implemented. • WS-11: Site areas containing potential contaminants (such as fuel, oil, grease and chemicals) will be covered and/or bunded in accordance with Australian Standard AS1940: The storage and handling of flammable and combustible liquids to prevent contamination of stormwater runoff, with offsite disposal of captured water/contaminants. • WS-12: Temporary and permanent onsite wastewater management systems for each site will:

Table F.5 Assessment of significance for the Paroo River Wetlands

Criteria	Discussion
	– be appropriate for each site based on consideration of the site layout, site conditions and relevant environmental constraints; and – be designed, constructed, operated, maintained and decommissioned in accordance with best practise and relevant guidelines (including WaterNSW 2019), applicable standards (including AS/NZS 1547:2012 On-site domestic wastewater management) and local Council requirements. • GE-02: Following completion of construction activities, all temporary wastewater management infrastructure will be decommissioned and removed from each site. Disturbed areas, including effluent spray fields where infrastructure is removed, will be appropriately stabilised and rehabilitated in accordance with the SWMP.
• a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland,	The action does not involve direct impact to the hydrological regime of the Paroo River Wetlands and, at this stage, does not involve direct impacts to surface water or groundwater volume, timing, duration or frequency of flow into, or out of, the system. The use of spray irrigation to discharge wastewater has the potential to result in indirect impacts to the Paroo River Wetlands via runoff and/or wind action; however, following implementation of mitigation, it is unlikely that this will occur. In addition, infiltration and evaporation will further minimise the likelihood of off-site impacts. Regardless, any indirect impacts are considered to be negligible and would not result in a substantial and measurable change in the hydrological regime of the wetlands. Mitigation is outlined within the main Modification Report 1, and includes the following as a minimum: • WS-01: A soil and water management plan (SWMP) will be prepared for the project and underpinned by primary erosion and sediment control plans (PESCPs) for each site, which will include soil characterisation, surface water and runoff management, and drainage, erosion and sediment control measures. • WS-03: Major land disturbance works will be scheduled to avoid periods of high wind, where practicable. Soil and erosion control measures will be adjusted to ensure appropriate management of erosion and sediment during adverse weather. • WS-04: Site drainage will be designed to maximise sheet flow and avoid longitudinal drainage where practicable. • WS-10: All reasonable and practicable measures needed to protect downstream waters and adjacent properties from the adverse effects of sediment and turbid water discharge should be implemented. • WS-11: Site areas containing potential contaminants (such as fuel, oil, grease and chemicals) will be covered and/or bunded in accordance with Australian Standard AS1940: The storage and handling of flammable and combustible liquids to prevent contamination of stormwater runoff, with offsite disposal of captured water/contaminants.
• the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected,	The MW433 site is located with an area that has been excised from the Paroo River Wetlands area; therefore, direct impacts will not occur to the wetlands. In terms of indirect impacts, the potential exists for erosion and runoff to occur, resulting in sedimentation downstream of the MW433 site. While there are two 1st order waterways located within the MW433 site, they are likely to remain dry for majority of the year and are only likely to contain water for short periods during major rainfall/flood events. Therefore, for the majority of the year, there is limited potential for runoff to occur from the MW433 site to the Paroo River Wetlands, making it unlikely that habitats and lifecycles of native aquatic species within the wetlands will be affected. The use of spray irrigation to discharge wastewater has the potential to result in indirect impacts to the Paroo River Wetlands via runoff and/or wind action; however, following implementation of mitigation, it is unlikely that this will occur. In addition, infiltration and

Table F.5 Assessment of significance for the Paroo River Wetlands

Criteria	Discussion
	evaporation will further minimise the likelihood of off-site impacts. Regardless, any indirect impacts are considered to be negligible and would not result in the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetlands being seriously affected. Mitigation is outlined within the main Modification Report 1, and includes the following as a minimum: • WS-03: Major land disturbance works will be scheduled to avoid periods of high wind, where practicable. Soil and erosion control measures will be adjusted to ensure appropriate management of erosion and sediment during adverse weather. • WS-04: Site drainage will be designed to maximise sheet flow and avoid longitudinal drainage where practicable. • WS-10: All reasonable and practicable measures needed to protect downstream waters and adjacent properties from the adverse effects of sediment and turbid water discharge will be implemented. • WS-11: Site areas containing potential contaminants (such as fuel, oil, grease and chemicals) will be covered and/or bunded in accordance with Australian Standard AS1940: The storage and handling of flammable and combustible liquids to prevent contamination of stormwater runoff, with offsite disposal of captured water/contaminants.
• a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or	The MW433 site is located with an area that has been excised from the Paroo River Wetlands area; therefore, direct impacts will not occur to the wetlands. The use of spray irrigation to discharge wastewater has the potential to result in indirect impacts to the Paroo River Wetlands via runoff and/or wind action, and erosion and runoff may result in sedimentation occurring with the wetlands. It is also possible that elevated salts and nutrients within the wastewater could result in evapoconcentration within the wetlands. However, following implementation of mitigation, it is unlikely that this will occur. In addition, infiltration and evaporation will further minimise the likelihood of off-site impacts. Regardless, any indirect impacts are considered to be negligible and are unlikely to result in a substantial and measurable change in the water quality of the wetlands (eg salinity, pollutants, nutrients, temperature) which may adversely impact on biodiversity and/or ecological integrity. Mitigation is outlined within the main Modification Report 1, and includes the following as a minimum: • WS-01: A soil and water management plan (SWMP) will be prepared for the project and underpinned by primary erosion and sediment control plans (PESCPs) for each site, which will include soil characterisation, surface water and runoff management, and drainage, erosion and sediment control measures. • WS-02: Cut and fill will employ slope design rules and stabilisation measures (where required), guided by material erosion and agronomic characterisation of the site soils. • WS-03: Major land disturbance works will be scheduled to avoid periods of high wind, where practicable. Soil and erosion control measures will be adjusted to ensure appropriate management of erosion and sediment during adverse weather. • WS-04: Site drainage will be designed to maximise sheet flow and avoid longitudinal drainage where practicable.WS-05 Following removal of temporary infrastructure, the wastewater spray field will be rehabilitated and vegetated with drought tolerant species. • WS-07: Priority will be given to the prevention or minimisation of soil erosion rather than allowing erosion to occur and relying on sediment control measures to trap and contain sediment and turbid runoff.

Table F.5 Assessment of significance for the Paroo River Wetlands

Criteria	Discussion
	• WS-10: All reasonable and practicable measures needed to protect downstream waters and adjacent properties from the adverse effects of sediment and turbid water discharge should be implemented. • WS-11: Site areas containing potential contaminants (such as fuel, oil, grease and chemicals) will be covered and/or bunded in accordance with Australian Standard AS1940: The storage and handling of flammable and combustible liquids to prevent contamination of stormwater runoff, with offsite disposal of captured water/contaminants. • WS-12: Temporary and permanent onsite wastewater management systems for each site will: – be appropriate for each site based on consideration of the site layout, site conditions and relevant environmental constraints; and – be designed, constructed, operated, maintained and decommissioned in accordance with best practise and relevant guidelines (including WaterNSW 2019), applicable standards (including AS/NZS 1547:2012 On-site domestic wastewater management) and local Council requirements. • GE-02: Following completion of construction activities, all temporary wastewater management infrastructure will be decommissioned and removed from each site. Disturbed areas, including effluent spray fields where infrastructure is removed, will be appropriately stabilised and rehabilitated in accordance with the SWMP.
• an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.	The action does not involve the introduction of an invasive species as the action is solely concerned with clearing of native vegetation, construction activities, maintenance activities and spray irrigation of treated wastewater. In terms of indirect impacts, the potential for weed species to be introduced and/or spread as a result of increased traffic and use of earthworks equipment exists, as well as the potential increase and/or introduction of pest species such as the Goat, the Rabbit and the Pig. Exotic herbivore species cause degradation to vegetation and habitat. However, following implementation of mitigation, these impacts are likely to be negligible and are unlikely to result in an invasive species that is harmful to the ecological character of the wetlands being established (or an existing invasive species being spread) in the Paroo River Wetlands. Mitigation measures are outlined in Table 8.2.
Conclusion	The modification will not have a significant impact on the Paroo River wetlands as: • no direct impacts will occur; • the waterways within the site are considered to remain dry for majority of the year and therefore unlikely to cause runoff into the Paroo River wetlands; and • mitigation measures will be implemented to prevent any indirect impacts occurring to the wetlands.