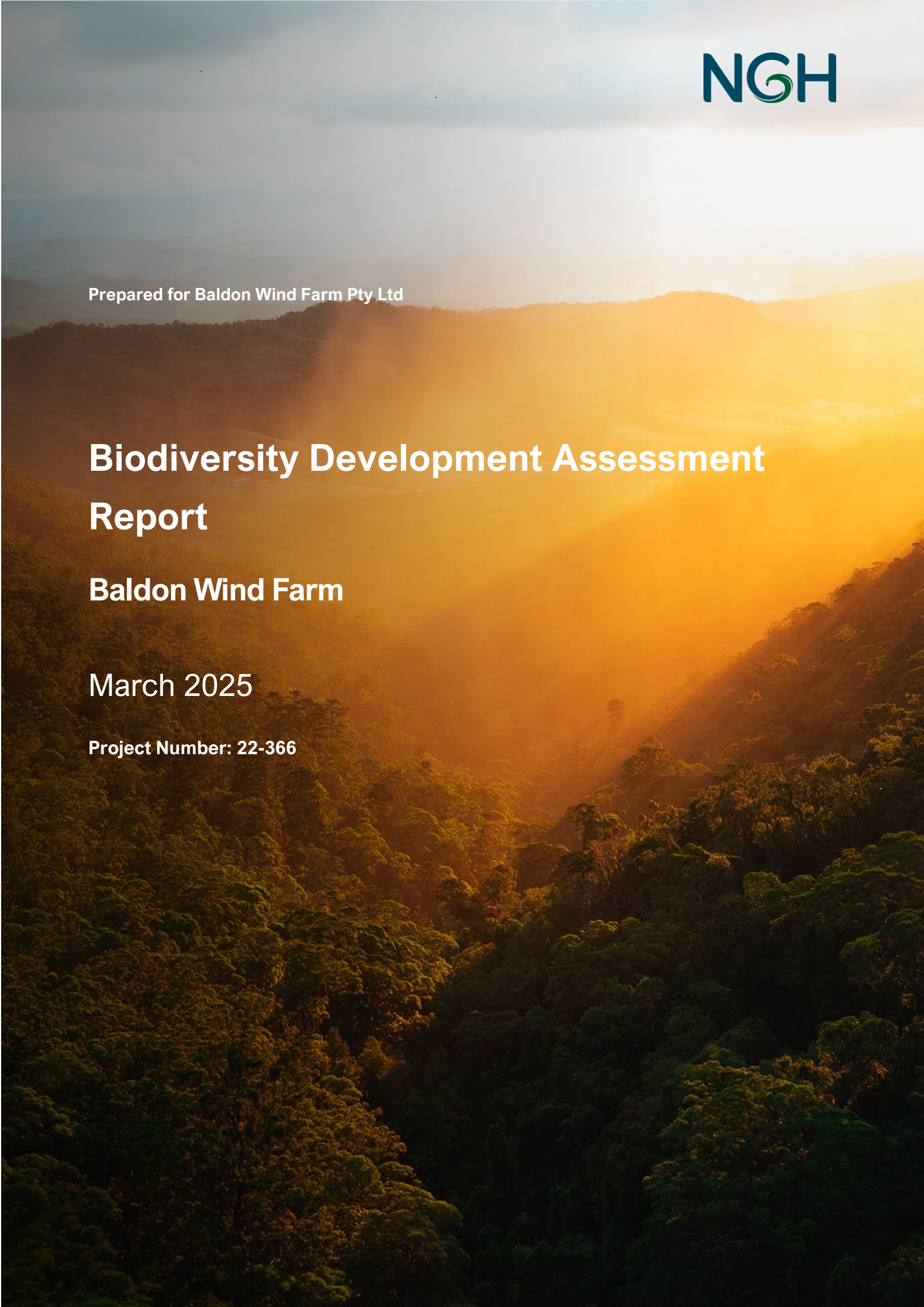


Prepared for Baldon Wind Farm Pty Ltd

Biodiversity Development Assessment Report

Baldon Wind Farm

March 2025

Project Number: 22-366

Document verification

Project Title:	Baldon Wind Farm
Project Number:	22-366
Project File Name:	22-366 Baldon Wind Farm Final V2

Revision	Date	Prepared by	Reviewed by	Approved by
Draft V1	3/05/2024	Evan Creek Elise Keane (BAAS 23013) Julie Gooding (BAAS 18074) Julia Chabros	Rebecca Phyland	Rebecca Phyland
Draft V2.0	01/07/2024	Evan Creek Julie Gooding (BAAS 18074)	Greg Calvert	Julie Gooding
Final V1	17/07/2024	Evan Creek (minor changes) Julie Gooding (BAAS18074)	Brooke Marshall	Brooke Marshall Julie Gooding (BAAS18074)
Final V2	02/05/2024	Julie Gooding (BAAS18074) Rachel Ivory Maddie Robertson	Brooke Marshall	Julie Gooding (BAAS18074)

NGH Pty Ltd is committed to environmentally sustainable practices, including fostering a digital culture and minimising printing. Where printing is unavoidable, NGH prints on 100% recycled paper.

Executive summary

The proposed Baldon Wind Farm (the Development) is classified as State Significant Development (SSD) under the Planning Systems State Environmental Planning Policy (SEPP). This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposed Development according to the NSW Biodiversity Assessment Methodology (BAM) and the *Biodiversity Conservation Act 2016* (BC Act), as required by the Secretary's Environmental Assessment Requirements (SEARs). NGH has prepared this BDAR on behalf of the Proponent, Baldon Wind Farm Pty Ltd.

This BDAR Version 2.0 now addresses comments from Biodiversity Conservation & Science Group (BCS) following exhibition of the Development Application and BDAR on 14th August 2024. This update reflects the removal of five turbines from the proposed Development and minor changes to access and reticulation, primarily driven by biodiversity and hydrology constraints.

The proposed Development is in the Murray River and Hay Shire Local Government Area, approximately 13 km north of the town of Moulamein NSW, and 64 km southwest of the town of Hay NSW. The Development will involve the construction and operation of 175 wind turbines, and associated battery energy storage systems (BESS) that would supply electricity to the national electricity grid as well as associated infrastructure of internal access tracks, underground cabling, substations, site compounds, accommodation camp and laydown areas. The project would also include onsite quarrying of gravel for track construction.

The proposed Development Footprint covers 795 ha of the 2,847 ha Subject Land, within the wider 46,259 ha Project area. A total of 41,435 ha is located south of the Sturt Highway and no impacts are proposed north of the Sturt Highway. As such this BDAR considers only the Project area south of the Sturt Highway.

The Subject Land is an extensive linear network of tracks and infrastructure within the Project Area. The Subject Land is currently used for grazing of sheep at low stocking rates, with a previous history of irrigated agriculture, intensive grazing and associated native vegetation disturbance.

The Project is likely be completed in two stages, with a smaller footprint of 219.07 ha for Stage 1 to complete the grid connection works, 46 wind turbines and associated infrastructure. Stage 2 would include the construction of the remaining 129 turbines and associated infrastructure covering an area of 575.82 ha.

In this BDAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and field assessment completed in accordance with the BAM.
- Evaluation of impacts to Matters of National Environmental Significance (MNES) under the commonwealth *Environmental and Protection Biodiversity Conservation Act 1999* (EPBC Act) and
- Developing mitigation measures to reduce any indirect or prescribed impacts and consideration of serious and irreversible impacts on biodiversity.

The vegetation within the Subject Land was assessed by NGH through stratification and vegetation integrity plot (BAM plot) surveys conducted in March 2023, October to December 2023 and January 2024. These surveys were used to determine the type and condition of Plant Community Types (PCTs) and associated Threatened Ecological Communities (TECs) within the Subject Land. Additional BAM plots were undertaken in November 2024 and January 2025 in response to BCS comments, as well as for new areas added to the Development Footprint.

Ten native PCTs were identified as present within the Subject Land, with their entry into the BAM-Calculator (BAM-C) generating the ecosystem credits detailed in the below (Table i). One patch of PCT 46 met the

criteria for the Critically Endangered Ecological Community (CEEC) *Natural Grasslands of the Murray Valley Plains* listed under the Commonwealth EPBC Act.

Table i Summary of ecosystem credits generated

PCT	PCT Name	Stage 1 Development Footprint		Stage 2 Development Footprint	
		Impact Area (Ha)	Ecosystem Credits required	Impact Area (Ha)	Ecosystem Credits Required
15	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)'	0.95	10	9.34	144
17	'Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)'	-	-	0.57	15
28	'White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone'	0.24	3	5.93	76
46	'Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion'	20.53	492	21.44	497
46	Meeting *Natural Grasslands of the Murray Valley Plains* CEEC	-	-	1.12	47
57	Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	0.01	1	0.27	3
153	'Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones'	0.68	9	68.61	1,073

PCT	PCT Name	Stage 1 Development Footprint		Stage 2 Development Footprint	
		Impact Area (Ha)	Ecosystem Credits required	Impact Area (Ha)	Ecosystem Credits Required
153	'Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones (Euston intersection)	0.16	3	n/a	n/a
159	'Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)'	0.55	25	6.45	297
160	'Nitre Goosefoot shrubland wetland on clays of the inland floodplains'	7.58	168	20.24	355
163	'Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones'	5.88	111	3.00	50
164	'Cotton Bush open shrubland of the semi-arid (warm) zone'	174.89	4,096	420.91	9,947
	Total:	**211.47**	**Total:**	**557.88**	

Targeted threatened fauna and flora surveys and habitat surveys were undertaken between August 2023 and January 2025. Nine threatened fauna and four threatened flora species were detected within the Subject Land. Six of these are ecosystem species as defined under the Biodiversity Assessment Methodology (BAM) and no species credits are required;

- Black-breasted Buzzard *Hamirostra melanosternon,*
- Blue-winged Parrot *Neophema chrysostoma*
- Pink Cockatoo *Lophochroa leadbeateri*
- White fronted Chat *Epthianura albifrons*
- Plains-wanderer *Pedionomus torquatus*
- Southern Whiteface *Aphelocephala leucopsis*

The remaining seven threatened species detected are credit species;

- Mossgiel Daisy *Brachyscome papillosa*
- Chariot Wheels *Maireana cheelii*
- Slender Darling Pea *Swainsona murrayana*
- Spike-Rush *Eleocharis obicis*
- Little Eagle *Hieraaetus morphnoides*
- Southern Myotis *Myotis macropus*
- Southern Bell Frog *Litoria raniformis*

Two threatened flora species, Bindweed (*Convolvulus tedmoorei*) and Slender Darling Pea (*Swainsona murrayana*) were unable to be surveyed at the site access intersection, due to being a recent addition to the footprint and surveys were unable to be undertaken within the survey period for these species. These species have been assumed to be present at the site entrance as a result.

Species credit offsets are detailed in Table ii below.

Table ii Summary of species credits generated

Species	**Stage 1 Development Footprint**			**Stage 2 Development Footprint**		
	Associated PCTs	**Impact area (ha)**	**Species credits required**	**Associated PCTs**	**Impact area (ha)**	**Species credits required**
Flora						
Brachyscome papillosa Mossgiel Daisy	46, 159, 160, 164	91.79	4,292	15, 17, 46, 153, 159, 160, 163, 164	203.62	9,240

Species	Stage 1 Development Footprint			Stage 2 Development Footprint		
	Associated PCTs	**Impact area (ha)**	**Species credits required**	**Associated PCTs**	**Impact area (ha)**	**Species credits required**
Convolvulus tedmoorei Bindweed (Assumed Presence)	164	0.17	5	n/a	0	n/a
Eleocharis obicis Spike-Rush (Assumed Presence)	15, 28, 160, 163	14.65	577	15, 17, 28, 160, 163	39.08	1,164
Maireana cheelii Chariot Wheels	163, 164	27.22	1,273	28, 46, 153, 159,163, 164	35.44	1,608
Swainsona murrayana Slender Darling Pea (Assumed Presence)	164	0.17	8	164	0.21	10
Fauna						
Hieraaetus morphnoides Little Eagle	-	0	0	15, 164	0.74	23
Litoria raniformis Southern Bell Frog	15, 160, 164	5.99	262	15, 28, 46, 153, 159, 160, 164	31.06	1,347
Myotis macropus Southern Myotis	160, 164	5.37	249	28, 46, 160, 164	27.74	1,235

The proposed 'avoid and minimise' measures are in accordance with the development mitigation hierarchy, which aims for a result of 'no net loss' of biodiversity through implementing, in the following order, avoidance, mitigation, rehabilitation/restoration and offsetting.

Avoid and minimise strategies have been developed:

- Through the design of the Development Footprint and consideration of alternatives
- In consideration of preliminary constraints mapping, detailed ecological surveys and agency consultation. This includes layout amendments which have been made post the EIS submission, including the removal of five turbines and adjustment to other infrastructure.

It is important to note that whilst the Project is spread over a large area (46,259 ha, with all impacts confined south of the Sturt Highway), the estimated Development Footprint (795 ha) constitutes less than 2% of the Project Area and the impacts will be addressed through extensive mitigation measures.

The key biodiversity impact for this project is the potential to have ongoing population impacts on birds or bats that are either excluded from the Development Footprint or injured by operational turbines. Extensive bird and bat utilisation data has been undertaken to ensure that turbine placements minimise potential impacts. A Bird and Bat Adaptive Management Plan will be prepared to identify specific adaptive mitigation measures and is included in Appendix J of this BDAR.

This assessment has been carried out in accordance with the NSW Biodiversity Offsets Scheme (BOS) under the NSW BC Act and implementation of the mitigation measures are considered a requirement under the BAM. The mitigation measures are included in Section 9.

If species that have been assumed to be present cannot be ruled out by targeted surveys prior to the Development's determination, then the retirement of the credits will be carried out in accordance with the NSW BOS, and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme based on the like-for-like rules, or
b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or
c) Funding a biodiversity action that benefits the threaten entities impacted by the development.

An Offset Strategy has been developed with input from local and agency stakeholders to inform these options and maximise benefits associated with the considerable offset obligation.

This BDAR also documents impact on Commonwealth Matters of National Environmental Significance (MNES). A referral under the EPBC Act was undertaken for the Project and the Project was designated a controlled action, with assessment and approval required under the EPBC Act. MNES has been assessed under the NSW BAM as part of the Bilateral Assessment Agreement with DCCEEW (Cwth) and NSW Government. EPBC Act offset obligations would be met in accordance with the NSW BOS. No additional offsets for MNES are required.

Provided the recommended mitigation measures are implemented and required biodiversity offset credits are retired the Project would not result in a significant impact to threatened flora or fauna, threatened ecological communities or MNES and is considered an acceptable risk to the environment.

Accredited Assessor Declarations

Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared on the basis of the requirements of, and information provided under the Biodiversity Assessment Method and s6.15 of the BC Act. It has been assessed in accordance with BAM 2020. A full list of staff qualifications and experience can be found in Appendix F of this report.

In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct.

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

Signature: 

Name: Julie Gooding

Date: 02/05/2025

BAM Assessor Accreditation No: BAAS18074

The associated development cases: 00034998/BAAS23013/24/00045828 – Revision 5 (Stage 1 Assessment), 00034998/BAAS23013/24/00046985 – Revision 8 (Stage 2 Assessment) and 00034998/BAAS18074/25/00054223 – Revision 0 within the BAM Calculator (BAM-C) has been finalised as of 02/05/2025 The BAM-C case has been submitted to BCD Southwest Planning Team via BOAMs.

Conflict of interest

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

This declaration has been made in the interests of full disclosure to the decision-maker.

Full disclosure has also been provided to the client.

Signature: J. Gooding

Date: 02/05/2025

BAM Assessor Accreditation no: BAAS18074

Table of contents

Document verification i

Accredited Assessor Declarations vi

Certification under clause 6.15 Biodiversity Conservation Act 2016 vi

Conflict of interest vi

Table of contents vii

1. Introduction 1

1.1 The proposal 1

1.1.1 Report terminology 2

1.2 Subject Land 4

1.2.1 Location 4

1.2.2 Site description 5

1.3 Study aims 6

1.3.1 BAM Calculator cases 8

1.4 Response to BCS submission 9

1.5 Sources of information 15

2. Landscape context 23

2.1 Overview 23

2.2 IBRA bioregions and subregions 23

2.3 NSW landscape regions 24

2.4 Hydrology 26

2.4.1 Strahler stream order – rivers, creeks and streams 26

2.4.2 Wetlands and water bodies 27

2.5 Connectivity features 29

2.6 Geology and soils 29

2.6.1 Areas of geological significance 29

2.6.2 Soil hazards 30

2.7 Areas of outstanding biodiversity value 30

2.8 Cleared areas and Category 1 land 30

2.9 Percent native vegetation cover 30

3. Native vegetation 40

3.1 Native vegetation extent 40
3.1.1 Non-native vegetation 40
3.2 Plant community types (PCTs) 42
3.2.1 Methods to assess PCTs 42
3.2.2 Existing native vegetation mapping 42
3.2.3 Field surveys 44
3.2.4 Limitations 45
3.2.5 Plant Community Types identified 46
3.2.6 BC Act Threatened Ecological Communities 74
3.2.7 Planted Vegetation 78
3.3 Vegetation integrity assessment 80
3.3.1 Vegetation zones and survey effort 80
3.3.2 Vegetation integrity assessment results 88
4. Threatened species 95
4.1 Background searches 95
4.1.1 EPBC Act Protected Matters 95
4.1.2 BioNet 95
4.1.3 Bird and Bat Surveys 104
4.1.4 Adjacent projects 112
4.2 Ecosystem credit species 114
4.3 Ecosystem credit species included 128
4.4 Ecosystem credit species excluded from assessment 130
4.5 Species credit species 130
4.5.1 Additional species credit species 143
4.6 Targeted surveys 146
4.6.1 Candidate species requiring surveys (confirmation of presence of absence) 146
4.6.2 Survey weather conditions and limitations 158
4.6.3 Candidate species survey effort and results 163
4.6.4 Justification for selecting areas for species polygons 209
4.6.5 Further survey recommendations 213
5. Matters of National Environmental Significance 217
5.1 Ramsar wetlands of international importance 217
5.2 Threatened ecological communities (TECs) 218

5.2.1 Natural Grasslands of the Murray Valley Plains 219
5.3 Threatened species 234
5.4 Migratory species 235
6. Identifying prescribed biodiversity impacts 237
6.1.1 Occurrences of karst, caves, crevices and cliffs, rocks and other geological features 237
6.1.2 Occurrences of human-made structures and non-native vegetation 237
6.1.3 Occurrences of habitat connectivity 238
6.1.4 Water bodies, water quality and hydrological processes 238
6.1.5 Wind farm developments 239
6.1.6 Vehicle strike 246
7. Avoid and minimise impacts 250
7.1 Avoiding and minimising direct/indirect impacts on biodiversity values 250
7.1.1 Site selection 250
7.1.2 Alternative technologies 250
7.1.3 Proposal design 251
7.2 Avoiding and minimising prescribed impacts 265
8. Assessment of impacts 272
8.1 Direct impacts 272
8.1.1 Loss of Native Vegetation 278
8.1.2 Loss of species credit species habitat or individuals 281
8.1.3 Loss of hollow-bearing trees 284
8.2 Indirect impacts 285
8.3 Prescribed impacts 293
8.3.1 Impacts of development on human-made structures and non-native vegetation 293
8.3.2 Impacts of development on habitat connectivity 293
8.3.3 Impacts of development on water quality, water bodies and hydrological processes 294
8.3.4 Impacts of wind turbine strikes 296
8.3.5 Impacts of vehicle strikes on threatened fauna or fauna part of a TEC 309
8.4 Cumulative Impacts 311
8.5 Impacts to biodiversity values that are uncertain 317
8.6 Impacts to Matters of National Environmental Significance 317
8.6.1 Threatened ecological communities 317
8.6.2 Threatened species 318

8.6.3 Migratory species 334
8.7 Assumptions and limitations 335
9. Mitigating and managing impacts 336
9.1 Mitigation measures 336
9.1.1 Direct impacts (clearing of vegetation and threatened species habitat) 336
9.1.2 Indirect impacts 336
9.1.3 Prescribed impacts 337
9.1.4 Post Approval Plans 355
9.1.5 Operational stage mitigation and management 355
9.2 Adaptive management strategy for uncertain biodiversity impacts 356
9.2.1 BBAMP 356
9.2.2 Southern Bell Frog 360
9.2.3 Plains-wanderer 362
10. Serious and irreversible impacts (SAII) 363
10.1 Potential serious and irreversible impact entities 363
10.1.1 Threatened species 363
10.1.2 SAII assumptions and limitations 373
10.1.3 Data and information used in SAII assessment 373
11. Offset requirement 375
11.1 Impacts requiring offset 375
11.1.1 Ecosystem credits 375
11.1.2 Species credits 381
11.1.3 Offsets required under the EPBC Act 388
11.2 Impacts not requiring offset 411
11.3 Areas not requiring assessment 411
12. Conclusion 415
13. References 428

Figures

Figure 1-1 Subject Land map (noting the BDAR considers the Project area south of the Sturt Highway only). 18
Figure 1-2 Subject Land (Project Area) in relation to NPWS Reserves and Gayini Wetland 19

Figure 1-3 Subject Land (Euston Intersection Upgrade).....20
Figure 1-4 Subject Land (Balranald Intersection Upgrade) 21
Figure 1-5 Lots within the Subject Land 22
Figure 2-1 Example of farm dam within the Project Area 28
Figure 2-2 Example of wetland within the Project Area 28
Figure 2-3 IBRA regions and hydrology within the Project Area and Subject Land 32
Figure 2-4 Mitchell Landscapes within the Project Area and Subject Land 33
Figure 2-5 Soil types within the Project Area and Subject Land.....34
Figure 2-6 Landscape Features (Euston intersection) 35
Figure 2-7 Landscape Features (Balranald Intersection).....36
Figure 2-8 Native vegetation extent within the Assessment Area - windfarm site. 37
Figure 2-9 Native vegetation extent (Euston Intersection).....38
Figure 2-10 Native Vegetation Extent (Balranald Intersection).....39
Figure 3-1 Non-native vegetation within intersection upgrade areas at Balranald.....41
Figure 3-2 Example of PCT 15 woodland high condition.....48
Figure 3-3 Example of PCT 15 woodland low condition 49
Figure 3-4 Example of PCT 15 grassland moderate condition 49
Figure 3-5 Example of PCT 17 high condition.....51
Figure 3-6 Example of PCT 28 woodland moderate condition 53
Figure 3-7 Example of PCT 28 grassland moderate condition 54
Figure 3-8 Example of PCT 46 high condition.....56
Figure 3-9 Example of PCT 46 moderate condition.....56
Figure 3-10 Example of PCT 57 high condition.....58
Figure 3-11 Example of PCT 57 moderate condition 59
Figure 3-12 Example of PCT 153 high condition 61
Figure 3-13 Example of PCT 153 moderate condition 62
Figure 3-14 Example of PCT 153 Low condition - Euston Intersection 62
Figure 3-15 Example of PCT 160 high condition 66
Figure 3-16 Example of PCT 160 moderate condition 66
Figure 3-17 Example of PCT 163 high condition 68
Figure 3-18 Example of PCT 163 moderate condition 69
Figure 3-19 Example of PCT 164 high condition 71
Figure 3-20 Example of PCT 164 moderate condition 71

Figure 3-21 Plant Community Types and Threatened Ecological Communities within the Subject Land (refer to Appendix L.1 for Atlas series) 72

Figure 3-22 Plant Community Types and Threatened Ecological communities within the haul route intersection upgrades 73

Figure 3-23 Plant Community Types, associated zones and BAM plot locations within the Subject Land (refer to Appendix L.2 for Atlas series) 93

Figure 3-24 Plant Community Types, associated zones and BAM plot locations within the haul route Intersection upgrades. 94

Figure 4-1 *Brachyscome papillosa* detected during the September 2023 and September 2024 surveys 168

Figure 4-2 *Maireana cheelii* detected during the September 2023 and September 2024 surveys. 168

Figure 4-3 *Swainsona murrayana* detected during the September 2024 surveys 169

Figure 4-4 *Eleocharis* records in Project Area 175

Figure 4-5 Austral Pillwort BioNet records in Project Area 176

Figure 4-6 Wetland habitat at an Austral Pillwort reference site 177

Figure 4-7 *Eleocharis obicis* detected in Project Area (Outside Subject Land) 178

Figure 4-8 *Litoria raniformis* sightings during targeted surveys 185

Figure 4-9 Incidental sighting of a Plains-wanderer in PCT164 194

Figure 4-10 Stick nests recorded during targeted surveys 203

Figure 4-11 Flora survey effort within the Subject Land (refer to Appendix L.3 for Atlas series) 214

Figure 4-12 Flora species recorded within Subject Land and associated species polygons (refer to Appendix L.4 for Atlas series) 215

Figure 4-13 Fauna Survey Effort, Fauna Sightings and Species Polygons (refer to Appendix L.5 for Atlas series) 216

Figure 5-1 Patches of PCT 46 for assessment against diagnostic characteristics of *Natural Grasslands of the Murray Valley Plains* TEC 222

Figure 6-1 Raptor nest on old windmill within the Project Area, adjacent to Subject Land 237

Figure 6-2 Location of prescribed impacts where relevant to threatened entities assessed (refer to Appendix L.6 for Atlas series) 248

Figure 6-3 Habitual flight paths for nomadic and migratory species (refer to Appendix L.7 for Atlas series) 249

Figure 7-1 Removal of impacts, circled in Red, to dense populations of *Brachyscome papillosa* 253

Figure 7-2 Access track positioned south of the detected *Swainsona murrayana* individuals 255

Figure 7-3 Avoidance of Little Eagle habitat by removal of Wind Turbine 169 from footprint 255

Figure 7-4 Underground cabling only between Turbines 83 and 84 – access track has been removed 257

Figure 7-5 Avoidance of Hollow Bearing Trees within Black Box Woodland (PCT 15_Zone 1). 259

Figure 7-6 Minimising collision risks for breeding Wedge-tailed Eagle by removing turbine 126 from footprint 260

Figure 7-7 Biodiversity constraints avoided 264

Figure 7-8 Staged Assessment Footprint 267

Figure 7-9 Stage 1 Construction Footprint (refer to Appendix L.8 for Atlas series) 268

Figure 7-10 Stage 1 Construction Footprint - haul route intersections 269

Figure 7-11 Stage 2 Construction Footprint (refer to Appendix L.9 for Atlas series) 270

Figure 7-12 Operation Footprint 271

Figure 8-1 Modelled flood level impacts for 5% AEP Peak Velocity (Sourced from BMT, 2025) 296

Figure 10-1 Map of threatened entities at risk of SAII (refer to Appendix L.10 for Atlas series) 374

Figure 11-1 Impacts requiring offsets Stage 1 Development (refer to Appendix L.11 for Atlas series) 412

Figure 11-2 Impacts requiring offsets Stage 1 Development - Haul route intersections 413

Figure 11-3 Impacts requiring offset Stage 2 Development (refer to Appendix L.12 for Atlas series 414

Figure 13-1 BAM 137 located in similar landscape and locality to PCT 57_high in Stage 1 Development Footprint (Circled in Red). ..... A-II

Figure 13-2 BAM plot 305 located in similar landscape and locality to PCT 153_moderate in Stage 1 Development Footprint (Circled in Red). ..... A-III

Figure 13-3 BAM plot 303 located in same vegetation patch as PCT 160_high in Stage 1 Development Footprint (Circle in red). ..... A-IV

Figure 13-4 BAM plot 209, 210 and 411 in similar landscape and locality to Stage 1 Vegetation zone PCT 163_High (highlighted in green) ..... A-V

Figure 13-5 BAM plot 301 in similar landscape and locality to Stage 1 Vegetation zone PCT 164_moderate (highlighted in Yellow) ..... A-VI

Tables

Table 1-1 Lots included in the Subject Land 4

Table 1-2 BAM Calculator cases 8

Table 1-3 Summary of BCS comments and how addressed in BDAR V2 9

Table 1-4 Information sources used in the preparation of this report 15

Table 2-1 Native Vegetation Cover 31

Table 3-1 Mapped PCTs within the Subject Land (NSW DCCEEW 2022) 42

Table 3-2 Description of PCT 15 within the Subject Land 46

Table 3-3 Description of PCT 17 within the Subject Land 50

Table 3-4 Description of PCT 28 within the Subject Land 51

Table 3-5 Description of PCT 46 within the Subject Land 54

Table 3-6 Description of PCT 57 within the Subject Land 57

Table 3-7 Description of PCT 153 within the Subject Land 59

Table 3-8 Description of PCT 159 (Planted) within the Subject Land 63

Table 3-9 Description of PCT 160 within the Subject Land 64

Table 3-10 Description of PCT 163 within the Subject Land 67

Table 3-11 Description of PCT 164 within the Subject Land 69

Table 3-12 Assessment of *Acacia loderi shrublands* and associated PCTs 74

Table 3-13 Assessment of *Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions* TEC and associated PCT 75

Table 3-14 Assessment of *Artesian Springs Ecological Community in the Great Artesian Basin* TEC and associated PCTs 76

Table 3-15 Assessment of *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions* TEC and associated PCT 76

Table 3-16 Assessment of *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions* TEC and associated PCT 77

Table 3-17 Assessment of planted vegetation in accordance with Appendix D of the BAM (2020) 78

Table 3-18 Vegetation zones within the Development Footprint and Subject Land 82

Table 3-19 Monthly rainfall totals recorded at Moulamein Post Office (Station number 75046, Bureau of Meteorology) 88

Table 3-20 Rainfall thresholds for wet year modified benchmarks for PCTs in the Subject Land 89

Table 3-21 Current Vegetation Integrity scores for each Vegetation Zone within the Stage 1 Footprint 90

Table 3-22 Vegetation Integrity Scores for each Vegetation Zone within Stage 2 Footprint 91

Table 4-1 Species identified within BioNet search with potential habitat present within the Subject Land 96

Table 4-2 Summary of threatened and migratory bird species counts and habitat features recorded on-site during seasonal Bird Utilisation Surveys from 2023-2024 106

Table 4-3 Bird habitat features recorded within the Project Area 108

Table 4-4 Presence of threatened microbat species across each survey season over a two-year period 110

Table 4-5 Number of microbat survey nights across each survey season of a two-year period 111

Table 4-6 Species detected in adjacent projects 112

Table 4-7 Ecosystem credit species predicted by the BAM-C 115

Table 4-8 Additional ecosystem credit species added to the BAM-C 128

Table 4-9 Ecosystem credit species excluded from further assessment under BAM 130

Table 4-10 Candidate species identified in BAM C and included/excluded from assessment 131

Table 4-11 Candidate species identified in BAM C at Euston Intersection and included/excluded from assessment 141

Table 4-12 Additional species credit species added to the targeted survey plan 144

Table 4-13 Summary of species credit species surveyed within the Subject Land 147

Table 4-14 Weather summary 158

Table 4-15 September Flora Survey Methodology 164

Table 4-16 October Flora Survey methodology (Flora survey 2) 170

Table 4-17 Summer 2024/2025 Flora Survey 173

Table 4-18 Southern Bell Frog Survey Methodology 179

Table 4-19 Grey Snake Survey Methodology 186

Table 4-20 Nocturnal Birds survey methodology 190

Table 4-21 Plains-wanderer Survey Methodology 192

Table 4-22 Diurnal Birds Survey Methodology 195

Table 4-23 Raptor Survey Methodology 199

Table 4-24 Koala Survey Methodology 204

Table 4-25 Southern Myotis survey methodology 206

Table 5-1 Sampling effort in patches of PCT 46 220

Table 5-2 Assessment Step 1: Assessment of key diagnostic characteristics against representative patches assigned to PCT 46 223

Table 5-3 Assessment Step 2: Assessment of condition of the ecological community for representative patches that meet Step 1 key diagnostic characteristics 232

Table 6-1 Threatened aerial, migratory and raptor species likely to fly over the Subject Land 243

Table 7-1 Summary of avoidance and minimisation measures 260

Table 7-2 Approach taken to avoid and minimise prescribed impacts 265

Table 8-1 Direct impacts to biodiversity during the construction and operational phases 273

Table 8-2 Change in VI Score for each vegetation zone within the Stage 1 Development Footprint as a result of identified impacts 278

Table 8-3 Change in VI Score for each vegetation zone within the Stage 2 Development Footprint as a result of identified impacts 279

Table 8-4 Summary for species credit species loss within the Stage 1 Development Footprint 281

Table 8-5 Summary for species credit species loss within the Stage 2 Development Footprint 282

Table 8-6 Potential indirect impacts to biodiversity during the construction and operational phases 286

Table 8-7 Collision risk for bird and bat species of concern (known or likely to occur) 299

Table 8-8 Surrounding proposed windfarms, if approved likely to interact with Baldon Wind Farm 312

Table 8-9 Potential impacts to EPBC Act listed threatened species 319

Table 9-1 Mitigation measures proposed to avoid and minimise direct, indirect and prescribed impacts on native vegetation and habitat 338

Table 9-2 Extent, likelihood of impact and consequences of vehicle strike to the Southern Bell Frog 360

Table 9-3 Adaptive management plan for vehicle strike to the Southern Bell Frog (SBF) 361

Table 10-1 Plains-wanderer (*Pedionomus torquatus*) SAII Assessment 363

Table 10-2 *Convolvulus tedmoorei* (Bindweed) SAII Assessment 369

Table 11-1 PCTs and vegetation zones that require offsets within the Stage 1 Development Footprint 376

Table 11-2 PCTs and vegetation zones that require offsets within the Stage 2 Development Footprint 378

Table 11-3 Candidate species requiring offsets Stage 1 Development Footprint 382

Table 11-4 Candidate species requiring offsets Stage 2 Development Footprint 384

Table 11-5 MNES entities requiring offsets Stage 1 Development Footprint 389

Table 11-6 MNES entities requiring offsets Stage 2 Development Footprint 396

Table 12-1 Ecosystem credit summary requirement for Stage 1 and Stage 2 Development Footprints 419

Table 12-2 Species credit requirements summary for Stage 1 and Stage 2 Development Footprints 425

Table 13-1 BCS Bilateral Assessment Information and data requirements ..... B-XVIII

Table 13-2 List of entities identified within the supplementary SEARs and the justification for further assessment ..... B-XXX

Appendices

Appendix A Field Surveys ..... A-I

Appendix B Commonwealth MNES assessment ..... B-VIII

Appendix C BAM calculator credit reports ..... C-I

Appendix D BioNet Search Results ..... D-I

Appendix E Threatened Fauna Sightings ..... E-I

Appendix F Staff qualifications and experience ..... F-I

Appendix G Agency/consent authority consultation ..... G-I

Appendix H Hollow-bearing Tree Inventory ..... H-I

Appendix I Herbarium confirmation ..... I-I

Appendix J Bird and Bat Utilisation ..... J-III

Appendix K BDAR Requirements Compliance ..... K-I

Appendix L Atlas Maps ..... L-I

Appendix M Draft Land Category Map ..... M-I

Acronyms and abbreviations

AoS	Assessment of Significance (under the EPBC Act)
BAM	Biodiversity Assessment Methodology 2020
BAM-C	BAM Calculator
BESS	Battery Energy Storage System
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	*Biosecurity Act 2015* (NSW)
BOM	Australian Bureau of Meteorology
BOS	Biodiversity Offset Scheme
BMP	Biodiversity Management Plan
BBAMP	Bird and Bat Adaptive Management Plan
BBUS	Bird and Bat Utilisation Surveys
BUS	Bird Utilisation Surveys
CE	Critically Endangered (As listed under the BC Act or EPBC Act)
Cwth	Commonwealth
DAWE	(Former) Department of Agriculture, Water and the Environment (Cwth) (now DCCEEW-Cwth)
DCCEEW - Cwth	Department of Climate Change, Energy, the Environment and Water (Cwth Department) (formerly DAWE)
DCCEEW - NSW	Department of Climate Change, Energy, the Environment and Water (NSW Department) (formerly DPIE)
DPIE	(former) Department of Planning, Industry and Environment (NSW) – now DCCEEW-NSW
E	Endangered (As listed under the BC Act or EPBC Act)
EOO	Extent of Occurrence

EES	Environment, Energy and Science (NSW), Division of DCCEEW-NSW
EIS	Environmental impact statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EMS	Environmental Management Strategy
GW	Gigawatt
ha	hectares
HBT	Hollow Bearing Tree
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres
LEP	Local Environment Plan
LGA	Local Government Area
m	metres
MNES	Matters of National Environmental Significance under the EPBC Act (*c.f.*)
PCT	Plant Community Type
OEH	(Former) Office of Environment and Heritage (NSW) (now EES)
REZ	Renewable Energy Zone
RSA	Rotor Swept Area
RTS	Response to submissions
SAII	Serious and Irreversible Impact
SBF	Southern Bell Frog
SEARS	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TBDC	Threatened Biodiversity Data Collection

TECs	Threatened Ecological Communities – a general term given to both Commonwealth and NSW listed ecological communities.
V	Vulnerable (As listed under the BC Act or EPBC Act)
VI	Vegetation Integrity (Score generated by the BAM-C)
WTG	Wind Turbine Generator

1. Introduction

The proposed Baldon Wind Farm is classified as a State Significant Development (SSD) under the Planning Systems State Environmental Planning Policy (SEPP). This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposed Baldon Wind Farm (the Project) according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the project. NGH Pty Ltd has prepared this report on behalf of the proponent, Baldon Wind Farm Pty Ltd.

This BDAR Version 2.0 addresses comments from Biodiversity Conservation & Science Group (BCS) following exhibition of the Development Application and BDAR on 14th August 2024. This update reflects the removal of five turbines from the proposed Development and minor changes to access and reticulation, as well as addition of Southern Myotis candidate species generated from the BAM-Calculator (BAM-C)

1.1 The proposal

Baldon Wind Farm Pty Ltd (the Proponent) is proposing to develop Baldon Wind Farm across approximately 795 ha of the 46,259 ha Project Area. The Project would comprise the installation of a wind farm that would generate in excess of 1GW of renewable energy for the national electricity grid enough to power over 500,000 NSW homes.

The Proponent is proposing to develop the Baldon Wind Farm (here on referred to as the Project) in the Murrumbidgee subregion of the Riverina, New South Wales (NSW). The Project Area is located within the South West Renewable Energy Zone (REZ) (EnergyCo NSW, 2022). The Project is located 13 km north of Moulamein, NSW through to the A20 Sturt Highway, within both the Hay Local Government Area (LGA) and Murray River LGA.

The Project would include the installation of:

- 175 Wind Turbine generators [1](WTG), each with:
    - Three blades mounted to a rotor hub on a nacelle above a tubular steel tower (hub height approximately 130-180 m high), with a blade tip height (blade length plus hub height) of up to 300 m Above Ground Level (AGL); and
    - Adjacent hardstand areas (approximately 85 m x 70 m) for use as crane pads, assembly and laydown areas.
- Internal access tracks approximately 6 – 10 m wide and unsealed, depending on location and use.
- Drainage provisions alongside roads and project infrastructure
- Underground cabling to connect groups of turbines to the substations, or BESS facilities.
- Overhead transmission lines (likely 220 kV or 330 kV), approximately 33 km in total, to connect the project substations to the point of connection. Overhead lines may also be used as well as underground cabling within the site to connect groups of turbines.
- Substations and switching stations and other related electrical facilities. Up to 7 substations/switching stations may be proposed with the site and these areas may also include some operations facilities.

[1] This is a reduction from the EIS-exhibited BDAR of five turbines, primarily driven by additional biodiversity and hydrology investigations.

- Battery Energy Storage System (BESS) Facilities, One or both of the following forms:
    - A large BESS up to 200 MW/400 MWh (2-8 hours storage) located at or near to one or more of the Project's substations; or
    - A number of small BESS connected to all or a subset of the wind turbines and located on the turbine hardstand.
- Connection to the National Electricity Grid via either:
    - The existing 220 kV transmission line;
    - The 330 kV Project Energy Connect in the central part of the Project Area; and/or
    - Future augmentations of the surrounding electricity network.
- Operations and maintenance facilities
- Upgrades to the offsite haul route required to facilitate component deliveries. This will require vegetation impacts to two intersection upgrades.
- A primary site access, off the Sturt Highway for construction and operational access.
- The following temporary elements will be required during the construction phase of the Project:
    - Temporary construction facilities and laydown areas
    - Temporary concrete batching plants and mobile rock crushing equipment
    - A temporary accommodation camp may be required, subject to availability and suitability of accommodation in the surrounding region.
- In addition, the Project will include:
    - Onsite quarrying of gypsum to assist with road stabilisation, during construction.
    - Sourcing gravel and road base materials from local available quarries
    - Establishment of water bores to assist with construction water supply and minimal operational requirements.
    - The upgrading of an existing water pipeline along Baldon Road.

The Project would likely be completed in two stages. Stage 1 would consist of the grid connection works, 46 turbines and associated infrastructure. Stage 2 of the Project would consist of the remaining 129 wind turbines and additional associated infrastructure being constructed, commissioned, and having operation of the stage commence. The need for staging and associated timing will depend on the project being successful in securing Access Rights under the Access Scheme arrangements for the South West REZ.

Stage 1 and Stage 2 would be constructed, commissioned and commence operation independently of the other stage, although Stage 1 would begin the process first. However, the staging and construction timings will be dependent on the project's ability to secure Access Rights within the REZ. Once operational, the wind farm would operate continuously as wind conditions and electricity market prices are suitable.

Individual turbines will be shut down for periodic scheduled inspections and maintenance and, as necessary, unscheduled maintenance. The on-site operational facility will be host to a team of about 35 permanent on-site service staff. Construction facilities, laydown areas, underground cabling and temporary sites would be rehabilitated and do not form part of the operational footprint.

1.1.1 Report terminology

The following terms are used in this document:

- **Project -** Baldon Wind Farm; the proposed construction, operation and decommissioning of a wind farm and ancillary infrastructure including battery storage.
- **Development Footprint**– all areas of land which may be directly impacted by the Project, either during construction, operation or decommissioning. The Development Footprint accounts for all direct impacts required to allow for construction activities. Development Footprint areas are used in

the BAM Calculator (BAM-C) to generate ecosystem and species credits and is approximately 795 ha. The Project would likely be completed in two stages, and therefore to consider offset requirements, the Development Footprint has been further broken down into the Stage 1 Development Footprint and Stage 2 Development Footprint within the impact assessment.

  - **Stage 1 Development Footprint –** All areas of land which may be directly impacted by Stage 1 of the Project. Stage 1 development includes the grid connection works, 46 turbines and associated infrastructure. The Stage 1 Development Footprint covers an area of 219.07 ha.
  - **Stage 2 Development Footprint –** All areas of land which may be directly impacted by Stage 2 of the Project. Stage 2 development includes the construction of the remaining 129 turbines and additional associated infrastructure. The Stage 2 Development Footprint covers an area of 575.82 ha.

- **Construction footprint –** Areas which will be directly impacted during the construction phase of the Project. The construction footprint covers an area of approximately 795 ha. The construction footprint covers the same area as the Development Footprint in this report.
- **Operational footprint -** Areas which will be directly impacted during the operational phase of the Project. The operational footprint is contained within the construction footprint, however the total area to be impacted during this phase will less than during the construction phase. The operational footprint covers an area of 339.58 ha.
- **Subject Land** – Subject Land is the Development Footprint plus buffers around the Development Footprint for environmental assessment purposes and to consider some flexibility during the detailed project design. The Subject Land is the area where Stage 1 of the BAM has been applied and vegetation assessment and targeted surveys have been undertaken. The Subject Land covers an area of approximately 2,847 ha, which is comprised of approximately 2,846 ha within the Project Area and approximately 1.4 ha at the two access route upgrades along the offsite haul route. The following buffers around the centre line and/or point of proposed infrastructure are used when defining the Subject Land:
  - 30 m buffer for access tracks
  - 15 m buffer for underground cables
  - 50 m buffer for overhead transmission lines
  - 80 m buffer for wind turbines

- **Assessment Area** – The assessment area is the Subject Land plus additional buffers around the Subject Land for the purposes of determining site context such as landscape features and native vegetation extent. The BAM 2020 defines the Assessment Area, as the area of land within the 1,500 m buffer zone surrounding the Subject Land, or 500 m buffer zone for linear proposals. As the Subject Land contains both linear and non-linear components, a 500 m buffer zone has been placed around the linear areas (e.g. access tracks, cabling) and a 1,500 m buffer zone has been placed around the non-linear areas (e.g substation, BESS, compounds). The Assessment Area is approximately 31,364 ha.
- **Project Area –** The property boundaries of Project host landowners who have entered into an agreement to host Project infrastructure. The Project Area covers approximately 46,259 ha. Of this, 41,435 ha are located south of the Sturt Highway. As no infrastructure or impacts are proposed north of the Sturt Highway, only areas south of the highway (41,435 ha) have been considered in this

BDAR. Surveys for highly mobile species such as birds and bats have been included within the Project Area (south of the Sturt Highway) to consider broader landscape impacts.

- **Category 1 land - exempt land** – native vegetation clearing is allowed without approval from Local Land Services, under Part 5A of the LLS Act. Biodiversity values within these areas are not assessed under the BAM (2020).
- **Category 2 land - regulated land** – authorisation may be required from Local Land Services for native vegetation clearing on rural zoned land, under Part 5A of the LLS Act. Biodiversity values within these areas are assessed under the BAM (2020) for developments requiring assessment under the EP&A Act 1979.

1.2 Subject Land

1.2.1 Location

The Subject Land is located approximately 13 km north of Moulamein, 55 km east of Balranald and 75 km southwest of Hay in NSW. The Subject Land is located across two Rural property holdings comprised of multiple lots all of which are zoned Primary Production (RU1), in the Murray River and Hay Shire Local Government Areas (LGA). The Murray River is located to the south and west of the Subject Land, with the closest point being 45 km southwest of the Subject Land.

The Subject Land also covers the offsite haul route, which travels in NSW along the Sturt Highway from Euston to the Project Area. This route requires two offsite intersection upgrades: one at Euston, on the corner of the Murray Valley Highway and Sturt Highway and the other at Balranald, on the corner of the Sturt Highway (Market St) and the Sturt Highway (McCabe St). A third intersection upgrade would be required at the North of the Project Area, at the site access entrance off the Sturt Highway.

The Subject Land covers lots listed in Table 1-1 and shown in Figure 1-5.

Table 1-1 Lots included in the Subject Land

Lot	DP	Lot	DP
1-6,8-12,14,15	114086	5,11,12,14,16,52,53,69-81,85-87	751175
12,14	114102	9	751190
2,3	134029	4-7	751225
121-124	134030	13,15,17-19,21-31,,48-52,100-109	756506
3	235869	44,46,47,72,73	756549
1,3	235870	22-24,36,57-59	756555

Lot	DP	Lot	DP
1,2	241013	19-21,23-29,38-43,48,49	756573
3	235869	27-30	756595
2	527290	1-8,11-20,25-37	756596
1	664937	1,2,12,19,22-26,36-47,49,65,66,68,70-73,88-90	756601
Corner Murray Valley Highway and Sturt Highway (Euston)		Corner Sturt Highway (Market St) and Sturt Highway (Balranald).	

The Yanga State Conservation Area (SCA), Yanga National Park and Yanga Nature Reserve (collectively known as the Yanga Parks), are located 17 km west from the northwestern corner of the Subject Land. The Yanga Parks protect significant vegetation and landscape types within the largely cleared Riverina Bioregion, including part of the third largest contiguous stand of river red gum forest in Australia, as well as providing habitat for a range of threatened species.

The Gayini Wetlands Conservation Area are located 6 km north of the northeastern most point of the Project Area. The Gayini Wetlands covers 88,000 hectares on the Lowbdigee Floodplain, the largest remaining area of wetlands in the Murrumbidgee in the southern Murray-Darling Basin. It has high biodiversity and cultural significance.

The Subject Land is approximately 2,847ha, as shown in Figure 1-1, including two haul route intersection upgrades and the site access intersection upgrade.

1.2.2 Site description

The Subject Land is primarily covered by native shrubland and grassland with high diversity of forb species within the ground layer. Dominant shrub species include various species of Saltbush (*Atriplex* spp.), Bluebush (*Mairena spp.*), Copperburrs (*Scleroleana* spp) and Saltwort (*Salsola* spp.) which are present as patches within the Subject Land. Dominant grass species include various species of Speargrass (*Austrostipa* spp), Windmill Grass (*Enteropogon* spp) and Wallaby Grass (*Rytidosperma* spp). Sheep graze throughout the Subject Land at a current low stocking rate of one sheep per two ha, along with native herbivores such as kangaroos. There are also numerous anthropogenic dams scattered across the Subject Land that act as watering points for livestock. Wetlands and creek-lines are recorded within the Subject Land.
The Subject Land has a past history of overstocking of sheep that caused extensive damage to groundcover and resulted in bare ground over much of the land. However, land management within the last ten years, involving low stocking rates and revegetation of Old Man Saltbush (*Atriplex nummularia*), has greatly improved groundcover and allowed native vegetation to regenerate.

The Euston intersection upgrade is surrounded by irrigated cropping landscape with patches of chenopod shrubland along the roadside. The Balranald intersection upgrade occurs within an urban area, and contains no native or remnant vegetation.

Key features of the Subject Land include:

- Wetlands
    - Gunyah Swamp
- Watercourses
    - Abercrombie Creek
    - Snaky Creek
- Manmade dams and irrigation channels
- Remnant native woodland
- Native chenopod shrublands and riverine plain grasslands
- Scattered solitary trees
- Hollow bearing trees
- Planted rows of Old Man Saltbush
- Agricultural pastoral land
- Roads
    - Baldon Road
    - Keri Keri East Road

The topography of the Subject Land is varied ranging between 68-80 m above sea level, with large expanses of flat plains of chenopod shrubland intermixed with claypans and depressions, sand lunettes, black box billabongs, wetland complexes and ephemeral watercourses.

1.3 Study aims

The aim of this BDAR is to address the requirements of the Biodiversity Assessment Methodology 2020 (BAM 2020) in accordance with Section 7.9 of the NSW *Biodiversity Conservation Act 2016* (BC Act). This includes;

- An assessment of the biodiversity values of the project including plant community types (PCTs), threatened species, migratory species and habitat values.
- An assessment of the likely biodiversity impacts of the project including the application of the avoid, minimise and offset framework.
- Details of the biodiversity offset requirements and the measures proposed to address the offset obligations.

The Secretary's Environmental Assessment Requirements (SEARS) requires the following assessments on Biodiversity:

- *Assessment of the biodiversity values and the likely biodiversity impacts of the project, including impacts associated with transport route road upgrades and indirect impacts on Yanga State Conservation Area and Gayini wetlands in accordance the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity*

Development Assessment Report (BDAR), including a detailed description of the proposed regime for avoiding, minimising, managing and reporting on the biodiversity impacts (including on grasslands) of the development over time, and a strategy to offset any residual impacts of the development in accordance with the BC Act;

- *An assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the Fisheries Management Act 1994, and a description of the measures to minimise and rehabilitate impacts, including impacts to Abercrombie Creek and the Aquatic Endangered Ecological Community of the Murray River; (see section 6.1.4)*
- *an assessment of the impacts of the development on birds and bats, including blade strike, low air pressure zones at the blade tips (barotrauma), alteration to movement patterns, and cumulative impacts of other wind farms in the vicinity; and*
- *If an offset is required, include details of the measures proposed to address the offset obligation.*

This BDAR also includes an assessment of impacts to protected matters listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This assessment includes use of the Protected Matters Search Tool (PMST) to determine potential species and communities occurring within the locality. Targeted surveys and Bird and Bat Utilization Surveys (BBUS) were conducted within the Subject Land to detect the presence of these entities or their habitats. Entities known or considered likely to occur have been included in the impact assessment. A referral has been made to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW – Cwth) and the proposal has been designated a controlled action under Section 75 of the EPBC Act (EPBC 2024/097772). The EPBC Act controlling provisions for the proposed actions are:

- Listed threatened species and communities.

The project will require assessment and approval under the EPBC Act. The Commonwealth and NSW Government have entered into a bilateral assessment agreement to streamline assessment processes for major projects. Under the agreement, NSW government can assess development applications on behalf of the Australian Government and the BAM and Biodiversity Offset Scheme (BOS) can be used to meet federal offset requirements.

Supplementary SEARs were issued on 2 July 2024 and the BDAR and EIS have addressed the requirements of the Supplementary SEARS through assessment of Matters of National Environmental Significance (MNES). Appendix A of the Supplementary SEARs lists the following entities as having the potential to experience significant impacts based on the information in the referral document, the location of the action, species records and likely habitat present in the area:

- Plains-wanderer (*Pedionomus torquatus*) – Critically Endangered
- Winged Peppercress (*Lepidium monoplocoides*) – Endangered
- Mossgiel Daisy (*Brachyscome papillosa*) – Vulnerable

Additionally, Appendix A of the supplementary SEARs states there is a possibility that the proposed action will have or is likely to have significant impacts on the following entities and levels of impacts should be further investigated:

- Pink Cockatoo (eastern) (*Lophochroa leadbeateri leadbeateri*) – Endangered
- Southern Bell Frog (*Litoria raniformis*) – Vulnerable
- Blue-winged Parrot (*Neophema chrysostoma*) – Vulnerable

- Southern Whiteface (*Aphelocephala leucopsis*) – Vulnerable
- Chariot Wheels (*Maireana cheelii*) – Vulnerable
- *Natural Grasslands of the Murray Valley Plains* – Critically Endangered
- Curlew Sandpiper (*Calidris ferruginea*) - Critically Endangered
- Swift Parrot (*Lathamus discolor*) - Critically Endangered
- Australasian Bittern (*Botaurus poiciloptilus*) – Endangered
- Australian Painted Snipe (*Rostratula australis*) – Endangered
- South-eastern Hooded Robin (*Melanodryas cucullata cucullata*) – Endangered
- Common Greenshank (*Tringa nebularia*) – Endangered
- Grey Falcon (*Falco hypoleucos*) – Vulnerable
- Painted Honeyeater (*Grantiella picta*) – Vulnerable
- Malleefowl (*Leipoa ocellata*) – Vulnerable
- Diamond Firetail (*Stagonopleura guttata*) – Vulnerable
- Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*) – Vulnerable
- Latham's Snipe, Japanese Snipe (*Gallinago hardwickii*) – Vulnerable
- Sharp-tailed Sandpiper (*Calidris acuminata*) – Vulnerable
- Trout Cod (*Maccullochella macquariensis*) – Endangered
- Murray Cod (*Maccullochella peelii*) – Vulnerable
- Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (*Phascolarctos cinereus*) – Endangered
- Corben's Long-eared Bat, South-eastern Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable
- Grey Snake (*Hemiaspis damelii*) – Endangered
- Slender Darling-pea, Slender Swainson, Murray Swainson-pea (*Swainsona murrayana*) – Vulnerable

These MNES have been addressed throughout this BDAR in Section 5, 8.6, 11.1.3 and Appendix B. Appendix B.6 provides a summary of the impacts to MNES.

1.3.1 BAM Calculator cases

Three BAM Calculator (BAM-C) child cases have been set up and submitted for this BDAR under Parent Case Number 00034998. Each child case covers a different stage of the development. One child case (003499) set up initially, covered the whole Development Footprint to inform targeted survey requirements and has not been submitted. BAM-C cases are shown in the following table.

Table 1-2 BAM Calculator cases

BAM-C Case Number	Revision	Development Footprint assessed	IBRA region/ Subregion	Finalised
0003499	0	All stages of the Development Footprint in the Project Area	Riverina / Murrumbidgee	Not submitted
00045828	5	Stage 1 – Initial Construction Footprint	Riverina / Murrumbidgee	02/05/2025

00046895	8	Stage 2 – Secondary Construction Footprint	Riverina / Murrumbidgee	02/05/2025
00054223	0	Road Intersection upgrade (Euston)	Riverina / Robinvale Plains	02/05/2025

1.4 Response to BCS submission

This BDAR V2.0 addresses the agency comments received from exhibition of the BDAR on 14th August 2024. Table 1-3 summarises the changes in the BDAR in response to each of the BCS comments and following further consultation with BCS and other agencies.

Table 1-3 Summary of BCS comments and how addressed in BDAR V2

Number	BCS Comment	How/where addressed
2	A draft Bird and Bat Adaptive Management Plan needs to be prepared. A Bird and Bat Adaptive Management Plan (BBAMP) based on sufficient survey data and documenting commitments to monitor, mitigate and offset residual impacts to avifauna needs to be provided.	Draft BBAMP prepared (Appendix J.1) and summarised in Section 9.2.1
3	Additional Bird and Bat Utilisation Survey (BBUS) effort is required so that the BBUS can be used to reliably inform the draft BBAMP.	Bird and Bat Utilisation surveys completed to cover two years of data, including at height data for bats. Bat Surveys have now been completed in Autumn, Winter, Spring 2023, Summer, Autumn, Winter, Spring 2024 & Summer 2025. Bird Surveys have now been completed in Summer, Autumn, Winter, Spring 2023 & Summer, Autumn, Winter, Spring 2024. Results of the field surveys are summarised in Section 4.1.3. Section 6.1.5, and Section 8.3.4. Reports are provided in Appendix J.
4	The BDAR needs to include more detail to demonstrate that biodiversity impacts have been avoided or minimised. The BDAR requires additional information to demonstrate that impacts have been avoided and minimised, including to SAII	Section 7.1 updated to discuss avoidance of biodiversity issues. Table 7-1 added and Figure 7-1 (now Figure 7-6) updated to include biodiversity impacts only. Additional avoidance measures include removal of two wind turbines (WTG 126 and 169) in vicinity of known raptor (Little Eagle, Wedge-tail Eagle) nests, removal of cabling and turbines in dense

Number	BCS Comment	How/where addressed
	entities.	*Brachyscome papillosa* populations and removal of access track near Plains-wanderer sightings.
5	Impacts to Plains-wanderer habitat and recorded locations need to be avoided.	As discussed with BCS and the species expert, all native vegetation onsite can be assumed as habitat for this species, which are likely to range across the site as habitat structure changes with grazing and season. Avoidance based on habitat or recorded locations is not considered possible or warranted; approximately 2% of the habitat in the Project Area would be impacted which is considered to be a minor impact to its habitat. Access tracks between Turbine 83 and 84 have been removed to reduce fragmentation to an area adjacent to Plains Wanderer sightings. Strong and proactive mitigation seeks to achieve a net benefit for this species, set out in Section 9, focussed on pest management. The species is only considered a SAII entity within the area mapped as Important Habitat as defined under the BAM. As the Development does not affect mapped Important Habitat for this species defined under the BAM, the species is not considered to be a SAII entity. A SAII assessment was still conducted based on the number of sightings of the species within the Project Area and can be viewed in Section 10.1.1.
6	Potential SAII are unknown as flora species are assumed to be present.	Additional surveys were undertaken for *Convolvulus tedmoorei* in Spring 2024 in areas previously assumed present and the species was not detected. Results of the additional survey areas are updated in Section 4.6.3. Surveys were not able to be completed at the new site entrance intersection on the Sturt Highway, due to the updated Development Footprint for the intersection upgrade being provided after the survey window of the species. A total of 0.17 ha of habitat has therefore been assumed present at the new site entrance intersection. Pre-clearance surveys of this 0.17 ha are recommended to avoid any impacts to *C. tedmoorei* SAII assessment for the species was updated in Section 10.1.1

Number	BCS Comment	How/where addressed
7	Variability across PCT 164 does not account for wetland areas and gilgai habitats. PCT, Threatened Ecological Communities (TEC), and vegetation zone identification and mapping need to be revised and the biodiversity credit calculation updated.	A Gilgai assessment was undertaken in November 2024 and January 2025. Twenty BAM plots and 20 Rapid Assessment points were undertaken in visible Gilgai locations. The results showed the vegetation mostly aligns to PCT 164. There were four exceptions, with these areas being small patches dominated by Nitre Goosefoot (*Chenopodium nitrariaceum*) aligning to PCT 160, surrounded by the dominant PCT 164. These areas have been adjusted in the PCT mapping of the Subject Land. Gilgai assessment results have been updated in Section 3.2.3 and Appendix A.3.
8	Vegetation integrity (VI) scores need to be revised for each project Stage.	BAM plots were split into Stage 1 and Stage 2 Development Footprints. The allocation is shown in Section 3.3.1. Two additional BAM plots were undertaken in January 2025 for inclusion into Stage 1 footprint. Six zones in Stage 1 were short of BAM plots. Justification for using BAM plots from Stage 2 is given in Appendix A.4. BAM-C was updated with adjusted plots and the VI scores were updated in Section 3.3.2.
9	Threatened flora recorded for Project EnergyConnect and on adjacent proposed wind farms should be included in the revised BDAR. New BioNet records for threatened flora, including SAII species, should be included in the assessment to guide avoidance and mitigation measures.	A new BioNet search was undertaken in January 2025 and updated in Table 4-1. As a result of *Eleocharis obicis* being detected in the Project Area, this species was added into the BAM-C as a candidate species. *Eleocharis obicis* was not visible during November 2024 surveys and no further surveys were planned or samples able to be collected. *E. obicis* was detected in January 2025 surveys in a wetland, however this was outside of the survey window. *E. obicis* has been assumed present in areas of associated PCT 15, 17 160 & 163. Species surveys and species polygons have been updated in Sections 4.6.1, 4.6.2 and 4.6.3. Species impacts and offset requirements are provided in Sections 8.1.2, 9.1 and 11.1.
10	Microhabitats and survey effort for *Pilularia novae-hollandiae* need to be appropriately estimated.	*Pilularia novae-hollandiae* was surveyed in December 2024. Reference populations in the Project Area were surveyed to determine species presence and typical microhabitats. No *Pilularia novae-hollandiae* was detected at these reference population sites or within the Subject Land. Wetland habitat comprised of

Number	BCS Comment	How/where addressed
		sedges was found at all *Pilularia novae-hollandiae* reference population locations. The reference populations in the Project Area occur in distinct wetland habitat, not typical of the vegetation across the Subject Land. No species polygons have been created for *Pilularia novae-hollandiae*. Results of these surveys were updated in Section 4.6.4 and Appendix A.5. Assumed present species polygons have been removed and updated in the credit obligation.
11	Ensure survey effort meets threatened species survey requirements for Koala.	Justification for excluding koala habitat based on the highly degraded habitat in the Subject Land was provided to BCS in January 2025 and BCS concurred with NGH's approach to exclude the koala from further survey. Koala survey methodology was updated in Section 4.6.3 and consultation documentation with BCS provided in Appendix G.4.
12	Species polygons need to be consistent with section 5.2.5 and Box 2 of the BAM.	Justification is provided for species polygons in Sections 4.6.1 and 4.6.4. Updated species impacts is provided in Sections 8.1.2 and 11.1.2. Targeted surveys were undertaken in Spring 2024 and results were updated in Section 4.6.3. A small patch of *Swainsona murrayana* was detected in the Southeastern corner of the Subject Land between Turbines 177 and 178, comprising of seven individuals. A species polygon was created for this species, and direct impacts to detected individuals will be avoided by the Development Footprint. The site entrance intersection area was unable to be surveyed for *S. murrayana* and 0.17 ha of habitat has been assumed present in this area *Lepidium monoplocoides, Solanum karsense, Leptorhynchos, Sclerolaena napiformis, Solanum karsense, Swainsona plagiotropis* were not detected during targeted surveys and are considered not to occur within the Subject Land. Species polygons and credit obligations for these species have been removed. *Convolvulus tedmoorei* was not detected during Spring 2024 surveys and has been excluded from these areas, however the site entrance intersection upgrade was unable to be surveyed within the survey

Number	BCS Comment	How/where addressed
		period for the species and 0.17 ha of habitat has been assumed present for *Convolvulus tedmoorei.* Updated impacts and credit obligations are given in Sections 8, 9 and 11.
13	The direct impact assessment needs to include impacts associated with the haul route. Some direct, indirect and prescribed impacts need to be appropriately assessed.	The haul route has been included as part of the Development Footprint and updated throughout the BDAR. Vegetation mapping, threatened species assessment and impact assessment has been updated to include the haul route. The offsite haul route encompasses the Sturt Highway from Euston to the Project Area and include three intersection upgrades, comprising an additional impact to 0.17ha of PCT 164 along site entrance on Sturt Highway, 0.16 ha of PCT 153 at Euston intersection upgrade and 0.18 ha of exotic vegetation at Balranald intersection upgrade for assessment. Impacts occur to 0.17ha of PCT 164 at site entrance intersection and 0.16ha of PCT 153 at Euston intersection. Euston intersection upgrade was included as a new BAM-C case (00054223) as it occurred in a different IBRA subregion.
14	The indirect impact assessment should include turbine noise and loss of fauna habitat.	Table 8-6 was updated to address indirect impacts of wind turbine noise. Most of the research regarding turbine noise impacts on fauna, relates to birds but does include other fauna. NGH have cited existing literature and applied these results regarding potential interference with fauna calls. No additional mitigation is considered warranted. Table 8-6 has also been updated to include potential impacts of trench excavation and mitigation measures have been updated Table 9-1.
15	The prescribed impact assessment and proposed mitigation measures need to adequately address impacts of vehicle strike on Southern Bell Frog.	An adaptive management plan has been included in Section 9.2.2 for the Southern Bell Frog. The plan discusses performance criteria, actions proposed and monitoring/management requirements to support the objective of no injuries/deaths occur.

Number	BCS Comment	How/where addressed
16	Prescribed impacts need to be assessed for each impacted entity.	Species or guilds have been updated as relevant in Section 8.3 which includes disused wind mill structures relevant to raptor nests, habitat connectivity impacts to five fauna species, hydrology changes relevant to one frog species, one mammal species and four flora species, turbine and vehicle strike relevant to bird and bat guilds with specific discussion of species of concern.
17	The assessment of flight paths and collision risk needs to be revised.	Collision risk has been revised using the NSW government draft Turbine Risk Assessment and Avoidance Guidance (NSW DCCEEW, 2024) which resulted in higher risk levels for threatened species. Risk levels were updated where necessary in Section 8.3.4 and the revised risk analysis report can be viewed in Appendix J. Flight paths have also been addressed within the Bird and Bat Utilisation Survey Final Report provided by Nature Advisory and can be viewed in Appendix J. A summary of the flight paths is provided in this BDAR in Section 6.1.5.
18	Mitigation measures should be detailed in the BDAR to demonstrate effective management of impacts and to give confidence that the offset liability is adequate. Mitigation measures need to include more detail to demonstrate that impacts will be successfully managed.	Mitigation measures updated in Table 9-1 with extra details on actions, timing, and consequences of residual impacts. The key management plan relevant to the Project is the Bird and Bat Adaptive Management Plan, which is now submitted in draft form and can be viewed in Appendix J.1.
19	Impacts to Plains-wanderer to address the specific project risks is unclear – existing access tracks should be used. Matters of National Environmental Significance – consider additional offsets and mitigation for this species.	Risks to this species have been characterised in accordance with Commonwealth guidelines Appendix B updated with Assessment of Significant Impact for Plains-wanderer. Access track design must accommodate large machinery and use of existing tracks is not always achievable; 50km of existing tracks are used. As all native vegetation in the Project Area is considered habitat for this species, approximately 2% of the habitat in the Project Area would be impacted, which is considered to be minor. As discussed with DCCEEW (Cwth), all Plains-wanderer habitat will be offset (NSW ecosystem credits are generated for all PCT clearing). In addition, strong and proactive mitigation seeks to achieve a net

Number	BCS Comment	How/where addressed
		benefit for this species, set out in Section 9, focussed on pest management.
20	The area of EPBC-listed Natural Grasslands of the Murray Valley Plains Threatened Ecological Community needs to be assessed at the patch scale.	TEC was assessed at patch scale rather than BAM plot, and results provided in section 5.1.2. No changes to results of TEC areas.
21	A complete MNES assessment should be provided to address the Assessment Bilateral.	Section 5, Section 8.6 and Appendix B updated to address MNES. 17 MNES assessments of significance undertaken and included in Appendix B. Results are summarised in Section 8.6.
22	Any threatened flora records should be verified by a herbarium.	*Maireana cheelii* sample was sent to National Herbarium of NSW on December 2024. Herbarium confirmation identification is included in Appendix I. *Swainsona murrayana* sample was not collected in the field due to its small population size.

1.5 Sources of information

The sources of information used in this assessment are shown in Table 1-4.

Table 1-4 Information sources used in the preparation of this report

Information	Source
Australia's Interim Biogeographic Regionalisation for Australia (IBRA) bioregions and subregions (DAWE, 2020)	www.environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
Mitchell Landscapes (DECCW, 2002)	Department of Environment and Climate Change NSW (DECC, 2002). Descriptions for NSW (Mitchell) Landscapes, Version 3
NSW Biodiversity Assessment Method (BAM) calculator (BAM C)	DCCEEW - NSW, NSW Biodiversity Accredited Assessor System (https://customer.lmbc.nsw.gov.au/assessment/s/userlogin?startURL=%2Fassessment%2Fs%2F

Information	Source
NSW BioNet Threatened Biodiversity Database Collecion (TBDC)	DCCEEW-NSW Accessed online via login at www.BioNet.nsw.gov.au
BioNet vegetation classification database (DPE, 2025)	Accessed online via login at: www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
Concept design and project information	Baldon Wind Farm Pty Ltd
Biodiversity Assessment Method 2020 (DPE, 2020)	www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/accredited-assessors/biodiversity-assessment-method-2020
Department of Primary Industries (DPI) profiles of threatened species, populations, ecological communities and key threatening processes (DPI, n.d.)	www.dpi.nsw.gov.au/fishing/threatened-species/what-current
Directory of Important Wetlands (DCCEEW, 2021)	www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands
Transitional Native Vegetation Regulatory Mapping	https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap
NSW Biodiversity Values Map and Threshold Tool (NSW Gov, n.d.)	www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap
NSW Flora Online (PlantNET, n.d.)	https://plantnet.rbgsyd.nsw.gov.au
NSW Government SEED mapping (SEED, 2021)	https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
NSW Soil and Land Information (eSpade, n.d.)	www.environment.nsw.gov.au/eSpade2WebApp#
NSW Threatened Species Profiles (NSW Government) (OEH, n.d.(a))	https://www.environment.nsw.gov.au/threatenedSpeciesApp/
DPIE VIS mapping (DPIE, 2019)	Accessed online at:

Information	Source
	http://www.environment.nsw.gov.au/research/VISmap.htm
NSW Threatened Species Scientific Committee final determinations (DPE, n.d.)	www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/nsw-threatened-species-scientific-committee-final-determinations
Protected Matters Search Tool (Commonwealth Government) (DCCEEW, n.d.)	www.environment.gov.au/epbc/protected-matters-search-tool
Species Profiles and Threats (SPRAT) Database (Commonwealth Government) (DCCEEW, n.d.)	http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
Aerial imagery of historical land use	Sourced from Google Earth and NSW Spatial Services Delivery
Department of Primary Industries (DPI) Fisheries Spatial Data Portal (Department of Primary Industries , n.d.)	www.dpi.nsw.gov.au/fishing/fisheries-research/spatial-data-portal
NSW Environment Protection Authority (EPA, n.d.) Contaminated land record of notices	https://app.epa.nsw.gov.au/prclmapp/searchregister.aspx
NSW Government Department of Planning, Housing and Infrastructure Major Projects (NSW Government , n.d.)	https://www.planningportal.nsw.gov.au/major-projects

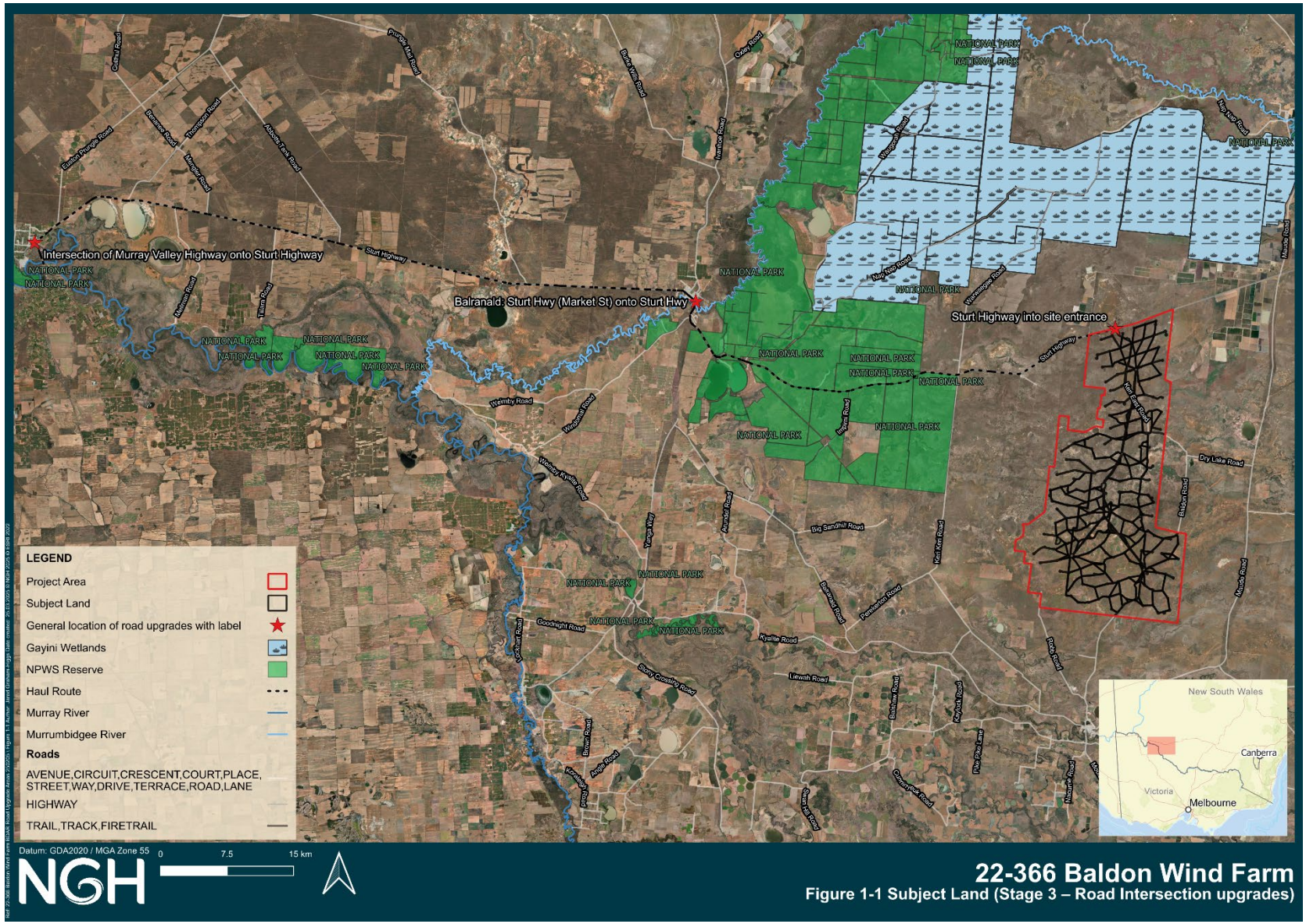


Figure 1-1 Subject Land map (noting the BDAR considers the Project area south of the Sturt Highway only).

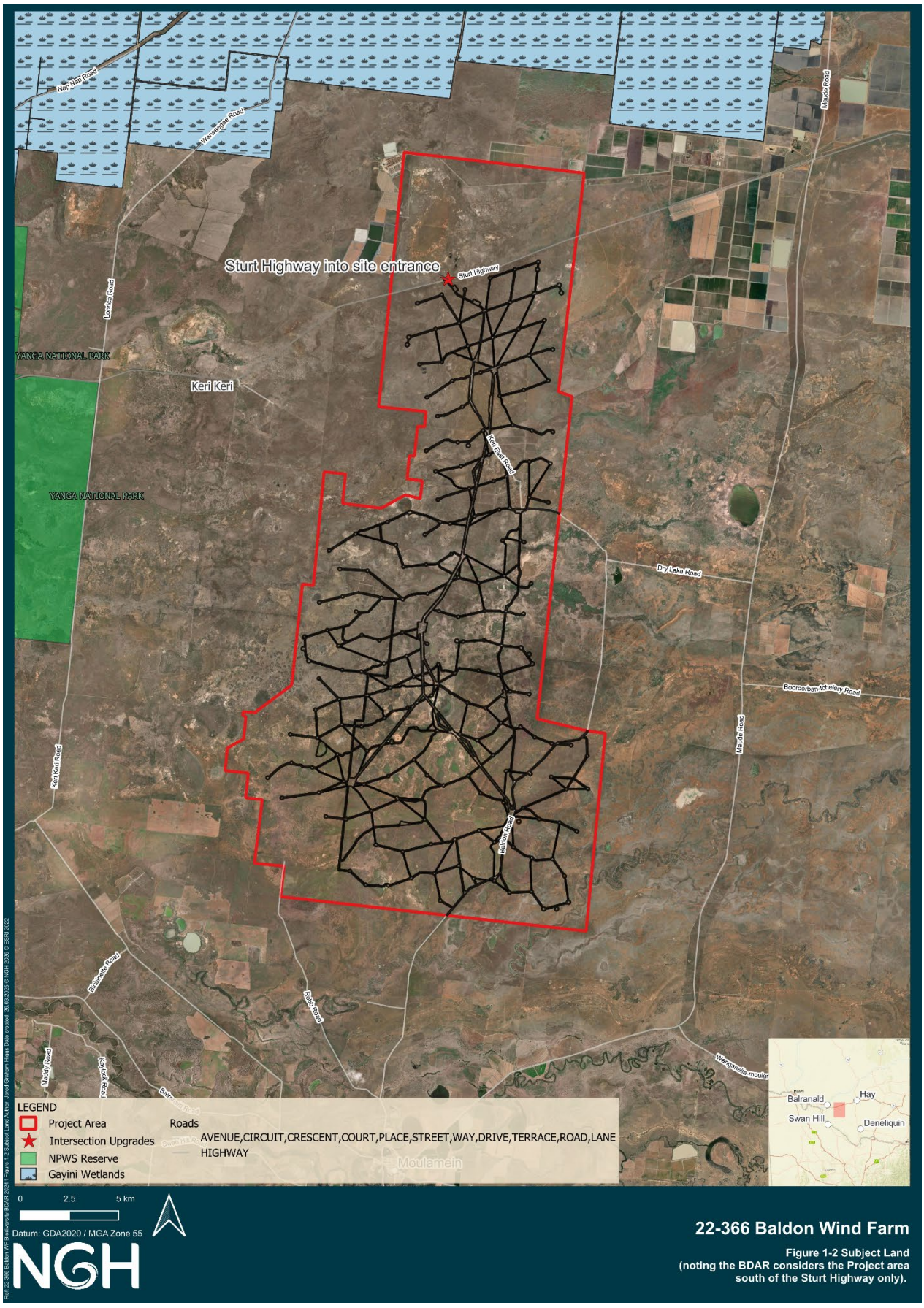


Figure 1-2 Subject Land (Project Area) in relation to NPWS Reserves and Gayini Wetland



Figure 1-3 Subject Land (Euston Intersection Upgrade)



Figure 1-4 Subject Land (Balranald Intersection Upgrade)

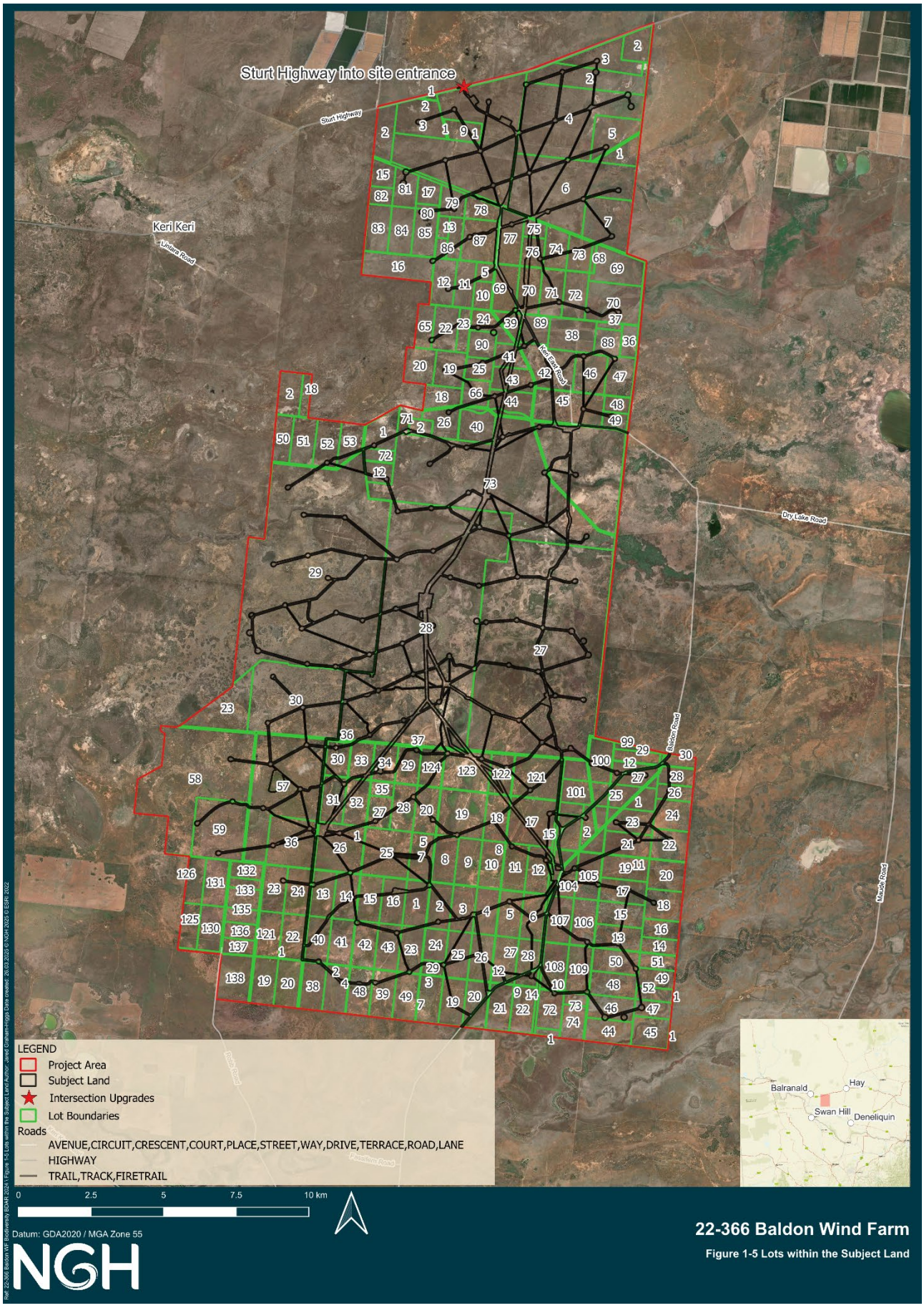


Figure 1-5 Lots within the Subject Land

2. Landscape context

2.1 Overview

The Subject Land is a complex network of linear infrastructure over a very large Project Area, and it is difficult to distinguish landscape features within the linear network over a broad scale. As such, the following landscape context of the site is described within the entirety of the Project Area (property boundary of the site) allowing landscape features to be more easily identified and visible on the mapping.

The Project Area occurs within the flat riverine plains between the townships of Hay and Balranald. The topography of the Project Area is varied, ranging between 68-80 m above sea level, with large expanses of flat plains of chenopod shrubland intermixed with claypans and depressions, sand lunettes, Black Box billabongs, wetland complexes and ephemeral watercourses.

The Murrumbidgee River is located approximately 25 km north of the Project Area. The nearest reserved lands include Yanga National Park (11 km west), Murray Valley National Park (28 km south) and Kalyarr National Park (40 km northeast).

Two road intersection upgrades for the offsite haul route are included as part of the Subject Land. These intersection upgrades occur at Euston, on the corner of the Murray Valley Highway and Sturt Highway and at Balranald, on the corner of the Sturt Highway (Market St) and Sturt Highway. The Euston intersection upgrade is surrounded by irrigated cropping landscape with patches of chenopod shrubland along the roadside. The Balranald intersection upgrade occurs in the township within an urban area and contains no native or remnant vegetation.

The landscape features described in the following section are illustrated in Figure 2-3- Figure 2-4

2.2 IBRA bioregions and subregions

Interim Biogeographical Regionalisation for Australia (IBRA) bioregions are geographically distinct bioregions based on common climates, geology, landforms and native vegetation (Thackway & Cresswell, 1995) There are 89 bioregions within Australia. The Project Area falls within a single IBRA Bioregion, the Riverina Bioregion, and within the Murrumbidgee IBRA subregion (Figure 2-3).

The intersection upgrade at Balranald also falls within the same IBRA region and subregion. The intersection upgrade on the Murray Valley Highway/Sturt Highway at Euston falls within the Riverina IBRA Bioregion and the Robinvale Plains subregion.

Bioregion information was sourced from the Environment NSW website for bioregions and subregions (https://www.environment.nsw.gov.au/bioregions).

The Riverina Bioregion is an extensive area lying in the southwest of New South Wales and extending into central-north Victoria. The majority of the bioregion is contained within NSW accounting for 7,090,008 ha (74.03%) of its 9,4578,964 ha extent. The NSW portion of Riverina bioregion accounts for 8.86% of the wider state" (NPWS, 2003). *This bioregion is characterised by large river systems including the Murray and Murrumbidgee Rivers and their associated major tributaries, the Lachlan and Goulburn Rivers, which flow from the eastern highlands westwards across the broad expanse of the Riverina plain. Notable settlements within the bioregion include the towns of Hay, Coleambally, Deniliquin, Leeton, Mossgiel, Hillston, Booligal and Wentworth. (NPWS, 2003)*

The Riverina Bioregion is characterised by a dry, semi-arid climate with hot summers and cool winters. There is little variation in seasonal temperatures across the bioregion, however summer and winter temperatures tend to be slightly higher in the more northward portion of the region. Annual rainfall increases moving from west to east and from north to south (NPWS, 2003). Mean annual rainfall is reported as between 238-617mm, with rainfall highest between May and September. Summer rainfall primarily occurs during brief localised thunderstorms; however, periods of drought are not uncommon in this region.

The topography of the Riverina is dominated by overlapping, low gradient alluvial fans within the upper catchment of the Lachlan, Murrumbidgee, and Murray Rivers. The lower catchment consists of floodplain with seasonal overflow lakes. The landscape, including the soil and vegetation which characterise the lower tracts of the Riverina bioregion were primarily determined by past and present patterns of sediment deposition by local river systems" (NPWS, 2003).

Each bioregion is subdivided in a subregion and within the broader context of the Riverina bioregion, the Project Area is located within Murrumbidgee IBRA subregion. The Murrumbidgee IBRA subregion is characterised by the river system from which it derives its name. This subregion covers approximately 2,946,813 ha of land. The subregion is characterised by sandy soils and saline heavy grey and brown clays within the lower floodplains, graduating to more interior red-brown clays (NPWS, 2003). These red-brown and grey clays support nationally significant grassland communities, while sandier soils are associated with mallee communities present within the bioregion. Notable vegetation within the region includes River Red Gum *(Eucalyptus camaldulensis)* and River Cooba *(Acacia stenophylla)* primarily located along water channels, Black Box *(Eucalyptus largiflorens*), Lignum *(Muehlenbeckia spp.)* and Old Man Saltbush *(Atriplex nummularia)* predominating across the floodplain, Weeping Myall *(Acacia pendula),* grasses and saltbush dominating the backplains and White Cypress Pine *(Callitris spp.)* localised to dune systems (NPWS, 2003).

The Robinvale Plains IBRA subregion is characterised by narrow floodplains with meandering channels, billabongs, levees and low dunes, with overflow lakes with lunettes also occurring. This subregion covers approximately 97,485 ha of land. The subregion is characterised by yellow texture contrast soils, with red brown earths, grey clays and deep sands also occurring. Notable vegetation includes River Red Gum *(Eucalyptus camaldulensis)* primarily located along water channels, Black Box *(Eucalyptus largiflorens*), River Cooba *(Acacia stenophylla)* Lignum *(Muehlenbeckia spp.),* Belah (*Casuarina cristata*) and Old Man Saltbush *(Atriplex nummularia)* predominating across the floodplain, and White Cypress Pin *(Callitris spp.),* Mallee *Acacia* species and Bluebush (*Maireana spp.*) localised to lunettes and dune systems (NPWS, 2003).

The Riverina Bioregion and Murrumbidgee Subregion was added to the BAM-C (Case 00045828 & 00046895) for assessment of the Project Area.

The Riverina Bioregion and Robinvale Plains Subregion was added to the BAM-C (Case 00054223) for assessment of the Euston intersection upgrade.

2.3 NSW landscape regions

The Project Area falls across four Mitchell Landscapes. These are:

- Murrumbidgee Channels and Floodplains (4925.7 ha)
- Murrumbidgee Depression Plains (22135.4 ha)
- Murrumbidgee Lakes, Swamps and Lunettes (2569.1 ha)
- Murrumbidgee Scalded Plains (11805.4 ha)

The dominant Mitchell Landscape within the Project Area and Subject Land is the Murrumbidgee Depression Plains. This was entered into the BAM-C (Case 00045828 & 00046895) for assessment of the Project Area.

The Mitchell Landscape within the Euston intersection upgrade is Murray Channels and Floodplains. This was entered into the BAM-C (Case 00054223) for assessment of the Euston intersection upgrade.

The Mitchell Landscape within the Balranald intersection upgrade is Murrumbidgee Channels and Floodplains.

Murrumbidgee Depression Plains is described as "*Quaternary alluvial plains with numerous circular depressions interpreted as high floodplains or low terraces beyond the reach of average floodwaters, relief to 10m. Grey to brown clays and clay loams with linear patterns of sandy prior streams. Now extensive grasslands of white-top, windmill grass, sand broom, and spear grasses, heavily grazed and invaded by exotic species. Reported to have originally been myall (Acacia pendula), old man saltbush (Atriplex nummularia) and bladder saltbush (Atriplex vesicaria). Sandy ridges of prior streams support patches of white cypress pine (Callitris glaucophylla), with needlewood (Hakea leucoptera), western pittosporum (Pittosporum phylliraeoides) and spear grasses (Austrostipa sp.).*" (DECCW, 2002)

Murrumbidgee Lakes, Swamps and Lunettes is described as. "*Large active freshwater lakes and swamps frequently flooded by the river, sometimes near permanent, generally round or kidney shaped. Often nested within larger relic Quaternary lake features. May include areas of saline plains. Beaches, sand and clay pellet lunettes and sand hills on the eastern margins. Lake beds and associated channels of grey cracking clay, beaches of brown to white sands, lunettes of deep cemented yellow to white sands, with or without interbedded strata of pelleted clay. Relief of lakes and channels to 8m, lunettes to 15m. Scattered black box (Eucalyptus largiflorens), river red gum (Eucalyptus camaldulensis), nitre goosefoot (Chenopodium nitrariaceum), lignum (Muehlenbeckia cunninghamii), yanga bush (Maireana brevifolia) and old man saltbush (Atriplex nummularia) on lakebeds. Shallower swamps with cumbungi (Typha orientalis), common reed (Phragmites australis), bushy groundsel (Senecio cunninghamii), spike rush (Eleocharis sp.) and water couch (Paspalum paspalodes). Numerous aquatic plants in standing water. Lunettes and sand hills with marginal bimble box (Eucalyptus populnea), white cypress pine (Callitris glaucophylla), yanga bush, bluebush (Maireana sp.) and grasses*". (DECCW, 2002)

Murrumbidgee Scalded Plains is described as "*Quaternary alluvial plains with extensive scalding interpreted as relic floodplains or terraces. Grey, brown and red cracking clays, red brown texture-contrast soils with scalds. Levees traces evident, relief generally <1m, up to 5m on associated pans, swamps and lunettes. Low shrublands and grasslands of bladder saltbush (Atriplex vesicaria), other annual saltbushes (Atriplex sp.), numerous burrs (Sclerolaena sp.), cottonbush (Maireana aphylla), bush minuria (Minuria cunninghamii), white-top grass (Austrodanthonia caespitosa), windmill grass (Chloris truncata), and hill wallaby grass (Austrodanthonia eriantha)*" (DECCW, 2002)

Murrumbidgee Channels and Floodplains includes "*Quaternary alluvium on seasonally inundated floodplains, active and inactive channels, billabongs, levees and swamps of the Murrumbidgee River and its effluent streams. Relief to 10 m. Includes scalded alluvial flats, broad elevated floodplains and associated relict channels; isolated sandy rises, relief to 5m. Grey and brown clay with occasional areas of low sandy rise. Open forest of river red gum (Eucalyptus camaldulensis), river cooba (Acacia stenophylla), cooba (Acacia salicina), lignum (Muehlenbeckia cunninghamii), nitre goosefoot (Chenopodium nitrariaceum) with numerous grasses along the channels and floodplain. Black box (Eucalyptus largiflorens) woodland with lignum, nitre goosefoot, thorny saltbush (Rhagodia spinescens), old man saltbush (Atriplex nummularia) and annual*

saltbushes (Atriplex sp.) on more distal floodplains and back plains. Cumbungi (Typha orientalis), common reed (Phragmites australis) and nardoo (Marsilea drummondii) in flooded depressions". (DECCW, 2002)

Murray Channels and Floodplains includes *"Active channels and seasonally inundated floodplains of the Murray streams in Quaternary alluvium with associated billabongs, swamps, channels, levees and source bordering dunes, relief to 10m. Includes scalded alluvial flats, broad elevated floodplains and associated relict channels; isolated sandy rises, relief to 5 m. Channel banks of grey and brown clays with river red gum (Eucalyptus camaldulensis), black box (Eucalyptus largiflorens), and river cooba (Acacia stenophylla). River red gum around billabongs with dense lignum (Muehlenbeckia cunninghamii), common reed (Phragmites australis) and cumbungi (Typha orientalis). Flats of silty or cracking grey clays, rimmed with black box, lignum, and canegrass (Eragrostis australasica). Highest flooded terrace with brown clays or red-brown texture-contrast soils carry yellow box (Eucalyptus melliodora). Dunes and sandplains of deep sandy brown soils or texture-contrast soils, locally calcareous, with belah (Casuarina cristata), white cypress pine (Callitris glaucophylla), mallee (Eucalyptus sp.) rosewood (Alectryon oleifolius), needlewood (Hakea leucoptera) and marginal clumps of black box, belah, prickly wattle (Acacia victoriae) over bluebush (Maireana sp.) and grasses"* (DECCW, 2002).

2.4 Hydrology

The Project site is situated on broad floodplains between Murrumbidgee and Edward Rivers. There are no permanent waterbodies and the site is very flat, with limited low relief drainage lines and natural depressions that provide temporary flood storage in flood events, but are without distinguishable bed and banks. Key drainage patterns are subject to movement; mapped watercourses (public Strahler data sets etc) often differ from the current aerial imagery and on ground inundation

2.4.1 Strahler stream order – rivers, creeks and streams

There are three mapped watercourses within the Project Area, all of which are the tributaries of the Murray River. These include:

- The Forest Creek.
- Snaky Creek.
- Abercrombie Creek.

There are also numerous decommissioned irrigation canals, which are found throughout the entire Project Area.

Abercrombie Creek, a ninth order stream flows through the middle of the Project Area. This stream is ephemeral and only flows during flooding events. There is no defined channel. This stream has been dry during surveys conducted by NGH ecologists.

Snaky Creek, a first order stream runs through Gunya Swamp in the southern end of the Project Area. This stream is ephemeral and only flows during floods. This stream has been dry during surveys conducted by NGH ecologists.

The Forest Creek, a ninth order stream found in the southeastern corner of the Project Area. This stream is ephemeral and only flows during flooding events. This stream has been dry during surveys conducted by NGH ecologists.

There are 265 irrigation canals present in the Project Area. Many of these are currently dry and are used for diverting water for agricultural purposes.

No watercourses occur within the intersection upgrade areas at Balranald or Euston.

Watercourses and canals within the Project Area are shown in Figure 2-3.

2.4.2 Wetlands and water bodies

There are 18 mapped ephemeral wetlands located within the Project Area (DPE, 2010). The majority of these are mapped as Floodplain Wetlands, which includes Gunyah Swamp, and are mostly located in the southern and central areas of the Project Area. Creeks and wetlands are local depressions within the Subject Land with no definable bank or shore. The Abercrombie Creek bed level drops only 1.5m over the 14km distance it intersects the Project site from east to west. The majority of these wetlands were dry at the time of site surveys. There is one ephemeral freshwater lake, Rawleys Lake, which is located in the southern portion of the Project Area approximately 6.8 km west of Baldon Road, and one reservoir, located approximately 3 km west of Rawleys Lake.

Most of the wetlands are located in the southern and central sections, with one wetland located in the north of the Project Area. None of the wetlands located in the Project Area are of international importance (DPE, 2010). A search of the Protected Matters Search Tool (PMST) under the EPBC Act completed on the 5th of December 2023 identified four wetlands of international importance located down stream of the Project Area. The closest of these wetlands is the Hattah-kulkyne lakes 150 km northwest.

There are 182 man-made dams present within the Project Area, however many of these have been dry during surveys conducted by NGH. These dams were previously filled by irrigation canals, that are no longer in use. Most of the dams in the Project Area are in areas of native vegetation with terrestrial vegetation encroaching on dams not containing water. 27 dams in the Project Area contained water at the time of survey. These dams provide habitat and a water source for native fauna and livestock.

No waterbodies occur within the intersection upgrade areas at Balranald or Euston.



Figure 2-1 Example of farm dam within the Project Area



Figure 2-2 Example of wetland within the Project Area

2.5 Connectivity features

The Subject Land is connected to similar chenopod shrublands and grasslands in all directions, allowing ample movement for ground-dwelling wildlife between the Subject Land and habitat in the surrounding Project Area. Roads such as the Sturt highway located on the northern boundary of the Project Area and fence lines within and surrounding the Project Area can provide a hazardous barrier for movement of ground dwelling fauna. There is limited woodland connectivity, with only isolated and fragmented pockets of woodland remaining in the Subject Land and Project Area, minimising any connectivity for arboreal species. Habitat connectivity throughout the Project Area is important for many threatened species occurring throughout the Subject Land. This includes but is not limited to a range of threatened bird species, three threatened bat species (see Section 4.1.3) and the threatened amphibian Southern Bell Frog.

The Murray River is located 48 km south of the Project Area. The land between the Murray River and the Project Area is farmland used for cropping and grazing, with native vegetation along waterways forming a connection allowing the movement of wildlife between these areas.

Gayini Wetlands Conservation Area are located 5 km north of the Project Area. There is native vegetation and farmland used for cropping and grazing located between the Project Area and the wetlands. Manmade canals connect the wetlands and the hydrological areas within the Project Area.

Yanga State Conservation Area is located 35 km west of the Project Area. There is native vegetation and farmland used for cropping and grazing located between the Project Area and the Conservation Area. There are no direct connectivity features, including waterways or continuous patches of native vegetation, between the two areas.

2.6 Geology and soils

2.6.1 Areas of geological significance

The Project Area falls within flat riverine plains. There are no caves, karsts, cliffs or rocky outcrops occurring within the Project Area.

The following soil types are present in the Project Area (Geoscience Australia and Australian Stratigraphy Commission, 2023):

- **Lake deposits**: Lake and swamp deposits; mud, silt, evaporites, limestone; minor sand, peat.
- **Dunes**: Dunes, sandplain with dunes and swales; may include numerous interdune claypans; may be locally gypsiferous.
- **Alluvium**: Channel and flood plain alluvium; gravel, sand, silt, clay; may be locally calcreted.
- **Lunette dunes**: Quartz and gypsum dunes and mounds (kopi); may include minor silt, sand, gravel, and clay flats adjacent to playas; locally includes some playa sediments.
- **Shepparton Formation**: Unconsolidated to poorly consolidated mottled variegated clay, silty clay with lenses of polymictic, coarse to fine sand and gravel; partly modified by pedogenesis, includes intercalated red-brown paleosols. Forms extensive flat alluvial floodplains.

The dominant soil type in the Project Area and Subject Land is the Shepparton formation (Figure 2-5).

Only one soil type is present within each of the additional intersection upgrade locations. Alluvium is the soil type present within the Balranald intersection site and the Shepparton Formation is the soil type present within the Euston intersection site.

2.6.2 Soil hazards

The NSW Acid Sulfate Soils Risk mapping (eSpade, n.d.) Environmental Protection Authority contaminated lands records (EPA, n.d.), and Environmental Planning Instrument – Salinity mapping (eSpade, n.d.) were reviewed. There was no acid sulfate soil risk recorded. No Environmental Protection Authority contaminated lands records were present in the Project Area. (EPA, n.d.). There was one salinity mapping point present in the Project Area, recording no salting evident. (eSpade, n.d.)

2.7 Areas of outstanding biodiversity value

Areas of outstanding biodiversity value are special areas with irreplaceable biodiversity values that are important to the whole of New South Wales, Australia or globally. There are no areas of outstanding biodiversity value occurring within or adjacent to the Subject Land or Project Area.

2.8 Cleared areas and Category 1 land

Despite some areas of the Subject Land previously being cleared for agriculture or heavily degraded by overgrazing of stock, all areas of the Subject Land (apart from roads and tracks) are currently comprised of native vegetation in moderate to good condition. The Project Area has a history of disturbance; over grazing lead to substantial soil loss in the past and rehabilitation trials were undertaken in the 1990s to stabilise soils. The key strategy used was planting of saltbush in rows, which appears to have been highly successful. The rows are still apparent and have increased native plant diversity and improved soil conditions. The has been observed by the NGH ecology field team in surveys conducted between 2022 – 2024.

The Draft Native Vegetation Regulatory (NVR) Map (DCCEEW N. , 2024), shows some areas of the Subject Land as comprised of Category 1 Land (Appendix M). During site inspection these areas have been identified as either areas containing threatened species habitat or moderate condition grasslands. These areas are thus ineligible to be categorised as Category 1 Land and have been considered to meet the requirements of Category 2 Land. No Land Category Assessment has been completed as all areas of the Subject Land have been included in the BDAR for assessment.

2.9 Percent native vegetation cover

The Assessment Area is the area of land within a 1500m buffer zone, or 500m buffer zone for linear proposals, surrounding the Subject Land. The Project contains both linear and non-linear shaped components. Within the linear shaped components, consisting mostly of tracks, underground cables and road intersection upgrades, a 500 m buffer has been used for the Assessment Area. Within the non-linear shaped components, including the substation, BESS and site compounds, a 1,500 m buffer has been used for the Assessment Area.

The first step in calculating native vegetation cover was to use GIS processing tools to buffer a 500 m and 1,500 m distance around the Subject Land. Native vegetation cover inside the Subject Land was determined through vegetation stratification and field survey according to the BAM 2020. Native vegetation outside the Subject Land was determined using NSW State Native Vegetation mapping (NSW DCCEEW, 2023) with adjustments made for local observations made during field work. Field observations of the Project Area were undertaken by NGH during preliminary field assessments in September 2020 and floristic surveys in March 2023 and September to December 2023 (detailed in section 3.2.1).

The Subject Land is comprised of the windfarm site and two discrete intersection upgrades at Euston and Balranald as part of the haul route. The Euston intersection is geographically distinct from the windfarm site and occurs in a different IBRA subregion. A separate BAM-C case has been set up for this area, and thus, a separate native vegetation cover extent has been calculated for the two assessment areas. No native vegetation occurs at the Balranald intersection upgrade, with no BAM-C case has been

The windfarm site assessment area was considered to comprise native vegetation in the form of native grasslands, shrublands or woodlands. Some internal access tracks, roads and farm infrastructure contain no native vegetation however as these features are less than 30 m wide, the native 'non-woody' vegetation surrounding these features is considered to be a continuous 'patch' of vegetation. (Figure 3-21, Appendix L.1 for Atlas series). This equates to 100% native vegetation coverage.

The native vegetation cover entered into the BAM-C for each of the assessment areas is shown in Table 2-1. Figure 2-8 and Figure 2-9 shows native vegetation cover within each of the assessment areas. Native vegetation is described in more detail in Section 3.1.

Table 2-1 Native Vegetation Cover

BAM-C Case Number	Development Footprint	IBRA region/subregion	Assessment Area (Ha)	Native vegetation within Assessment Area (Ha)	Native Vegetation Cover (%)
00045828	Stage 1 – Windfarm site Initial Construction Footprint	Riverina / Murrumbidgee	31,364	31,364	100
00046895	Stage 2 – Windfarm site Secondary Construction Footprint	Riverina / Murrumbidgee	31,364	31,364	100
00054223	Road Intersection upgrade (Euston)	Riverina / Robinvale Plains	103.8	33.9	33

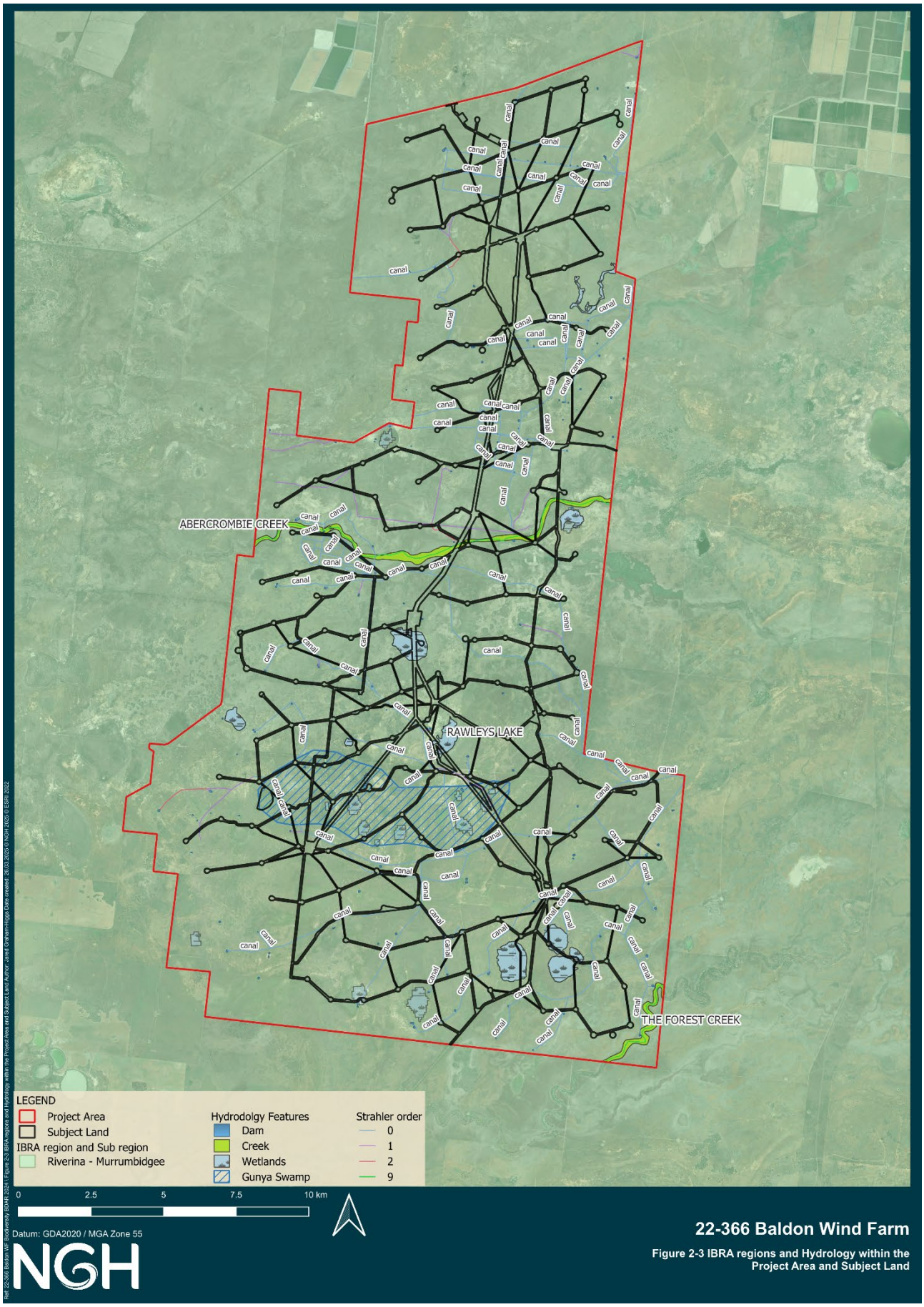


Figure 2-3 IBRA regions and hydrology within the Project Area and Subject Land

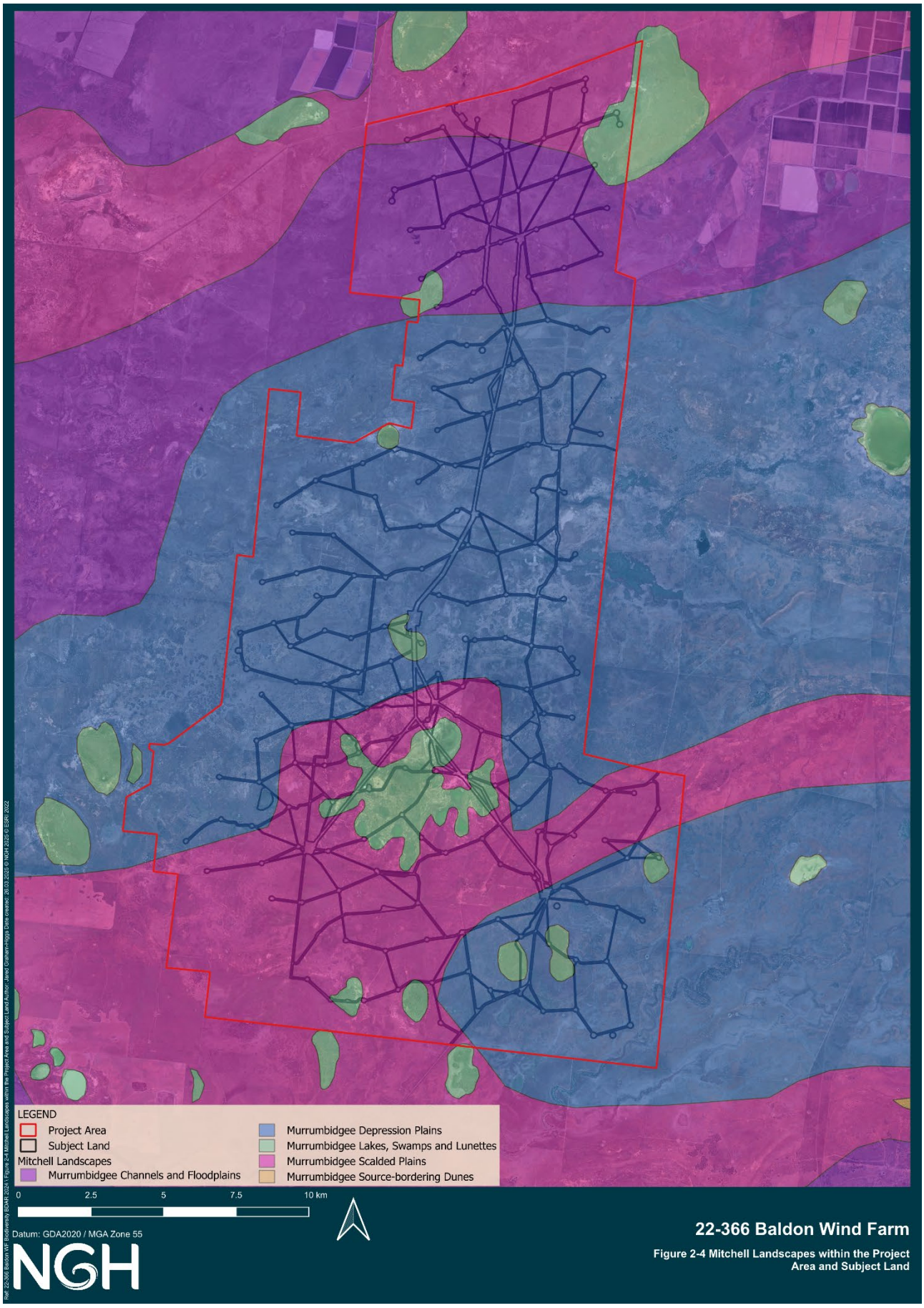


Figure 2-4 Mitchell Landscapes within the Project Area and Subject Land

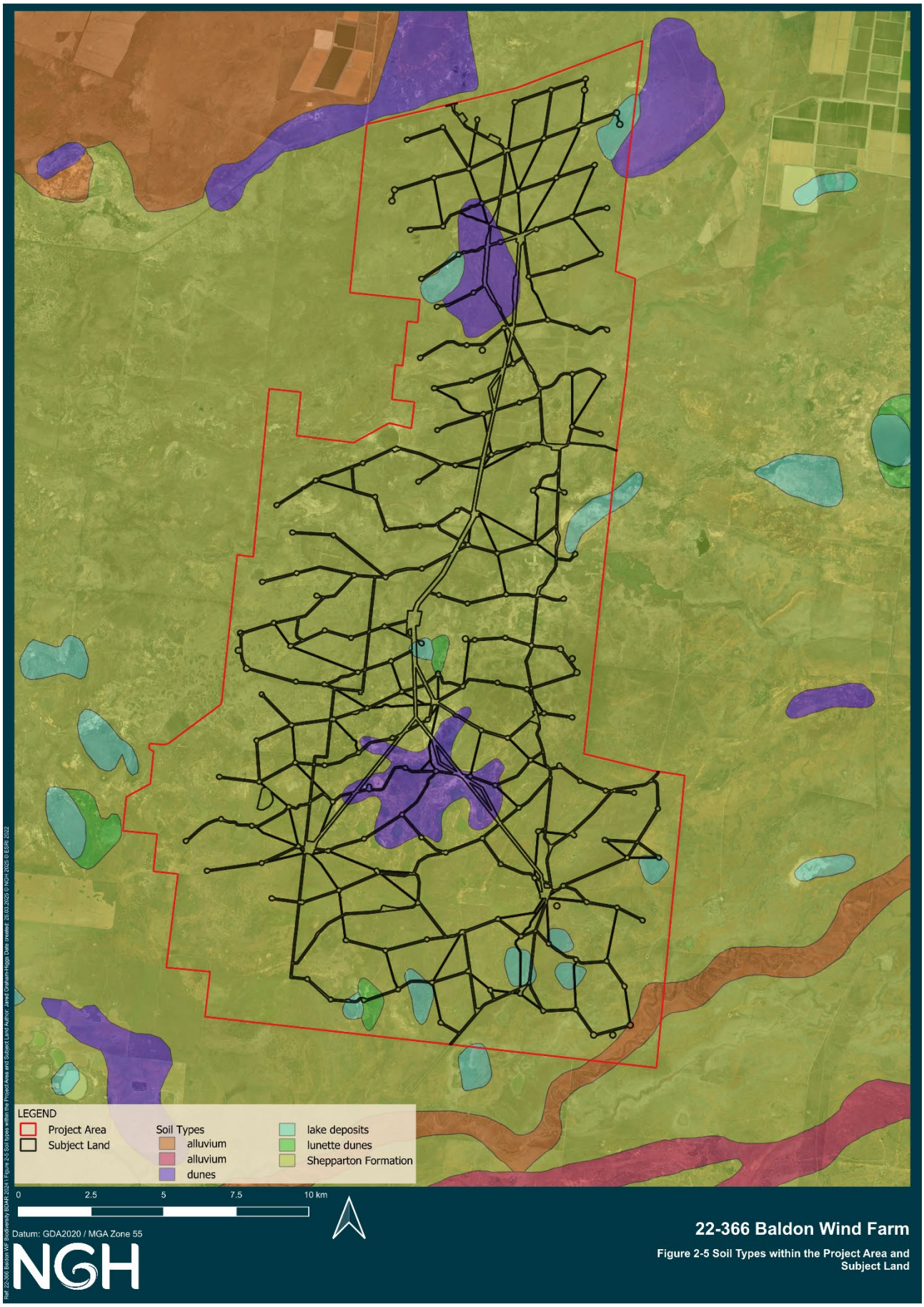


Figure 2-5 Soil types within the Project Area and Subject Land



Figure 2-6 Landscape Features (Euston intersection)



Figure 2-7 Landscape Features (Balranald Intersection)

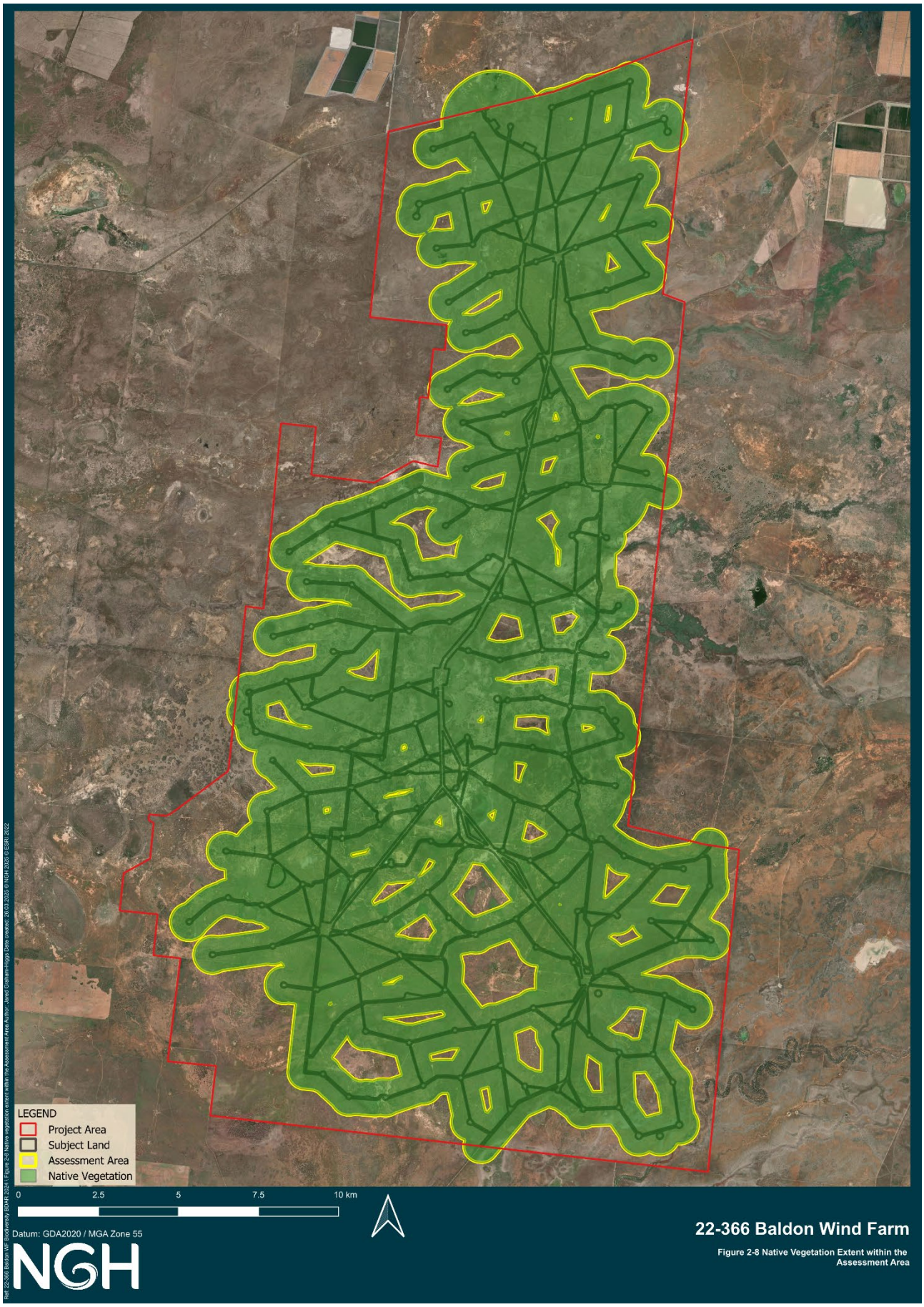


Figure 2-8 Native vegetation extent within the Assessment Area - windfarm site.

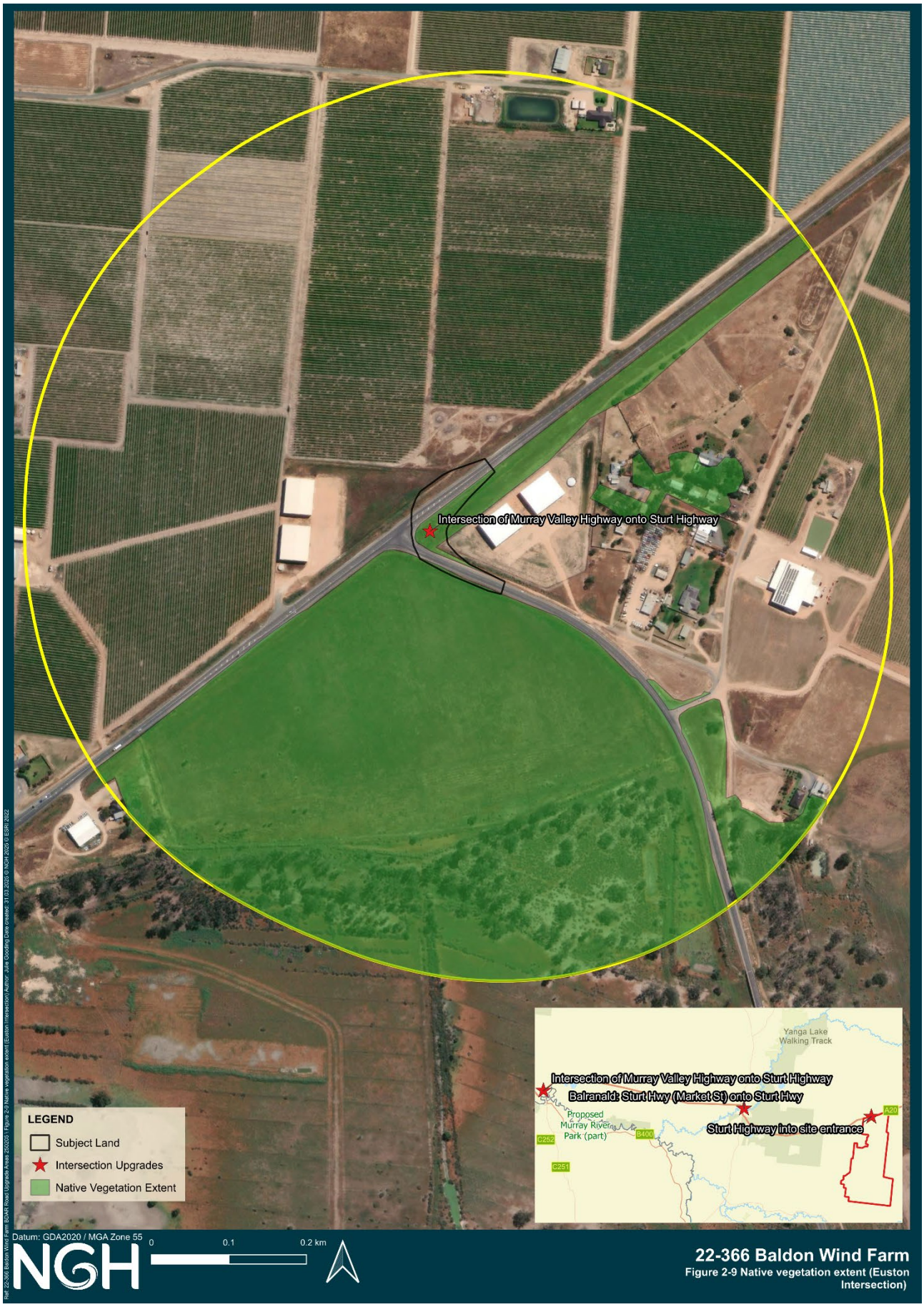


Figure 2-9 Native vegetation extent (Euston Intersection)

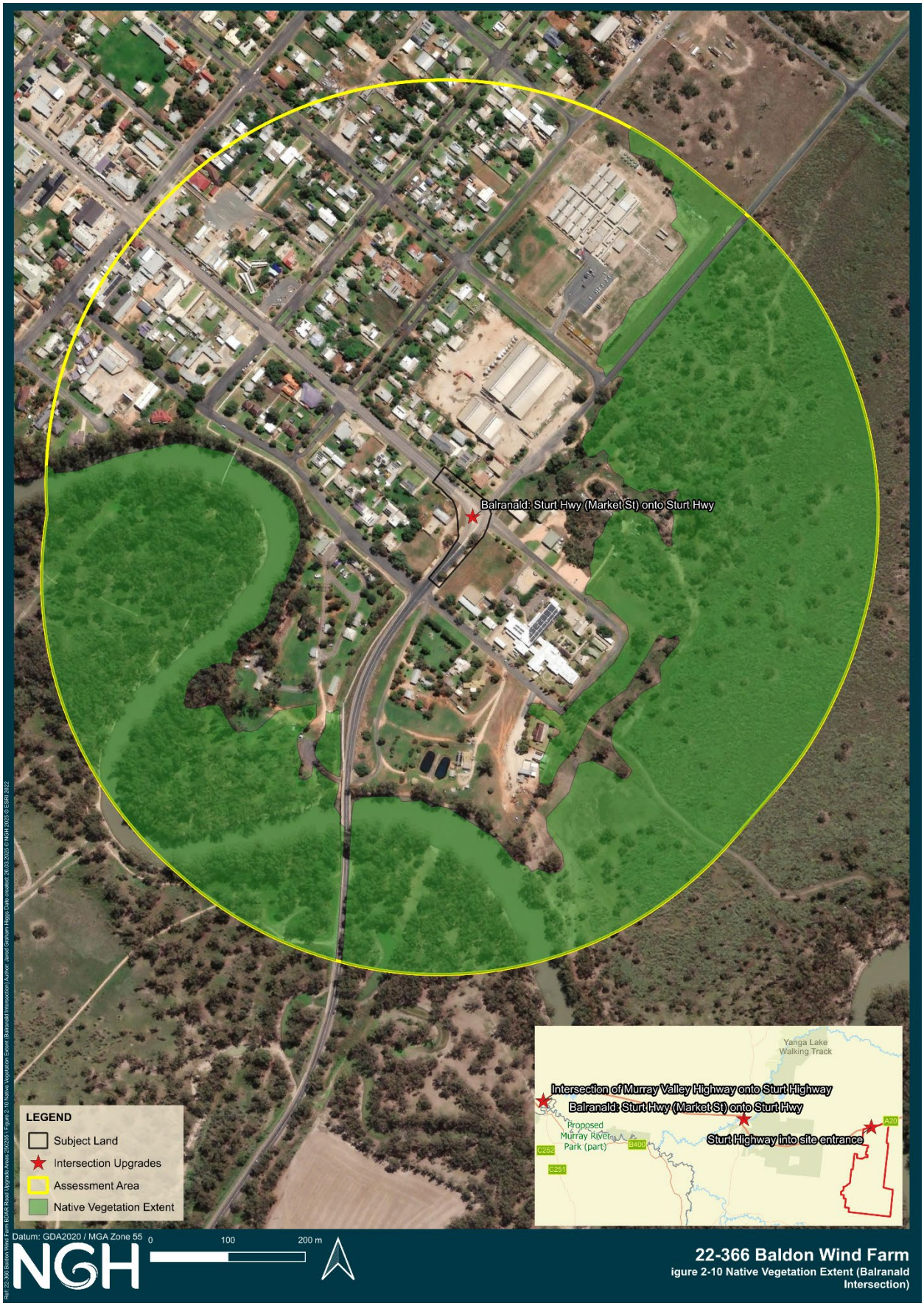


Figure 2-10 Native Vegetation Extent (Balranald Intersection).

3. Native vegetation

3.1 Native vegetation extent

The majority of the Subject Land is dominated by native vegetation. The Project Area has a history of agricultural use and is currently being grazed by sheep as evidenced from site visits.

Based on field survey identification, approximately 2,812.41 ha of native vegetation occurs within the Subject Land made up of the following ten Plant Community Types (PCTs):

- 48.56 ha of PCT 15: '*Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)* '
- 1.62 ha of PCT 17: '*Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)*'
- 19.46 ha of PCT 28: '*White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone* '
- 137.51 ha of PCT 46: '*Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion* '
- 1.70 ha of PCT 57: '*Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion* '
- 214.68 ha of PCT 153: '*Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones* '
- 29.37 ha of PCT 159: '*Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)*'
- 122.38 ha of PCT 160: *Nitre Goosefoot shrubland wetland on clays of the inland floodplains*'
- 43.44 ha of PCT 163: '*Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones* '
- 2,166.27 ha of PCT 164: *Cotton Bush open shrubland of the semi-arid (warm) zone* '

These PCTs are discussed further in Section 3.2

3.1.1 Non-native vegetation

Areas of non-native vegetation include roads (Baldon Road) and farm tracks which are comprised of compacted gravel or dirt. These roads and tracks are visible on aerial imagery and have not been mapped as a PCT. Roads and main tracks cover an area of 34.56 ha within the Subject Land.

Roadside intersection upgrade areas at Balranald (Sturt Highway) are comprised of non-native vegetation. These areas are landscaped street verges comprised of exotic lawn grasses such as Kikuyu (*Cenchrus clandestinus*) and non-indigenous planted trees such as Sugar Gum (*Eucalyptus cladocalyx*) and Crimson Bottlebrush (*Callistemon citrinus*). These areas do not comprise a plant community type. This zone covers an area of 0.17 ha.



Figure 3-1 Non-native vegetation within intersection upgrade areas at Balranald.

3.2 Plant community types (PCTs)

3.2.1 Methods to assess PCTs

PCT assessment was undertaken using an initial review of existing state vegetation mapping, followed by field surveys to validate or modify the mapped PCTs. The results of the PCT assessment is discussed in Section 3.2.2 and Section 3.2.3.

3.2.2 Existing native vegetation mapping

A search was undertaken of the BioNet Vegetation Classification database and the NSW SEED Mapping Portal to review existing vegetation mapping within the Subject Land. Relevant mapping of the Subject Land included NSW State Vegetation Type Map (NSW DCCEEW, 2022). This identified 17 PCTs that may occur within and surrounding the Subject Land. These are summarised in Table 3-1.

Table 3-1 Mapped PCTs within the Subject Land (NSW DCCEEW 2022)

Mapped PCTs	Presence within the Subject Land
PCT 13: Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not present within the Subject Land but could be present in wetland areas to the southeast.
PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Present within wetland areas in woodland and derived grassland form across the Subject Land.
PCT 17: Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion	Present as a small patch in the southeast corner of the Subject Land.
PCT 24: Canegrass swamp tall grassland wetland of drainage depressions: lakes and pans of the inland plains (TEC)	Not present within the Subject Land but could be present in wetland areas to the east.
PCT 28: White Cypress Pine open woodland of sand plains: prior streams and dunes mainly of the semi-arid (warm) climate zone (TEC)	Present in small patches on sandy soils within the southern half of the Subject Land.
PCT 46: Curly Windmill Grass – speargrass – wallaby grass grassland on alluvial clay and loam on the Hay Plain: Riverina Bioregion	Present as a large patch within the north of the Subject Land, and as small patches in the south of the Subject Land.

Mapped PCTs	Presence within the Subject Land
PCT 57: Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain	Present as small patches dominated by *Alectryon oleifolius* within the southern half of the Subject Land.
PCT 153: Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid z	Present as large patches in the southwest and north of the Subject Land, with smaller patches scattered through the Subject Land.
PCT 157: Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Not present within the Subject Land but could be present to the east of the Subject Land.
PCT 159: Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW) (TEC)	Present as planted rows in the southeast of the Subject Land.
PCT 160: Nitre Goosefoot shrubland wetland on clays of the inland floodplains (TEC)	Present as small patches scattered through the Subject Land.
PCT 163: Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones (TEC)	Present as small scattered patches within the south of the Subject Land, often coinciding with the presence of a wetland.
PCT 164: Cotton Bush open shrubland of the semi-arid (warm) zone	Present across the majority of the Subject Land, as the dominant PCT.
PCT 166: Disturbed annual saltbush forbland on clay plains and inundation zones mainly of southwestern NSW	Not present within the Subject Land but could be present within areas containing wetlands or channels in the north and east of the Subject Land.
PCT 216: Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Not present within the Subject Land but could be present to the northwest of the Subject Land.
PCT 236: Derived Giant Redburr low shrubland on alluvial plains of the semi-arid (warm) climate zone	Not present within the Subject Land but could be present to the northwest of the Subject Land.
PCT 238: Permanent and semi-permanent freshwater lakes wetland of the inland slopes and plains	Not present within the Subject Land but could be present in small patches to the northwest or southwest of the Subject Land, associated with

Mapped PCTs	Presence within the Subject Land
	wetland areas.

3.2.3 Field surveys

Initial on-site field surveys were conducted by BAM accredited ecologists in March 2023 to determine the PCTs within the Subject Land and determine the presence of any Threatened Ecological Communities (TECs). Further field surveys were undertaken in October – December 2023 and January 2024, where 97 Vegetation Integrity plots (BAM plots) were conducted across the Subject Land. The haul route intersections were surveyed in November 2024. The aim of this fieldwork was to assess the vegetation visually and conduct an acceptable number of BAM plots in the representative PCTs observed onsite in accordance with BAM 2020.

PCT Identification was based on:

- most dominant native species present inside 20 x 20 m plots;
- tree species observed in similar and adjoining landforms to the Subject Land (for woodland PCTS where trees absent in plots);
- Soil type, landform elements and digital elevation modelling (Spatial Services, 2023),
- location in the IBRA subregion and distribution using the BioNet Vegetation Classification Database.

Once PCTs were identified, they were then stratified into different condition states. Condition states were determined using a combination of comparison of plot data to benchmark values and Vegetation Integrity (VI) scores. For shrubland PCTs, condition states were split based on comparisons to the shrub cover (%) benchmark value. Further information on PCT justification is provided in Section 3.2.5.

Vegetation integrity quadrats (BAM plots) consisting of 20 x 20 m floristic survey plots (composition, structure) and 20 x 50 m function plots in accordance with the BAM were replicated across the Development Footprint within each vegetation zone. Data was collected utilising the methodology presented in the BAM (DPIE 2020) by an accredited BAM assessor. The number of BAM plots was undertaken in accordance with the minimum required detailed in the BAM, in most zones more BAM plots were undertaken than the minimum required to pick up on any variation across the large range of the Subject Land. However, following readjustment of zones after field work a few zones did not meet the minimum number of BAM plots required. For these zones, duplication of the best condition plot was used to add to the BAM calculator.

All plot surveys, impact assessment and credit calculations were directed by and certified by an accredited BAM assessor. Details of personnel involved in field surveys is provided in Appendix F.

Gilgai Investigations

Further field surveys were undertaken in November 2024 and January 2025 following BCS comments that aerial imagery showed apparent vegetation changes of smaller wetland and Gilgai's within areas mapped as PCT 164.

Two ecologists visited these areas, and undertook Rapid Assessment Points or BAM plots to determine if there were any difference between the small wetland and Gilgai areas visible on the aerial imagery and the

adjacent areas mapped as PCT 164. It is noted that BCS referred to different aerial imagery than was used by NGH to inform the PCT mapping. NGH used ESRI satellite imagery captured 1st Feb 2023. LPI imagery (shown in BCS comments) is captured from December 2011 (Appendix A.3). The Project Area is subject to changes over time from flooding and grazing intensity and aerial imagery can look different over time. Twenty BAM plots and 20 rapid assessment points were undertaken over 21 discrete Gilgai areas investigated. BAM plots were undertaken within the visible Gilgai area and an adjacent area of PCT 164 to compare any differences in vegetation.

On further field investigations it was determined that despite the aerial imagery giving the impression of potential changes in PCT– all but four of these areas were confirmed as PCT 164, dominated by Cottonbush (*Maireana aphylla*) and other associated species of this community such as *Rhagodia spinescens, Atriplex lindleyi, Maireana pentagona*, *Rytidosperma setaceum* and *Sclerolaena muricata* Usually, the species composition was similar within the visible Gilgai areas to species composition recorded in adjacent areas of PCT 164, but the abundance of shrub species was generally slightly less cover. There were usually slight changes in soil composition to a greyer soil and/or very small differences in elevation (<5cm). It is suspected that these areas hold water longer following recent flooding of the site and were evident on the aerial imagery, however, were not holding water during the current surveys.

There were only four exceptions, with these areas being small patches dominated by Nitre Goosefoot (*Chenopodium nitrariaceum*) and aligning to PCT 160, surrounded by the dominant PCT 164. These areas have been adjusted in the PCT mapping of the Subject Land.

Field data and photos of Gilgai investigations can be shown in Appendix A.3. These BAM plots were used to confirm plant composition with the Gilgai areas and adjacent PCT 164 communities. They have not been used in the BAM Calculator as sufficient BAM plots were undertaken during the initial field surveys in Spring 2023 and Summer 2024.

3.2.4 Limitations

The Subject Land has a past history of overstocking of sheep that caused extensive damage to groundcover and resulted in bare ground over much of the land. It is likely that a large proportion of the vegetation is a derived community, recovering from overgrazing and occupied by coloniser species. There is little indication of remnant species that may have been present before intensive grazing. Disturbed areas have been highly modified, resulting in the presence of the midstorey and groundcover stratums only across much of the Subject Land. These areas have been assigned the best fit PCT based on their proximity to trees or by the dominant species within the patch.

There is potential for some flora species not to be recorded during the survey due to the timing of the survey (outside optimal survey periods). In particular, inconspicuous species which have the potential to flower outside of the BAM plot survey periods may not have been recorded due to limited detectability.

Above average rainfall occurred within the region during October to December 2023, with 243.6 mm of rain recorded within this period (Swan Hill Aerodrome 077094 (BoM, 2024)). This rainfall had a transformative effect on the landscape with an increase in grass cover recorded during the January 2024 surveys.

Although sufficient survey methods and effort were undertaken to identify all hollow-bearing trees within the Subject Land, it is possible that some hollows in the canopy of large trees may not have been detected.

Due to changes in footprint, access constraints and weather conditions, the minimum number of plots was not achieved for onevegetation zone within the Subject Land. This vegetation zone was short by one plot. As

such, one plot was duplicated within this vegetation zone to meet the minimum number of plots required by the BAM-C, with the plot scoring the highest vegetation integrity score selected as the duplicate plot.

3.2.5 Plant Community Types identified

Ten PCTs were identified within the Subject Land:

1. PCT 15: 'Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)'
2. PCT 17: 'Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)'
3. PCT 28: 'White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone'
4. PCT 46: 'Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion'
5. PCT 57: 'Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion'
6. PCT 153: 'Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones'
7. PCT 159: 'Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)'
8. PCT 160: 'Nitre Goosefoot shrubland wetland on clays of the inland floodplains'
9. PCT 163: 'Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones'
10. PCT 164: 'Cotton Bush open shrubland of the semi-arid (warm) zone'

Descriptions of the PCTs identified are provided in Table 3-2 to Table 3-11. Location of the PCTs are shown in Figure 3-21 (refer to Appendix L.1 for Atlas series).

Table 3-2 Description of PCT 15 within the Subject Land

PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)		
Vegetation formation	Semi-arid Woodlands (Grassy sub-formation)	
Vegetation class	Inland Floodplain Woodlands	
Vegetation type	PCT ID	15
	Common Community Name	Black Box open woodland wetland with chenopod understorey

PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)		
Areas within Subject Land.	Zone 1: 24.78 ha - Woodland high condition (Scattered remnant trees, VI score >60,) Zone 2: 5.35 ha - Woodland low condition (No living trees – dead Black Box trees) Zone 3: 18.43 ha - Grassland moderate condition	
Species relied upon for PCT identification	Species name	Average cover %
	Eucalyptus largiflorens	12%
	Sclerolaena muricata var. villosa	10%
	Chenopodium nitrariaceum	7%
	Rhagodia spinescens	5%
	Sclerolaena tricuspis	5%
	Enchylaena tomentosa	5%
	Teucrium racemosum	7%
Justification of evidence used to identify the PCT	The dominance of the canopy species *Eucalyptus largiflorens* within the Riverina IBRA Bioregion and Murrumbidgee IBRA Subregion narrowed the possible PCTs down to three, PCT 13, PCT 15 and PCT 16. PCT 16 was excluded, as the understorey for this PCT is dominated by forbs, grasses and low growing chenopods, and lacks shrubs, whereas the midstorey and understorey of these vegetation zones within the Subject Land are dominated by a range of chenopod species. PCT 13 was excluded as this PCT is described as being a woodland dominated by sparse to dense sands of Lignum. Whilst this species was recorded within one of the patches of these vegetation zones, it was not considered a dominant species. PCT 15 matches well in canopy, mid and ground stratum, particularly with the range of chenopod shrubs present in the midstorey and understorey, including *Maireana pyramidata, Chenopodium nitrariaceum, Rhagodia spinescens, Sclerolaena tricuspis* and *Enchylaena tomentosa.*	
TEC Status	No associated TECs	

PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	
Estimate of percent cleared within NSW	50%
Examples	 Figure 3-2 Example of PCT 15 woodland high condition

PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)



Figure 3-3 Example of PCT 15 woodland low condition



Figure 3-4 Example of PCT 15 grassland moderate condition

Table 3-3 Description of PCT 17 within the Subject Land

PCT 17 Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion		
Vegetation formation	Freshwater Wetlands	
Vegetation class	Inland Floodplain Shrublands	
Vegetation type	PCT ID	17
	Common Community Name	Lignum shrubland wetland of the semi-arid plains
Areas within Subject Land	Zone 4: 1.62 ha – high condition (VI score >60)	
Species relied upon for PCT identification	Species name	Average cover %
	Duma florulenta	10%
	Austrostipa nitida	10%
	Sclerolaena tricuspis	2%
	Atriplex leptocarpa	1%
	Sclerolaena muricata	0.5%
	Rhagodia spinescens	0.2%
Justification of evidence used to identify the PCT	There were a total of three PCTs with the dominance of Lignum (*Duma florulenta*) within the midstorey, PCT 11, PCT 13 and PCT 17. PCT 11 was excluded due to the absence of River Red Gum (*Eucalyptus camaldulensis*) across the Subject Land. PCT 13 was also excluded due to the absence of Black Box (*Eucalyptus largiflorens*) within close proximity to this vegetation community. PCT 17 was chosen due to the dominance of *Duma florulenta*, as well as the presence of small shrubs including *Sclerolaena tricuspis* and *Sclerolaena muricata.* Additionally, this vegetation zone occurred within a wetland depression on clay soils, which matched the landscape features for PCT 17.	

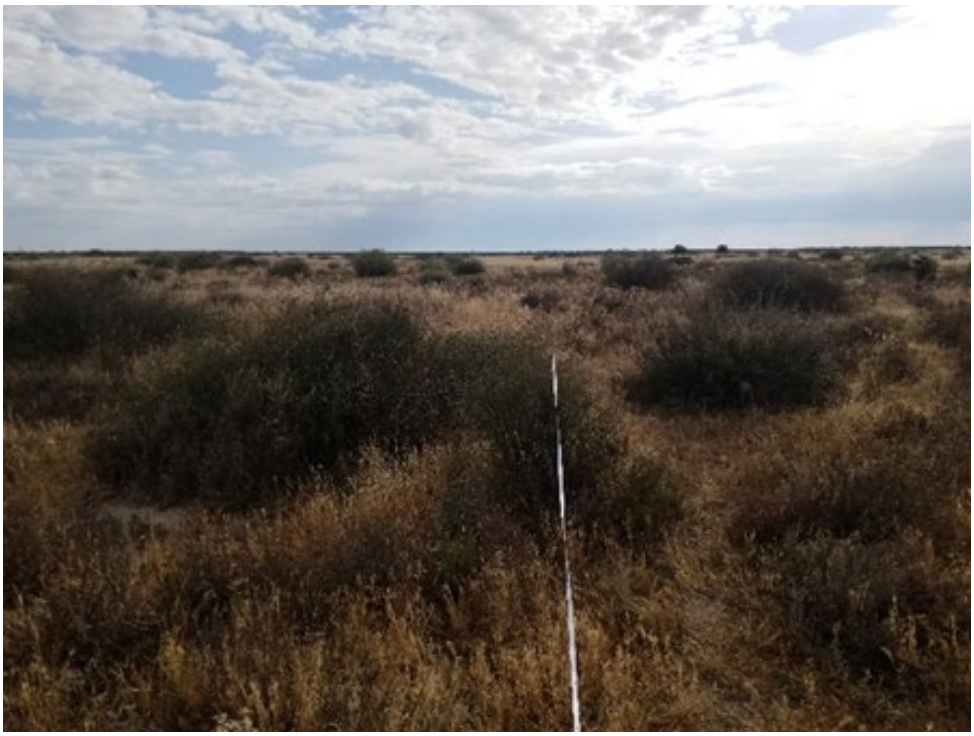
PCT 17 Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion	
TEC Status	No associated TECs
Estimate of percent cleared within NSW	63%
Examples	 Figure 3-5 Example of PCT 17 high condition

Table 3-4 Description of PCT 28 within the Subject Land

PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone		
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)	
Vegetation class	Riverine Sandhill Woodlands	
Vegetation type	PCT ID	28
	Common Community Name	White Cypress Pine open woodland

PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone		
Areas within Subject Land	Zone 5: 3.59 ha – woodland moderate condition (dominated by *Acacia oswaldii*) Zone 6: 15.87 ha – grassland moderate condition (absence of overstory species)	
Species relied upon for PCT identification	Species name	Average cover %
	Acacia oswaldii	2%
	Alectryon oleifolius	2%
	Rhagodia spinescens	7%
	Enteropogon ramosus	3%
	Einadia nutans	0.2%
	Enchylaena tomentosa	0.1%
	Maireana pyramidata	0.1%
Justification of evidence used to identify the PCT	These vegetation zones occurred on sandy loam soils, on areas of sandy rises. *Acacia oswaldii* was present within these vegetation zones, often as the dominant species. There were four potential PCTs within the Riverina Bioregion and Murrumbidgee Sub-region which occur within this landscape position, with *Acacia oswaldii* present. These included PCT 22, PCT 28, PCT 170 and PCT 190. PCT 22 is restricted to the Balranald region, and therefore was discounted, as the Subject Land is east of this region. PCT 170 and PCT 190 occur as mallee woodlands or open mallee shrublands. PCT 170 is mainly restricted to the Murray-Darling Depression Bioregion of NSW. PCT 190 occurs as small stands adjoining the South Australian border. There were no mallee woodlands recorded within the Subject Land, and therefore these PCTs are not considered to be present. PCT 28 is an open woodland or derived grassland, dominated by *Callitris glaucophylla*, as well as containing *Allocasuarina luehmannii, Hakea* species, *Alectryon oleifolius* and *Acacia oswaldii*. A range of chenopod and copper burr species are present within the midstorey and understorey. This PCT occurs on sandy loam soils. Whilst there was no *Callitris glaucophylla* present within the Subject Land, this species was historically logged in the region, and so had the potential to occur in sandy areas onsite. There were patches of *Acacia oswaldii* on sandy soils within the Subject Land, and there were a	

PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	
	range of midstorey and understorey species present within these patches. Therefore, PCT 28 was mapped within these areas of sandy rises.
TEC Status	Has associated BC Act listed TECs, *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions* *Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions* This PCT within the Subject Land does not conform to either of these TECs, as shown in Section 3.2.6.
Estimate of percent cleared within NSW	73%
Examples	 Figure 3-6 Example of PCT 28 woodland moderate condition

PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	
	 Figure 3-7 Example of PCT 28 grassland moderate condition

Table 3-5 Description of PCT 46 within the Subject Land

PCT 46 Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion		
Vegetation formation	Grasslands	
Vegetation class	Riverine Plain Grasslands	
Vegetation type	PCT ID	46
	Common Community Name	Curly Windmill Grass - speargrass - wallaby grass grassland
Areas within Subject Land	Zone 7: 131.45 ha – high condition (20 – 60% native grass cover, VI score > 60) Zone 8: 6.06 ha – moderate condition (<20% native grass cover, VI score < 60)	
Species relied	Species name	Average cover %

PCT 46 Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion		
upon for PCT identification	*Austrostipa nodosa*	25%
	Rytidosperma setaceum	15%
	Austrostipa nitida	15%
	Rytidosperma caespitosum	10%
	Enteropogon ramosus	10%
	Sclerolaena tricuspis	2%
	Maireana aphylla	2%
	Sclerolaena muricata var. muricata	2%
Justification of evidence used to identify the PCT	There were two grassland dominated PCTs within the Riverina IBRA Bioregion and Murrumbidgee IBRA Sub-region, PCT 44 and PCT 46. Both PCTs contained several matching ground strata species. However, PCT 46 was considered to match the vegetation description, being an open to closed tussock grassland dominated by *Enteropogon ramosus, Austrostipa nodosa* and a range of wallaby grass species, with a range of forbs and a very sparse shrub layer. PCT 46 was also selected over PCT 44 due to distribution, with PCT 46 noted as occurring on the western Riverine Plain (Hay Plain) near Hay and north-east of Deniliquin in the Riverina Bioregion. PCT 44 distribution is noted as being southern part of the Riverine Plain Bioregion from Urana in the east to Deniliquin in the west and to the north, with the study area considered to occur outside of this distribution.	
TEC Status	Has associated EPBC Act listed TEC*: Natural Grasslands of the Murray Valley Plains*. Assessment as to whether vegetation within the Subject Land conforms to this TEC is contained in Section 5.2.1. One patch conforms to the TEC.	
Estimate of percent cleared within NSW	20%	

PCT 46 Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	
Examples	 Figure 3-8 Example of PCT 46 high condition  Figure 3-9 Example of PCT 46 moderate condition

Table 3-6 Description of PCT 57 within the Subject Land

PCT 57 Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion		
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)	
Vegetation class	Semi-arid Sand Plain Woodlands	
Vegetation type	PCT ID	57
	Common Community Name	Belah/Black Oak – Western Rosewood – Wilga woodland
Areas inside Subject Land	Zone 9: 0.16 ha – high condition (Higher shrub diversity and functional elements; VI score >60) Zone 10: 1.54 ha – moderate condition (Lower shrub diversity and functional elements; VI score <60)	
Species relied upon for PCT identification	Species name	Average cover %
	Alectryon oleifolius	10%
	Maireana pyramidata	10%
	Rhagodia spinescens	12%
	Enchylaena tomentosa	4%
	Sclerolaena diacantha	2%
	Sclerolaena tricuspis	2%
Justification of evidence used to identify the PCT	There were two PCTs with *Alectryon oleifolius* as a dominant species within either the upper or midstorey within the Riverina Bioregion and Murrumbidgee Sub-region, PCT 21 and PCT 57. PCT 57 was considered the best fit PCT, due to the dominance of *Alectryon oleifolius*, with low shrubs including *Maireana pyramidata* and a range of other chenopod species. These vegetation zones also occurred on clay soils, whereas PCT 21 is noted as occurring on sandy rises.	

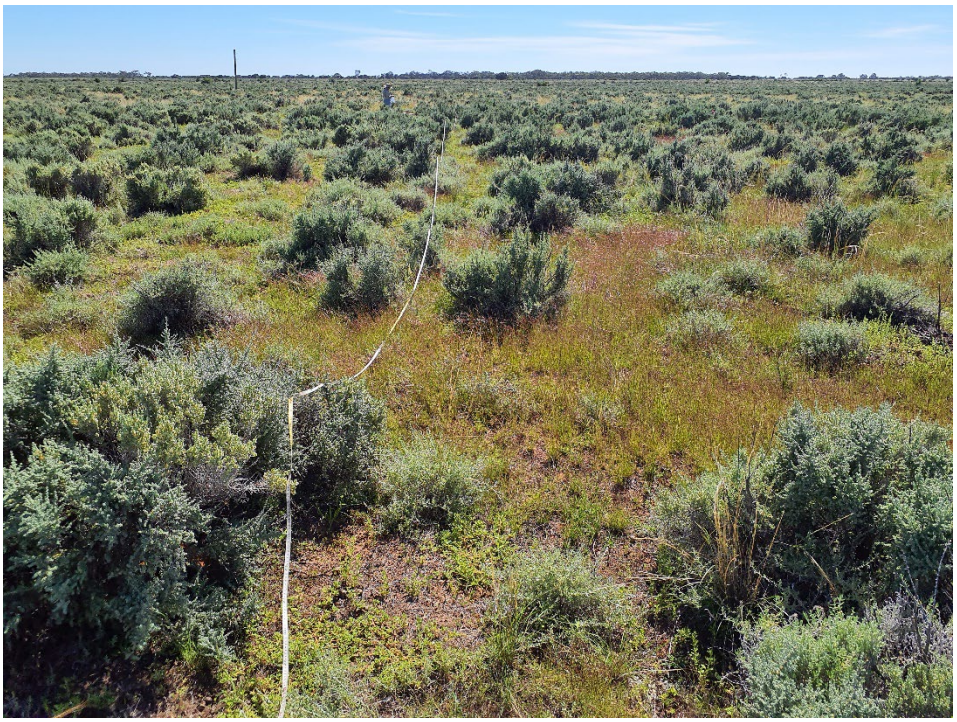
PCT 57 Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	
TEC Status	Has associated BC Act listed TEC, *Acacia loderi shrublands* (Part) This PCT within the Subject Land does not conform to this TEC, as shown in Section 3.2.6.
Estimate of percent cleared within NSW	43%
Examples	 Figure 3-10 Example of PCT 57 high condition

PCT 57 Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	
	 Figure 3-11 Example of PCT 57 moderate condition

Table 3-7 Description of PCT 153 within the Subject Land

PCT 153 Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones		
Vegetation formation	Arid Shrublands (Chenopod sub-formation)	
Vegetation class	Aeolian Chenopod Shrublands	
Vegetation type	PCT ID	153
	Common Community Name	Black Bluebush low open shrubland
Areas inside Subject Land	Zone 11: 19.75 ha – high condition (shrub cover > 50% of benchmark value) Zone 12: 215.41 ha – moderate condition (shrub cover 25-50% of benchmark value) Zone 13: 6.52 ha – low condition (shrub cover <25% of benchmark value) Zone 21: 0.16 ha – low condition (Euston Intersection Upgrade) (shrub cover <25% of	

PCT 153 Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones		
	benchmark value)	
Species relied upon for PCT identification	Species name	Average cover %
	Maireana pyramidata	2%
	Maireana sedifolia	4%
	Austrostipa nodosa	11%
	Nitraria billardierei	4%
	Sclerolaena muricata	4%
	Sclerolaena tricuspis	1%
	Rytidosperma setaceum	2%
	Atriplex lindleyi	1%
Justification of evidence used to identify the PCT	There were two PCTs which contained *Marieana pyramidata* and *Maireana sedifolia* as the dominant species within the Riverina Bioregion and Murrumbidgee Sub-region, PCT 153 and PCT 154. Both PCTs contained similar floristic characteristics in common with these vegetation zones within the Subject Land, including a range of *Maireana* species and *Sclerolaena* species and *Nitraria billardierei* in the midstorey and understorey, as well as *Austrostipa* species, *Enchylaena tomentosa* and *Atriplex* species in the understorey. PCT 153 was selected due to the landscape characteristics, occurring within areas on clay loam soils or sandy rises, and within some drainage depression areas. High grass cover was observed across areas mapped within PCT 153, as shown in a number of BAM plots. This is likely due to the above average rainfall within the region, particularly towards the end of 2023 when the majority of BAM plots were undertaken. Therefore, the high grass cover is considered an anomaly, and where *Maireana pyramidata* was present and the landscape characteristics conformed to PCT 153, the patch was mapped as this shrubland PCT, rather than as a grassland PCT.	
TEC Status	Has associated BC Act listed TEC,	

PCT 153 Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	
	Acacia loderi shrublands This PCT within the Subject Land does not conform to this TEC, as shown in Section 3.2.6.
Estimate of percent cleared within NSW	40%
Examples	 Figure 3-12 Example of PCT 153 high condition

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



Figure 3-13 Example of PCT 153 moderate condition



Figure 3-14 Example of PCT 153 Low condition - Euston Intersection

Table 3-8 Description of PCT 159 (Planted) within the Subject Land

PCT 159 Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)		
Vegetation formation	Arid Shrublands (Chenopod sub-formation)	
Vegetation class	Riverine Chenopod Shrublands	
Vegetation type	PCT ID	159
	Common Community Name	Old Man Saltbush shrubland
Areas inside Subject Land	Zone 14: 29.37 ha – planted condition	
Species relied upon for PCT identification	Species name	Average cover %
	Atriplex nummularia	35%
	Austrostipa nodosa	16%
	Maireana aphylla	2%
	Atriplex lindleyi	2%
	Sclerolaena tricuspis	0.5%
	Rhagodia spinescens	0.5%
Justification of evidence used to identify the PCT	This vegetation zone is planted rows of *Atriplex nummularia* and is not representative of a remnant community however *A. nummularia* is a characteristic species within the IBRA region. There is only one PCT with *Atriplex nummularia* as the dominant species within the Riverina Bioregion and Murrumbidgee Sub-region. There were a range of other species present within these vegetation zones which occur in PCT 159, including *Rhagodia spinescens, Maireana pyramidata, Atriplex lindleyi* and *Austrostipa nodosa*.	
TEC Status	Has associated BC Act listed TEC;	

PCT 159 Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	
	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions. This PCT within the Subject Land does not conform to this TEC, as shown in Section 3.2.6.
Estimate of percent cleared within NSW	92%
Examples	 Figure 3-7 Example of PCT 159 planted condition

Table 3-9 Description of PCT 160 within the Subject Land

PCT 160 Nitre Goosefoot shrubland wetland on clays of the inland floodplains		
Vegetation formation	Freshwater Wetlands	
Vegetation class	Inland Floodplain Shrublands	
Vegetation type	PCT ID	160
	Common Community Name	Nitre Goosefoot shrubland wetland

PCT 160 Nitre Goosefoot shrubland wetland on clays of the inland floodplains		
Areas inside Subject Land	Zone 15: 119.58 ha – high condition (shrub cover >50% of benchmark value) Zone 16: 2.80 ha – moderate condition (shrub cover <50% of benchmark value)	
Species relied upon for PCT identification	Species name	Average cover %
	Chenopodium nitrariaceum	15%
	Sclerolaena tricuspis	5%
	Sclerolaena muricata var. villosa	10%
	Sclerolaena muricata	1%
	Duma florulenta	2%
	Rhagodia spinescens	0.5%
	Rytidosperma caespitosum	0.5%
	Atriplex leptocarpa	0.2%
Justification of evidence used to identify the PCT	*Chenopodium nitrariaceum* was the dominant species within these vegetation zones. There is only one PCT with *Chenopodium nitrariaceum* as the dominant species within the Riverina Bioregion and Murrumbidgee Sub-region, PCT 160, although several other PCTs contained *Chenopodium nitrariaceum*, including PCT 17, PCT 157 and PCT 159. PCT 160 was selected due to the dominance of *Chenopodium nitrariaceum*. There were several other species present within these vegetation zones which occur within PCT 160, including *Duma florulenta, Einadia nutans, Sclerolaena tricuspis*. This PCT also matched the landscape position, being found on clay soils in drainage depressions or ephemeral depressions.	
TEC Status	Has associated BC Act listed TEC, *Artesian Springs Ecological Community in the Great Artesian Basin* This PCT within the Subject Land does not conform to this TEC, as shown in Section 3.2.6.	
Estimate of percent cleared	28%	

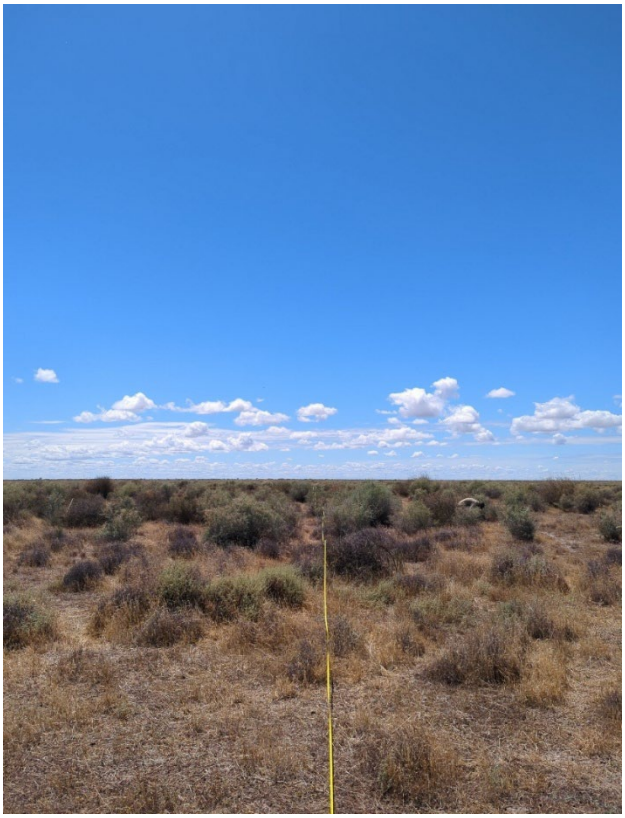
PCT 160 Nitre Goosefoot shrubland wetland on clays of the inland floodplains	
within NSW	
Examples	 Figure 3-15 Example of PCT 160 high condition  Figure 3-16 Example of PCT 160 moderate condition

Table 3-10 Description of PCT 163 within the Subject Land

PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones		
Vegetation formation	Arid Shrublands (Chenopod sub-formation)	
Vegetation class	Riverine Chenopod Shrublands	
Vegetation type	PCT ID	163
	Common Community Name	Dillon Bush (Nitre Bush) shrubland
Areas inside Subject Land	Zone 17: 25.93 ha – high condition (shrub cover > benchmark value) Zone 18: 17.51 ha – moderate condition (shrub cover < benchmark value)	
Species relied upon for PCT identification	Species name	Average cover %
	Nitraria billardierei	14%
	Sclerolaena muricata	4%
	Sclerolaena tricuspis	3%
	Atriplex lindleyi	1%
	Rhagodia spinescens	2%
Justification of evidence used to identify the PCT	*Nitraria billardierei* was the dominant species within these vegetation zones. There is only one PCT with *Nitraria billardierei* as the dominant species within the Riverina Bioregion and Murrumbidgee Sub-region, PCT 163, although several other PCTs contained *Nitraria billardierei*, including PCT 17, PCT 153, PCT 157, PCT 159 and PCT 164. PCT 163 was selected due to the dominance of *Nitraria billardierei.* There were several other species present within these vegetation zones which occur within PCT 163, including *Sclerolaena muricata, Sclerolaena tricuspis, Atriplex lindleyi, Rhagodia spinescens* and *Maireana aphylla*. This PCT also matched the landscape position, being found on clay soils. High grass cover was observed across some areas mapped within PCT 163. This is likely due to the above average rainfall within the region, particularly towards the end of	

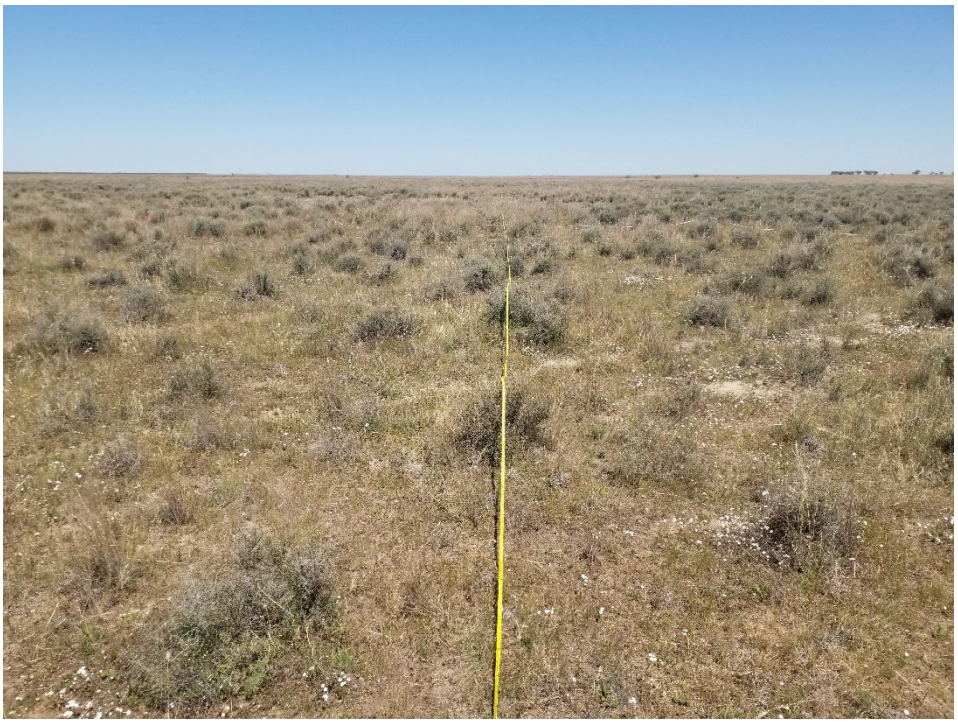
PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	
	2023 when the majority of BAM plots were undertaken. Therefore, the high grass cover is considered an anomaly, and where *Nitraria billardierei* was present and the landscape characteristics conformed to PCT 163, the patch was mapped as this shrubland PCT, rather than as a grassland PCT.
TEC Status	Has associated BC Act listed TEC, *Artesian Springs Ecological Community in the Great Artesian Basin* This PCT within the Subject Land does not conform to this TEC, as shown in Section 3.2.6.
Estimate of percent cleared within NSW	26%
Examples	 Figure 3-17 Example of PCT 163 high condition

PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	
	 Figure 3-18 Example of PCT 163 moderate condition

Table 3-11 Description of PCT 164 within the Subject Land

PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone		
Vegetation formation	Arid Shrublands (Chenopod sub-formation)	
Vegetation class	Riverine Chenopod Shrublands	
Vegetation type	PCT ID	164
	Common Community Name	Cotton Bush open shrubland
Areas inside Subject Land	Zone 19: 2,157.72 ha – high condition (shrub cover >50% of benchmark value) Zone 20: 8.55 ha – moderate condition (shrub cover < 50% of benchmark value and evidence of past cropping)	
Species relied upon for PCT identification	Species name	Average cover %
	Maireana aphylla	9%

PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone		
	Sclerolaena tricuspis	13%
	Austrostipa nodosa	6%
	Rytidosperma setaceum	3%
	Nitraria billardierei	3%
	Maireana pentagona	0.5%
Justification of evidence used to identify the PCT	*Maireana aphylla* was the dominant species within these vegetation zones. There is only one PCT with *Maireana aphylla* as the dominant species within the Riverina Bioregion and Murrumbidgee Sub-region, PCT 164, although several other PCTs contained *Maireana aphylla, including* PCT 46 and PCT 163. PCT 164 was selected due to the dominance of *Maireana aphylla.* There were several other species present within these vegetation zones which occur within PCT 164, including *Sclerolaena tricuspis, Nitraria billardierei, Sclerolaena muricata, Rhagodia spinescens, Rhodanthe corymbiflora, Rytidosperma setaceum* and *Rytidosperma caespitosum*. This PCT also matched the landscape position, being found on clay soils within a depressed alluvial plain.	
TEC Status	No associated TECs	
Estimate of percent cleared within NSW	8%	

PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone	
Examples	 Figure 3-19 Example of PCT 164 high condition  Figure 3-20 Example of PCT 164 moderate condition

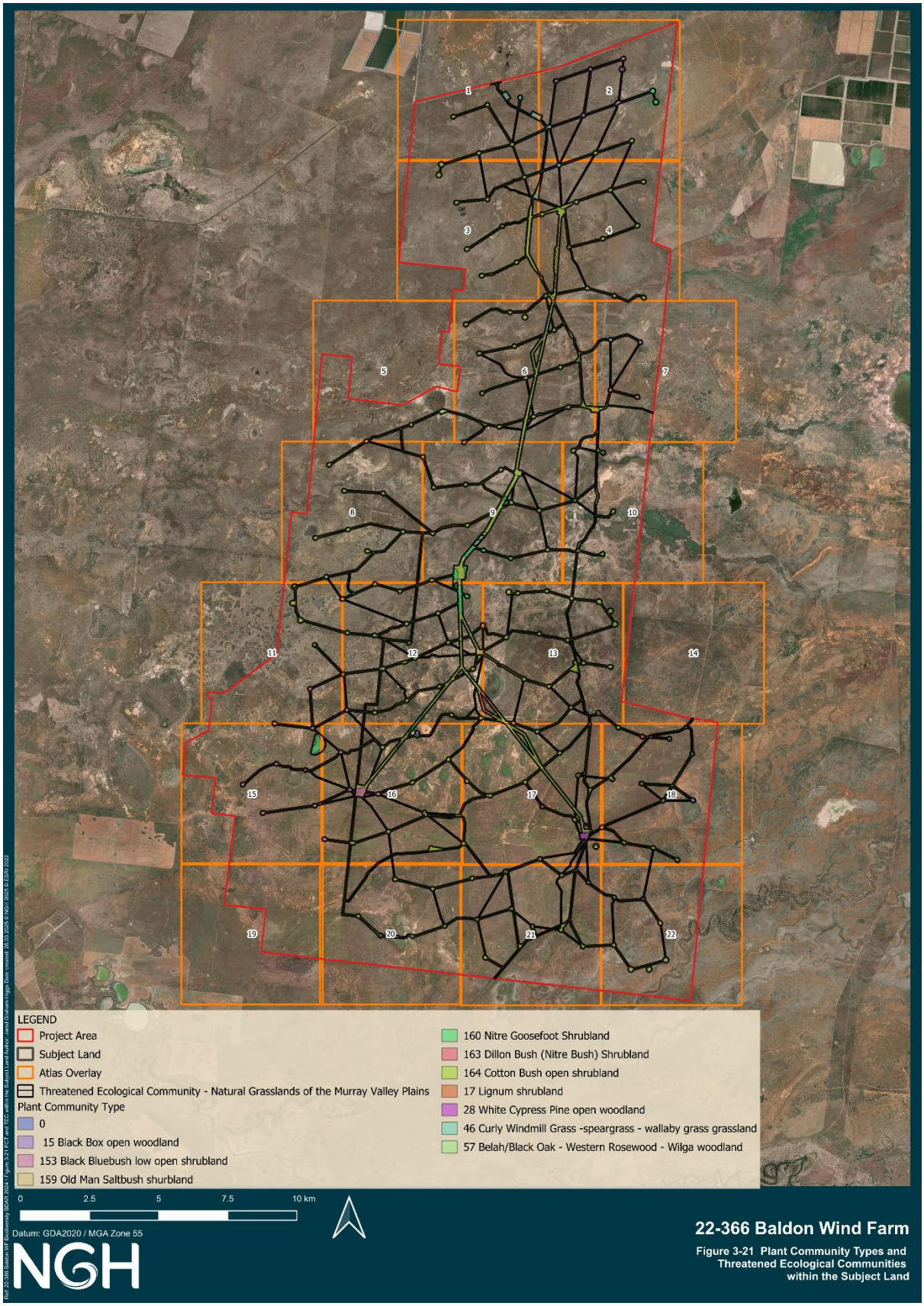


Figure 3-21 Plant Community Types and Threatened Ecological Communities within the Subject Land (refer to Appendix L.1 for Atlas series)



Figure 3-22 Plant Community Types and Threatened Ecological communities within the haul route intersection upgrades

3.2.6 BC Act Threatened Ecological Communities

Vegetation zones for PCTs that are associated with a BC Act listed TEC have been assessed against the relevant scientific determinations. These TECs include:

- *Acacia loderi* shrublands
- *Acacia melvillei shrubland in the Riverina and Murray-Darling Depression bioregions*
- *Artesian Springs Ecological Community in the Great Artesian Bas*in
- *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions*
- *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions*

None of the associated PCTs met the scientific determination criteria for any of the above listed TECs. As such, there are no BC Act TECs considered to be present within the Subject Land. The assessment is shown in Table 3-12 to Table 3-16 below.

Table 3-12 Assessment of *Acacia loderi shrublands* and associated PCTs

Scientific Determination	PCT 57	PCT 153
PCT dominated by the tall shrub/small tree *Acacia loderi*	No *Acacia loderi* was not recorded within this associated PCT within the Subject Land.	No *Acacia loderi* was not recorded within this associated PCT within the Subject Land.
The community has a naturally open structure of individual shrubs to small trees (to 8 m high) with a low, diverse understorey dominated by chenopod subshrubs, herbs and grasses.	Does not meet above criteria.	Does not meet above criteria.
Known from the Broken Hill Complex, Murray-Darling Depression, Cobar Peneplain, Riverina, Mulga Lands and Darling Riverine Plains Bioregions.	Does not meet above criteria.	Does not meet above criteria.
Found on solonized brown and duplex soils on level to undulating plains or on calcareous red earths	Does not meet above criteria.	Does not meet above criteria.
Conclusion	**Does not meet scientific determination criteria due to the**	**Does not meet scientific determination criteria due to the**

Scientific Determination	PCT 57	PCT 153
	absence of *Acacia loderi* – does not form part of the threatened ecological community	**absence of *Acacia loderi* – does not form part of the threatened ecological community**

Table 3-13 Assessment of *Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions* TEC and associated PCT

Scientific Determination	PCT 28
PCT occurs in the south-western portion of NSW in the Riverina or Murray darling Depression bioregion	Yes This associated PCT within the Subject Land was recorded within the Riverina Bioregion, in the Murrumbidgee subregion.
PCT has an upper stratum that is dominated by *Acacia melvillei*	No *Acacia melvillei* was not recorded within this associated PCT within the Subject Land.
PCT occurs on sandhills and undulating sandplains	Does not meet above criteria
PCT occurs on red-brown, sandy loam soils	Does not meet above criteria
PCT structure comprises of an open canopy of shrubs or small trees, sometimes with scattered mid-shrubs, and with a sometimes sparse, but highly variable ground layer dominated by grasses, chenopods and herb	Does not meet above criteria
PCT contains an assemblage of species that are listed as frequently occurring within this EEC?	Does not meet above criteria
Outcome	**Does not meet scientific determination criteria due to the absence of *Acacia melvillei* – does not form part of the threatened ecological community**

Table 3-14 Assessment of *Artesian Springs Ecological Community in the Great Artesian Basin* TEC and associated PCTs

Scientific Determination	PCT 160	PCT 163
Naturally restricted to artesian springs at the southern and western margins of the Great Artesian Basin in north western NSW	Subject Land is outside of the Great Artesian Basin boundary	Subject Land is outside of the Great Artesian Basin boundary
Conclusion	**Does not meet scientific determination criteria due to being outside the Great Artesian Basin boundary – does not form part of the threatened ecological community**	**Does not meet scientific determination criteria due to being outside the Great Artesian Basin boundary – does not form part of the threatened ecological community**

Table 3-15 Assessment of *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions* TEC and associated PCT

Scientific Determination	PCT 159
PCT occurs in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina or NSW South Western Slopes bioregions	Yes This associated PCT within the Subject Land was recorded within the Riverina Bioregion, in the Murrumbidgee subregion.
Community occur on red-brown earths, heavy textured grey or brown alluvial soils	Yes This associated PCT within the Subject Land occurred on red-brown clay soils
Acacia pendula (Weeping Myall) the characteristic or only tree species present	No *Acacia pendula* was not recorded within the Subject Land.
The structure of the community can vary based on condition and disturbance history from low woodland, low open woodland, low sparse woodland or open shrubland. The understorey will include an	Does not meet above criteria

Scientific Determination	PCT 159
open layer of chenopod shrubs and other woody plant species and open to continuous groundcover of grasses and herbs.	
PCT contain the assemblage of species that characterises Weeping Myall Woodland	Does not meet above criteria
Outcome	**Does not meet scientific determination criteria due to the absence of *Acacia pendula* – does not form part of the threatened ecological community**

Table 3-16 Assessment of *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions* TEC and associated PCT

Scientific Determination	PCT 28
PCT occurs in the Riverina, Murray-Darling Depression or NSW South Western Slopes Bioregions	Yes This associated PCT within the Subject Land was recorded within the Riverina Bioregion, in the Murrumbidgee subregion.
PCT dominated by Callitris glaucophylla or infrequently by Callitris gracilis subsp. Murrayensis	No Neither *Callitris glaucophylla* or *Callitris gracilis* subsp. *murrayensis* were not recorded within this associated PCT within the Subject Land.
Does the PCT occur on red-brown loamy sands with alkaline sub-soils on the alluvial plain of the Murray River and its tributaries, and on parts of the sandplain in south-western NSW? Or In the Riverina bioregion and the far south-western portion of the NSW South Western Slopes bioregion, the community is typically associated with prior streams and aeolian sourcebordering dunes, which are scattered within an extensive alluvial clay plain dominated by chenopod shrublands. Or	Does not meet above criteria.

Scientific Determination	PCT 28
Murray-Darling Depression bioregion, the community occurs as scattered patches on sandhills and lunettes within an extensive aeolian sandplain dominated by woodlands of mallee eucalypts or belah.	
PCT structure comprise of an open tree canopy with sometimes sparse, but highly variable ground layer dominated by grasses and herbs, sometimes with scattered shrubs and/or small trees	Does not meet above criteria.
Conclusion	**Does not meet scientific determination criteria due to the absence of *Callitris glaucophylla* or *Callitris gracilis* subsp. *murrayensis* – does not form part of the threatened ecological community**

3.2.7 Planted Vegetation

There was one patch and one vegetation zone which contained planted native vegetation. The decision-making key outlined in Appendix D of the BAM (2020) was utilised to determine the assessment of this vegetation.

There were numerous patches of vegetation dominated by rows of planted *Atriplex nummularia*. These patches were assigned to PCT 159, with further details in Table 3-17

The other patch of planted vegetation (0.34 ha), had been planted with Mallee Eucalypts not local to the area. It did however, have native understory shrubs both planted and naturally regenerated and was considered best to also be assigned to PCT 159 based on the presence of *Atriplex nummularia* (Old Man Saltbush) (Table 3-17).

Table 3-17 Assessment of planted vegetation in accordance with Appendix D of the BAM (2020)

Decision-making Key	Planted Mallee Vegetation	Planted *Atriplex nummularia*
Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?	Yes Planted vegetation dominated by Eucalyptus tree species not native to the region. As such, the patch could not be assigned to a PCT known to occur in the same IBRA region as the project. However, the understory was similar to the surrounding vegetation, comprised	Yes, vegetation conforms to PCT 159, which occurs within the Murrumbidgee IBRA subregion. Vegetation meets the description of this PCT, being a tall shrubland dominated by *Atriplex nummularia*, with a lower chenopod shrub layer dominated by bluebushes, *Rhagodia spinescens, Atriplex vesicaria* and *Chenopodium*

Decision-making Key	Planted Mallee Vegetation	Planted *Atriplex nummularia*
	of *Rhagodia spinescens, Atriplex nummularia, Atriplex semibaccata, Einadia nutans* and *Enchylaena tomentosa.* This planted vegetation has been allocated to Vegetation Zone 14 - PCT 159	*nitrariaceum.* This planted vegetation has been allocated Vegetation Zone 14 – PCT 159 Planted, with further details in Table 3-8 above.
Is the planted native vegetation: a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	Meets criteria 1 so no further assessment required.	Meets criteria 1 so no further assessment required.
Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following: a. a species recovery project b. *Saving our Species* project c. other types of government funded restoration project d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat e. legal obligation as part of a condition or ruling of	Meets criteria 1 so no further assessment required.	Meets criteria 1 so no further assessment required.

Decision-making Key	Planted Mallee Vegetation	Planted *Atriplex nummularia*
court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act) f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?		
Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?	Meets criteria 1 so no further assessment required.	Meets criteria 1 so no further assessment required.

3.3 Vegetation integrity assessment

3.3.1 Vegetation zones and survey effort

Vegetation integrity plots were used to further delineate PCTs into specific zones based on condition, which was determined using benchmark data and the vegetation integrity score (VI score) calculated in the BAM-C and extrapolated out in combination with on-site vegetation stratification and aerial imagery. For shrubland PCTs, vegetation was classified as high condition where shrub cover was >50% of the benchmark value,

moderate condition where shrub cover was between 25-50% of the benchmark value and low condition where shrub cover was <25% of the benchmark value. For all other PCTs, vegetation condition was determined using vegetation covers compared to benchmark values and the presence of functional elements (i.e. logs, litter, hollows, etc.) and was classified as low condition for VI scores lower than 15, moderate condition between 15-60, and high condition above 60.

The number of vegetation integrity plots (BAM plots) undertaken per zone was based on Table 3 & Section 4.3.4 of the BAM (2020). As BAM plots were used to inform planning to avoid and minimise impacts, BAM plots undertaken by NGH exceed the minimum required by the BAM in most zones. This also allowed any variation across the Subject Land to be captured.

For this BDAR V2.0, as requested by BCS, BAM plot allocations were divided into Stage 1 and Stage 2 Development Footprints. On dividing BAM plots into Stage 1 or Stage 2 Development Footprints, six vegetation zones did not meet the minimum number of plots for Stage 1. In these cases, BAM plots that were located in the Stage 2 footprint were used as these were considered to form a similar homogenous landscape to the Stage 1 footprint. Justification for using BAM plots from other stages is given in Appendix A.4. Table 3-18 shows the BAM Plots used in the BAM-C for each of the Stage 1 and Stage 2 Development Footprints.

Table 3-18 Vegetation zones within the Development Footprint and Subject Land

Zone ID	PCT ID	Zone Condition	Subject Land Area (ha)	Stage 1 Development Footprint Impact area (ha)	Stage 1 Plots undertaken (and required under the BAM)	Stage 2 Development Footprint Impact area (ha)	Stage 2. Plots undertaken (and required under the BAM)	Patch size (ha)
1	PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Woodland high	24.78	0.95	1 (1) BAM plot 820	2.72	3 (3) BAM plot 6, 120, 407	100
2	PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Woodland low	5.35	0	0 (0)	1.78	4 (1) BAM plot 122, 123, 126, 401	100
3	PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Grassland moderate	18.43	0	0 (0)	4.84	3 (2) BAM plot 316, 400, 402	100

Zone ID	PCT ID	Zone Condition	Subject Land Area (ha)	Stage 1 Development Footprint Impact area (ha)	Stage 1 Plots undertaken (and required under the BAM)	Stage 2 Development Footprint Impact area (ha)	Stage 2. Plots undertaken (and required under the BAM)	Patch size (ha)
4	PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	High	1.62	0	0 (0)	0.57	1 (1) BAM plot 125	100
5	PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Woodland moderate	3.59	0	0 (0)	0.98	3 (1) BAM plot 5, 204, 413	100
6	PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Grassland moderate	15.87	0.24	1 (1) BAM plot 818	4.95	3 (2) BAM plot 7, 110, 410	100
7a	PCT 46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	High	124.38	20.53	4 (4) BAM plot 18, 105, 133, 206	20.14	10 (4) BAM plot 2, 8, 13, 101, 104, 106, 131, 132, 205, 404	100

Zone ID	PCT ID	Zone Condition	Subject Land Area (ha)	Stage 1 Development Footprint Impact area (ha)	Stage 1 Plots undertaken (and required under the BAM)	Stage 2 Development Footprint Impact area (ha)	Stage 2. Plots undertaken (and required under the BAM)	Patch size (ha)
7b	PCT 46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	High - TEC	7.07	0	0 (0)	1.12	1(1) BAM plot 104	100
8	PCT 46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Moderate	6.06	0	0 (0)	1.30	1 (401) BAM plot 403	100
9	PCT 57 - Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	High	0.16	0.01	0 (*1) *BAM plot 137	0	1 (0) BAM plot 137	100
10	PCT 57 - Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	Moderate	1.54	0	0 (0)	0.27	2 (1) BAM plot 9, 124	100
11	PCT 153 - Black Bluebush low open shrubland of the alluvial plains and	High	19.75	0	0 (0)	6.72	2 (3[Δ]) BAM plot 307,	100

Zone ID	PCT ID	Zone Condition	Subject Land Area (ha)	Stage 1 Development Footprint Impact area (ha)	Stage 1 Plots undertaken (and required under the BAM)	Stage 2 Development Footprint Impact area (ha)	Stage 2. Plots undertaken (and required under the BAM)	Patch size (ha)
	sandplains of the arid and semi-arid zones						405, Δ405	
12	PCT 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Moderate	215.41	0.68	1 (*1) *BAM plot 305	59.51	7 (5) BAM plot 102, 130, 305, 308, 309, 312, 412	100
13	PCT 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Low	6.52	0	0 (0)	2.38	2 (2) BAM plot 12, 406	100
14	PCT 159 - Old Man Saltbush shrubland mainly of the semi-arid warm) climate zone (south western NSW)	Planted	29.37	0.55	0 (*1) * BAM plot 1, 10, 121, 127, 207	6.45	5 (3) BAM plot 1, 10, 121, 127, 207	100
15	PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	High	119.58	7.58	2 (*3) BAM plot, 138, 1005, *303	19.13	8 (4) BAM plot 11, 128, 134, 135, 303, 319, 408,	100

Zone ID	PCT ID	Zone Condition	Subject Land Area (ha)	Stage 1 Development Footprint Impact area (ha)	Stage 1 Plots undertaken (and required under the BAM)	Stage 2 Development Footprint Impact area (ha)	Stage 2. Plots undertaken (and required under the BAM)	Patch size (ha)
							1002	
16	PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Moderate	2.80	0	0 (0)	1.11	1 (1) BAM plot 1001	100
17	PCT 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	High	25.93	2.53	0 (*2) *BAM plot 209, 210, 411	1.13	3 (1) BAM plot 209, 210, 411	100
18	PCT 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Moderate	17.51	3.35	2 (2) BAM plot 16, 103	1.87	2 (1) BAM plot 129, 306	100
19	PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone PCT 164 - Cotton Bush open shrubland of the semi-arid (warm)zone	High	2,157.72	174.70	8 (6) BAM plot 14, 19, 108, 109, 302, 304, 310, 311	417.92	17 (7) BAM plot 3, 4, 15, 17, 107, 136, 201, 203, 208, 300, 313, 314, 315, 317, 318, 409, 1000	100

Zone ID	PCT ID	Zone Condition	Subject Land Area (ha)	Stage 1 Development Footprint Impact area (ha)	Stage 1 Plots undertaken (and required under the BAM)	Stage 2 Development Footprint Impact area (ha)	Stage 2. Plots undertaken (and required under the BAM)	Patch size (ha)
20	PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate	8.55	0.19	0 (1*) *BAM plot 301	2.99	2 (2) BAM plot 301, 1004	100
21	PCT 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Low (Euston Intersection Upgrade)	0.42	0.16	1 (1) BAM plot 904	0	0	47.2
Total Area (ha)			**2,812.41**	**211.47**		**557.88**		

*Did not meet the minimum plot number requirements, plots in same vegetation zone and similar landscape within another stage were used in the BAM-C

$^{\Delta}$ Did not meet minimum plot number requirements, duplicate plot of best quality used.

3.3.2 Vegetation integrity assessment results

The results of the plot field data can be found in Appendix A.1 and photos of each plot are shown in Appendix A.2. The plot data from the vegetation integrity survey plots were entered into the BAM calculator.

Wet year modified Benchmarks

The study area of Baldon Wind Farm experienced a large amount of rainfall and flooding events in the 12 months prior to flora surveys occurring in September 2023. The total 12-montly rainfall recorded at the nearest weather station at Moulamein from October 2022 to September 2023 is 535.8 mm (Table 3-19). This 12-month rainfall total exceeds the wet rainfall threshold within the BioNet Vegetation Classification (Veg-C) database for each of the PCTs on site. BAM plots undertaken within a three-month period of the high rainfall year can use the wet year modified benchmarks specified within the BioNet Veg-C (DPIE, 2020). BAM plots undertaken in October, November and December 2023 meet the criteria for using wet year modified benchmarks in the BAM-C.

Additional heavy rainfall occurred in December 2023 and the total 12-montly rainfall recorded at the Moulamein weather station from January 2023 to December 2023 is 415mm (Table 3-19). This total exceeds the wet rainfall threshold in the Veg-C for PCTs 17, 153, 159, 160, 163 and 164 (Table 3-20). BAM plots undertaken in January 2024 can use the wet weather modified benchmarks for these PCTs.

Thus, the wet year modified benchmarks within the BioNet Vegetation Classification database (Veg-C) are proposed to be used to determine the Vegetation Integrity Score (VI Score) for PCTs 17, 153, 159, 160, 163 and 164. Approval was sought from BCD to use this method and endorsed on 7th June 2024 (Appendix G.3)

Table 3-19 Monthly rainfall totals recorded at Moulamein Post Office (Station number 75046, Bureau of Meteorology)

Month	Monthly Rainfall (mm)	12-month Total Rainfall (mm) Oct 22 – Sept 23	12-month Total Rainfall (mm) Jan 23 – Dec 23
Sep-22	50		
Oct-22	186.2	**535.8**	
Nov-22	100.6		
Dec-22	24.2		
Jan-23	50.2		**415.0**
Feb-23	1.8		
Mar-23	7.8		
Apr-23	38.8		
May-23	15		
Jun-23	67.4		
Jul-23	16.6		
Aug-23	23.2		

Sep-23	4		
Oct-23	63.8		
Nov-23	43		
Dec-23	83.4		

Table 3-20 Rainfall thresholds for wet year modified benchmarks for PCTs in the Subject Land

PCT ID	Vegetation Class	IBRA	Benchmark Calculation Level	Benchmark Variation	Rainfall Threshold (mm)	Rainfall Threshold met Oct 23	Rainfall Threshold met Jan 24
15	Inland Floodplain Woodlands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 415**	**Yes**	**No**
17	Inland Floodplain Shrublands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 402**	**Yes**	**Yes**
28	Riverine Sandhill Woodlands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 452**	**Yes**	**No**
46	Riverine Plain Grasslands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 455**	**Yes**	**No**
57	Riverine Plain Grasslands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 455**	**Yes**	**No**
153	Aeolian Chenopod Shrublands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 357**	**Yes**	**Yes**
159	Riverine Chenopod Shrublands	Riverina	Class/IBRA	monthly average, following WET	**> 399**	**Yes**	**Yes**

PCT ID	Vegetation Class	IBRA	Benchmark Calculation Level	Benchmark Variation	Rainfall Threshold (mm)	Rainfall Threshold met Oct 23	Rainfall Threshold met Jan 24
				RAINFALL year			
160	Inland Floodplain Shrublands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 402**	**Yes**	**Yes**
163	Riverine Chenopod Shrublands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 399**	**Yes**	**Yes**
164	Riverine Chenopod Shrublands	Riverina	Class/IBRA	monthly average, following WET RAINFALL year	**> 399**	**Yes**	**Yes**

Vegetation Integrity Scores

The results of the current vegetation integrity assessment are provided in Table 3-21.

Wet year modified benchmarks have been used for zones marked with an Asterix.

Table 3-21 Current Vegetation Integrity scores for each Vegetation Zone within the Stage 1 Footprint

Zone ID	PCT/Zone	Hollow Bearing Trees?	Composition score	Structure score	Function score	Vegetation Integrity Score
1	15_Woodland_high	Present	44.3	45.9	17.2	32.7
6	28_Grassland_moderate	Absent	73.0	91.0	7.2	36.2
7a	46_High	Absent	99.3	92.8	n/a	95.9
9	57_High	Absent	58.8	67.3	52.8	59.3
12	153_moderate	Absent	100	24.5	n/a	49.5

Zone ID	PCT/Zone	Hollow Bearing Trees?	Composition score	Structure score	Function score	Vegetation Integrity Score
14	159_Planted	Absent	98.6	86.1	n/a	92.1*
15	160_High	Absent	98.2	79.6	n/a	88.4*
17	163_High	Absent	93.4	84.9	n/a	89*
18	163_Moderate	Absent	94.1	48	n/a	65.2*
19	164_High	Absent	99.9	89.6	n/a	93.7*
20	164_Moderate	Absent	99.2	16.7	n/a	40.6*
21	153 – Low (Euston intersection upgrade)	Absent	70.1	94.6	n/a	81.4

Table 3-22 Vegetation Integrity Scores for each Vegetation Zone within Stage 2 Footprint

Zone ID	PCT/Zone	Hollow Bearing Trees?	Composition score	Structure score	Function score	Vegetation Integrity Score
1	15_Woodland_high	Present	91.3	84.7	49.9	72.8
2	15_Woodland_low	Absent	78	64.1	34.2	55.5
3	15_Grassland_moderate	Absent	90	57.7	7.5	33.9
4	17_High	Absent	99.2	74.1	n/a	85.7*
5	28_Woodland_moderate	Absent	98.9	100	0.9	21.5
6	28_Grassland_moderate	Absent	94.8	94.1	5.5	36.7
7a	46_High	Absent	98.9	91.2	n/a	95

Zone ID	PCT/Zone	Hollow Bearing Trees?	Composition score	Structure score	Function score	Vegetation Integrity Score
7b	46_High (TEC)	Absent	81.8	86.7	n/a	84.2
8	46_Moderate	Absent	100	33.6	n/a	57.9
10	57_Moderate	Absent	51.4	73.2	28.7	47.6
11	153_High	Absent	100	98.5	n/a	99.2*
12	153_Moderate	Absent	99.9	35.1	n/a	59.2*
13	153_Low	Absent	100	17.7	n/a	42.1*
14	159_Planted	Absent	98.6	86.1	n/a	92.1*
15	160_High	Absent	93.4	54.8	n/a	71.5*
16	160_Moderate	Absent	98.9	20.9	n/a	45.5*
17	163_High	Absent	93.4	84.9	n/a	89*
18	163_Moderate	Absent	76.3	36.5	n/a	52.8*
19	164_High	Absent	100	89.9	n/a	94.8*
20	164_Moderate	Absent	100	26.6	n/a	51.6

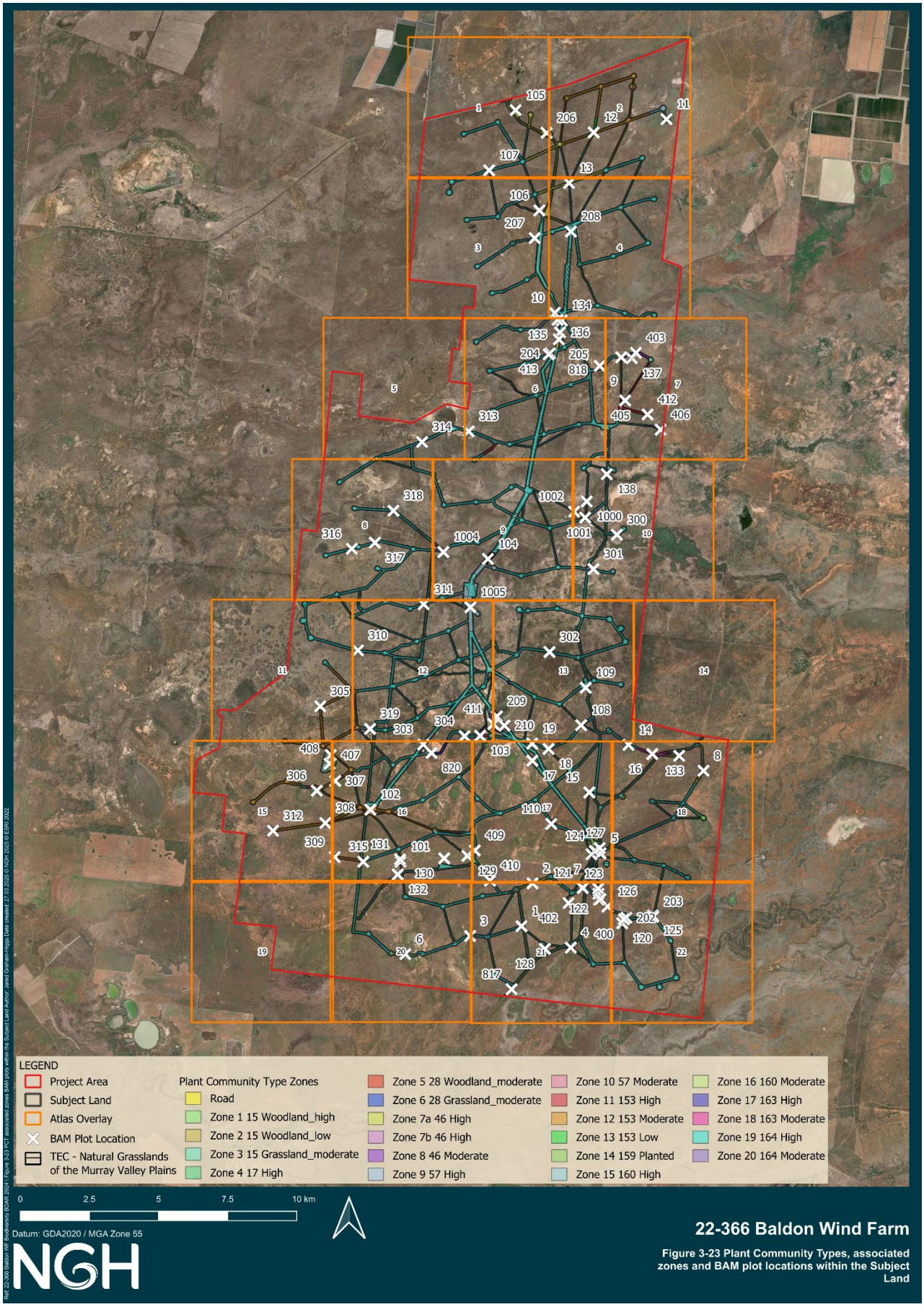


Figure 3-23 Plant Community Types, associated zones and BAM plot locations within the Subject Land (refer to Appendix L.2 for Atlas series)

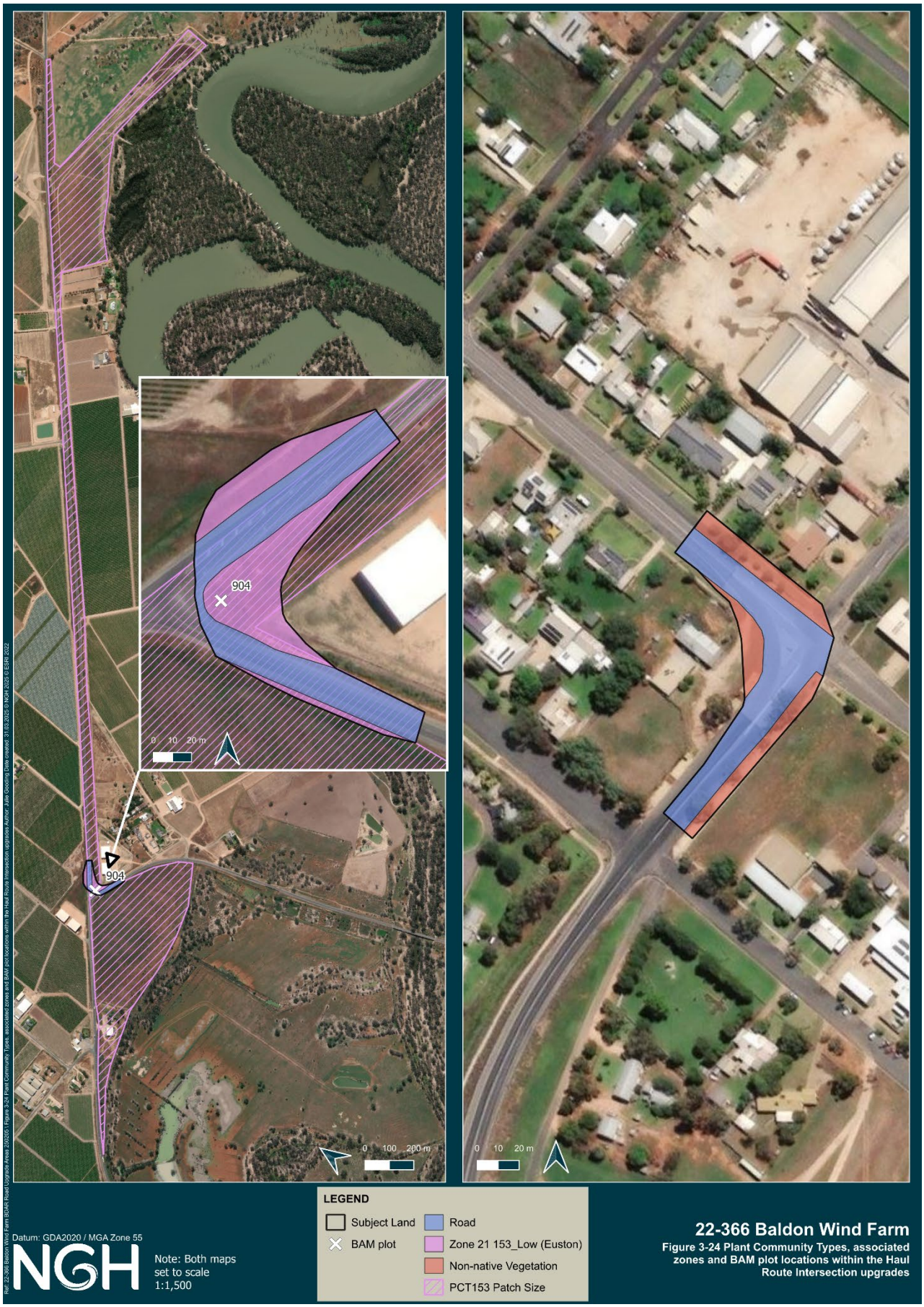


Figure 3-24 Plant Community Types, associated zones and BAM plot locations within the haul route Intersection upgrades.

4. Threatened species

4.1 Background searches

Under the BAM, threatened species that require assessment are generated under the BAM-C. These species are discussed in Section 4.2 to Section 4.5. To ensure all threatened species were considered, background searches were undertaken to determine if any additional threatened species should be included for assessment. These are detailed in Section 4.1.1 to Section 4.1.4 below.

4.1.1 EPBC Act Protected Matters

A Protected Matters Search Tool (PMST) search for Matters of National Environmental Significance (MNES) was undertaken on 5 December 2023. An updated search was undertaken on 27 February 2025 to capture the 10km from the Project Area (wind farm location) as well as new searches being undertaken within 10km of the two additional haul route intersection upgrades at Balranald and Euston. There were sixteen threatened species and 12 migratory species considered likely to occur within the Project Area. Details are provided in Section 5 and the habitat assessment is provided in Appendix B.2.

4.1.2 BioNet

A NSW BioNet (DPE, 2025) search was undertaken on 8 December 2023, which identified species recorded within 10 km of the Project Area (Appendix D). A habitat assessment was undertaken to assess the likelihood of these species occurring within the Project Area based on the available habitat (Table 4-1). One additional species, Flame Robin *Petroica phoenicea*, was considered to have suitable habitat and was not captured by the BAM-C. This species was added to the BAM-C as an Ecosystem species.

One species, *Gelochelidon nilotica* (Gull-billed Tern), listed as migratory under the EPBC Act, was also identified as having the potential to utilise habitat within the Project Area. This species is addressed in Section 5 .

An additional search was undertaken on 18th February 2025 to capture threatened species that had been added in the last 12 months or occurred within the locality of the haul route intersection upgrades. Two species, Austral Pillwort (*Pilularia novae-hollandiae*) and Spike-Rush (*Eleocharis obicis*) have been detected in adjacent projects and recorded on BioNet. Spike-rush was subsequently added into the BAM-C as a candidate species. The additional search also included a 10km buffer around the haul route intersection at Balranald and Euston to determine if there were any threatened species likely to utilise these habitats.

Table 4-1 Species identified within BioNet search with potential habitat present within the Subject Land

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
Fauna						
Aphelocephala leucopsis Southern Whiteface	15* 0^	Vulnerable	Vulnerable	Dry, open forest and woodlands.	Yes	Predicted species in BAM-C added after the October 2024 update
Artamus cyanopterus cyanopterus Dusky Woodswallow	0* 1^	Vulnerable	Not Listed	Dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris	Yes	Existing Predicted species in BAM-C
Botaurus poiciloptilus Australasian Bittern	1* 0^	Endangered	Endangered	Permanent freshwater wetlands with tall, dense vegetation, particularly	Yes	Existing Predicted species in BAM-C

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
				bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.).		
Circus assimilis Spotted Harrier	5* 9^	Vulnerable	Not Listed	Grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. Native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands	Yes	Existing Predicted species in BAM-C
Epthianura albifrons White-fronted Chat	91* 22^	Vulnerable	Not Listed	Bare or grassy ground in wetland areas.	Yes	Existing Predicted species in BAM-C
Falco subniger Black Falcon	5* 5^	Vulnerable	Not Listed	Tree-lined watercourses and in isolated woodlands,	Yes	Existing Predicted species in BAM-C

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
				mainly in arid and semi-arid areas.		
Gelochelidon nilotica Gull-billed Tern	1* 0^	Not listed	Migratory	Freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands	Yes	Further detailed provided in Section 5.4
Hieraaetus morphnoides Little Eagle	1* 3^	Vulnerable	Not Listed	Open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW.	Yes	Existing Candidate species in BAM-C
Litoria raniformis Southern Bell Frog	10* 4^	Endangered	Vulnerable	Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum	Yes	Existing Candidate species in BAM-C

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
				swamps or billabongs along floodplains and river valleys.		
Lophochroa leadbeateri Pink Cockatoo	11* 1^	Vulnerable	Not Listed	Treed and treeless inland habitats, always within easy reach of water. Nests in hollow trees.	Yes	Existing Candidate species in BAM-C
Neophema chrysostoma Blue-winged Parrot	1* 1^	Vulnerable	Vulnerable	Grasslands and grassy woodlands coastal and semi-arid zones.	Yes	Predicted species in BAM-C added after the October 2024 update
Pedionomus torquatus Plains-wanderer	4* 0^	Endangered	Critically Endangered	Semi-arid, lowland native grasslands that typically occur on hard red-brown soils.	Yes	Existing Candidate species in BAM-C
Petroica phoenicea Flame Robin	1* 0^	Vulnerable	Not Listed	Eucalypt forests and woodlands, often on ridges and slopes,	Yes	Added to BAM-C

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
				clearings or areas with open understoreys, native grasses and the shrub layer may be either sparse or dense. Temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes.		
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	1* 0^	Vulnerable	Not Listed	Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.	Yes	Existing Predicted species in BAM-C
Flora						

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
Brachyscome papillosa Mossgiel Daisy	2* 3,823^	Vulnerable	Vulnerable	Clay soils on Bladder Saltbush (*Atriplex vesicaria*) and Leafless Bluebush (*Maireana aphylla*) plains, but also in grassland and in Inland Grey Box (*Eucalyptus microcarpa*) - Cypress Pine (*Callitris* spp.) woodland.	Yes	Existing Candidate species in BAM-C
Calotis moorei A burr-daisy	0* 42^	Endangered	Endangered	Grows in sandy soil on flats, low dunes and small hills and appears to be associated with Acacia woodlands and chenopod shrublands.	Yes	Existing Candidate species in BAM-C
Eleocharis obicis Spike-rush	0* 73^	Vulnerable	Vulnerable	Grows in ephemerally wet situations such as roadside mitre drains and depressions, usually in	Yes	Yes, added to the BAM-C as a candidate species.

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
				low-lying grasslands.		
Lepidium monoplocoides Winged Peppercress	0* 74^	Endangered	Endangered	Grows in seasonally moist to waterlogged sites with heavy fertile soils.	Yes	Existing Candidate species in BAM-C
Maireana cheelii Chariot Wheels	18* 389^	Vulnerable	Vulnerable	Heavier, grey clay soils with *Atriplex vesicaria* (Bladder Saltbush). Recorded on the Hay Plain in *Atriplex vesicaria*, *Maireana aphylla* and *Acacia homalophylla* shrublands. Soils include heavy brown to red-brown clay-loams, hard cracking red clay, other heavy texture-contrast soils.	Yes	Existing Candidate species in BAM-C
Pilularia Novae-hollandiae	0* 22^	Endangered	Not Listed	Austral Pillwort grows in shallow swamps and	Yes	Existing Candidate species in BAM-C

Species	Number of records within 10 km * 2023 search ^additional records in 2025 search	NSW listing status	National listing status	Habitat requirements	Habitat present within Subject Land?	Additional assessment required?
Austral Pillwort				waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous		
Swainsona murrayana Slender Darling Pea	0* 221^	Vulnerable	Vulnerable	Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Generally found on clay-based soils.	Yes	Existing Candidate species in BAM-C

* Number of records returned from December 2023 search

^ Number of additional records returned from February 2025 search

4.1.3 Bird and Bat Surveys

Bird and Bat Utilisation Surveys (BBUS) were undertaken by ecologists from Nature Advisory. The BBUS aim to provide baseline data to inform the impacts of a development on local bird and bat populations.

Bird Utilisation Surveys

Bird surveys were conducted in February (summer), April (autumn), August (winter), and October (spring) of 2023. Surveys were unable to be undertaken during Spring 2022 due to flooding and restricted site access. Final bird surveys then took place for Summer, Autumn, Winter and Spring 2024, totalling two years (24 months) of bird surveys. Results from the two-year period are displayed in Table 4-2.

Year 1 surveys

There were nine survey points (Impact) located in proposed turbine locations and offered a minimum 270-degree viewing out to 200 metres. Three points were situated away from proposed turbine locations, selected as reference points (Ref) that acted as controls, totalling 12 survey points across the site. Surveys were conducted using the fixed-point bird count method in 15-minute intervals, and in four periods of the day: early morning (8:00am to 10:30am), late morning (10:30am to 12:30pm), early afternoon (1:00pm to 3:30pm) and late afternoon (3:30pm to 5:30pm). This methodology followed the Survey guidelines for Australia's threatened birds (Department of the Environment, Water, Heritage and the Arts, 2017).

Year 2 surveys

Following the first year of surveys, the provision of the draft Bird and Bat Survey (BBUS) guidelines through Biodiversity, Conservation and Science (BCS) in mid-2023 prompted the Proponent to increase the number of survey points to better align the survey methodology and increase coverage across the Project Area to provide further certainty that all avian habitats were represented. Survey points increased to a total of 20 impact points (increase of 11 compared to previous year), and three reference points (unchanged), totalling 23 survey points across the site. Full methodology is provided in Appendix J.16. This change was implemented in the first survey period of Year 2 in summer 2024 and applied for all of the Year 2 surveys. Each survey point was surveyed eight times for a 15-minute period at each point (eight replicates); twice each during four different periods of the day: early morning (8:00am to 10:30am), late morning (10:30am to 12:30pm), early afternoon (1:00pm to 3:30pm) and late afternoon (3:30pm to 5:30pm). Survey times for the four periods of day changed from August 2024 to the following: early morning (6:00ma to 10:00am), late morning (10:00am to 12:00pm), early afternoon (12:00pm to 3:00pm) and late afternoon (3:00pm to 7:00pm).

Across the entire survey period, a total of 72 species of birds were recorded, with an additional four only recorded to genus level. Eight threatened and one migratory bird species were recorded during the surveys(Table 4-2). The most common threatened bird species recorded was the White-fronted Chat (*Epthianura albifrons)*, which was present in all survey seasons. Southern Whiteface *(Aphelocephala leucopsis)* was also present across all survey seasons and was the second most common threatened bird species to occur onsite. Two additional threatened bird species were recorded incidentally in between survey points; Flame Robin (*Petroica phoenicea)* and Plains-wanderer (*Pedionomus torquatus*).

Incidental sightings of significant bird habitat features were also recorded (Table 4-3). Nine Wedge-tailed eagle nests were detected across the Project Area

Full results of the Bird Utilisation surveys are listed in Appendix J (J.12 to J.20) in each respective season and year.

Table 4-2 Summary of threatened and migratory bird species counts and habitat features recorded on-site during seasonal Bird Utilisation Surveys from 2023-2024

Species name	Summer 2023		Autumn 2023		Winter 2023		Spring 2023		Summer 2024		Autumn 2024		Winter 2024		Spring 2024		Total
	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	
Threatened bird																	
Aphelocephala leucopsis Southern Whiteface	28	0	5	7	18	16	0	4	2	5	9	0	3	5	10	0	**112**
Circus assimilis Spotted Harrier	0	0	3	0	4	0	1	0	4	0	1	0	8	0	0	0	**21**
Epthianura albifrons White-fronted Chat	5	3	160	70	256	200	18	1	11	0	35	3	79	22	8	4	**875**
Falco subniger Black Falcon	0	0	1	0	0	0	0	1	3	0	2	0	2	0	0	0	**9**
Hamirostra melanosternon Black-breasted Buzzard	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
Hieraaetus morphnoides Little Eagle	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**

Species name	Summer 2023		Autumn 2023		Winter 2023		Spring 2023		Summer 2024		Autumn 2024		Winter 2024		Spring 2024		Total
	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	Impact	Ref	
Lophochroa leadbeateri Pink Cockatoo (Major Mitchell's Cockatoo)	0	0	2	0	2	0	0	0	0	0	0	6	2	2	10	6	**30**
Neophema Chrysostoma Blue-winged Parrot	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	**2**
Migratory bird																	
Gelochelidon nilotica Gull-billed Tern	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**

Table 4-3 Bird habitat features recorded within the Project Area

Habitat feature	Number of incidental sightings
Raptor platform	4
Wedge-tailed Eagle (*Aquila audax*) nest	9

Bat Surveys

Bat surveys were conducted in July (Winter) 2022, April (autumn), August (winter), and October (spring) of 2023, Summer, Autumn, Winter and Spring of 2024 and Summer 2025 to complete two consecutive years of data. Surveys were unable to be undertaken during Spring 2022 due to flooding and restricted site access.. Song Meter Mini Bat detectors were used for acoustic recordings in winter 2022 and autumn 2023. Acoustic recordings were made with Wildlife Acoustics SM4BAT-Full Spectrum (FS) detectors in Winter and Spring of 2023, Summer and Spring of 2024, and Summer of 2025. Wildlife Acoustics SM Mini Full Spectrum (FS) detectors were used in Autumn and Winter 2024.

Year 1 Surveys

Acoustic recorders (Song Meters) were deployed at six locations across the Project Area. Acoustic recorders were secured to trees or fence posts approximately 1.5 - 2 metres above ground. The detectors were programmed to commence operation approximately 30 minutes before dusk, and to cease approximately 30 minutes after dawn.

Year 2 Surveys

Following the first year of surveys, the provision of draft Bird and Bat Survey (BBUS) guidelines through Biodiversity, Conservation and Science (BCS) in mid-2023 prompted the Proponent to increase the number of survey points to better align the survey methodology and increase coverage across the Project Area to provide further certainty of all habitats represented. Survey points increased to a total of 15 locations (increase of 9 compared to previous year), across the Project Area. This change was implemented in the first survey period of Year 2 in Autumn 2024. A total of six of these acoustic recorders were also placed on Met Masts during the Year 2 surveys, with three of these recorders being 1.5-2m above ground level and the remaining three recording at-height data, positioned 70m above ground level attached to the three meteorological masts on site.

Over the entirety of the two-year survey period, 669 nights of survey data was captured via bat detectors (Table 4-5). Number of survey nights per detector location is detailed in each respective seasonal survey report in Appendix J.

The detectors recorded the species-specific echolocation calls of free-flying bats. The deployment sites varied between chenopod shrubland, *Acacia* shrubland, and areas with tree cover, and were chosen to be representative of the habitat types within the Project Area. The detectors were active from approximately 30 minutes before dusk to 30 minutes after dawn. Recordings were analysed by *Balance! Environmental* in Winter 2022, Autumn 2023, and by Amanda Lo Cascio in Winter 2023, Spring 2023, Summer 2024, Autumn 2024, Winter 2024, Spring 2024 and Summer 2025. Bat call recordings were analysed using Anabat Insight (Version 2.0.8) and with the Decision Tree analysis tool. The two years of data analysis resulted in the

identification of 30 bat taxa (15 to species level, 1 to genus level and 14 unresolved calls) (Appendix J.2 to J.11). Four threatened bat species were detected across the two-year survey period:

- Little Pied Bat (*Chalinolobus picatus*),
- Inland Forest Bat (*Vespadelus baverstocki*),
- Yellow-bellied sheath-tailed Bat *(Saccolaimus flaviventris)*, and
- Southern Myotis (*Myotis Macropus*).

Across the survey period, the genus *Nyctophilus* was recorded within the study area. Corben's Long-eared Bat *(Nyctophilus corbeni)* and the Lesser Long-eared Bat *(Nyctophilus geoffroyi)* are the two *Nyctophilus* spp. most likely to occur in the region, however the calls are indistinguishable and presence cannot be confirmed via acoustic surveys

Full results of the bat utilisation surveys are given in Appendix J.2 to Appendix J.11

Table 4-4 Presence of threatened microbat species across each survey season over a two-year period

Species name	Presence of threatened microbat species calls across all detectors , Number of recordings									
	Winter 2022	Autumn 2023	Winter 2023	Spring 2023	Summer 2024	Autumn 2024	Winter 2024	Spring 2024	Summer 2025	Total No. of Recordings
Inland Forest Bat *(Vespadelus baverstocki)*	0	12	Detected	28	Detected	Detected	Detected	21	47	>108
Little Pied Bat *(Chalinolobus picatus)*	0	9	Probable	0	Detected	0	1	0	0	>10
Yellow-bellied sheath-tailed Bat *(Saccolaimus flaviventris)*	0	0	0	0	Probable	0	1	0	1	2
Southern Myotis (*Myotis macropus*)	0	0	0	0	0	0	0	8 confirmed 35 possible	14 confirmed 4 possible	22 confirmed
Nyctophilus sp.	25	109	Detected	324	Detected	Possible - unconfirmed	Possible - unconfirmed	442	165	>1065

Table 4-5 Number of microbat survey nights across each survey season of a two-year period

	Winter 2022	Autumn 2023	Winter 2023	Spring 2023	Summer 2024	Autumn 2024	Winter 2024	Spring 2024	Summer 2025	Total
Survey dates	21/07/2022 – 27/07/2022	11/04/2023 – 20/04/2023	31/07/2023 – 08/08/2023	23/10/2023 – 01/11/2023	29/02/2024 – 07/03/2024	21/05/2024 – 26/05/2024	20/08/2024 – 27/08/2024	13/11/2024 – 19/11/2024	14/01/2025 _ 22/01/2025	
Detectors/locations	6	6	6	6	14	15	15	14	14	96
Total detector survey nights	42	58	54	61	98	78	108	84	112	695

4.1.4 Adjacent projects

A search of the NSW major projects website (NSW Government , n.d.) was undertaken to determine if any local projects had recorded threatened species not yet uploaded to BioNet. Two adjacent projects were reviewed – Keri Keri Wind Farm (NSW Gov, n.d.) and Energy Connect-NSW-Eastern Section. Thirteen threatened species have been identified in these projects (Table 4-6). All these species have been accounted for in the BAM-C and no additional species have been added.

Table 4-6 Species detected in adjacent projects

Ecosystem credit species	Number of records	NSW listing status	National listing status	Location (project name)
Flora				
Brachyscome papillosa Mossgiel Daisy	560	Vulnerable	Vulnerable	Energy Connect, (10km to 800m west of Project Area), Keri Keri Wind Farm
Mariana cheelii Chariot Wheels	84	Vulnerable	Vulnerable	Energy Connect (10 -5km of Project Area & 4 -100km east of ProjectArea), Keri Keri Wind Farm
Pilularia nova-hollanidae Austal Pillwort	9	Endangered	n/a	Energy Connect, (80km east of Project Area)
Swainsona murrayana Slender Darling Pea	31	Vulnerable	Vulnerable	Energy Connect, (10km east of Project Area), Keri Keri Wind Farm
Fauna				
Apus pacificus Fork-tailed Swift	1 observation of 13 individuals and 1 observation of 30	Not Listed	Migratory	Keri Keri Wind Farm

Ecosystem credit species	Number of records	NSW listing status	National listing status	Location (project name)
	individuals			
Circus assimilis Spotted Harrier	1 (7 observations of 1 individual)	Vulnerable	Not Listed	Keri Keri Wind Farm
Epthianura albifrons White-fronted Chat	2	Vulnerable	Not listed	Energy Connect, Keri Keri Wind Farm
Falco subniger Black Falcon	1	Vulnerable	Not Listed	Keri Keri Wind Farm
Hieraaetus morphnoides Little Eagle	4 observations of 1 individual and 1 observation of 3 individuals	Vulnerable	Not Listed	Keri Keri Wind Farm
Lophochroa leadbeateri Pink Cockatoo	9 observations totalling 98 individuals	Vulnerable	Not Listed	Keri Keri Wind Farm
Neophema chrysostoma Blue-winged Parrot	1	Vulnerable	Vulnerable	Keri Keri Wind farm
Pedionomus torquatus Plains-wanderer	1	Endangered	Critically Endangered	Keri Keri Wind Farm
Saccolaimus flaviventris Yellow-bellied Sheath-tailed Bat	7	Vulnerable	Not Listed	Keri Keri Wind Farm

4.2 Ecosystem credit species

The following ecosystem credit species were returned by the BAM calculator (BAM-C) as being associated with the PCTs present inside the Development Footprint (Table 4-7). These species are assumed to occur with suitable habitat onsite and contribute to ecosystem credits.

Three additional ecosystem credit species have been manually added to the BAM-C (Table 4-8). These species are:

- Black Breasted Buzzard (*Hamirostra melanosternon*) included based on observations during surveys within or surrounding the Subject Land,
- Flame Robin (*Petroica phoenicea)* included based on being recorded in a BioNet background search
- Corben's Long-eared Bat (*Nyctophilus corbeni*) included as a precautionary approach due to an unidentified *Nyctophilus* species being recorded during bat surveys.

Table 4-7 Ecosystem credit species predicted by the BAM-C

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
Fauna				
Anseranas semipalmata Magpie Goose	15 Woodland High 15 Woodland Low 15 Grassland Moderate 160 High 160 Moderate 163 High 163 Moderate	Vulnerable	Not Listed	Moderate
Aphelocephala leucopsis Southern Whiteface	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 Moderate 57 High 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate	Vulnerable	Vulnerable	Low

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	164 Moderate			
Artamus cyanopterus cyanopterus Dusky Woodswallow	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate	Vulnerable	Not Listed	Moderate
Botaurus poiciloptilus Australasian Bittern	17 High 160 High 160 Moderate	Endangered	Endangered	Moderate
Certhionyx variegatus Pied Honeyeater	15 Woodland High 15 Woodland Low 15 Grassland Moderate	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	28 Woodland Moderate 28 Grassland Moderate 153 High 153 Moderate 153 Low 163 High 163 Moderate			
Chalinolobus picatus Little Pied Bat	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate	Vulnerable	Not Listed	High
Circus assimilis Spotted harrier	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate			
Daphoenositta chrysoptera Varied Sittella	15 Woodland High 15 Woodland Low 15 Grassland Moderate 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate	Vulnerable	Not Listed	Moderate
Epthianura albifrons White-fronted Chat	17 High 46 High 46 Moderate 153 High 153 Moderate 153 Low 159 Planted	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate			
Falco hypoleucos Grey Falcon	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate	Vulnerable	Vulnerable	Moderate
Falco subniger Black Falcon	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate			
Grantiella picta Painted Honeyeater	15 Woodland High 15 Woodland Low 15 Grassland Moderate 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate	Vulnerable	Vulnerable	Moderate
Grus rubicunda Brolga	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 160 High 160 Moderate 163 High 163 Moderate	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
Haliaeetus leucogaster White-bellied Sea Eagle	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate	Vulnerable	Not Listed	High
Hamirostra melanosternon Black-breasted Buzzard (Foraging)	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate			
Hieraaetus morphnoides Little Eagle (Foraging)	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
Hirundapus caudacutus White-throated Needletail	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 46 High 46 Moderate 159 Planted 160 High 160 Moderate	Vulnerable	Vulnerable	High
Lathamus discolor Swift Parrot (Foraging)	15 Woodland High 15 Woodland Low 15 Grassland Moderate	Endangered	Critically Endangered	Moderate
Lophochroa leadbeateri Pink Cockatoo (Foraging)	15 Woodland High 15 Woodland Low 15 Grassland Moderate 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 163 High 163 Moderate	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
Lophoictinia isura Square-tailed Kite (Foraging)	15 Woodland High 15 Woodland Low 15 Grassland Moderate 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low	Vulnerable	Not Listed	Moderate
Melanodryas cucullata cucullata South-eastern Hooded Robin	15 Woodland High 15 Woodland Low 15 Grassland Moderate 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate	Endangered	Endangered	Moderate
Neophema chrysostoma Blue-winged Parrot	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate	Vulnerable	Vulnerable	Low

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate			
Oxyura australis Blue-billed Duck	17 High 160 High 160 Moderate	Vulnerable	Not Listed	Moderate
Pachycephala inornata Gilbert's Whistler	17 High 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate	Vulnerable	Not Listed	Moderate
Pedionomus torquatus Plains-wanderer (Foraging)	46 High 46 Moderate	Endangered	Critically Endangered	High
Petroica phoenicea Flame Robin	15 Woodland High 15 Woodland Low 15 Grassland Moderate	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
	17 High 28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate 153 High 153 Moderate 153 Low 159 Planted 160 High 160 Moderate 163 High 163 Moderate 164 High 164 Moderate			
Polytelis swainsonii Superb Parrot (Foraging)	28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate	Vulnerable	Vulnerable	Moderate
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	15 Woodland High 15 Woodland Low 15 Grassland Moderate 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate	Vulnerable	Not Listed	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
Pyrrholaemus brunneus Redthroat	17 High 153 High 153 Moderate 153 Low 159 Planted 163 High 163 Moderate	Vulnerable	Not Listed	Moderate
Rostratula australis Australian Painted Snipe	17 High 160 High 160 Moderate	Endangered	Endangered	Moderate
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	15 Woodland High 15 Woodland Low 15 Grassland Moderate 17 High 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate 160 High 160 Moderate	Vulnerable	Not Listed	High
Stagonopleura guttata Diamond Firetail	28 Woodland Moderate 28 Grassland Moderate 46 High 46 Moderate 57 High 57 Moderate	Vulnerable	Vulnerable	Moderate

Species	Associated PCT & veg zones	NSW Listing Status	National Listing Status	Sensitivity to potential gain
Stictonetta naevosa Freckled Duck	17 High 160 High 160 Moderate	Vulnerable	Not Listed	Moderate
Tiliqua occipitalis Western Blue-tongued Lizard	57 High 57 Moderate 153 High 153 Moderate 153 Low	Vulnerable	Not Listed	High
Vespadelus baverstocki Inland Forest Bat	15 Woodland High 15 Woodland Low 15 Grassland Moderate 28 Woodland Moderate 28 Grassland Moderate 57 High 57 Moderate	Vulnerable	Not Listed	High

4.3 Ecosystem credit species included

Three additional ecosystem credit species were added to the BAM-C, as shown in Table 4-8.

Table 4-8 Additional ecosystem credit species added to the BAM-C

Ecosystem credit species	Vegetation zones included	NSW Listing Status	National Listing Status	Sensitivity to potential gain	Reason for inclusion
Hamirostra melanosternon	All vegetation zones	Vulnerable	Not Listed	Moderate	Detected on site by

Ecosystem credit species	Vegetation zones included	NSW Listing Status	National Listing Status	Sensitivity to potential gain	Reason for inclusion
Black-breasted Buzzard					BBUS surveys
Nyctophilus corbeni Corben's Long-eared Bat	All associated vegetation zones	Vulnerable	Vulnerable	High	Precautionary approach due to the genus *Nyctophilus* being recorded during BBUS surveys
Petroica phoenicea Flame Robin	All vegetation zones	Vulnerable	Not listed	Moderate	Recorded in BioNet background search

4.4 Ecosystem credit species excluded from assessment

The following ecosystem credit species were excluded from further assessment based on geographic limitations specified in the BAM-C.

Table 4-9 Ecosystem credit species excluded from further assessment under BAM

Ecosystem credit species	Vegetation zones excluded	Reason for exclusion
Polytelis anthopeplus monarchoides Regent Parrot (eastern subspecies)	All vegetation zones	Project Area is not within 10km of the junction of the Murray River.

4.5 Species credit species

The BAM-C predicted the following species credit species shown in Table 4-10 to occur within the Subject Land within the Project Area (Murrumbidgee IBRA subregion) Under the BAM, these generate additional species credits unless:

1. They are excluded because key habitat features don't exist, or they are geographically limited. Some species may also be excluded because important habitat mapping does not exist inside the Subject Land, or
2. Habitat components are lacking such that they could not occur, or
3. Survey effort has demonstrated they are not present.

Criteria 1 and 2 are addressed in the table below.

The Euston intersection within the Robinvale IBRA subregion predicted five candidate species (Table 4-11). There were no habitat components for any of these species and none were included for further surveys.

Table 4-10 Candidate species identified in BAM C and included/excluded from assessment

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Flora							
Austrostipa metatoris A spear-grass	Grows in sandy areas [2]	High	Vulnerable	Vulnerable	Sandy areas present	Included	Suitable habitat present on site
Austrostipa wakoolica A spear-grass	Alluvial plains and plains South of the Murrumbidgee River [1]	Moderate	Endangered	Endangered	Alluvial plains present	Included	Suitable habitat present on site
Brachyscome muelleroides Claypan Daisy	Floodplains on grey-brown or red-brown clays and claypans, Semi-permanent/ephemeral wet areas Wetland-grassland communities on grey-brown or red-brown clays and claypans East of the Cobb Highway	High	Vulnerable	Vulnerable	Subject Land not East of the Cobb Highway	Excluded	Geographic limitations

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
	and south of Griffith [1]						
Brachyscome papillosa Mossgiel Daisy	Clay soils and grasslands[2]	High	Vulnerable	Vulnerable	Grasslands and clay soils present	Included	Suitable habitat present on site
Caladenia arenaria Sand-hill Spider Orchid	East of Jerilderie[1]	Moderate	Endangered	Endangered	Not in geographic area. Subject Land not East of Jerilderie	Excluded	Geographic limitations
Calotis moorei A burr-daisy	Grows in sandy areas	High	Endangered	Endangered	Sandy areas present	Included	Suitable habitat present on site
Convolvulus tedmoorei Bindweed	Clay soils and flood plains	High	Endangered	Not Listed	Clay soils present	Included	Suitable habitat present on site
Eucalyptus leucoxylon subsp. pruinosa Yellow Gum	Sandy rises Loamy clay flats	High	Vulnerable	Not Listed	Loamy clay flats present	Included	Suitable habitat present on site

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Lepidium monoplocoides Winged Peppercress	Seasonally moist to waterlogged sites Heavy fertile soils [2]	High	Endangered	Endangered	Heavy soils and waterlogged areas present	Included	Suitable habitat present on site
Leptorhynchos orientalis Lanky Buttons	Woodlands and grasslands [2]	Moderate	Endangered	Not Listed	Grasslands present	Included	Suitable habitat present on site
Maireana cheelii Chariot Wheels	Heavy grey clay soils and claypans or shallow depressions West of Darlington Point, west of Jerilderie [1]	High	Vulnerable	Vulnerable	Heavy clay soils present	Included	Suitable habitat present on site
Pilularia novae-hollandiae Austral Pillwort	Shallow swamps and waterways, often in drying mud [2] East of Deniliquin [1]	High	Endangered	Not Listed	Shallow swamps present	Included	Suitable habitat present on site
Sclerolaena napiformis	Hay Plain [1]	High	Endangered	Endangered	Geographic area is suitable	Included	Suitable habitat

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Turnip Copperburr							present on site
Solanum karsense Menindee Nightshade	Semi-permanent/ephemeral wet areas West of Maude [1]	Moderate	Vulnerable	Vulnerable	Wetlands present	Included	Suitable habitat present on site
Swainsona murrayana Slender Darling Pea	Clay soils [2]	High	Vulnerable	Vulnerable	Clay soils present	Included	Suitable habitat present on site
Swainsona plagiotropis Red Darling Pea	Hay Plain [1]	High	Vulnerable	Vulnerable	Geographic area suitable	Included	Suitable habitat present on site
Swainsona sericea Silky Swainson-pea	Sandy loamy soil [2]	High	Vulnerable	Not Listed	Suitable soils	Included	Suitable habitat present on site
Fauna							
Aprasia parapulchella	Rocky areas Or within 50m of rocky	High	Vulnerable	Vulnerable	No rocky areas	Excluded	No suitable habitat on site

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Pink-tailed Legless Lizard	areas [1]						
Ardeotis australis Australian Bustard	Grasslands Shrublands	High	Endangered	Not Listed	Grasslands and shrublands present	Included	Suitable habitat present on site
Burhinus grallarius Bush Stone-curlew	Fallen/standing dead timber including logs [1]	High	Endangered	Not Listed	Standing and fallen timber present	Included	Suitable habitat present on site
Climacteris affinis - endangered population White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	Woodlands within Carrathool LGA[2]	High	Endangered Population	Not Listed	Subject Land not within Carrathool LGA.	Excluded	Species is vagrant. Subject Land is located outside of the Carrathool LGA.

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Haliaeetus leucogaster White-bellied Sea-Eagle	Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines [1]	High	Vulnerable	Not Listed	Trees within 1 km of wetlands present	Included	Suitable habitat present on site
Hemiaspis damelii Grey Snake	Floodplains and ephemeral wetlands associated with heavy clay soils	Moderate	Endangered	Endangered	Suitable habitat in the form of floodplains and ephemeral wetlands on clay soils present within the Subject Land.	Included	Species habitat present on site.
Hamirostra melanosternon Black-breasted Buzzard	Waterbodies Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts [1]	Moderate	Vulnerable	Not Listed	Waterbodies present	Included	Suitable habitat present on site
Hieraaetus morphnoides	Nest trees - live (occasionally dead) large old trees within	Moderate	Vulnerable	Not Listed	Suitable nest trees present	Included	Suitable habitat

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Little Eagle	vegetation) [1]						present on site
Lathamus discolor Swift Parrot	Within Mapped Important Areas[2]	Moderate	Endangered	Critically Endangered	Subject Land not within mapped important areas	Excluded	Not within mapped important areas.
Litoria raniformis Southern Bell Frog	Permanent or ephemeral swamps, flood plains, river valleys [2]	Moderate	Endangered	Vulnerable	Swamps and farm dams present	Included	Suitable habitat present on site
Lophochroa leadbeateri Pink Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows greater than 10cm diameter [1]	High	Vulnerable	Not Listed	Hollow bearing trees present	Included	Suitable habitat present on site
Lophoictinia isura Square-tailed Kite (Breeding)	Nest trees [1]	High	Vulnerable	Not Listed	Suitable nest trees	Included	Suitable habitat present on site
Myotis Macropus Southern Myotis	Waterbodies with permanent pools/stretches 3m of	High	Vulnerable	Not Listed	Farm dams occur within the Subject Land, and within 200m of the	Included	Suitable habitat

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
	wider including rivers, large creeks, billabongs, lagoons, estuaries, dams or waterbodies on or within 200m of the site				Subject Land.		present on site
Ninox connivens Barking Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground [1]	High	Vulnerable	Not Listed	Hollow bearing trees present	Included	Suitable habitat present on site
Pedionomus torquatus Plains-wanderer (Breeding)	As per Important Habitat Map [1]	High	Endangered	Critically Endangered	Site not within important habitat mapping. Grasslands present	Included	Not mapped on Important Habitat Map, however incidentally detected on site and further investigation required. (see Table 4-12)

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Phascolarctos cinereus Koala	Presence of koala use trees	High	Endangered	Endangered	Koala use trees (Black Box) present, however very isolated and lacking connectivity.	Excluded	Habitat degraded. (Refer to Table 4-24 Koala Survey Methodology).
Polytelis anthopeplus monarchoides Regent Parrot (eastern subspecies)	Hollow bearing trees Living or dead E. camaldulensis with hollows greater than 5 cm diameter, greater than 5 m above the ground OR trees with DBH of greater than 40 cm, within 1 km of watercourses or billabongs. Trees can be isolated but within 20 km of mallee Within 10 km of the junction of the Murray River [1]	High	Endangered	Vulnerable	Subject Land Not within 10 km of the junction of the Murray River	Excluded	Not within geographic range

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Polytelis swainsonii Superb Parrot (Breeding)	Hollow bearing trees 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 [1]	High	Vulnerable	Vulnerable	Hollow bearing trees present	Included	Suitable habitat present on site
Tyto novaehollandiae Masked Owl	Hollow bearing trees Living or dead trees with hollows greater than 20 cm [1]	High	Vulnerable	Not Listed	Hollow bearing trees present	Included	Suitable habitat present

1. From BAM C data.
2. From BioNet TBDC data (NSW DCCEEW, 2024)

Table 4-11 Candidate species identified in BAM C at Euston Intersection and included/excluded from assessment

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Fauna							
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines [1]	High	Vulnerable	Not Listed	No living or dead mature trees within the Euston intersection	Excluded	No breeding habitat present
Hamirostra melanosternon Black-breasted Buzzard (Breeding)	Waterbodies Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts [1]	Moderate	Vulnerable	Not Listed	No waterbodies present within 40m of Euston intesection No living or dead mature trees within the Euston intersection	Excluded	No breeding habitat present
Hieraaetus morphnoides Little Eagle (Breeding)	Nest trees - live (occasionally dead) large old trees within vegetation) [1]	Moderate	Vulnerable	Not Listed	No living or dead mature trees within the Euston intersection	Excluded	No breeding habitat present

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance in Subject Land	Included or Excluded	Reason for Inclusion or exclusion
Lophochroa leadbeateri Pink Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows greater than 10cm diameter [1]	High	Vulnerable	Not Listed	No living or dead mature trees within the Euston intersection	Excluded	No breeding habitat present
Lophoictinia isura Square-tailed Kite (Breeding)	Nest trees [1]	High	Vulnerable	Not Listed	No living or dead mature trees within the Euston intersection	Excluded	No breeding habitat present

4.5.1 Additional species credit species

Table 4-12 below includes additional species credit species added to the targeted survey plan. These species were added because of evidence suggesting they have potential to use the Subject Land, either through the EPBC Act PMST (see Section 4.1.1), BioNet search (see Section 4.1.2) or were incidentally identified.

Table 4-12 Additional species credit species added to the targeted survey plan

Species Credit Species	Key habitat requirements, geographic restrictions, important habitat mapping	Biodiversity Risk Weighting/Sensitivity to gain class	NSW listing status	National listing status	Criterion 1: Notes on key habitat and geographic limits. Important habitat mapping relevant to Subject Land	Criterion 2: Suitable habitat quality and abundance	Reason for inclusion
Austrostipa metatoris A spear-grass	Grows on sandy areas of the Murray Valley.	High	Vulnerable	Vulnerable	N/A	Suitable habitat in the form of sandy areas present within the Subject Land.	Species identified through EPBC Act PMST search. Has the potential to occur in sandy areas.
Eleocharis obicis Spike-Rush	Semi-permanent/ephemeral wet areas: Periodically waterlogged sites (Including table drains and farm dams)	High	Vulnerable	Vulnerable	N/A	Suitable habitat in the form of gilgai's and ephemeral wet areas.	Species identified incidentally on site. Adjacent BioNet records within 10km.
Hamirostra melanosternon	Land within 40 m of riparian woodland on	Moderate	Vulnerable	Not listed	N/A	Suitable habitat in the form of inland watercourses/	Detected during BBUS surveys.

Species Credit Species	Key habitat requirements, geographic restrictions, important habitat mapping	Biodiversity Risk Weighting/Sensitivity to gain class	NSW listing status	National listing status	Criterion 1: Notes on key habitat and geographic limits. Important habitat mapping relevant to Subject Land	Criterion 2: Suitable habitat quality and abundance	Reason for inclusion
Black-breasted Buzzard	inland watercourses/ waterholes containing dead or dying eucalypts					waterholes containing dead or dying eucalypts present within the Subject Land.	
Pedionomus torquatus Plains-wanderer	Within Mapped Important Areas[2]	High sensitivity to gain	Endangered	Critically endangered	Subject Land is not mapped on Important Habitat Mapping.	Suitable habitat in the form of semi-arid, lowland native grassland on hard red-brown soils present within Subject Land.	Incidentally detected numerous times and further investigation required.

4.6 Targeted surveys

4.6.1 Candidate species requiring surveys (confirmation of presence of absence)

As they could not be excluded on the basis of criterion 1 or 2, the following species in Table 4-13 require survey in accordance with the BAM and other relevant guidelines or must be assumed to occur and generate credits. Table 4-13 summarises whether each species was detected during surveys and if so the area of habitat that would be impacted by the Project and therefore required to be offset. Details regarding the targeted surveys undertaken are provided in Section 4.6.3.

The Balranald intersection, being comprised of an urban 'nature' strip did not contain any native vegetation or potential threatened species habitat, and no targeted surveys were undertaken at this location. Similarly, there were no candidate threatened species associated with the Euston intersection and targeted surveys were not undertaken at this location. No species polygons have been created within these intersection upgrade areas.

Table 4-13 Summary of species credit species surveyed within the Subject Land

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
Flora							
Austrostipa metatoris A spear-grass	2.0	October, November	Y 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023	Surveyed – not present	No	N/A	N/A
Austrostipa wakoolica A spear-grass	2.0	October - December	Y 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023	Surveyed – not present	No	N/A	N/A
Brachyscome papillosa Mossgiel Daisy	2.0	September - November	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 08/10/2023 –	Present	Yes	Species polygon: Vegetation Zones 1, 2, 3, 4, 7, 8, 11, 12, 13, 14, 15, 16, 17, 19, 20 Unit of measure:	Within Stage 1 Development Footprint: 91.79 ha Within Stage 2 Development Footprint: 203.62 ha

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
			14/10/2023 16/10/2023 – 20/10/2023			Area	
Calotis moorei A burr-daisy	3.0	September – November	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023	Surveyed – not present	No	N/A	N/A
Convolvulus tedmoorei Bindweed	3.0	June - September	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 10/09/2024 – 17/09/2024	Surveyed – not present. Assumed present in site access entrance along Sturt Highway where no surveys were undertaken.	Assumed present	Species polygon: Vegetation Zones 19 Unit of measure: Area	Within Stage 1 Development Footprint: 0.17 ha Within Stage 2 Development Footprint: 0 ha

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
Eucalyptus leucoxylon subsp. pruinosa Yellow Gum	2.0	All year	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023	Surveyed – not present	No	N/A	N/A
Eleocharis obicis Spike Rush	2.0	October – November	N 26/11/2024 10-11/12/2024 (present)	Present from incidental sightings. Assumed Present throughout site as conditions not suitable for survey.	Yes	Species polygon: Vegetation Zones 1, 2, 3, 4, 5, 6, 15, 16, 17, 18 Unit of measure: Area	Within Stage 1 Development Footprint: 14.65 ha Within Stage 2 Development Footprint: 39.08 ha
Lepidium monoplocoides Winged Peppercress	2.0	September - December	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023	Surveyed – Not present	No	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
			08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023 10/09/2024 – 17/09/2024				
Leptorhynchos orientalis Lanky Buttons	2.0	September - November	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023 10/09/2024 – 17/09/2024	Surveyed – Not Present	No	N/A	N/A
Maireana cheelii Chariot Wheels	2.0	September - December	Y 10/09/2023 – 16/09/2023 18/09/2023 –	Present	Yes	Vegetation Zones 6, 7, 11, 12, 14, 17, 18, 19 Unit of measure:	Within Stage 1 Development Footprint: 27.22 ha Within Stage 2

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
			21/09/2023 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023			Area	Development Footprint: 35.44 ha
Pilularia novae-hollandiae Austral Pillwort	3.0	October - December	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023 10/12/2024-11/12/2024	Surveyed – Not present	No	N/A	N/A
Sclerolaena napiformis Turnip Copperburr	2.0	September - December	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023	Surveyed – Not present	No	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
			08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023 10/09/2024 – 17/09/2024				
Solanum karsense Menindee Nightshade	1.5	September - November	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023 10/09/2024 – 17/09/2024	Surveyed – not present	No	N/A	N/A
Swainsona murrayana Slender Darling Pea	2.0	September	Y 10/09/2023 – 16/09/2023 18/09/2023 –	Present	Yes	Species polygon: Vegetation Zones 19 Unit of measure:	Within Stage 1 Development Footprint: 0.17 ha Within Stage 2

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
			21/09/2023 10/09/2024 – 17/09/2024			Area	Development Footprint: 0.21 ha
Swainsona plagiotropis Red Darling Pea	2.0	September	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 10/09/2024 – 17/09/2024	Surveyed – Not Present	No	N/A	N/A
Swainsona sericea Silky Swainson-pea	2.0	September - November	Y 10/09/2023 – 16/09/2023 18/09/2023 – 21/09/2023 08/10/2023 – 14/10/2023 16/10/2023 – 20/10/2023	Surveyed – not present	No	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
Fauna							
Ardeotis australis Australian Bustard	2.0	All year		Surveyed – not present	No	N/A	N/A
Burhinus grallarius Bush Stone-curlew	2.0	All year	Y 08/08/2023 – 11/08/2023 05/11/2023 – 09/11/2023	Surveyed – not present	No	N/A	N/A
Haliaeetus leucogaster White-bellied Sea-Eagle	2.0	July - December	Y 07/11/2023 – 15/11/2023	Surveyed – not present	No	N/A	N/A
Hamirostra melanosternon Black-breasted Buzzard	1.5	September - November	Y 07/11/2023 – 15/11/2023	Surveyed – no breeding habitat detected	No	N/A	N/A
Hemiaspis damelii Grey Snake	2.0	October – February	Y 17/10/2023 – 20/10/2023 07/11/2023 –	Surveyed – not present	No	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
			10/11/2023				
Hieraaetus morphnoides Little Eagle	1.5	August - October	N 07/11/2023 – 15/11/2023	Present	Yes	Vegetation Zones 10, 19 Unit of measure: Area	Within Stage 1 Development Footprint: 0 ha Within Stage 2 Development Footprint: 0.74 ha
Litoria raniformis Southern Bell Frog	2.0	January, October - December	Y 17/10/2023 – 20/10/2023,	Present	Yes	Vegetation Zones 1, 5, 7, 11, 12, 14, 15, 19, 20 Unit of measure: Area	Within Stage 1 Development Footprint: 5.99 ha Within Stage 2 Development Footprint: 31.06 ha
Lophochroa leadbeateri Pink Cockatoo	2.0	September - December	Y 07/11/2023 – 15/11/2023	Surveyed – not present utilising potential breeding habitat in Subject Land. BUS surveys identified two Pink Cockatoo nests in	Yes	N/A No species polygons occurring within Subject Land. Included as ecosystem credit species.	N/A

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
				Project Area, over 500m from Subject Land.			
Lophoictinia isura Square-tailed Kite	1.5	January, September - December	Y 07/11/2023 – 15/11/2023	Surveyed – not present	No	N/A	N/A
Myotis Macropus Southern Myotis	2.0	October – March	Y 14/01/2025 – 02/02/2025	Present	Yes	Vegetation Zones 28, 46, 160, 164 Unit of measure: Area	Within Stage 1 Development Footprint: 5.37 ha Within Stage 2 Development Footprint: 27.74 ha
Ninox connivens Barking Owl	2.0	May - December	Y 08/08/2023 – 11/08/2023	Surveyed – not present	No	N/A	N/A
Pedionomus torquatus Plains-wanderer	3.0	No period listed	N/A 08/08/2023 – 11/08/2023 16/10/2023 – 19/10/2023	Present	Yes	N/A Site not mapped within important habitat mapping, thus no species	N/A

Species Credit Species	Biodiversity risk weighting	Survey period	Surveyed within recommended survey window? Y/N	Present (or assumed present)	Present?	Vegetation zone and species polygon	Calculation of species polygon
			05/11/2023 – 09/11/2023			credits generated. Included as ecosystem credit species.	
Phascolarctos cinereus Koala	2.0	All year	Y 08/08/2023 – 11/08/2023	Surveyed – not present	No	N/A	N/A
Polytelis swainsonii Superb Parrot (Breeding)	2.0	September - November	Y 07/11/2023 – 15/11/2023	Surveyed – not present	No	N/A	N/A
Tyto novaehollandiae Masked Owl	2.0	May - August	Y 08/08/2023 – 11/08/2023	Surveyed – not present	No	N/A	N/A

4.6.2 Survey weather conditions and limitations

Weather conditions recorded for these dates form the Bureau of Meteorology (BOM) at Swan Hill (Swan Hill Aerodrome) station (ID 077094) are presented in Table 4-14.

Table 4-14 Weather summary

Survey Date	Max. temp (°C)	Min. temp (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Surveys undertaken
8/08/23	17.4	0.7	100	0, 6.8	15	Nocturnal birds, Arboreal mammals
9/08/23	19.7	0.5	87	0.2, 6.8	46	Nocturnal birds, Arboreal mammals
10/08/23	15.7	7.6	100	2.6, 6.8	50	Nocturnal birds, Arboreal mammals
11/08/23	15.7	9.0	84	0, 9.4	26	Nocturnal birds, Arboreal mammals
04/09/2023	22.0	7.0	42	0, 6.0	44	Threatened flora
05/09/2023	16.9	1.3	84	0.8, 5.4	46	Threatened flora
06/09/2023	22.6	1.6	33	0, 1.4	43	Threatened flora
07/09/2023	18.8	7.6	61	0, 1.2	61	Threatened flora
08/09/2023	14.7	6.8	77	4.2, 1.2	67	Threatened flora
09/09/2023	15.0	0.6	80	0, 5.4	31	Threatened flora
10/09/2023	17.6	17.6	95	0, 5.4	33	Threatened flora
11/09/2023	19.9	2.9	81	0, 5.4	28	Threatened flora
12/09/2023	23.2	3.5	81	0, 5.4	28	Threatened flora

Survey Date	Max. temp (°C)	Min. temp (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Surveys undertaken
13/09/2023	25.8	4.4	66	0, 5.4	30	Threatened flora
14/09/2023	27.4	4.7	66	0, 5.2	28	Threatened flora
15/09/2023	24.5	7.8	69	0, 5.0	48	Threatened flora
16/09/2023	26.3	4.9	66	0, 5.0	31	Threatened flora
17/09/2023	28.5	5.5	64	0, 5.0	28	Threatened flora
18/09/2023	38	19	20	0. 10	45	Threatened flora
19/09/2023	36	21	25	0,10	60	Threatened flora
20/09/2023	23	11	65	0, 10	55	Threatened flora
21/09/2023	18	10	65	0.1, 10	10	Threatened flora
9/10/2023	24.4	7.3	80	0, 33	24	Threatened flora, BAM plots
10/10/2023	23.6	5.7	74	0, 33	31	Threatened flora, BAM plots
11/10/2023	29.3	5.1	66	0, 33	39	Threatened flora, BAM plots
12/10/2023	18.6	14	67	0, 33	70	Threatened flora, BAM plots
13/10/2023	19.4	4.3	76	1, 33	44	Threatened flora, BAM plots
14/10/2023	22.7	10.3	67	0, 34	56	Threatened flora, BAM plots

Survey Date	Max. temp (°C)	Min. temp (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Surveys undertaken
16/10/2023	19.4	9.9	69	0, 34	57	Threatened flora, BAM plots, Plains-wanderer
17/10/2023	21.3	4.9	62	0.2, 33.4	33	Threatened flora, BAM plots, Amphibians, Reptiles, Plains-wanderer
18/10/2023	25.7	5.1	64	0, 1.2	30	Threatened flora, BAM plots, Amphibians, Reptiles, Plains-wanderer
19/10/2023	29.3	7.9	57	0, 1.2	20	Threatened flora, BAM plots, Amphibians, Reptiles, Plains-wanderer
20/10/2023	32.9	9.9	57	0, 1.2	28	Threatened flora, BAM plots, Amphibians, Reptiles
5/11/2023	32.4	11.3	54	0, 0	50	Nocturnal birds
6/11/2023	34.5	16.4	53	0, 0	41	Nocturnal birds
7/11/2023	34.8	17.4	35	0, 0	48	Reptiles, Nocturnal birds, Diurnal birds, Raptors
8/11/2023	33.5	12.6	45	0, 0	67	Reptiles, Nocturnal birds, Diurnal birds, Raptors
9/11/2023	32.1	12.9	49	0.4, 0	33	Reptiles, Nocturnal

Survey Date	Max. temp (°C)	Min. temp (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Surveys undertaken
						birds, Raptors
10/11/2023	37.2	10.7	46	0, 0.4	37	Reptiles, Diurnal birds, Raptors
11/11/2023	31.1	21.1	25	0, 0.4	50	Diurnal birds, Raptors
12/11/2023	26.6	7.6	57	0, 0.4	48	Diurnal birds, Raptors
13/11/2023	27.2	7.0	55	0, 0.4	35	Diurnal birds, Raptors
14/11/2023	23.2	13.0	79	0, 0.4	37	Diurnal birds, Raptors
15/11/2023	27.2	9.7	65	0.2, 0.4	39	Diurnal birds, Raptors
20/11/2023	33.3	15.8	20	0 & 0.6	37	BAM plots
21/11/2023	33.8	17.3	23	0, 0.6 Whilst no rain was recorded in Swan Hill, there was a large thunderstorm in the afternoon and evening, and the tracks were flooded/boggy the following morning	44	BAM plots

Survey Date	Max. temp (°C)	Min. temp (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Surveys undertaken
22/11/2023	30.7	13.6	31	0, 0.6	37	BAM plots
23/11/2023	31.3	13.9	35	0, 0.6	39	BAM plots
15/12/2023	27.8	13.0	23	0, 1.2	44	BAM plots
16/12/2023	26.4	10.9	32	0, 1.2	48	BAM plots
17/12/2023	30.2	10.4	25	0, 1.2	28	BAM plots
18/12/2023	36.4	16.2	18	0, 1.2	54	BAM plots
19/12/2023	26.7	18.2	39	0, 1.2	54	BAM plots
22/01/2024	29.1	12.5	60	0, 12.4	37	BAM plots
23/01/2024	34.5	11.2	64	0, 12.4	24	BAM plots
24/01/2024	36.4	18.4	45	0, 12.4	44	BAM plots
25/01/2024	31.0	23.1	48	0, 12.4	39	BAM plots
26/01/2024	26.4	15.0	78	3.8, 12.4	50	BAM plots
27/01/2024	27.4	11.8	59	0, 16.2	46	BAM plots
10/09/2024	22.7	1.4	79	0, 1.6	24	Threatened Flora
11/09/2024	24.2	6.3	60	0, 1.6	48	Threatened Flora
12/09/2024	19.0	5.9	62	5.0, 1.6	43	Threatened Flora
13/09/2024	20.5	3.2	72	0, 6.6,	31	Threatened Flora
14/09/2024	17.0	3.3	81	0, 6.6	50	Threatened Flora

Survey Date	Max. temp (°C)	Min. temp (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Surveys undertaken
15/09/2024	16.8	0.8	58	0, 6.6	41	Threatened Flora
16/09/2024	18.0	-1.5	63	0, 6.6	35	Threatened Flora
17/09/2024	20.1	0.0	76	0, 6.4	35	Threatened Flora
26/11/2024	30.5	14.6	49	0	N/A	BAM plots, threatened flora
27/11/2024	30.5	14.6	49	0, 6.6	N/A	BAM plots, threatened flora
12/01/2025	40.1	17.9	N/A	0	N/A	BAM plots
13/01/2025	39.0	20.5	43	0	N/A	BAM plots
14/01/2025	41.9	23.5	54	0	N/A	BAM plots
15/01/2025	34.7	23.7	57	0	N/A	BAM plots
16/01/2025	34.7	17.9	N/A	0	N/A	BAM plots
17/01/2025	32.2	17.9	N/A	0	N/A	BAM plots

4.6.3 Candidate species survey effort and results

Detailed description of each of the candidate species survey effort and result is shown in Table 4-15 to Table 4-24.

Flora

Table 4-15 September Flora Survey Methodology

September Flora Survey
Species Targeted
Brachyscome papillosa (Mossgiel Daisy), *Calotis moorei* (A Burr-daisy), *Convolvulus tedmoorei* (Bindweed), *Lepidium monoplocoides* (Winged Peppercress), *Maireana cheelii* (Chariot Wheels), *Solanum karsense* (Menindee Nightshade), *Swainsona murrayana* (Slender Darling Pea) and *Swainsona plagiotropis* (Red Darling Pea).
Guidelines used
Consultation occurred with BCD prior to surveying (Appendix G) to determine the most effective way to survey a large linear site. *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020) was used as a guideline to determine the most effective survey methodology across the Subject Land. As potential areas of habitat were greater than 50 ha for these species, the two phase grid based survey approach (100 m X 100 m grids) could be used. However, over a linear Subject Land, with widths of 25 – 50 m, the 100 m X 100 m grid did not adequately cover the survey area. Instead a combination approach was used, combining two parallel field transects in linear corridor areas and grid point surveys in areas wider than 70 m. Southwest BCD team provided in-principle support for this methodology in August 2023 (Appendix G). Consultation with BCD also recommended that the number of survey species be split up into two survey periods (September and October) to minimise the number of flora species surveyed for in one survey period. Additional consideration was given to Flora Species with Specific Survey Requirement documented in the TBDC.

Species	Common Name	Specific Survey Requirements.	Field comments:
Calotis moorei	A burr-daisy	Short-lived perennial. Use flowering/fruiting material to locate. Flowering occurs in the first year of growth.	No flowering *Calotis* detected during surveys.
Convolvulus tedmoorei	Bindweed	Use fruit to identify. Survey Jun - Sep, 1 month after good rain.	Surveys undertaken in September. The total rainfall in Balranald (~66 km north-west of Moulamein) in August 2023 was 29.0 mm (BOM, 2024). The median total August rainfall between 1879-2023 was 26.2 mm,

September Flora Survey			
			and the mean 29.4 mm. Therefore, the area received an average amount of rainfall in August 2023. Additional surveys were undertaken in September 2024. The total rainfall in Moulamein (Techlery) in August 2024 was 23.0 mm (BOM, 2025) just below average rain. During targeted surveys, ground conditions were generally moist soils with high foliage cover and diversity of ground cover species indicating good seasons for germination of forb species.
Lepidium monoplocoides	Winged Peppercress	Use seed-heads to identify. Survey about 1 month after significant rain.	Surveys undertaken in September. The total rainfall in Balranald (~66 km north-west of Moulamein) in August 2023 was 29.0 mm (BOM, 2024). The median total August rainfall between 1879-2023 was 26.2 mm, and the mean 29.4 mm. Therefore, the area received an average amount of rainfall in August 2023. Additional surveys were undertaken in September 2024. The total rainfall in Moulamein (Techlery) in August 2024 was 23.0 mm (BOM, 2025) During targeted surveys, ground conditions were generally moist soils with high foliage cover and diversity of ground cover species indicating good seasons for germination of forb species.
Solanum karsense	Menindee Nightshade	Survey after flood recession if possible as flowering is driven by flood disturbance. Species does not flower every year.	Site was flooded and unreachable November 2022 – January 2023 due to periods of heavy rain. October 2022 received the highest total rainfall on record (184.6 mm). November 2022 received nearly three times more (87.4 mm) than the mean (29.2 mm). January and June 2023 also received above average rainfall (34.4 mm and 39.2 mm) (BOM, 2024).

Survey planning
The targeted flora surveys were applied to land within the Development Footprint. A grid spaced at 100

September Flora Survey
square metres (m^2) nested within a one-square-kilometre grid from a topographic map image was overlayed onto the Subject Land using a geographic information system (GIS). Surveys were proposed where the 100-square-metre gridlines intersected with suitable habitat for the targeted flora species in Subject Land greater than 70m wide. The grid points that were situated within the Development Footprint were then adjusted to target turbine locations and ensure coverage across the vegetation zones For linear corridors of less than 70m width, two parallel walking transects 10m apart were overlayed onto the Subject Land using GIS. Suitable habitat was considered to include all native vegetation zones. A total of 1,055 grid points were proposed to be surveyed within the Subject Land and the total length of proposed walking transects was 327.25 km.
Survey personnel
Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the threatened flora searches. Survey personnel are detailed in Appendix F.
Survey method and effort
The 328 grid points were targeted for threatened flora surveys, totalling 327.25 km of transects to be completed in September. Of these, 298.1 km of transects were surveyed during the September survey effort. At each survey location point, a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species by conducting parallel field traverses across the area with transects four metres apart (open vegetation) for all threatened flora species with the exception of eucalyptus species. All trees within the 40-metre diameter area were inspected and identified to determine if they were the target species. Surveys for threatened eucalypts were only conducted in woodland vegetation zones. Any threatened flora detected were recorded using a tablet or GPS generating an easting and a northing. A photo of the threatened species and other descriptive notes were also recorded with each sighting.
Comment on survey effectiveness
Despite nine field teams and 298.1 km of transects surveyed, not all of the Subject Land was able to be covered in the month of September 2023. Areas that were not surveyed during the month of survey, were continued to be surveyed for these species in October and November 2023. *B. papillosa, C. moorei, L. monoplocoides, S. karsense* and *M. cheelii* have survey periods that cover September to November. The Subject Land and Development Footprint had subsequently changed since targeted surveys were undertaken to avoid impacts on heritage constraints and there are some areas that were not suitably surveyed for targeted flora in September 2023. Areas that were not able to be surveyed in September 2023 were surveyed in September 2024 using the same methodology. Around 136 km of transects were walked in September 2024 covering an area of 225.54 ha comprised of PCT 13, 15, 46, 153, 157, 159, 160, 163 and 164.

September Flora Survey
Survey methodology included the two-point grid system and sampling walking transects, however rather than an additional fine scale grid survey, where a species was detected in a grid point or walking transect, the whole width of the corridor was assumed to be suitable habitat for these species. This was considered appropriate due to the wide range of *B. papillosa* and *M. cheelii*¸ the linear shape of the Development Footprint and time constraints for September.
Survey results
The September 2023 targeted flora surveys detected populations of two threatened species, *Brachyscome papillosa* and *Maireana cheelii* (Figure 4-1 and Figure 4-2). *B. papillosa* was found as extensive populations in the northern part of the Subject Land. The species was exhibiting variation from the normal form with white ray florets present instead of mauve. A sample was sent to the National Herbarium and confirmed to be *B. papillosa* (Appendix I). Populations of *B. papillosa* varied from scattered individuals to small patches of 10-50 individuals, however the range of *B. papillosa* was extensive across the Subject Land and observed to be present outside the Subject Land in similar densities. *M. cheelii* was found as scattered populations in the mid southern portion of the Subject Land. Populations of *M. cheelii* also varied from scattered individuals to small patches of 10 - 500 individuals. A sample was sent to the National Herbarium and confirmed to be *M. cheelii* (Appendix I). Several individuals of Lepidium species were found in the Subject Land and identified as non-threatened *Lepidium phlebopetalum* based on the shape of the silicula. However, one incidental sighting of *Lepidium monoplocoides* was recorded during PCT surveys. This location occurred outside the Subject Land. The September 2024 targeted flora surveys detected a small population of Slender Darling Pea (*Swainsona murrayana*). Seven individuals were found in a small patch in the Southeastern Corner of the Subject Land. No samples were taken due to the small population size of the patch. Photos are shown in Figure 4-3. *B. papillosa* and *M. cheelii* were found in small, scattered patches in the September 2024 survey areas, however in much less abundance than the September 2023 surveys.

September Flora Survey



Figure 4-1 *Brachyscome papillosa* detected during the September 2023 and September 2024 surveys



Figure 4-2 *Maireana cheelii* detected during the September 2023 and September 2024 surveys.

September Flora Survey



Figure 4-3 *Swainsona murrayana* detected during the September 2024 surveys

Species polygons

Species polygons were generated for the following species detected during the site surveys:

- *Maireana cheelii*
- *Brachyscome papillosa*
- *Swainsona murrayana*

Suitable habitat for these species was considered to be a 100 m buffer around detected sightings. The 100 m buffer was used to encompass the whole width of a linear corridor (ranging from 20 to 70m wide) and connect populations sighted at adjacent grid points. Additionally, if the 100m buffer occurred within 100m of another buffer these areas were joined together. Additionally for areas of *Maireana*, associated habitat also included claypan, and where sightings were detected within a claypan, the entire claypan was included as part of the species polygon.

Species polygons were generated for the following species that were unable to be surveyed during the correct time frame.

- *Convolvulus tedmoorei* (Assumed presence)

C. tedmoorei was unable to be surveyed at the site entrance intersection, added to the Development Footprint following the September 2024 surveys. This species was assumed present in areas of associated PCT 164 at the site entrance intersection off the Sturt Highway. Similarly, *M. cheelii*, *B. papillosa* and *S. murrayana* were also assumed present at the site entrance intersection in areas of PCT 164 as it is an associated PCT to these species.

Further justification for species polygon is provided in Section 4.6.4

September Flora Survey
Limitations
Due to the large size of the Subject Land, surveys have been undertaken using a combination of the grid based systematic survey (DPIE, 2020) and walking transects in consultation with BCS. This survey methodology provides uniform and consistent coverage of suitable habitat across the Subject Land however does not cover the entire area. As a result, some threatened species could be missed.

Table 4-16 October Flora Survey methodology (Flora survey 2)

October Flora survey (Flora survey 2)
Species Targeted
Austrostipa metatoris (A spear-grass), *Austrostipa wakoolica* (A spear-grass), *Eucalyptus leucoxylon subsp. pruinose* (Yellow Gum) , *Leptorhynchos orientalis* (Lanky Buttons), *Pilularia novae-hollandiae* (Austral Pillwort), *Sclerolaena napiformis* (Turnip Copperburr), *Swainsona sericea* (Silky Swainson-Pea).
Guidelines used
Consultation occurred with BCD prior to surveying (Appendix G) to determine the most effective way to survey a large linear site. *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020) was used as a guideline to determine the most effective survey methodology across the Subject Land. As potential areas of habitat were less than 50 ha for these species, parallel field transects in associated PCTS were considered the best survey methodology for these species. Southwest BCD team provided in-principle support for this methodology in August 2023 (Appendix G). Additional consideration was given to Flora Species with Specific Survey Requirement documented in the TBDC.

Species	Common Name	Specific Survey Requirements.	NGH comments:
Swainsona sericea	Silky Swainson-pea	Survey months differ based on location. Survey Oct - Nov on Monaro. Survey Sep - Oct in the Riverina.	Surveyed September to October in Riverina.
Austrostipa	A spear-grass	Use fertile material to identify. Flowers in response to above	Above average rainfall occurred in June 2023 (39.2 mm, mean = 29.4

October Flora survey (Flora survey 2)			
wakoolica		average rain in winter and spring. Optimal survey months are Oct - Dec.	mm) and October 2023 (63 mm, mean = 31.6 mm). The total rainfall in July and August 2023 was close to average (BOM, 2024). During targeted surveys, ground conditions were generally moist soils with high foliage cover indicating good rainfall prior to survey.
Pilularia novae-hollandiae	Austral Pillwort	Survey Oct - Dec in drying mud after inundation. Strongly recommend expert report to discount presence or absence if conditions do not meet requirements.	Site was flooded and unreachable November 2022 – January 2023 due to periods of heavy rain. October 2022 received the highest total rainfall on record (184.6 mm). November 2022 received nearly three times more (87.4 mm) than the mean (29.2 mm). January and June 2023 also received above average rainfall (34.4 mm and 39.2 mm) (BOM, 2024).

Survey planning

The targeted flora surveys were applied to land within the Development Footprint. 10 m parallel walking transects were mapped within areas of the Development Footprint that were mapped as PCT 15, 17, 28 and 46. These PCTs are associated with the threatened species targeted in the October flora surveys. Parallel transects 10 m wide were overlayed onto the Subject Land using a geographic information system (GIS). Surveys were proposed where the parallel transect lines intersected with suitable habitat for the targeted flora species.

Suitable habitat was considered to include all native vegetation zones. A total of 112.13 km of walking transects were planned within the Subject Land.

Survey personnel

Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the threatened flora searches. Survey personnel are detailed in Appendix F.

Survey method and effort

October Flora survey (Flora survey 2)
10 m parallel walking transects were undertaken within areas of suitable habitat for the October threatened species, which included areas within the Subject Land mapped as PCT 15, 17, 28 and 46. A total of 112.13 km of transects were walked during the October surveys. All transects were walked during the October survey period. Any threatened flora detected were recorded using a tablet or GPS generating an easting and a northing coordinate. A photo of the threatened species and other descriptive notes were also recorded with each sighting.
Comment on survey effectiveness
All 112.13 km of required transects were surveyed in the October 2023 Flora surveys. Within the surveyed area, the targeted surveys conducted to date are considered sufficient to rule out the presence of each species targeted within the Subject Land. However, the Subject Land was subsequently changed since surveys were undertaken and additional areas were added to the construction footprint to avoid impacts on heritage matters. These additional areas were not suitably surveyed for Lanky Buttons (*Leptorhynchos orientalis*), Turnip Copper Burr (*Sclerolaena napiformis*) or Austral Pillwort (*Pilularia novae-hollandiae*). The additional construction footprint did not contain suitable PCTs for *Austrostipa metatoris, Austrostipa wakoolica* and *Swainsona sericea* and surveys are considered sufficient. The additional areas were subsequently surveyed for Lanky Buttons and Turnip Copper Burr as part of the September 2024 Flora surveys, as described in Table 4-15. 29.63 ha of suitable habitat comprised of PCT 46 and 160 was surveyed using 10m parallel walking transects. Additional surveys for Austral Pillwort were undertaken as a separate survey in December 2024. Refer to Table 4-17
Survey results
None of the targeted flora surveys for October were detected within the field surveys. No threatened *Austrostipa* species were detected. The dominant species found was *Austrostipa nodosa*. Several plant specimens were collected during transects with none found to be *Austrostipa metatoris* or *Austrostipa wakoolica*. Several individuals of *Leptorhynchos* individuals were found and identified as non-threatened *Leiocarpa panaetioides* and *Leptorhynchos elongata*. Species were confirmed by observing the margins of involucre bracts and florets under a microscope as well as noting the leaf length. Additional populations of *M. cheelii* and *B. papillosa* were detected during the October Surveys and these areas were added to their respective species polygons.
Species polygons
None of the targeted flora surveys for October were detected within the field surveys, therefore no species polygons were generated for these species.

October Flora survey (Flora survey 2)
Limitations
NA

Table 4-17 Summer 2024/2025 Flora Survey

Summer 2024/2025 Flora survey
Species Targeted
Spike Rush (*Eleocharis obicis*), Austral Pillwort (*Pilularia novae-hollandiae*)
Guidelines used
Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (DPIE, 2020) was used as a guideline to determine the most effective survey methodology across the Subject Land. As potential areas of habitat were less than 50 ha for these species, parallel field transects in associated PCTs and microhabitats were considered the best survey methodology for these species. Additional consideration was given to Flora Species with Specific Survey Requirement documented in the TBDC.

Species	Common Name	Specific Survey Requirements.	NGH comments:
Eleocharis obicis	Spike Rush	Ephemeral, and requires good soaking rains to emerge, primarily in spring. Survey after soaking rains.	Rainfall had been limited in the month prior to surveys with limited rainfall, however one day of heavy rain (28mm) occurred in mid-October (BOM, 2025) Surveys were planned to be undertaken in known locations first and if the species was present, surveys would be undertaken.
Pilularia novae-hollandiae	Austral Pillwort	Survey Oct - Dec in drying mud after inundation. Strongly recommend expert report to discount presence or absence if conditions do not meet	Rainfall had been limited in the months prior to surveys, however one day of heavy rain (28mm) occurred in mid-October (BOM, 2025) and above average rainfall

Summer 2024/2025 Flora survey			
		requirements.	(77mm) occurred in the last week of November (BOM, 2025). Surveys were planned to be undertaken in known locations first and if the species was present, surveys would be undertaken.

Survey planning

E. obicis grows in ephemerally wet depressions and relies on rainfall to emerge. Rainfall had been limited in the month prior to survey. To determine if conditions were suitable to survey for *E. obicis,* known populations were planned to be surveyed first. If *E. obicis* was visible at these locations, then associated PCTs would be surveyed across the rest of the Subject Land. Five locations were planned to be surveyed first (Figure 4-4) where *E. obicis* or an unspecified Eleocharis had been detected. Two locations in the South East corner of the Project Area were from BAM plots that identified *E. obicis.* Another southern location was from a BAM plot with an *Eleocharis* sp. not identified to species level. The northern two locations were BioNet records not available on BioNet at the time of BDAR preparation.

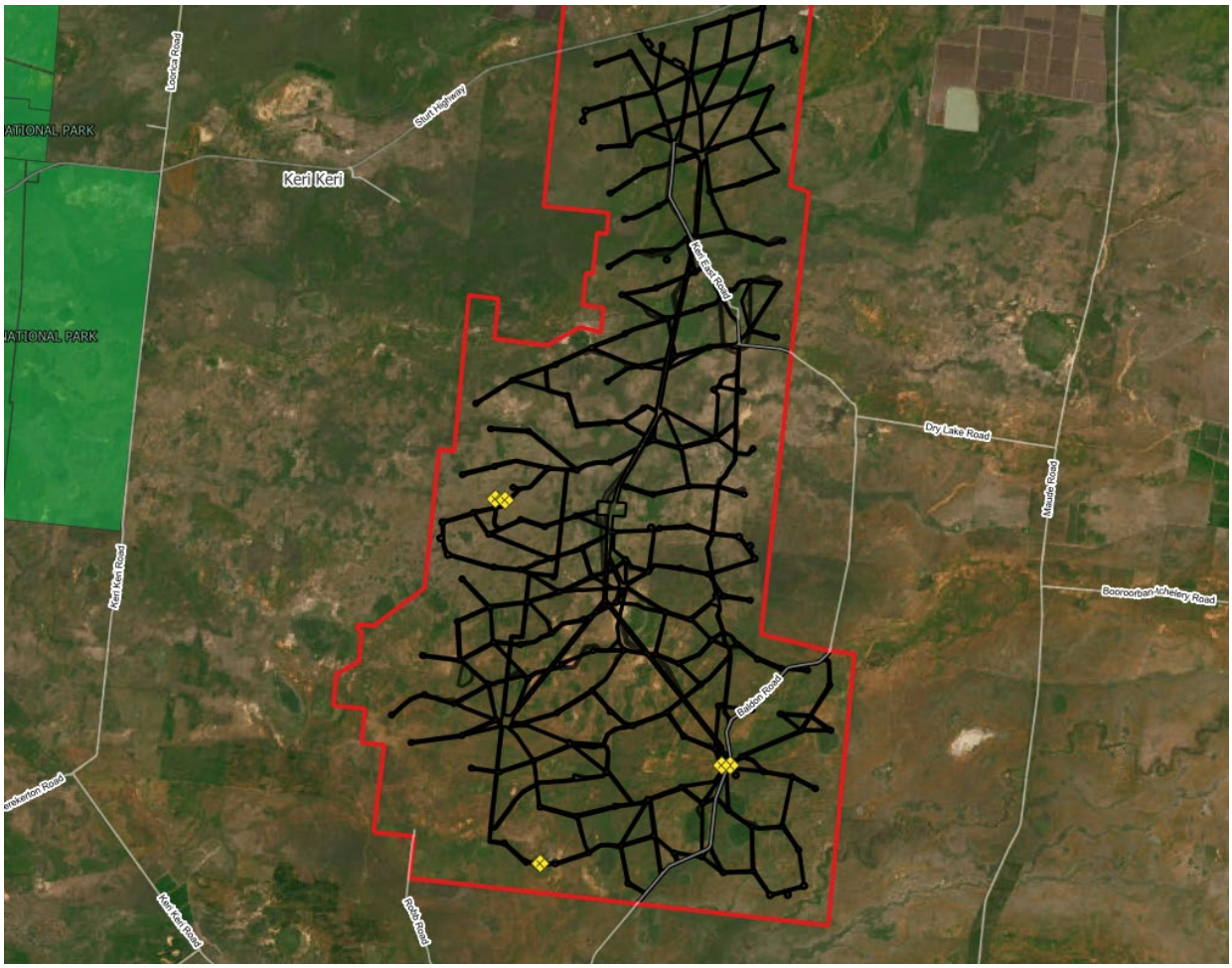


Figure 4-4 *Eleocharis* records in Project Area

Austral Pillwort also grows in shallows swamps and wetlands, visible in drying mud. Twelve populations have been recorded in the Project Area on BioNet from another project. These records were not available during the BDAR preparation. Reference populations were planned to be surveyed first to determine if seasonal conditions were suitable, and if so, surveys would be undertaken in the remaining areas not surveyed in October 2023 (The majority of Austral Pillwort habitat was surveyed in October 2023, refer to Table 4-16). If seasonal conditions were not suitable, a search for associated microhabits (wetlands and depressions) would be undertaken to determine if habitat for Austral Pillwort was present.

Summer 2024/2025 Flora survey

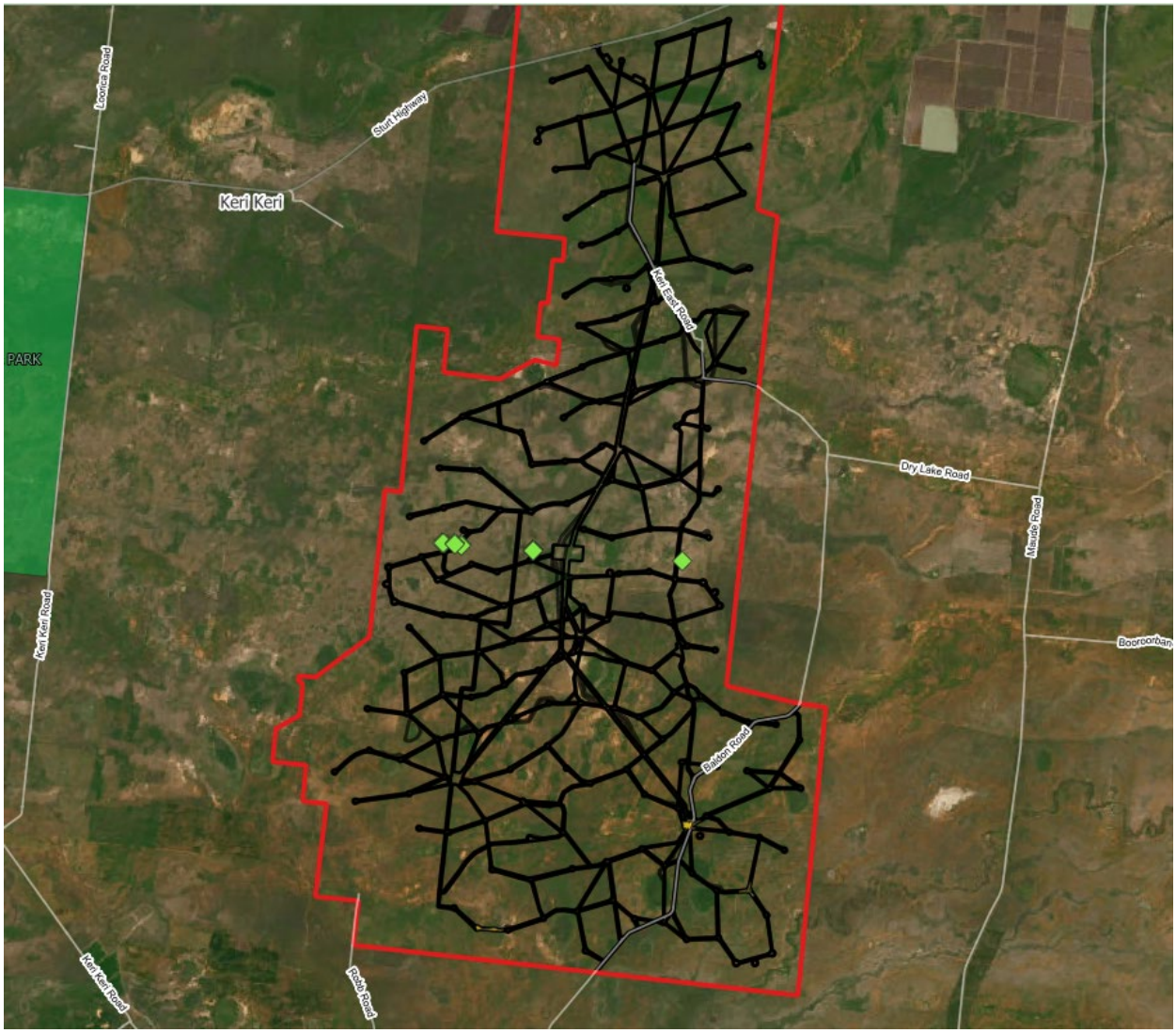


Figure 4-5 Austral Pillwort BioNet records in Project Area

Survey personnel

Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the threatened flora searches. Survey personnel are detailed in Appendix F.

Austral Pillwort surveys were undertaken by subconsultants; Ecology and Restoration Australia (ERA).

Survey method and effort

Surveys for *E. obicis* were undertaken on the 26th November 2024. 10 m parallel walking transects were undertaken within areas of suitable habitat in three southern localities of known *E. obicis* populations. A total of 23.6 km of transects were walked during the November surveys. Heavy rainfall over the next three days prevented any more targeted surveys being able to be undertaken in November.

Summer 2024/2025 Flora survey

Surveys for Austral Pillwort were undertaken on 10th – 11th December. Reference populations were surveyed to determine species presence and typical microhabitats. Parallel walking transects, 10m apart, were undertaken within areas not surveyed in October 2023. An area of 25.34 ha was surveyed in associated PCTs 45 and 15.

Survey results

No plants in the *Eleocharis* genus were found during the November 2024 surveys, including in known reference site locations indicating conditions were not suitable for surveys. No further surveys were undertaken, and the species was assumed present in areas of associated PCTs.

No Austral Pillwort was detected within the reference population locations or the Subject Land during the December 2024 surveys. Wetland habitat comprised of sedges was found at all Austral Pillwort reference population locations. Site conditions around reference populations varied from moderately large patches (3mx10m) with standing water to 2cm depth, to mostly dry areas with a small amount of moisture retained in clayey areas <1m^2. One species with similar habitat to Austral Pillwort was detected - Plain Quillwort (*Isoetes drummondii*), which also grows in shallow water or mud. Despite similarities in habitat preference and ecology of these species *Pillularia novae-hollandiae* may take longer than *Isoetes drummondii* to respond to sufficient rainfall events which stimulate its germination and growth. Thus, Austral Pillwort may have been present but undetectable during these surveys (ERA, 2024).

The remaining areas were surveyed for similar microhabitat to the reference population locations. Transects did not contain suitable microhabitat for Austral Pillwort with the areas consisting of mostly disturbed environments with no natural Gilgai formations.



Figure 4-6 Wetland habitat at an Austral Pillwort reference site

Four *E. obicis* populations were detected in the northern reference population during the December

Summer 2024/2025 Flora survey

surveys (Figure 4-6). As such, transects undertaken for Austral Pillwort in December, also surveyed for *E. obicis.* No further *E. obicis* or similar microhabitats were detected in the December 2024 survey area, and it has been ruled out of these areas.



Figure 4-7 *Eleocharis obicis* detected in Project Area (Outside Subject Land)

Full results from ERA are provided in Appendix A.5.

Species polygons

Presence was assumed for *E. obicis* within associated PCTs. A species polygon was generated in the zones of PCT 15, 17, 28, 160 and 163. PCT 159 is an associated PCT, however PCT 159 within the Subject Land is a planted community comprised of rows of Old Man Saltbush (*Atriplex nummularia*). This zone is not included as part of the species polygon, as a man-made community, it lacks the gilgais and wetlands that form part of *E. obicis* habitat. Additional information on the species polygon is provided in Section 4.6.4.

The Subject Land has been adequately surveyed for Austral Pillwort and not detected. The reference populations in the Project Area occur in distinct wetland habitat, not typical of the vegetation across the Subject Land. No species polygons have been created for Austral Pillwort.

Limitations

Conditions were likely too dry for *E. obicis*, and not detected where *E. obicis* had been recorded previously. The presence of Juncus indicated the areas surveyed are periodically wet. One paddock was heavily grazed and sheep were present in it at the time of surveys, so it is possible that the Eleocharis plants had been grazed.

Fauna

Southern Bell Frog

Table 4-18 Southern Bell Frog Survey Methodology

Amphibian species
Species targeted
Litoria raniformis, Southern Bell Frog
Guidelines used
The *NSW Guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE, NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method, 2020b) was used to establish the survey methodology across the Project Area. The survey objective was to determine, with a high level of confidence, the species present within the Subject Land and, if present, to map the extent of habitat as a species polygon.
Survey planning
Thirty-six (36) aquatic sites were selected for survey based on the most suitable breeding and non-breeding habitat within the Project Area for the species targeted for survey as listed above. Wetlands and dams were selected from initial field data, aerial imaging and their proximity (within or less than 200 m) from the Subject Land. Surveys included dams that were within 200 m of the Subject Land to investigate potential for indirect impacts for mobile species across the Project Area. Waterbodies with no standing water with significant growth of terrestrial vegetation were not included in further surveys as they were not considered as potential Southern Bell Frog habitat.
Survey personnel
Ecologists experienced in the identification of threatened frogs and trained in the survey methodology conducted the threatened amphibian surveys. Survey personnel are detailed in Appendix F.
Survey method
Audio-visual surveys are a combination of listening for the calls of frogs and searching for individuals along a transect. One survey night covered a minimum 120-minute period of listening for calling frogs and conducting a visual search along a 500 metre transect in breeding habitat along, around or through a suitable waterbody. Where there was insufficient habitat to accommodate a 500 metre transect a pro-rata effort was applied, with all available habitat being searched.

Amphibian species
Audio-visual surveys commenced with an Audiosurvey where the surveyor/s listened for calls (in silence and darkness), for a minimum of five minutes whilst remaining still. The Audiosurvey process was repeated every 50 metres of the transect (i.e. 11 points on a full 500 metre transect). The visual survey detected frogs via 'eyeshine' or sitting along the shoreline/upper banks of the waterbody. Suitable habitat was scanned along the transect, around and between Audiosurvey points, using a headlamp with a minimum of 200 lumens brightness. Focus was on the habitats in which individuals would be expected to be active. Surveyors walked slowly and quietly whilst undertaking the visual search to assist in noticing moving frogs (e.g., those fleeing disturbance). A minimum of five minutes was taken to cover each 50 metres of transect with a visual search, regardless of the number of surveyors involved. An audio-visual survey on a 500 metre transect involved a minimum time commitment of 11 blocks of five minutes listening and 10 blocks of five minutes of visual searching, totalling 105 minutes on the transect. Audio-visual surveys included a call-playback component where a loudspeaker was used to broadcast the advertisement calls of target threatened frogs to elicit either an advertisement or territorial response call. Call playbacks were completed at the same location as the audiosurvey and were undertaken after the audiosurvey for each point. The call was broadcast continuously through the speaker for a period of no less than two minutes and responses were typically heard within the first minute. The playback period was followed by a two-minute listening period to detect any late responses or responses masked by the sound of the broadcast call. Volume of the call playback was audible over a distance of at least 20 metres. Any frogs heard responding that were not calling initially were recorded and any frogs that calls were not immediately identifiable were also recorded.

Survey effort

Dam No.	Survey No.	Survey effort	Comment
1	1	Audio-visual survey, present	Recently dried out dam, no evidence of intrusion/growth by terrestrial plants. Cracked clay substrate. Large number of Southern Bell Frog (SBF) still in residence despite the lack of available water
2	2	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, significant overgrowth by terrestrial plants (salt bush, rye grass), no SBF calling or visual encounters. Not considered potential SBF habitat.
3	3	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, significant overgrowth by terrestrial plants (salt bush, rye grass), no SBF calling or visual encounters. Not considered potential SBF habitat.

Amphibian species			
4	4	Audio-visual survey, present	Dam with standing water. SBF heard calling and seen during visual survey.
5	5	Audio-visual survey, present	Dam with standing water. SBF heard calling and seen during visual survey.
6	6, 55	Audio-visual survey, excluded.	Dam with standing water. No emergent/floating vegetation. No SBF heard calling or seen during visual survey
7	7	Excluded.	Dry Wetland. No clear transect.
8	8	Excluded.	Dry Wetland. No clear transect.
9	9	Audio-visual survey, present	Dam with standing water. SBF responded to call-playback and seen during visual survey.
10	10	Audio-visual survey, present	Dam with standing water.. Fish present. SBF observed visually. No reply to call playback.
11	11	Audio-visual survey, present	Dam with standing water.. SBF heard calling and observed visually..
12	12,	Audio-visual survey, present	Dam with standing water. SBF observed visually..
13	13	Audio-visual survey, present	Dam with standing water. SBF heard calling and observed visually.
14	14	Audio-visual survey, excluded.	Dry dam, no evidence of recent water.
15	15	Audio-visual survey, present	Dam with standing water.. SBFseen during visual survey.
16	16	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, significant overgrowth by terrestrial plants (salt bush, rye grass), no SBF calling or visual encounters. Not

Amphibian species			
			considered potential SBF habitat.
17	17	Audio-visual survey, present	Dam with standing water. SBF heard calling and seen during visual survey in significant numbers.
18	18	Audio-visual survey, present	Dam with standing water. SBF heard calling and seen during visual survey in significant numbers.
19	19	Audio-visual survey, present	Dam with standing water. SBF heard calling and seen during visual survey in significant numbers.
20	20	Audio-visual survey, present	Small dam with standing water. SBF seen during visual surveys in significant numbers.
21	21	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, No SBF calling or visual encounters.
22	22	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, No SBF calling or visual encounters.
23	23	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, No SBF calling or visual encounters.
24	24	Audio-visual survey, present	Dam with standing water.. SBF heard calling, visual survey reported a significant number of SBF individuals
25	25,41	Audio-visual survey, present	Dam with standing water. SBF seen during visual survey in significant numbers.
26	26	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, significant overgrowth by terrestrial plants (salt bush, rye grass, small trees), no SBF calling or visual encounters. Not considered potential SBF habitat.
27	27	Audio-visual survey, excluded.	Dry dam, no evidence of recent water, significant overgrowth by terrestrial plants (salt bush, rye grass, small trees), no SBF calling or visual encounters. Not considered potential SBF habitat.

Amphibian species			
28	28	Audio-visual survey, present	Dam with standing water. SBF observed visually.
29	29	Audio-visual survey, present	Large dam with standing water, with large mats of floating aquatic vegetation. SBF heard calling and observed visually in large numbers within the water and along the banks.
30	32	Audio-visual survey, present	Dam with standing water. SBF observed visually in significant numbers.
31	33, 57	Audio-visual survey, present	Dam with standing water. SBF visually observed during second survey.
32	34	Excluded	Dry dam. Transect not attempted as no obvious water/shoreline available.
33	35	Excluded	Dry Wetland. No clear transect.
34	36	Excluded	Dry dam, no evidence of water.
35	37	Audio-visual survey, present	Dam with standing water. SBF heard calling, visual survey reported a significant number of SBF individuals
36	38	Audio-visual survey, present	Dam with standing water. SBF visually observed during survey.
37	39, 52, 65	Audio-visual survey, not present	Dam with standing water. No response to call playback.
38	40, 63	Audio-visual survey, present	Dam with standing water. SBF recorded in high numbers calling, visual observations..
39	45,	Audio-visual survey, present	Small dam with standing water. SBF observed visually.
40	47	Audio-visual survey, present	Dry dam.. Significant number of SBF recorded visually.

Amphibian species			
41	49,	Audio-visual survey, present	Dam with standing water. SBF calling, observed visually.
42	50	Excluded	Dry dam, no evidence of recent water, significant overgrowth by terrestrial plants (salt bush, rye grass, small trees), no SBF calling or visual encounters. Not considered potential SBF habitat.
43	51	Audio-visual survey, present	Dam with standing water. SBF calling, observed visually.
44	54	Audio-visual survey, present	Large dam with standing water, with large mats of floating aquatic vegetation. SBF heard calling and observed visually in large numbers within the water and along the banks.
45	58	Audio-visual survey, present	Large dam with standing water, with large mats of floating aquatic vegetation. SBF heard calling and observed visually in large numbers within the water and along the banks.
46	60	Audio-visual survey, present	Dam with standing water, with large mats of floating aquatic vegetation. SBF heard calling and observed visually in large numbers within the water and along the banks.
47	69	Audio-visual survey, present	Dam with standing water. SBF calling, observed visually.
Total		**Southern Bell Frog present in 30 available dams**	
Survey results			
All surveys were conducted from 17th to 20th October 2023 (four nights) with 0mm of rain across the Project Area totalling 160 survey hours. Southern Bell Frogs were detected throughout the Project Area where standing water was present (aside from one dam) (Figure 4-8 Litoria raniformis sightings during targeted surveysThe survey locations are shown in Figure 4-13 (refer to Appendix L.5 for Atlas series). The following non-targeted frog species were detected during surveys:			

Amphibian species

- *Limnodynastes tasmaniensis*
- *Limnodynastes fletcheri*

Survey guidelines indicate that surveys should be conducted 2-3 hours after sunset, however some surveys were conducted late into the night to take advantage of personnel being onsite after dark.



Figure 4-8 *Litoria raniformis* sightings during targeted surveys

Comment on survey effectiveness

This survey is considered suitable for the frog species targeted. All but one dam with potential habitat (water present) was recorded as having Southern Bell Frog present, and as such did not require subsequent surveying. The sole unoccupied dam was surveyed twice, on the 17th and 20th of October 2023. As the Southern Bell Frog was found throughout the Subject Land it has been assumed present within all dams with suitable habitat where the species was not recorded.

Survey guidelines indicate that surveys should be conducted 2-3 hours after sunset, however some surveys were conducted later into the night to take advantage of personnel being onsite after dark and create survey efficiencies. Calls were not recorded to reduce significantly throughout the survey period; however the sites were visited in different order each survey night to account for any variation in call activity.

Surveys were carried out within a four-day period with no significant variation in weather conditions recorded. The weather was considered suitable for the targeted survey.

Species polygon

Species polygon was created for Southern Bell Frog in accordance with the species polygon guidance in the *NSW Survey Guide for Threatened Frogs* (DPIE, NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method, 2020b). A 200 m buffer was created from the high water mark for all dams that had Southern Bell Frog observations or contained suitable habitat. Due to the abundance of Southern Bell Frog observations across the survey sites, it was assumed all dams that contained water would provide suitable habitat. No dams would be removed by the Project, however foraging and migratory habitat within 200 m of the dams would be

Amphibian species
impacted. Additional vegetated areas providing connectivity between dams were also considered part of the species polygon. Areas of foraging and migratory habitat within the Development Footprint were considered the impact area for the species polygon.
Limitations
Survey sites were observed across four consecutive nights, frogs were abundant across the majority (27/28) of waterbodies and broader Project Area meaning secondary amphibian surveys were not required following the confirmation of presence. Overall, this survey is considered suitable for detecting Southern Bell Frogs.

Table 4-19 Grey Snake Survey Methodology

Reptile species
Species targeted
Hemiaspis damelii Grey Snake
Guidelines used
Survey Guidelines were not available for this species as it has yet to be included in State or Federal Guidelines following it's recent (2022) listing in the state of New South Wales. Consultation was undertaken with BCD (Appendix G) to determine if any internal guidelines were available. No guidelines were available prior to survey.
Survey planning
There are no guidelines specifically for Grey Snake, however, consultation with species expert Damian Michael and a literature review was undertaken to determine survey methodology (Appendix G). Surveys for Grey Snake were proposed to follow the methodology outlined by Michael *et. al.* (2023). Survey methodology was planned to be undertaken along shoreline transects of wetlands after sunset in areas with significant frog populations and ephemeral or permanent water sources. The species is terrestrial and seems to favour habitats closer to wetland and riparian areas. Potential habitat is in the form of available standing water, prey species and vegetative cover for the species. The methodology was determined as; Transects will be **250 m long** (Damian Michael *per comms*, Michael *et al.,* 2023) and located 10 m adjacent to the water's edge, following the natural course of the shoreline. Transects will be separated by a minimum of 250 m to ensure independence. Each transect will be surveyed between 1900 h (or following full sun-

Reptile species
down) and 2400 h. Surveys (all transects) will be **repeated over four consecutive nights** (based on 0.25 detection probability, Damian Michael *per comms*) in October 2023 with a subsequent four survey nights conducted in November 2023 if the species has not been detected. Observers will use head lamps and hand-held torches to scan 10 m either side of the transect, recording any Grey Snake identified (Southern Bell Frogs observed will also be recorded). Transects should be walked at a regular pace to allow for proper observation and preventing the unwanted startling of target species. Grey Snake will not be handled over the course of these surveys. NGH proposes the following methodology for the targeted surveys of Grey Snake (*Hemiaspis damelii*). • 250 m transects located 10 m from the shoreline of each identified waterbody/wetlands. • Transects are to be separated by a minimum of 250 m to ensure independence. • Surveys should be conducted between 1900 h (or following full sun-down) and 2400 h. • Observers will use head lamps and hand-held torches to scan for Grey within 10 m of either side of the transect. • Transect surveys will be repeated four times over the October and November survey period (unless grey snake has been detected). Twelve wetlands sites were proposed to be surveyed across the Project Area. These were chosen based on potentially suitable habitat, following initial habitat survey. Surveys included wetlands that were within 200m of the Subject Land to investigate potential for indirect impacts to mobile species across the Project Area
Survey personnel
Ecologists experienced in the identification of threatened species and or trained in the survey methodology conducted the threatened reptile surveys. Survey personnel are detailed in Appendix F.
Survey method
Targeted surveys for this species consisted of nocturnal transect searches. Twelve sites were surveyed for this species with the transect at each site to be replicated four times on different nights. Survey effort for each transect was visual searches by two personnel along the entire perimeter of a waterbody and then within the ringing terrestrial vegetation within 10m of the shoreline. The species is anurophagic, feeding primarily on frogs and seems to favour habitats closer to riparian areas, considering the sites with a large population of Southern Bell Frog and where possible significant ringing vegetation were selected to survey. Due to the inconsistent extent of waterbody circumference a measured pace (50m per five minutes of transect) was taken at each to ensure consistent survey effort across sites.
Survey effort
Grey Snake surveys were conducted from 17 to 20th of October and 7th to 10th November across the twelve sites which were visited between two and three times during this period. Humidity ranged between 19.9% and 31.1%. There are no records of whether the species is more easily detected on humid nights or

Reptile species
following rainfall. Although temperatures overnight were low, the evening temperatures were considered suitable for reptile detection. Surveys consisted of visual searches along the extent of a waterbody's shoreline, and into the surrounding ringing vegetation up the banks.

Dam No.	Survey No.	Survey effort	Comment
1	1, 67, 71	3 visual surveys, absent	Dam with high water-level, some ringing vegetation. SBF heard calling from large rafts of floating vegetation. SMF and BF also heard calling.
12	12, 43, 73	3 visual surveys, absent	Dam with standing water, with heavy ringing riparian and aquatic vegetation. SBF heard calling and observed visually in large numbers within the water and along the banks.
13	13, 42, 62, 72	4 visual surveys, absent	Large dam with standing water, with heavy ringing riparian and aquatic vegetation. Fish present. SBF heard calling and observed visually in large numbers within the water and along the banks.
15	15, 44, 64, 74	4 visual surveys, absent	Dam with standing water, with heavy ringing riparian and aquatic vegetation. SBF heard calling and observed visually in large numbers within the water and along the banks.
18	18, 46, 76, 81	4 visual surveys, absent	Dam with standing water, heavily populated with floating vegetation. Southern Bell Frog (SBF) heard calling and seen during visual survey in significant numbers.
25	25, 41, 77, 82	4 visual surveys, absent	Dam with standing water. No evidence of SBF following audio, CP, and visual surveys, SBF heard calling from adjacent dams.
30	32, 56, 78, 83	4 visual surveys, absent	Large manmade dam along Abercrombie Creek corridor, banks have patches of salt bush cover. SBF present in significant numbers though not calling (non-responsive to call playback)
36	38, 66, 85	3 visual surveys, absent	Large manmade dam, water is eutrophic and has significant evidence of use by waterfowl. SBF present in significant numbers though not calling (non-responsive to call playback)
38	40, 63, 84	3 visual surveys, absent	Large dam with standing water, SBF present along with Spotted Marsh Frog, Barking Frog. Limited ringing vegetation.

Reptile species			
39	45, 61, 79	3 visual surveys, absent	Small dam with significant evidence of livestock, frogs not calling on arrival but recorded on visual examination.
41	49, 68, 70	3visual surveys, absent	Large dam with standing water, with large mats of floating aquatic vegetation. SBF heard calling and observed visually in large numbers within the water and along the banks.
47	69, 75, 80, 87	4 visual survey, absent	Dam with limited ringing vegetation. Significant number of SBF heard calling, with individuals recorded visually along bank shoreline.
Survey results			
No Grey Snake or signs of occupation (shed skin, roadkill etc) were detected. A range of common prey species were detected including Southern Bell Frog (as discussed above), Barking Frog, Spotted Marsh Frog, Gibber Geckos and Giant Banjo Frog.			
Comment on survey effectiveness			
The weather conditions were suitable and survey effort was targeted to suitable habitat with nocturnal searches conducted at the right time of year. This survey is considered suitable for the purposes of this assessment.			
Species polygons			
As the target species Grey Snake was not detected, no species polygon is required.			
Limitations			
Weather during field surveys is detailed in Section 4.6.2. This data is based on records from Swan Hill (Swan Hill Aerodrome) station (ID 077094). The daytime temperatures were between 22 and 32 degrees, the detectability of nocturnal surveys was considered suitable at the outset of surveys but likely declined over the course of the night as temperatures dropped below the ideal for Grey Snake activity. The order of resampling was switched so that sites were not sampled at the same time for each survey allowing all to be sampled earlier in the evening to provide the best opportunity for detectability.			

Table 4-20 Nocturnal Birds survey methodology

Nocturnal birds
Species targeted
Burhinus grallarius Bush Stone-curlew, *Ninox connivens* Barking Owl and *Tyto novaehollandiae* Masked Owl
Guidelines used
Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2010), Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC, 2004) BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)
Survey planning
The forest owls listed above were dual credit species at the time of survey, and therefore the aim was to detect breeding habitat and detect impacts to the habitat. Note that these species have changed to being species credits only (as of 14 March 2024), with surveys to be undertaken within all areas of suitable habitat. Due to the size of the Subject Land, survey efforts targeted potential breeding habitat for forest owls. Woodland areas constitute around 35 ha within the Subject Land but due to the linear nature of the Subject Land, woodland patches outside the Subject Land but within the Project Area were also surveyed. Ten survey sites were planned within each of the woodland patches adjacent to or within the Subject Land. Bush Stone-curlew is a species credit species for foraging and breeding and relevant woodland habitat was targeted during nocturnal surveys. Woodland areas were the only areas providing fallen timber habitat within the Subject Land. Surveys included targeted nocturnal surveys (in areas of HBTs for forest owls and areas of fallen timber for Bush Stone-curlew) and hollow bearing tree (HBT) surveys to establish breeding habitat/activity (for forest owls).
Survey personnel
Ecologists experienced in the identification of threatened species and or trained in the survey methodology conducted the threatened nocturnal bird surveys. Survey personnel are detailed in Appendix F.
Survey method
Nocturnal bird surveys were conducted using spotlighting and call playback techniques. Nocturnal spotlighting conducted using high wattage for purpose spotlights aiming to detect movement and eye shine by targeting logs habitat (Bush Stone-curlew) and tree habitat (forest owls). Spotlighting beams had a

Nocturnal birds
penetration of 20-40m depending on location. Call playback surveys were undertaken following the broadcast (call playback) methodology outlined in '*Survey guidelines for Australia's threatened birds* ' (DEWHA, 2010) and the TBDC (NSW DCCEEW, 2024). Twenty minutes of call playback was undertaken at each survey site with the loud haler projected in the direction of best quality habitat. Trees and ground were spotlighted for ten minutes before and after the call playback, as well as listening for calling responses (for at least 30 seconds) and observing the surrounding landscape throughout the survey. Calls from Morcombe's Birds of Australia (Available through Google Play) were broadcast using Samsung tablet and amplified through a megaphone.
Survey effort
Two teams, each comprising two ecologists were deployed for a period of four nights, from the 8-11th August 2023. The first team focused on replicating survey in the southern section of the Subject Land whilst the other team focused on the northern section of the Subject Land. Each team conducted a minimum of four call playbacks each night within suitable woodland habitat. Nine survey locations were undertaken. One of the planned survey locations had no suitable woodland habitat on inspection. Further surveys were undertaken from the 14-17th August 2023. One team, comprising two ecologists surveyed the entirety of suitable woodland habitat over four nights. Suitable habitat consisted of patches of vegetation containing live and dead eucalypts, with sparse to abundant fallen timber resources, usually surrounding a claypan or lower depression. Nocturnal call play backs commenced after dusk and each survey took an hour to complete and were replicated throughout the night at sites distanced 1.5km apart from each other. Spotlighting also targeted Bush Stone-curlew during this same survey period. Surveys were conducted from approximately 6pm to between 8:30pm and 10:30pm. The total survey effort was 55 hours of nocturnal surveys including spotlighting and call playback during August 2023.
Survey results
No threatened nocturnal birds were detected during targeted surveys. A full list of other species detected can be found in the Appendix to this report.
Comment on survey effectiveness
The August 2023 surveys had favourable conditions for call playback and spotlighting with no detection of any targeted species during the survey period. Multiple barn owls (*Tyto alba*) were sighted during survey indicating suitable habitat for owls. Tawny Frogmouths were also observed (*Podargus strigoides*). A total of 55 hours were invested into targeted survey at night (excluding driving between sites). Due to the number of sites and replication of surveys, and as per table 5.6 of DECC 2004, detectability of the species is presumed to be >90% confidence. The weather conditions were considered suitable for the targeted survey.

Nocturnal birds
Species polygons
As no threatened nocturnal birds were detected, no species polygons for Masked Owl, Barking Owl, or Bush Stone-curlew are required.
Limitations
Weather conditions were considered suitable for the targeted surveys. The entirety of the Subject Land was not surveyed. Surveys targeted potential breeding habitat for forest owls and foraging and breeding habitat for Bush Stone-curlew.

Table 4-21 Plains-wanderer Survey Methodology

Plains-wanderer
Species targeted
Pedionomus torquatus Plains-wanderer
Guidelines used
Plains-wanderer is a dual credit species, assessed for species credits within the important habitat map. No survey is required for this species under the BAM as species credits are determined by the important habitat mapping, thus no survey guidelines are provided in the TBDC (NSW DCCEEW, 2024). The Subject Land is not within mapped important habitat, however numerous incidental sightings warranted further investigation into the abundance and distribution of Plains-wanderer in the Subject Land. Consultation was undertaken with DCCEEW – Cwth and BCD, led by Plains-wanderer expert David Parker. The standard survey method for Plains-wanderers is to spotlight from the vehicle, travelling 6-7 km/hr. A typical survey area is set up as a grid, with a series (10-11) of transects of 1km set 50m apart (D. Parker pers comms).
Survey planning
Twenty five survey grids were planned across the Project Area. Survey grids were located in areas where Plains-wanderer had been detected incidentally, as well as covering representative areas of each of the different shrubland and grassland PCTs in varying condition. Survey grids were not constrained to the Subject Land due to the linear nature of the footprint and nomadic nature of the Plains-wanderer. Surveys targeted nocturnal surveys in areas that are representative of the whole Development Footprint.
Survey personnel

Plains-wanderer
Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the nocturnal Plains-wanderer surveys. Survey personnel are detailed in Appendix F.
Survey method
Nocturnal Plains-wanderer surveys were conducted using spotlighting from within the car. Ten 1km transects were driven at each site at a speed of 6-7km/h. 3-4 transects were driven per night (25 sites in total over 8 nights). Transect location was random across the Development Footprint, but representative of every shrubland PCT in the Subject Land. Nocturnal spotlighting was conducted using high wattage for purpose spotlights and 4WD high beams aimed to detect movement and eye shine from the ground and midstory. Spotlighting beams had a penetration of 20-40m depending on location. Surveys were undertaken in two periods; 16-19th October 2023 and 7-10th November 2023. Plains-wanderer were also opportunistically surveyed for whilst undertaking the August nocturnal surveys for forest owls and Bush Stone-curlew. Spotlighting for Plains-wanderer was undertaken as teams moved between the August nocturnal survey areas.
Survey results
Six Plains-wanderers were detected during the October targeted surveys, all of which were detected on the first survey night (16th October) across three transects and in the southwest of the Project Area. A further five Plains-wanderer were detected during the November targeted surveys, including one sighting on the 7th November along a track and two sightings on each of the 9th and 10th November. The two sightings on the 9th November were within the same transect, in the central west of the Project Area. One sighting on November 10th was within a transect, and one was towards the main track near the eastern gate, with both sightings within similar vegetation. Six incidental sightings of Plains-wanderer had occurred prior to the targeted surveys. One of these included an adult with four juveniles.

Plains-wanderer



Figure 4-9 Incidental sighting of a Plains-wanderer in PCT164

Comment on survey effectiveness

All survey periods had favourable conditions for spotlighting during the survey period.

Whilst headlights on 'high-beam' setting were used for the survey, it would have been preferable for lights to be installed above the windshield, to allow for easier identification of birds which flew directly upwards.

There was a link between the vegetation type and the likelihood of detecting Plains-wanderer during targeted surveys, with a higher amount of bare ground and grass cover resulting in a higher likelihood of sighting Plains-wanderer. This species is known to forage on grass seeds in bare ground.

Species polygons

Under the BAM, Plains-wanderer species polygons are identified as areas that contain 'important habitat mapping'. As such, no species polygon was required to be generated for Plains-wanderer under the BAM, as its offsets are calculated through ecosystem credits.

Limitations

Some transect areas during the October survey effort were inaccessible due to high bogging potential, vast areas with numerous concealed potholes, transects intersected by fence lines and/or irrigation channels. In these instances, the transects were either shortened or diverted to avoid these areas. Additional transects were added in areas of alike vegetation during the November survey effort.

Due to the size of the Subject Land, the entirety of the Subject Land was not surveyed and only

Plains-wanderer
representative sampling plots were undertaken within different PCTs. Each transect was completed once. There were no repeat surveys, so it is not known if the Plains wanderer detected were moving through the area, or residing in that location. As observations were recorded over separate days or times, it is not known if multiple records are of the same individuals or different individuals.

Table 4-22 Diurnal Birds Survey Methodology

Diurnal birds		
Species targeted		
Pink Cockatoo *Lophochroa leadbeateri*, Superb Parrot *Polytelis swainsonii,* Australian Bustard *Ardeotis australis*.		
Guidelines used		
Survey guidelines for Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2010); BUS undertaken in accordance with Onshore Wind Farms – interim guidance on bird and bat management (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)		
Survey planning		
A total of 39 sites were initially selected, by either the presence of woodland PCTs, aerial imagery and/or previous detection of hollow-bearing trees. These sites were surveyed for hollow-bearing trees. During the field verification of hollow-bearing trees, suitably sized hollows were identified as stag watch sites. A total of six sites were selected as stag watch survey sites.		
Stag watch survey sites		
Site 1	Tuesday 7th November, 2023	E 228964 N 6127205
Site 2	Tuesday 7th November, 2023	E 228573 N 6127192

Diurnal birds		
Site 3	Wednesday 8th November, 2023	E 229559 N 6134576
Site 4	Wednesday 8th November, 2023	E 229727 N 6134534
Site 5	Friday 10th November, 2023	E 237890 N 6148618
Site 6	Tuesday 14th November, 2023	E 225194 N 6133313

Survey personnel

Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the hollow-bearing tree assessment and the stag watch surveys for Pink Cockatoo and Superb Parrot. Survey personnel are detailed in Appendix F. Bird utilisation surveys (BUS) were undertaken by experienced ecologists from Nature Advisory.

Survey method

BUS survey method

Bird Utilisation Surveys (BUS) were undertaken by ecologists from Nature Advisory across two years. During the first year of surveys, nine survey points were located in proposed turbine locations and offered a minimum 270-degree viewing out to 200 metres. Three points away from proposed turbine locations were selected as reference points. During the second year of survey the number of survey locations in proposed turbine locations increased to 20 with three reference points still being surveyed. The surveys were conducted using the fixed-point bird count method in 15-minute intervals, which is commonly used in formal bird utilisation surveys and is considered adequate to generate representative data on bird species present.

During each 15-minute survey interval, all bird species and the number of individual birds observed were recorded. The height of the bird when first observed were documented. Auditory calls of all species within the range of the observer were also recorded with height and distance metrics, based on the known behaviour and ecology of each species. Minimum and maximum heights were recorded for species of concern, including listed threatened species, migratory species, raptors and waterbirds.

Hollow dependent birds survey method

A total of 39 sites were initially selected, by either the presence of woodland PCTs or previous detection of hollow-bearing trees. Woodland areas constitute around 35 ha within the Subject Land but due to the linear

Diurnal birds
nature of the Subject Land, woodland patches outside the Subject Land but within the Project Area were also surveyed. During the recording of hollow-bearing trees, suitably sized hollows were identified and used as stag watch sites. All area searches were systematically conducted in parallel transects to achieve full coverage of the alignment and record all hollow-bearing trees. These searches were conducted during daylight hours where visibility was greatest. Stag watches were conducted between dusk and dark for 1.5 hours. Surveying began 45 minutes prior to sunset and ended 45 minutes after. Head torches and spotlights were used intermittently to identify and fauna that returned to or left hollows.
Survey effort
BUS surveys
Scoping, BUS set up and preliminary surveys were conducted in July 2022. In 2023, full surveys were conducted in February (summer), April (autumn), August (winter), and October (spring). Surveys were conducted in four periods of the day: early morning (8:00am to 10:30am), late morning (10:30am to 12:30pm), early afternoon (13:00pm to 15:30pm) and late afternoon (15:30 to 17:30pm). 15-minute surveys were conducted at each point twice at each of the four time periods. This totalled in eight surveys (two survey hours) per point in each season. In 2024, survey points increased to a total of 20 impact points and three reference points as a result of the provision of the draft BBUS survey guidelines by BCS, totalling 23 survey points across the site. This change was implemented in the first survey period of Year 2 in summer 2024. Each survey point was surveyed eight times for a 15-minute period at each point (eight replicates); twice each during four different periods of the day: early morning (8:00am to 10:30am), late morning (10:30am to 12:30pm), early afternoon (1pm to 3:30pm) and late afternoon (3:30pm to 5:30pm). Survey times for the four periods of day changed from August 2024 for the remainder of the survey seasons to the following: early morning (6:00am to 10:00am), late morning (10:00am to 12:00pm), early afternoon (12:00pm to 3:00pm) and late afternoon (3:00pm to 7:00pm). Targeted surveys for the Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*) and an assessment of potential habitat were undertaken over a 5-day period between November 28th 2024 and December 1st 2024. Four stag-watch surveys were conducted at two potential nesting sites – two replicates during early morning (one hour post-sunrise to 11:00am AEST) and two replicates during late afternoon (4pm AEST to sunset), totalling a survey effort of 32 hours. Nest 1 was located in the western area of the site (coordinates: -34.9351, 144.0090) and Nest 2 was located in the east of the site (coordinates: -34.9270, 144.0903). Transect surveys were undertaken from a slow-moving vehicle traversing larger areas of suitable habitat.
Hollow dependent bird survey effort
Between the 7th November and 15th November 2023, approximately 66 hours were spent surveying for the presence of breeding habitat for the candidate species within the Project Area. A total of 35 area searches

Diurnal birds
were conducted to detect the presence of suitably sized hollows. A total of six stag watches were conducted where suitably sized hollows were located, with a total survey time of 9 hours. Woodland areas constitute around 35ha within the Subject Land but due to the linear nature of the Subject Land, woodland patches outside the Subject Land but within the Project Area were also surveyed. Opportunistic bird surveys were also undertaken by field staff across 2023 field surveys.
Survey results
Hollow dependent birds survey results
During the targeted surveys undertaken in November 2024 – December 2024, a total of 55 Eastern Pink Cockatoos were observed, likely comprising seven individuals repeatedly visiting. Two breeding pairs were recorded at their respective nesting hollows, which were confirmed to be active and contained nestlings due to frequent foraging behaviour and bobbing motion (performed for regurgitating) of the adults. Both nests had additional adult visitors other than the breeding pair.
Diurnal bird survey results
The following threatened and migratory diurnal birds were observed during formal BUS surveys: • Black falcon (*Falco subniger*) • Black-breasted Buzzard (*Hamirostra melanosternon*) • Blue-winged Parrot (*Neophema chrysostoma*) • Gull-billed Tern (*Gelochelidon nilotica*) • Little Eagle (*Hieraaetus morphnoides*) • Pink Cockatoo (*Lophochroa leadbeateri*) • Southern Whiteface (*Aphelocephala leucopsis*) • Spotted Harrier (*Circus assimilis*) • White-fronted Chat (*Epthianura albifrons*) The following threatened diurnal birds were observed within the Project Area opportunistically: • Flame Robin (*Petroica phoenicea)* • Plains-wanderer (*Pedionomus torquatus*)
Comments on survey effectiveness
The majority of habitat surveyed for the target species (hollow-bearing trees and stag watches) was considered to be marginal breeding habitat. Most trees were regrowth and the site lacks major riparian areas preferred by the two hollow dependent species. The use of stag watches to complement hollow-bearing tree surveys was considered suitable to detect presence or determine the absence of the targeted species, as were the bird utilisation surveys.

Diurnal birds
Species polygons
Superb Parrot were not observed breeding within the Subject Land, therefore, no species polygons were created for either species. Pink Cockatoo were observed breeding in two nesting sites in the Project Area. These nesting sites occurred more than 200m outside the Subject Land (Figure 4-13) and no species polygons were created within the Subject Land. These species are dual ecosystem/species credit species, and as such will be offset as ecosystem credits.
Limitations
Not all hollows were able to be surveyed within or adjacent to the Subject Land. Only hollows considered most suitable were surveyed due to the fragmented layout of woodland across the Subject Land. However, this survey effort was considered adequate as woodland areas only covered a small proportion (1.5%) of the Subject Land.

Table 4-23 Raptor Survey Methodology

Raptors
Species targeted
Haliaeetus leucogaster White-bellied Sea-Eagle, *Hieraaetus morphnoides* Little Eagle, *Lophoictinia isura* Square-tailed Kite, *Hamirostra melanosternon* Black-breasted Buzzard
Guidelines used
Survey guidelines for Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2010); BUS undertaken in accordance with Onshore Wind Farms – interim guidance on bird and bat management (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)
Survey planning
The three species listed above are all dual credit species, and the aim is to detect breeding habitat and detect impacts to these and other raptor species in relation to turbine collision risks. Surveys focused on Bird Utilisation Surveys (BUS) to determine turbine collision risk and potential species presence and stick nest surveys were conducted to establish breeding activity.

Raptors
Woodland areas were identified within the Project Area to survey for stick nests and breeding habitat for raptors. Woodland areas constitute around 35ha within the Subject Land but due to the linear nature of the Subject Land, woodland patches outside the Subject Land but within the Project Area were also considered. Twelve priority survey sites were planned within each of the woodland patches adjacent to or within the Subject Land and 27 secondary survey sites were identified to search for suitable stick nests and presence of raptor species.
Survey personnel
Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the BUS and stick nest surveys. BUS were conducted by ecologists from Nature Advisory. Survey personnel are detailed in Appendix F.
Survey method
BUS survey method
Bird Utilisation Surveys (BUS) were undertaken by ecologists from Nature Advisory across two years. During the first year of surveys, nine survey points were located in proposed turbine locations and offered a minimum 270-degree viewing out to 200 metres. Three points away from proposed turbine locations were selected as reference points. During the second year of survey the number of survey locations in proposed turbine locations increased to 20 with three reference points still being surveyed. The surveys were conducted using the fixed-point bird count method in 15-minute intervals, which is commonly used in formal bird utilisation surveys and is considered adequate to generate representative data on bird species present. During each 15-minute survey interval, all bird species and the number of individual birds observed were recorded. The height of the bird when first observed were documented. Auditory calls of all species within the range of the observer were also recorded with height and distance metrics, based on the known behaviour and ecology of each species. Minimum and maximum heights were recorded for species of concern, including listed threatened species, migratory species, raptors and waterbirds.
Stick nest survey method
Systematic area searches were conducted in areas mapped as woodland PCTs or where nests were detected during previous surveys. The surveys were undertaken whilst conducting hollow-bearing tree surveys and driving between survey sites. Most survey areas were able to be surveyed from the vehicle generally due to the lack of trees. When detected, stick nests were recorded using a GIS enabled hand-held tablet. Stick nest (and surrounds) were observed for 30 minutes to determine current use and the presence of any raptor species.

Raptors
Survey effort
BUS survey effort
Scoping, BUS set up and preliminary surveys were conducted in July 2022. In 2023, full surveys were conducted in February (summer), April (autumn), August (winter), and October (spring). Surveys were conducted in four periods of the day: early morning (8:00am to 10:30am), late morning (10:30am to 12:30pm), early afternoon (13:00pm to 15:30pm) and late afternoon (15:30 to 17:30pm). 15-minute surveys were conducted at each point twice at each of the four time periods. This totalled in eight surveys (two survey hours) per point in each season. In 2024, survey points increased to a total of 20 impact points and three reference points as a result of the provision of the draft BBUS survey guidelines by BCS, totalling 23 survey points across the site. This change was implemented in the first survey period of Year 2 in summer 2024. Each survey point was surveyed eight times for a 15-minute period at each point (eight replicates); twice each during four different periods of the day: early morning (8:00am to 10:30am), late morning (10:30am to 12:30pm), early afternoon (1pm to 3:30pm) and late afternoon (3:30pm to 5:30pm). Survey times for the four periods of day changed from August 2024 for the remainder of the survey seasons to the following: early morning (6:00am to 10:00am), late morning (10:00am to 12:00pm), early afternoon (12:00pm to 3:00pm) and late afternoon (3:00pm to 7:00pm).
Stick nest survey effort
Twenty one stick nests were previously recorded through incidental observations by NGH ecologists travelling the Project Area. A total of 39 areas, where woodland vegetation overlayed the Development Footprint were systematically surveyed for the presence of stick nests, totalling approximately 114 ha. Eleven additional stick nests were detected. Each stick nest was surveyed for a period of 30 minutes to determine their suitability for the target species, and current use by any raptor species.
Survey results
BUS results
In total, 13 raptor species were recorded during formal BUS surveys. The following raptor species were recorded: • Australian Hobby (*Falco longipennis*); 2 observations • Black Falcon (*Falco subniger*); 9 observations • Black Kite (*Milvus migrans*); 81 observations • Black-breasted Buzzard (*Hamirostra melanosternon*); 1 observation • Black-shouldered Kite (*Elanus axillaris*); 137 observations • Brown Falcon (*Falco berigora*); 139 observations • Brown Goshawk (*Accipiter fasciatus*); 1 observation

Raptors

- Little Eagle (*Hieraaetus morphnoides*); 2 observations
- Nankeen Kestrel (*Falco cenchroides*); 771 observations
- Peregrine Falcon (*Falco peregrinus*); 1 observation
- Spotted Harrier (*Circus assimilis*); 21 observations
- Wedge-tailed Eagle (*Aquila audax*); 339 observations
- Whistling Kite (*Haliastur sphenurus*); 23 observations

Nankeen Kestrel was the most abundant raptor species during the two years of BUS. Numbers were the highest during summer (335), followed by winter (183), autumn (139) and spring (114). A total of 34 Nankeen Kestrels were seen flying at Rotor Swept Area (RSA) height.

Wedge-tailed Eagles were the most abundant raptor species flying at RSA height (66.3% of the raptor flights at RSA) and was the second most abundant species recorded during the two years of surveys. Most Wedge-tailed Eagles observations occurred in summer (126) followed by autumn (96), winter (63) and spring (54).

A total of 13 raptor species were also incidentally observed flying over the Project Area in between survey points, with Swamp Harrier (*Circus approximans*) being the only additional species not recorded during formal surveys. Numbers of incidental records are:

- Australian Hobby (*Falco longipennis*); 5 observations
- Black Falcon (*Falco subniger*); 10 observations
- Black Kite (*Milvus migrans*); 215 observations
- Black-breasted Buzzard (*Hamirostra melanosternon*); 1 observation
- Black-shouldered Kite (*Elanus axillaris*); 33 observations
- Brown Falcon (*Falco berigora*); 45 observations
- Brown Goshawk (*Accipiter fasciatus*); 4 observations
- Little Eagle (*Hieraaetus morphnoides*); 2 observations
- Nankeen Kestrel (*Falco cenchroides*); 154 observations
- Spotted Harrier (*Circus assimilis*); 11 observations
- Swamp Harrier (*Circus approximans*); 1 observation
- Wedge-tailed Eagle (*Aquila audax*); 54 observations
- Whistling Kite (*Haliastur sphenurus*); 38 observations

Stick nest survey results

In addition to the 21 stick nests previously observed, a further 11 stick nests were recorded within the areas surveyed during stick nest surveys (Figure 4-10). Two stick nests were considered suitable for the target species. One of these was found to have signs of use around the base of the nest but no observable occupation. This nest was considered suitable habitat as a precaution. The second was observed during a stag watch on the 7th November 2023. Chicks were heard from afar and a Little Eagle was seen in the vicinity of the nest. The following evening (8th November 2023) an additional survey was conducted for this nest site and Little Eagle was observed once again adjacent to the suitable nesting site. It was therefore confirmed that Little Eagle breeding habitat occurs within the Development Footprint in the southwestern most point of the alignment (Figure 4-13, Appendix L.5 for Atlas series).

Raptors




Figure 4-10 Stick nests recorded during targeted surveys

Comment on survey effectiveness

The bird utilisation surveys are considered suitable for detecting the presence of threatened raptors utilising the area as foraging or soaring habitat. Of the four threatened raptors, only Little Eagle and Black-breasted Buzzard were observed across the two years of surveys.

The stick nest surveys were considered suitable for detecting the presence of threatened raptors breeding habitat. The use of previous survey data and desktop assessment of suitable habitat helped refine the survey area and allowed for more rigorous effort in those dedicated areas. The use of area searches to locate suitable nest sites was effective and able to be done simultaneously with hollow-bearing tree surveys although this meant some area searches extended beyond the intended 60 minute period.

Species polygon

One stick nest was detected to have Little Eagle actively breeding, which is located in the southwest of the Project Area and a potential Little Eagle active nest in the northeast of the Project Area. The species polygon was created in accordance with the guidance in the TBDC (NSW DCCEEW, 2024). A 300 m buffer was created around the two nest trees. The species polygon for Little Eagle is shown in Figure 4-13 (refer to Appendix L.5 for Atlas series).

Limitations

BUS observations indicate that none of the four threatened raptors were utilising the Subject Land over

Raptors
three seasonal windows. White-bellied Sea-Eagle, Square-tailed Kite and Black-breasted Buzzard were also not recorded during the stick nest surveys giving confidence that these threatened raptors are not currently breeding within the Subject Land. Due to the size of the Subject Land, the entire Subject Land was not surveyed during the stick nest survey. A combination of previous survey data and desktop assessment was utilised to refine the survey area to areas with potential nest trees only.

Table 4-24 Koala Survey Methodology

Koala
Species targeted
Phascolarctos cinereus Koala
Guidelines used
DPIE Koala Biodiversity Assessment Method Survey Guide (DPIE, 2022)
Survey planning
Surveys included spotlighting within suitable woodland areas for the Koala. Woodland areas comprise around 35ha of the Subject Land, or 1.5%. Due to the limited amount of habitat, including lack of connectivity between woodland habitat, small woodland patch sizes and limited Koala records within the locality, it is considered that koala habitat is highly degraded in the Subject Land, and therefore no additional survey method (such as SAT surveys or Koala Detection Dogs as per the Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPE, 2022)) was undertaken. Consultation was undertaken with BCS in January 2025 on the reasoning for excluding the Koala from further surveys and BCS concurred with NGH's approach (Appendix G.4).
Survey personnel
Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the threatened arboreal mammal surveys. Two teams of two ecologists conducted the survey from 8–11 August 2023. Survey personnel are detailed in Appendix F.
Survey method
Spotlighting was undertaken in conjunction with the nocturnal bird surveys, before and after call playback, between 8-11th August 2023 and 14-17th August 2023, in accordance with the Koala (*Phascolarctos*

Koala
cinereus) Biodiversity Assessment Method Survey Guide (DPE, 2022).
Survey effort
Opportunistic stationary spotlighting only (no Koala call playback) for Koalas occurred at each nocturnal bird call playback site. A total 20 minutes of spotlighting was conducted in total for each site, with ten minutes prior to call playback and ten minutes after call playback. A total of 55 hrs of spotlighting were conducted for Koalas. Where woodland areas did not contain suitable habitat for nocturnal birds, spotlighting was still undertaken for Koala. As a result, spotlighting was undertaken within all woodland areas containing feed trees for Koala (specifically *Eucalyptus largiflorens*) across the Subject Land.
Survey results
No Koalas were observed or heard during survey from the 8-11th August 2023 and 14-17th August 2023.
Comment on survey effectiveness
The woodland habitat in the project area is highly fragmented and comprised of ten discontinuous patches across the Subject Land (Figure 2). Discontinuous landscapes are described by the Koala BAM survey guidelines (DPE, 2022) as vegetation zones separated by more than 500 m. Woodland Patches within the Subject Land have a distance of greater than 500 m and in most cases a separation distance of between 1.5 km to 4 km. There is minimal connectivity between the woodland areas. Although Koalas can travel along the ground, movement between fragmented habitat has a high risk of mortality from vehicle collisions, dog or fox attacks and even cattle attacks (DPE, 2022) reducing likelihood of Koalas being present in this landscape. Patches of woodland habitat in the project area range in size from 0.5 ha to around 70 ha. Koalas can use small patches of woodland however many patches may be required to meet resources needs (DPE, 2022). Black Box trees within the Subject Land are generally small, sparse, low foliage cover, many suffering die back and are not considered a resource rich food source for Koala. Habitat quality in these isolated woodland patches is thus considered low quality due to the low quality of food sources, lack of connectivity between patches, and small proportion of available habitat in the landscape. There are also no permanent natural water sources on site, with only farm dams utilised by sheep. There are no Koala records within 50km (BioNet, 2024) of the Subject Land. The closest records being around 60km South West in River Red Gum woodland communities along the Murray River, 70km south in River Red Gum Woodland along the Murray River in Koondrook State Forest and 60km West in Hay. These locations are associated with the major river systems in the Riverina. There is a lack of connectivity between the Subject Land and known Riverine populations, with minimal tree cover and large expanses of chenopod shrublands and grasslands creating barriers for large scale movement. It is considered that Koala habitat is suitably degraded due to the highly fragmented and discontinuous woodland landscape, and lack of connectivity to any known population occurring along the major

Koala
watercourses in the Riverina. Koala is proposed to be excluded from the BAM-C candidate species list, as Subject Land is degraded habitat, and no further targeted surveys are proposed. BCS concurred with this approach following consultation in January 2025 (Appendix G.4)
Species polygons
As the target species Koala was excluded due to degraded habitat, no species polygons are required.

Table 4-25 Southern Myotis survey methodology

Bats
Species targeted
Southern Myotis (*Myotis Macropus*)
Guidelines used
The Documents, "*Species credit' threatened bats and their habitats – NSW Guide for the Biodiversity Assessment Method*" (DPIE, 2021) and BioNet Threatened Biodiversity Database Collection (TBDC) (NSW DCCEEW, 2024), was used to inform the survey plan.
Survey planning
Southern Myotis (*Myotis macropus*) was added by the BAM-C as a credit species for Baldon BDAR during the October 2024 BAM-C upgrade. Survey planning was undertaken in consultation with BCS in January 2025 (Refer to Appendix G.4). Bat surveys had been undertaken as part of the two year Bird and Bat Utilisation Surveys (BBUS) however survey locations had not focused on specific habitat requirements required by the BAM. Habitat requirements for Southern Myotis are "*Waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site*" (DPIE, 2021) Fifty farm dams, wider than three metres and containing water are located within 200m of the Subject Land and could provide foraging habitat for Southern Myotis. Wetlands, ephemeral streams, gilgais, canals or dry dams containing no water were not considered suitable habitat. There are two PCTs present in the Subject Land that are associated with Southern Myotis habitat as per the TBDC (DPIE, 2021).These are;

Bats
• PCT 17: Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) and, • PCT 160: Nitre Goosefoot shrubland wetland on clays of the inland floodplains Areas of PCTs 17 and PCT 160 that occurred within 200m of the farm dams were identified as potential habitat. Five dams were identified as potential habitat for Southern Myotis and proposed for survey. An additional twelve dams were selected that capture three other PCTS surrounding the farm dams as an additional survey effort, to determine if there may be Southern Myotis using non associated PCTs. NSW guide for the BAM (DPIE, 2021) indicates Southern Myotis can be surveyed by four different methods. NGH proposed to survey by passive acoustic detection in January and February using Song meters deployed at each of the 15 farm dams. Song meters would be left for a minimum period of four nights, providing an effort of 64 trap nights. Song meters data would be analysed by subconsultants, experienced in Microbat Ultrasonic call identification.
Survey personnel
Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the threatened flora searches. Surveys were undertaken by subconsultants; Nature Advisory. Survey personnel are detailed in Appendix F.
Survey effort
BBUS survey method
Bat Surveys over a period of two years were undertaken by ecologists from Nature Advisory as part of the Bird and Bat utilisations surveys (BBUS). Eight survey periods were undertaken, comprised of Summer, Autumn, Winter and Spring from March 2023 to January 2025. In Year 1, Passive acoustic recorders (Song Meters) were deployed at six locations across the Project Area. Acoustic recorders were secured to trees or fence posts approximately 1.5 - 2 metres above ground. In Year 2, survey points increased to a total of 15 locations across the Project Area based on the release of draft Bird and Bat Survey (BBUS) guidelines through Biodiversity, Conservation and Science (BCS) in mid-2023. Acoustic recorders in Year 2 were also placed at height on Met Masts. Recordings were analysed by *Balance! Environmental* in Winter 2022 and Autumn 2023, and by Amanda Lo Cascio in Winter 2023, Spring 2023, Summer 2024, Autumn 2024, Winter 2024, Spring 2024 and Summer 2025.
'Species Credit' Habitat survey method
Habitat surveys in accordance with the BAM were undertaken in January 2025. Passive acoustic recordings were made with Wildlife Acoustics SM4BAT-Full Spectrum (FS) detectors (Song meter). During song meter deployment it was observed nine of the farm dams proposed for survey were dry and deemed not suitable

Bats
habitat for Southern Myotis. No Song meters were deployed at these locations. Five Song meters were deployed at the planned farm dams within 200m of associated habitat (PCT 160 or PCT 17) and two within the planned control site within a non-associated PCT (PCT 15 or PCT 164). An additional seven song meters were deployed at other farm dams that contained water bringing the total to 17. Song meters were left at each location for a period ranging from 9 to 13 nights giving a total of 181 survey nights. Acoustic data was analysed by Amanda Lo Cascio (Appendix J.7)
Survey results
BBUS results
Southern Myotis calls were not recorded in the first six survey periods during the BBUS surveys (Autumn 2023 to Winter 2024). Eight calls of Southern Myotis were identified during Spring 2024 from four song meter locations, and 13 confirmed calls were identified during Summer 2024 from six song meter locations. Three of these being the same location as Spring 2024, given a total of seven confirmed locations. The remaining locations picked up probable Southern Myotis, based on the similarity with *Nyctophilus* spp. calls. Positive identification of Southern Myotis were recorded in the non-associated PCTs, PCT 28 (Zone 6), PCT 46 (Zone 7) and PCT 164 (Zone 19).
'Species Credit' Habitat survey method
Twenty-seven calls of Southern Myotis were confirmed within ten of the acoustic recorder locations. An additional four acoustic recorders picked up probable Southern Myotis, based on the similarity with *Nyctophilus* spp. calls. Three song meters did not pick up any Southern Myotis or *Nyctophilus* sp. calls. Locations of Song meters and Southern Myotis results are shown in Figure 4-13 Positive identification of Southern Myotis were recorded in the listed associated PCT, PCT 160 (Zone 15) as well as a non-associated PCT, PCT 164 (Zone 19 and 20).
Species polygon
Habitat features were identified as farm dams greater than 3 m wide. Aerial imagery was used to map the high bank mark of 55 farm dams within 200m of the Subject Land. A 200m buffer was created around the farm dams. Associated PCTS, listed in the TBDC, and occurring in the Subject Land are PCT 17 and PCT 160. Southern Myotis records in the Subject Land also occurred within PCT 28, 46 and 164. These five PCTS were selected as associated PCTs for Southern Myotis. Where associated PCTs intersected with the 200m habitat buffer, a species polygon was created.
Limitations

Bats
The identification of echolocation calls from microbats in south-eastern Australia is facilitated by the fact that many calls are species-specific. It is noted that the call sequence of Southern Myotis can overlap with the call sequence of non-threatened *Nyctophilus* species. A conservative approach was undertaken and calls that could not be identified definitively were assumed probable as Southern Myotis. Trapping would be required to positively confirm identification. A further limitation in the use of acoustic recorders is that it is not possible to determine the number of individuals present, only the number of recordings which could be made from the same individual repeatedly flying past the recorder. The bat detectors used during this survey sample a limited airspace to a distance of approximately20 - 30 metres. Bat activity levels may vary in response to weather variables such as air temperature, relative humidity, barometric pressure, wind speed, direction and gusts, rain and moonlight. However, as positive identification of Southern Myotis was recorded in a number of acoustic recorders, it is considered the survey was adequate to confirm the species is present.

4.6.4 Justification for selecting areas for species polygons

Flora

Three species, *Maireana cheelii* (Chariot Wheels), *Brachyscome papillosa* (Mossgiel Daisy) and *Swainsona murrayana* (Slender Darling Pea) were detected during targeted flora surveys. Two species *Convolvulus tedmoorei* (Bind weed) and *Eleocharis obicis* (Spike-Rush) have been assumed present where surveys were unable to be undertaken.

Details and justifications of preparing species polygons are given below. The species polygons for threatened flora species are shown in Figure 4-12.

Brachyscome papillosa

Brachyscome papillosa was detected at 6051 points comprised of 1-50 individuals and 504 patches scattered across the Subject Land. *B. papillosa* was generally detected in grey clay soils in *Maireana aphylla* (cotton bush) shrublands.

This species is an ‘area’ species for unit of measure in the BAM-C but no further information is provided in the TBDC on determining species polygon. *B. papillosa* is a perennial herb found primarily in clay soils on Bladder Saltbush (*Atriplex vesicaria*) and *Maireana aphylla* plains, but also in grassland and in Inland Grey Box (*Eucalyptus microcarpa*) - Cypress Pine (*Callitris* spp.) woodland (DCCEEW, NSW Threatened Species Profiles, 2018) There is limited literature on seed dispersal distance of *B. papillosa* but Brachycome, is part of the Asteraceae family which are generally wind dispersed. Studies on similar species (*Brachyscome ciliaris*), have demonstrated a seed dispersal distance of no more than 1m (Rina Aleman, 2015). Flooding is likely to be a key secondary dispersal for *B. papillosa* and it is possible that flooding in 2022 has dispersed this species across the site. Parts of the project area were flooded in November 2022 – January 2023 due to periods of heavy rain from October 2022 to January 2022. Seed germination conditions would have been ideal in 2023, due to high rainfall in the preceding season providing sufficient soil moisture and it is likely the

full extent of the population was visible during the 2023 targeted surveys. It was noted during the 2024 September flora surveys that very limited *B. papillosa* was visible.

To encompass the extent of suitable habitat, records of *B. papillosa* were buffered by 100m. As a combination of walking transects along linear corridors and 100m grid points were used for targeted surveys, the 100m buffer captured the entire width of the linear corridors and areas in between grid points. In addition, buffered areas within 100m of each other were joined together to connect suitable habitat where populations could occur in future. The 100m buffer was considered a suitable polygon, well above likely seed dispersal distances, and capturing adjacent habitats to known populations. Areas outside the 100m buffer were not considered part of the species polygon as the site was adequately surveyed during a high germination season and not detected.

An additional 0.17 ha was also assumed present at the site entrance intersection along the Sturt Highway in areas of associated PCT 164 as this area was unable to be surveyed.

The species polygon was clipped to the Stage 1 and Stage 2 Development Footprints to determine the species polygons entered into the BAM-C for each stage.

Maireana cheelii

Maireana cheelii was detected at 556 points comprised of 1-500 individuals and 184 patches scattered across the Subject Land. *M. cheelii* generally occurred in red claypan soils within PCT 164. This species is an 'area' species for unit of measure in the BAM-C but no further information is provided in the TBDC on determining species polygon.

M. cheelii is a small perennial shrub that dies back into a dormancy phase as a woody subterranean tuber during summer (Foreman, 2005). Fresh new branches resprout following the first significant autumn or winter rains. Seed production occurs in Summer and seeds either fall to the ground, are scattered by wind or removed by ants (Foreman, 2005). Chariot Wheels is almost exclusively found in microhabitats that are subject to seasonal microflooding or saturation such as natural clay depressions and scalds. Seed dormancy is thought to be broken by microflooding (Foreman, 2005). Seed germination conditions would have been ideal in 2023, due to high rainfall in the preceding season providing sufficient soil moisture and it is likely the full extent of the population were visible during the 2023 targeted surveys.

To encompass the extent of suitable habitat, records of *M. cheelii* were buffered by 100m. As a combination of walking transects along linear corridors and 100m grid points were used for targeted surveys, the 100m buffer captured the entire width of the linear corridors and areas in between grid points. In addition, buffered areas within 100m of each other were joined together to connect suitable habitat where populations could occur in future. Additionally, as associated microhabitat for this species in the Subject Land included red claypans, where sightings were detected within a claypan, the entire claypan was included as part of the species polygon. The 100m buffer and associated microhabitat was considered a suitable polygon, well above likely seed dispersal distances, and capturing the adjacent habitats to known populations. Areas outside the 100m buffer were not considered part of the species polygon as the site was adequately surveyed during a high germination season and not detected.

An additional 0.17 ha was also assumed present at the site entrance intersection along the Sturt Highway in areas of associated PCT 164 as this area was unable to be surveyed.

The species polygon was clipped to the Stage 1 and Stage 2 Development Footprints to determine the species polygons entered into the BAM-C for each stage.

Swainsons murrayana

A small population of *Swainsona murrayana* was detected in the Southeast corner of the Subject Land. Seven individuals were detected in Spring 2024 over an area of 0.01 ha within PCT 164. Surveys were conducted using 10m parallel walking transects as additional areas surveys were less than 50ha.

S. murrayana is a perennial forb that grows in a variety of vegetation types including Bladder saltbush, Black box and grassland communities on level plains, floodplains and depressions and is often found with *Maireana* species. The species may require some disturbance and has been known to occur in paddocks that have been moderately grazed or occasionally cultivated (DECC, 2005a). Plants die back in Summer and produce winter-spring growth following cool-season rains (DCCEEW, 2025).

Swainsona species are largely renascent perennials, resprouting in suitable conditions from a persistent rootstock (Cwth DCCEEW, 2025a). Little is known about the seed dispersal distance of *S. murrayana.* Swainsona are part of the Fabaceae family which generally have hard dormant seeds. Seeds are ejected from their pods passively or explosively, and primary seed dispersal is short (0-2m), (Auld, 1996). Secondary dispersal can be by ants, birds or mammals (Auld, 1996).

This species is an 'area' species for unit of measure in the BAM-C. The TBDC comments that "*The species polygon is to be drawn to encompass contiguous vegetation zones in which the species has been detected*". The Subject Land is entirely connected with contiguous vegetation zones, and thus the whole site would be considered a species polygon for *Swainsona murrayana* comprising 2,812.41 ha.

Surveys have been undertaken across the whole Subject Land and not detected elsewhere. Surveys undertaken in Spring 2023 followed above average cool-season rainfall in March, April and June 2023 likely providing sufficient soil moisture and ideal germination conditions if the species was present. Similarly, above average rainfall occurred in May 2024, providing ideal conditions for Spring 2024 surveys.

Considering the entire Subject Land has been surveyed and only been detected in a 0.01 ha area of land, a 2,812.41 ha species polygon was not representative of the extent of *S. murrayana* or its habitats across the Subject Land. Following consultation with BCS, it was advised that 'the species polygons may be reduced to a suitable buffer around the records and surveyed suitable habitat (Appendix G.5).

The species polygon in this situation has been refined to a 100m buffer around the known records capturing adjacent habitats but excluding the rest of the Subject Land that has been surveyed during optimal seasons.

An additional 0.17 ha was also assumed present at the site entrance intersection along the Sturt Highway in areas of associated PCT 164 as this area was unable to be surveyed.

Convolvulus tedmoorei

C. tedmoorei has not been detected within the Subject Land during targeted surveys. Additional intersection upgrades were added to the Development Footprint, following the survey period and surveys were unable to be completed for *C. tedmoorei* (Bindweed). Due to this, presence was assumed for *C. tedmoorei* (Bindweed) at the site entrance intersection in areas of associated PCT 164.

This species is an 'area' species for unit of measure in the BAM-C. The species polygon is comprised of 0.17 ha of PCT 164 (assumed present) within the Stage 1 Footprint.

Eleocharis obicis

Eleocharis obicis (Spike Rush) was detected incidentally in the Subject Land within three BAM plots. Additional sightings have been located within the Project Area and adjacent property through separate projects (Energy Connect and Tchelery Wind Farm). These records were not available on BioNet at the time of the Baldon BDAR preparation. Surveys were undertaken during the Response to Submissions phase however conditions were too dry to survey for the species and known populations were not present. As such, the species could not be ruled out and presence was assumed within associated PCTs.

Eleocharis obicis is an 'area' species for unit of measure in the BAM-C but no further information is provided in the TBDC on determining species polygon. Associated PCTs listed in the NSW TBDC (DPE, 2025) and occurring within the Subject Land are PCT 17, 159, 160 and 163. PCT 159 is an associated PCT, however PCT 159 within the Subject Land is a planted community comprised of rows of Old Man Saltbush (*Atriplex nummularia*). This zone is not included as part of the species polygon, as a man-made community, it lacks the gilgais and wetlands that form part of *E. obicis* habitat.

The three records detected incidentally by NGH occurred in PCT 15 and PCT 28 and so these PCTs were also considered associated communities within the Subject Land. A species polygon was generated in all areas of PCT 15, 17, 28, 160 and 163 within the Subject Land.

The species polygon was clipped to the Stage 1 and Stage 2 Development Footprints to determine the species polygons entered into the BAM-C for each stage.

Little Eagle

Species polygon was created in accordance with the guidance in the TBDC (NSW DCCEEW, 2024). A 300 m buffer was created around nests trees where Little Eagle was detected actively breeding. The buffer allows for feeding/grooming perches and fledgling requirements. The 300 m buffer was clipped to the Stage 1 and Stage 2 Development Footprints to enter the impact area into the BAM-C. The species polygon for Little Eagle (*Hieraaetus morphnoides)* is shown in Figure 4-13 (refer to Appendix L.3 for Atlas series).

Southern Bell Frog

Species polygon was created in accordance with the guidance in the *NSW Survey Guide for Threatened Frogs* (DPIE, NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method, 2020b). A 200 m buffer was created from the high-water mark for all dams that had Southern Bell Frog (*Litoria raniformis)* observations or contained suitable habitat (refer to Southern Bell ***Frog***

Table 4-18). Due to the abundance of Southern Bell Frog (*Litoria raniformis)* observations, all dams which contained water were considered suitable habitat. Additional vegetated areas providing connectivity between dams were also considered as part of the species polygon. Whilst no dams would be removed by the project, foraging and migratory habitat within 200 m of the dams would be impacted. The 200 m buffer was clipped to the Stage 1 and Stage 2 Development Footprints to enter the impact area into the BAM-C. The species polygon for Southern Bell Frog (*Litoria raniformis)* is shown in Figure 4-13 (refer to Appendix L.3 for Atlas series).

Pink Cockatoo

Two active Pink Cockatoo nests were detected by subconsultants during Bird Utilisation surveys in the wider Project Area. Species polygons were created in accordance with the TBDC (DPE, 2025). A 200m buffer was applied to the active nest trees to determine the species polygons. The species polygon did not occur within the Development Footprint (Figure 4-13) and no impact areas have been added to the BAM-C.

Southern Myotis

Species polygons were created in accordance with the guidance in the document - "*Species credit' threatened bats and their habitats – NSW Guide for the Biodiversity Assessment Method*" (DPIE, 2021).

Habitat features were identified as farm dams greater than 3 m wide. Aerial imagery was used to map the high bank mark of 55 farm dams within 200m of the Subject Land. A 200m buffer was created around the farm dams.

Associated PCTS, listed in the TBDC, and occurring in the Subject Land are PCT 17 and PCT 160. Southern Myotis records in the Subject Land also occurred within PCT 28, 46 and 164. These five PCTS were selected as associated PCTs and providing habitat for Southern Myotis.

Where associated PCTs intersected with the 200m habitat buffer, a species polygon was created. The species polygon covered an area of 117.87 ha in the Subject Land. The species polygon was clipped to the Stage 1 and Stage 2 Development Footprints to enter the impact area into the BAM-C.

4.6.5 Further survey recommendations

Additional areas for the site intersection upgrades were added to the Development Footprint following the September 2024 surveys, and due to this, presence was assumed here for *Convolvulus tedmoorei, Brachyscome papillosa, Maireana cheelii* and *Swainsona murrayana* in a total of 0.17ha of suitable habitat.

Pre-clearance surveys are recommended for these species within this 0.17ha of suitable habitat within the site entrance intersection, particularly those listed as SAII species (*Convolvulus tedmoorei*) to confirm their presence or absence within the Development Footprint.

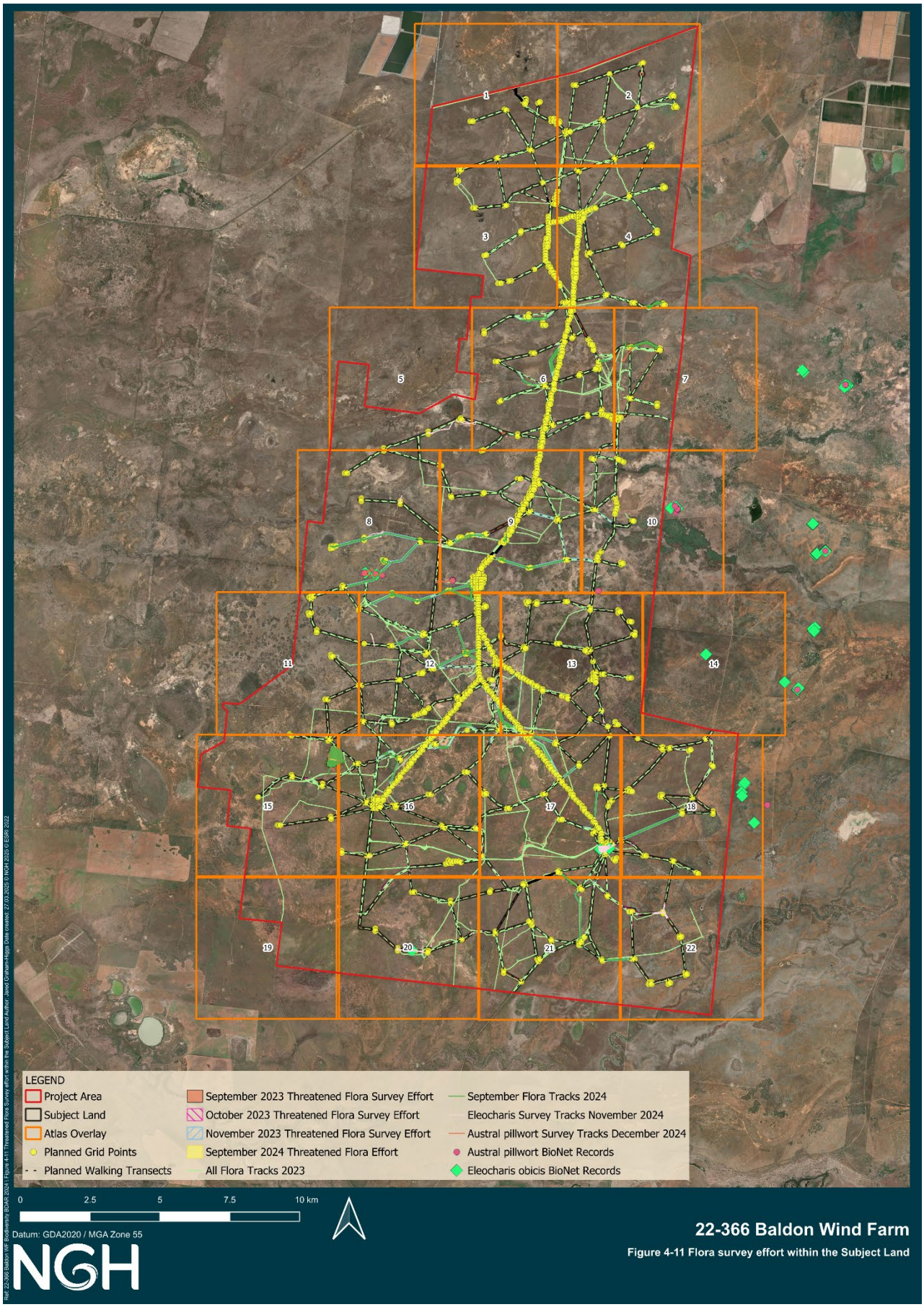


Figure 4-11 Flora survey effort within the Subject Land (refer to Appendix L.3 for Atlas series)

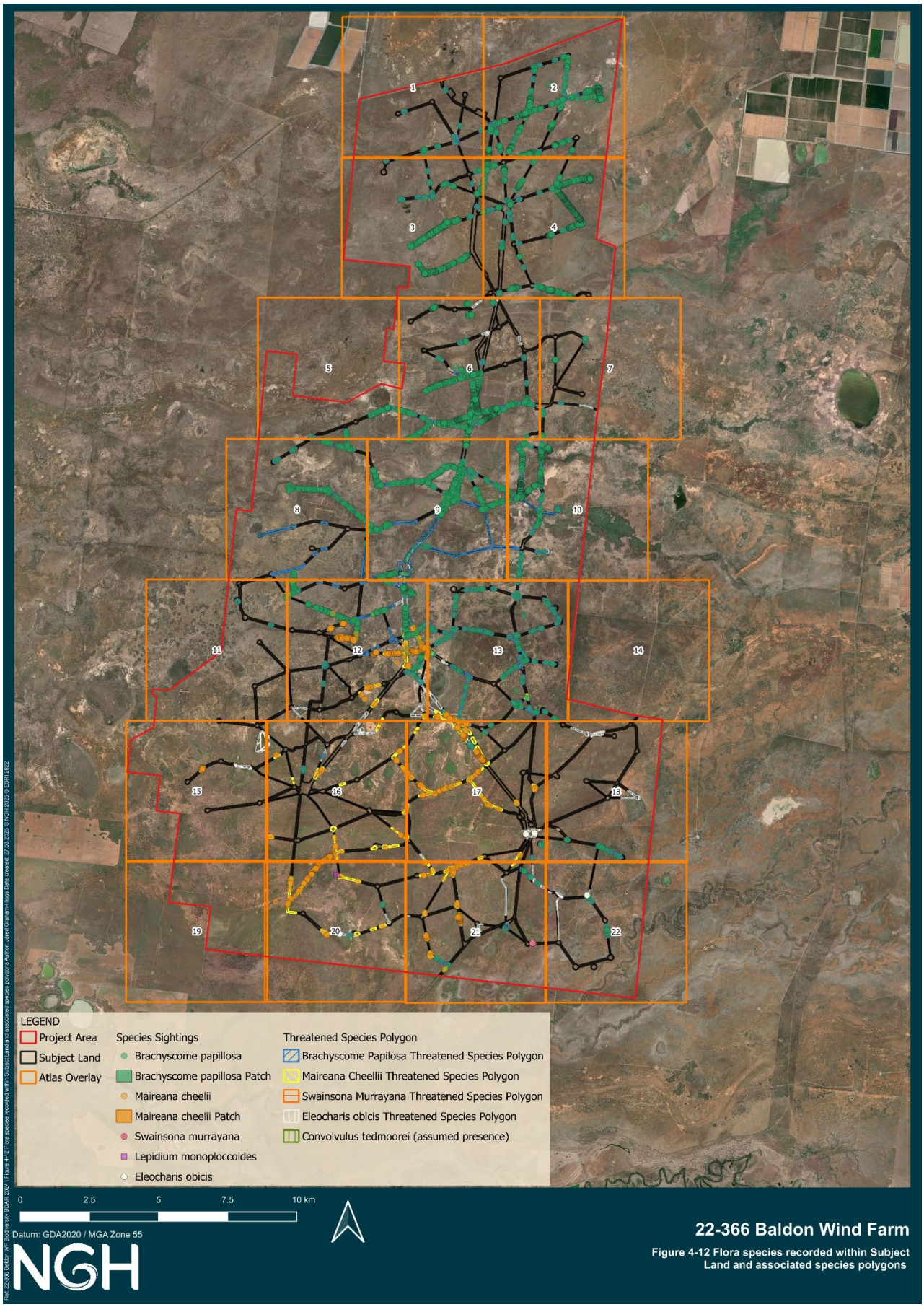


Figure 4-12 Flora species recorded within Subject Land and associated species polygons (refer to Appendix L.4 for Atlas series)

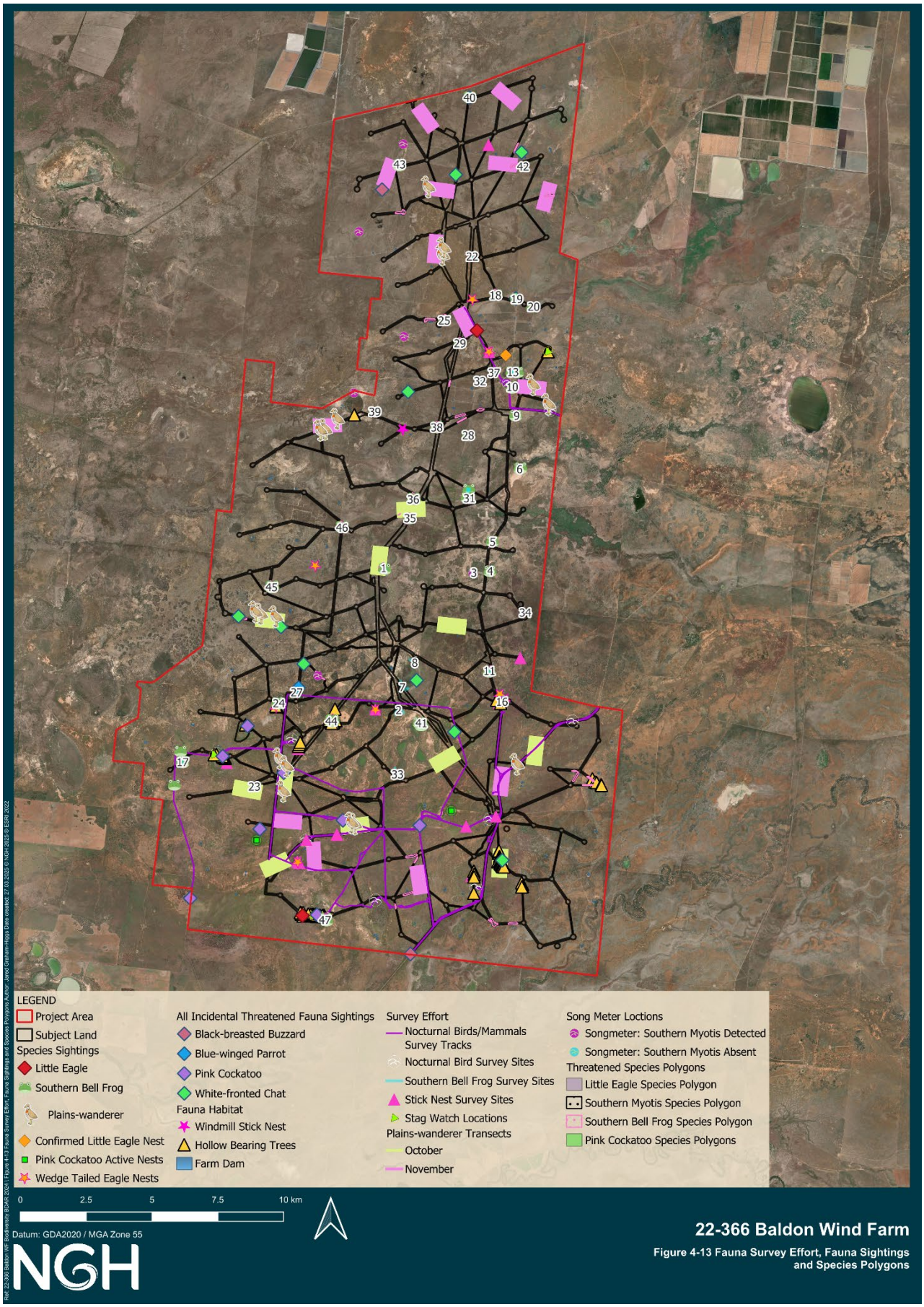


Figure 4-13 Fauna Survey Effort, Fauna Sightings and Species Polygons (refer to Appendix L.5 for Atlas series)

5. Matters of National Environmental Significance

An EPBC Act Protected Matters Report was generated on 05/12/2023 to identify Matters of National Environmental Significance (MNES) that have the potential to occur within 10km of the Project Area. Those relevant to this BDAR include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened Species
- Migratory Species

The Protected Matters Report was updated on 27/02/2025 for the Project Area (the wind farm site), as well as being undertaken for the new haul routes at the Balranald intersection upgrade and Euston intersection upgrade locations (Appendix Appendix B). The potential for these MNES to occur within these locations are discussed below.

5.1 Ramsar wetlands of international importance

Project Area

The EPBC Act Protected Matters Report identified the following four Ramsar Wetlands of International Importance downstream of the Subject Land:

- Banrock Station wetland complex 300 – 400km downstream
- Hattah-Kulkyne Lakes 100 – 150km downstream
- Riverland 200 – 300km downstream
- The Coorong, Lake Alexandria and Lake Albert wetland 400 – 500km downstream

The closest Ramsar Wetland of International Importance is the Hattah-kulkyne Lakes approximately 150km northwest.

Balranald intersection upgrade

The EPBC Act Protected Matters Report identified the following four Ramsar Wetlands of International Importance downstream of the Subject Land:

- Banrock Station wetland complex 200 – 300km downstream
- Hattah-Kulkyne Lakes 50 – 100km downstream
- Riverland 200 – 300km downstream
- The Coorong, Lake Alexandria and Lake Albert wetland 300 – 400km downstream

The closest Ramsar Wetland of International Importance is the Hattah-kulkyne Lakes approximately 100km west.

Euston intersection upgrade

The EPBC Act Protected Matters Report identified the following four Ramsar Wetlands of International Importance downstream of the Subject Land:

- Banrock Station wetland complex 200 – 300km downstream
- Hattah-Kulkyne Lakes 10 – 20km downstream
- Riverland 150 – 200km downstream
- The Coorong, Lake Alexandria and Lake Albert wetland 300 – 400km downstream

The closest Ramsar Wetland of International Importance is the Hattah-kulkyne Lakes approximately 30km southwest.

5.2 Threatened ecological communities (TECs)

Project Area

The EPBC Act Protected Matters Report identified five Threatened Ecological Communities, all considered 'likely to occur' in the search area:

- *Natural Grasslands of the Murray Valley Plains* (Critically Endangered under the EPBC Act)
- *Plains Mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions* (Critically Endangered under the EPBC Act)
- *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* (Endangered under the EPBC Act)
- *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* (Endangered under the EPBC Act)
- *Weeping Myall Woodlands* (Endangered under the EPBC Act)

A Habitat Evaluation table (Appendix B.2) was undertaken for these communities to determine if these TEC's are likely to occur within the Subject Land. One TEC, *Natural Grasslands of the Murray Valley Plains*, was considered likely to occur within the Subject Land, within areas of PCT 46. This community is described further in section 5.2.1 below. No characteristic species of the other four TECs were identified and these communities were not considered to occur within the Subject Land.

Balranald intersection upgrade

The EPBC Act Protected Matters Report identified five Threatened Ecological Communities, all considered 'likely to occur' in the search area:

- *Plains Mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions* (Critically Endangered under the EPBC Act)
- *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* (Endangered under the EPBC Act)
- *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* (Endangered under the EPBC Act)
- *Mallee Bird Community of the Murray Darling Depression Bioregion* (Endangered under the EPBC Act)
- *Weeping Myall Woodlands* (Endangered under the EPBC Act)

The vegetation within the roadside intersection upgrade areas at Balranald (Sturt Highway) are comprised of non-native vegetation. These areas are landscaped street verges comprised of exotic lawn grasses such as Kikuyu (*Cenchrus clandestinus*) and non-indigenous planted trees such as Sugar Gum (*Eucalyptus*

cladocalyx) and Crimson Bottlebrush (*Callistemon citrinus*). These areas do not comprise a plant community type and therefore are not associated with any of the TECs listed above. As a result, none of these TECs are considered to occur within the Balranald intersection site.

Euston intersection upgrade

The EPBC Act Protected Matters Report identified three Threatened Ecological Communities, all considered 'likely to occur' in the search area:

- *Plains Mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions* (Critically Endangered under the EPBC Act)
- *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* (Endangered under the EPBC Act)
- *Mallee Bird Community of the Murray Darling Depression Bioregion* (Endangered under the EPBC Act)

One PCT is present within the Euston intersection upgrade site, being PCT 153. This PCT is not associated with any EPBC Act listed TECs. Therefore, none of the above TECs are considered to occur within the site.

5.2.1 Natural Grasslands of the Murray Valley Plains

The Critically Endangered Ecological Community (CEEC) *Natural Grasslands of the Murray Valley Plains* occurs as an open grassland to forbland in which trees and tall shrubs are absent. The vegetation is dominated by the ground layer with a range of perennial grasses, forbs and small shrubs. The CEEC can be distinguished from other derived grasslands by the presence of indicator plant species that are typical of natural grasslands, but are uncommon in other grassland communities. The CEEC occurs predominantly across the southern parts of the Riverina Bioregion in NSW and Victoria, with the northern limit in NSW broadly corresponding to the northern boundary of the Murray Catchment Management Authority (CMA).

Within the Subject Land, one PCT is associated with this threatened community, *PCT 46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion*.

For a vegetation patch to meet the threatened ecological listing, it must meet specific listing advice of key characteristics and condition criteria, as outlined in Section 5 of the *Commonwealth Listing Advice on Natural Grasslands of the Murray Valley Plains* (TSSC, 2012). An initial analysis of the indicative distribution map (DSEWPaC 2012) determined that the Subject Land was located outside of the potential distribution of this TEC. However, the Subject Land is found within the Murray CMA, and therefore an assessment of the two-step key diagnostic characteristics and condition threshold criteria for this ecological community was undertaken.

Guidelines for sampling Natural Grasslands of the Murray Valley Plains are recommended as;

"Species richness should be assessed in a 20x20 m2 plot, with consideration given to the number of plots needed to adequately identify the diversity of the patch. Indicator species may also be detected using a random meander. The area with the highest level of structural and species richness of native species (i.e. the number of different species in a given area) should be adequately sampled to determine estimates of native species richness in each patch (TSSC, 2012)"

Timing of surveys is recommended to occur in late winter and spring or after significant rainfall events (TSSC, 2012).

BAM plots (20m x 20m) undertaken during the field surveys, were considered an appropriate sampling method, being undertaken in Spring 2023 following a good rainfall year.

There were ten patches of PCT 46 occurring in the Subject Land and these patches were assessed for their alignment to the *Natural Grasslands of the Murray Valley Plains* CEEC diagnostic characteristics. BAM plots used for assessing against the criteria are shown in Table 5-1 and Figure 5-1.

Table 5-1 Sampling effort in patches of PCT 46

Patch	Condition	Area (Ha)	BAM Plot numbers
1	High	81.86	13, 105, 106, 206
2	High	5.23	205
3	High	2.66	404
4	Moderate	6.06	403
5	High	7.07	104
6	High	8.57	101, 131, 132
7	High	13.07	8, 133
8	High	10.98	2
9	High	3.00	817 (Undertaken in Jan 2025 for assessment of CEEC patch)
10	High	2.58	18

The assessment of BAM plots within PCT 46 against Step 1 key diagnostic characteristics is shown in Table 5-2. A key feature of distinguishing natural grasslands from derived grasslands is the presence of more species shown in Table 1(A) than Table 1(B) of the Commonwealth listing advice (TSSC, 2012). Only one patch, (Patch 5), met the key diagnostic characteristics. This patch had the presence of one species (*Austrostipa nodosa*) from Table 1 (A) and one species occur in Table 1 (B) (refer to Appendix B.4.). Although there were minimal species representing a natural grassland, a precautionary approach was given to the assessment and Patch 5 was further considered in Step 2.

All remaining patches do not conform to the listed TEC due to having a greater number of species from Table 1 (B) than Table 1 (A). These patches are considered derived grassland rather than a natural grassland ecological community.

An assessment of Patch 5 met the Step 2 condition threshold, due to having 14 native vascular species recorded and having a patch size greater than 1 ha. Therefore, this patch (Patch 5) is considered to form part of the ecological community. This patch is located within the centre of the Subject Land (see Figure 5-1Figure 3-21, Appendix L.1 for Atlas series) and covers an area of 7.07 ha within the Subject Land.

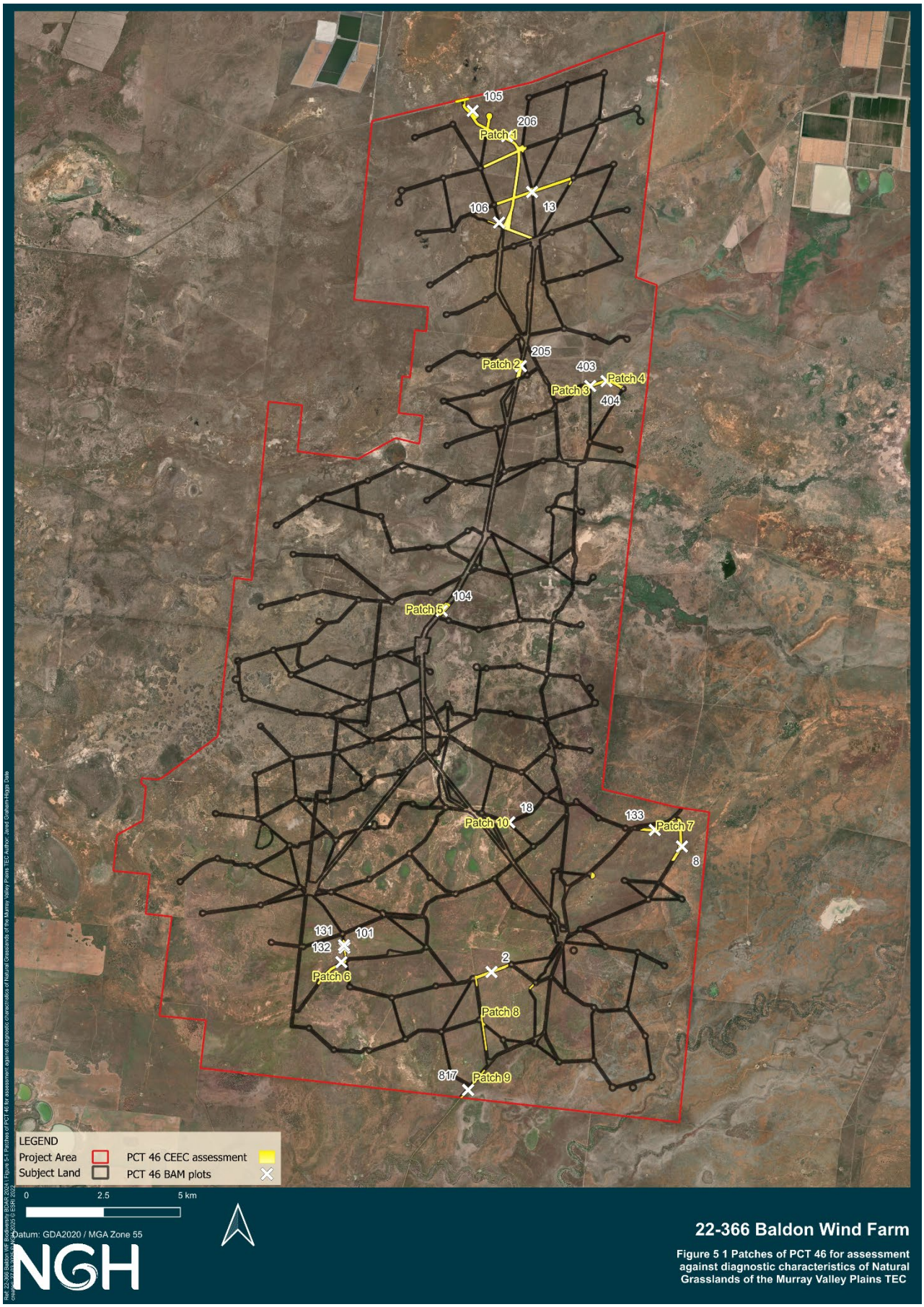


Figure 5-1 Patches of PCT 46 for assessment against diagnostic characteristics of *Natural Grasslands of the Murray Valley Plains* TEC

Table 5-2 Assessment Step 1: Assessment of key diagnostic characteristics against representative patches assigned to PCT 46

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
Distribution is primarily in the Riverina Bioregion and the Wimmera plains of the Murray Darling Depression Bioregion. Other outlying occurrences are also in the Murray Darling Depression Bioregion and the NSW South Western Slopes Bioregion. The approximate northern limit of the ecological community is in the Murrumbidgee subregion (IBRA RIV2), approximately near the northern boundary of the Murray Catchment Management Authority (CMA) in NSW.	Occurs in the Murrumbidgee subregion of the Riverina Bioregion.	Occurs in the Murrumbidgee subregion of the Riverina Bioregion.

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
It typically occurs on a landscape of flat alluvial lowland plains with heavy-textured grey, brown and red clays.	Occurs on red-brown clay on flat plains	Occurs on red-brown clay on flat plains.
The ecological community is typically dominated by a range of perennial grasses and/or forbs or co-dominated by small shrubs. Sites are not necessarily dominated by any particular plant species. Characteristic genera present typically include: for grasses – *Rytidosperma* (formerly Austrodanthonia1*), Austrostipa, Chloris* and *Enteropogon.* for forbs – *Arthropodium, Bulbine, Calotis,*	**Patch 1** • For grasses - *Austrostipa nodosa, Chloris truncata, Rytidosperma setaceum*, *Rytidosperma caespitosum* and *Enteropogon acicularis* were recorded. • For forbs - *Bulbine bulbosa*, *Calotis scabiosifolia, Chrysocephalum apiculatum, Leptorhynchos elongatus, Rhodanthe corymbiflora, Rhodanthe floribunda, Sida ammophila, Sida intricata, and Sida trichopoda* were recorded. • For shrubs -*Atriplex pseudocampanulata* and *Maireana aphylla* was recorded. **Patch 2** • For grasses - *Rytidosperma setaceum, Austrostipa scabra* and *Chloris truncata* were present. • For forbs - *Minuria integerrima, Sida corrugata, Calotis scabiosifolia, Sida trichopoda, Leptorhynchos elongatus, Rhodanthe floribunda* and *Chrysocephalum apiculatum*	**Patch 4** • For grasses - *Austrostipa nodosa, Austrostipa scabra, Chloris truncate, Enteropogon ramosus* and *Rytidosperma setaceum* were recorded. • For forbs -*Chrysocephalum apiculatum, Minuria leptophylla* and *Sida corrugata* were recorded. • For shrubs - *Maireana pentagona* and *Maireana aphylla* were recorded.

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
Chrysocephalum, Leptorhynchos, Minuria, Ptilotus, Rhodanthe, Sida and *Swainsona*. for small shrubs – *Atriplex* and *Maireana.*	were present. • For shrubs - *Maireana aphylla* was present. **Patch 3** • For grasses - *Chloris truncata, Enteropogon ramosus* and *Rytidosperma caespitosum* were present. • For forbs - *Calotis scabiosifolia* and *Sida corrugata* were present. • For shrubs - *Maireana pentagona, Atriplex pseudocampanulata, Atriplex semibaccata, Maireana aphylla* and *Maireana decalvans* were present. **Patch 5** • For grasses - *Austrostipa nodosa, Rytidosperma caespitosum* and *Rytidosperma setaceum* were recorded. • For forbs - *Calotis scabiosifolia, Leptorhynchos elongatus* and *Rhodanthe floribunda* were recorded. • For shrubs - *Atriplex semibaccata* and *Maireana aphylla* were recorded. **Patch 6** • For grasses - *Austrostipa nodosa, Austrostipa nitida, Rytidosperma caespitosum, Rytidosperma setaceum* and *Enteropogon acicularis* were recorded. • For forbs - *Chrysocephalum apiculatum, Leptorhynchos*	

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
	elongatus, Minuria cunninghamii, Sida corrugata and Sida *intricata* was recorded. • For shrubs -*Atriplex leptocarpa, Atriplex lindleyi, Atriplex vesicaria, Atriplex semibaccata, Maireana pyramidata, Maireana ciliata* and *Maireana aphylla* were recorded. **Patch 7** • For grasses - *Austrostipa nitida, Austrostipa nodosa, Chloris truncata, Enteropogon ramosus* and *Rytidosperma caespitosum* were present. • For forbs - *Sida intricata, Sida corrugata, Vittadinia gracilis, V. muelleri* and *Wahlenbergia gracilis* were present. • For shrubs - *Maireana aphylla, Maireana pyramidata, Atriplex semibaccata, Atriplex leptocarpa, Sclerolaena muricata and Rhagodia spinescens* were present. • For trees – *Acacia oswaldii* was present **Patch 8** • For grasses - *Austrostipa spp., Enteropogon ramosus and Rytidosperma caespitosum* were recorded. • For forbs - *Calotis scabiosifolia, Rhodanthe corymbiflora* and *Sida ammophila* were recorded. • For shrubs - *Atriplex pseudocampanulata, Atriplex vesicaria, Maireana aphylla* and *Maireana cheelii* were	

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
	recorded. **Patch 9** • For grasses - *Austrostipa nodos., Enteropogon spp. and Rytidosperma spp.* were recorded. • For forbs - *Cressa australis, Sida sp. and Solanum sp.* were recorded. • For shrubs - *Atriplex leptocarpa, Atriplex lindleyi, Atriplex semibaccata, Maireana pentagona* and *Maireana aphylla* were recorded. **Plot 10** • For grasses - *Austrostipa nodosa, Rytidosperma setaceum, Rytidosperma sp., Chloris truncata* and *Enteropogon ramosus* were recorded. • For forbs - *Bulbine bulbosa*, *Calotis scabiosifolia, Leptorhynchos elongatus* and *Rhodanthe corymbiflora* were recorded. • For shrubs - *Atriplex leptocarpa, Atriplex pseudocampanulata, Atriplex semibaccata* and *Maireana aphylla* was recorded.	
Trees and large shrubs (>1 m tall) are generally	Trees and large shrubs were absent or sparse. *Acacia oswaldii*	Trees and large shrubs were absent.

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
absent to sparse, amounting to less than 10% projective foliage cover for emergent trees or shrubs. Where tree and large shrub species are present they may often include *Acacia oswaldii* (umbrella wattle), *A. pendula* (weeping myall, boree), *Allocasuarina luehmannii* (buloke) and *Eucalyptus* spp. from intergrading communities. Where woodlands overlap or adjoin with the ecological community, they are not included as part of the Natural Grasslands of the Murray Valley Plains. The outer boundary for these adjacent ecological communities should be defined as two times the	present in patch 7.	

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
canopy width of the dominant tree species.		
The patch should contain at least as many, preferably more, of the species in Table 1(A) than in Table 1(B) (of the Listing Advice, (TSSC, 2012), when assessed at an appropriate time (e.g. late winter/spring and not soon after disturbance such as grazing). The species in Table 1(A) are characteristic of the natural grasslands ecological community and not derived grasslands, and the opposite applies to Table 1(B).	**Patch 1** • Within 4 representative plots, 4 species occur in Table 1 (A) and 10 occur in Table 1 (B). **Patch 2** • Of the 25 native species recorded within a representative plot, 1 occur in Table 1 (A) and 5 occur in Table 1 (B). **Patch 3** • Of the 27 native species recorded within a representative plot, 0 occur in Table 1 (A) and 7 occur in Table 1 (B). **Patch 5** • Of the 14 native species recorded within a representative plot, 1 occur in Table 1 (A) and 1 occur in Table 1 (B). **Patch 6** • Within 3 representative plots, 1 species occur in Table 1 (A) and 12 occur in Table 1 (B). **Patch 7** • Within 2 representative plots, 1 occur in Table 1 (A) and 5	**Patch 11** • Of the 24 native species present within this plot, 0 occur in Table 1 (A) and 6 occur in Table 1 (B). **Patch 4** • Of the 26 native species present within this plot, 2 occur in Table 1 (A) and 5 occur in Table 1 (B).

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
	occur in Table 1 (B). **Patch 8** • Of the 23 native species recorded within a representative plot, 2 occur in Table 1 (A) and 9 occur in Table 1 (B). **Patch 9** • Of the 20 native species recorded within a representative plot, 2 occur in Table 1 (A) and 5 occur in Table 1 (B). **Patch 10** • Of the 34 native species recorded within this plot, 2 occur in Table 1 (A) and 7 occur in Table 1 (B).	
If there is reliable evidence (e.g. historical records, photographs) that a patch was once a woodland or shrubland with >10% cover (of trees, shrubs >1m), then the patch is not considered to be part of the ecological community.	There is no evidence that the patch was once a woodland or shrubland.	There is no evidence that the patch was once a woodland or shrubland.

Diagnostic Characteristics (TSSC, 2012)	PCT 46 – High	PCT 46 - Moderate
Soil type and landscape position (e.g. alluvial soils, plains) that correspond with the ecological community and not other vegetation types may also assist in identifying the likely occurrence of natural grasslands ecological community.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.
Conclusion	Patch 5 has an equal number of species in Table 1(A) and Table 1 (B). This is comprised of only one species (*Austrostipa nodosa*) representative of Table 1(A) and one species (*Sclerolaena muricata*) representative of Table 1 (B). Although there are minimal representative species in Table 1(A), and only an equal number of species (not more) a precautionary approach has been adopted for this patch and the assessment considers the Step 1 – key diagnostic characteristics have been met. Proceed to Step 2. The remaining patches do not conform to the listed TEC due to having a greater number of species from Table 1 (B) than Table 1 (A). These patches are considered derived grassland rather than a natural grassland ecological community.	The moderate condition patch does not conform to the listed TEC due to having a greater number of species from Table 1 (B) than Table 1 (A). The PCT 46 moderate zone is considered a derived grassland rather than a natural grassland ecological community.

Table 5-3 Assessment Step 2: Assessment of condition of the ecological community for representative patches that meet Step 1 key diagnostic characteristics

Condition threshold	Plot 104
For all patches of the ecological community. The percentage cover of native vascular plants (annual and perennial) in the patch is greater than the percentage cover of perennial exotic species. AND Either category A or category B thresholds are met as below	Meets threshold. Native vascular cover was recorded at 49.3% with exotic cover recorded at 7.4%.
Category A. For patches with high diversity or that are relatively undisturbed. This recognises that many patches of the ecological community can maintain their diversity despite the highly fragmented nature of the community or small patch sizes: A1. 15 or more vascular plant species are present in the patch. AND A2. The patch contains one or more indicator species in Table 2, characteristic of sites that are relatively undisturbed (e.g. have little to no history of cultivation). AND Patch size: A3. The size of the grassland patch is at least 0.04 ha or more in size (i.e. at least 400 m2 or a 20m x 20 m square or equivalent area in any shape.	A1. Does not meet condition with 14 native vascular plant species recorded. *Go to Category B.*
Category B.	B1. Meets condition threshold with 14 native vascular species recorded.

Condition threshold	Plot 104
For larger patches that have good ground layer diversity: This applies where patches of the ecological community do not meet the high diversity or lack or disturbance criteria in Category A, but still retain sufficient elements of their natural diversity. Ground layer diversity: B1. 10 or more native vascular plant species are present in the patch. AND Patch size: B2. The size of the grassland patch is at least 1 ha or more in size (i.e. at least 10 000 m2 or a 100 m x 100 m square or equivalent area in any shape).	B2. Meets condition threshold with patch size exceeding 1 ha in size (patch size 7.07 ha).
Conclusion	Meets Step 2 (Category B) – condition threshold and forms part of the ecological community.

5.3 Threatened species

Project Area

The EPBC Act Protected Matters Report identified 36 threatened species with the potential to occur within a 10km locality of the Subject Land. The full list of species is provided in the Habitat Evaluation Table in Appendix B.2. Of these species, sixteen were considered likely to utilise habitat found within the Subject Land:

Flora

- Chariot Wheels *Maireana cheelii* – Vulnerable
- Winged Peppercress *Lepidium monoplocoides* - Endangered
- Mossgiel Daisy *Brachyscome papillosa* – Vulnerable
- Slender Darling Pea *Swainsona murrayana* – Vulnerable

Fauna

- Plains-wanderer *Pedionomus torquatus* – Critically Endangered
- Curlew Sandpiper *Calidris ferruginea* – Critically Endangered, Migratory
- Pink Cockatoo (eastern) *Lophochroa leadbeateri* – Endangered
- South-eastern Hooded Robin *Melanodryas cucullata cucullata* – Endangered
- Southern Whiteface *Aphelocephala leucopsis* – Vulnerable
- Blue-winged Parrot *Neophema chrysostoma* – Vulnerable
- Diamond Firetail *Stagonopleura guttata* – Vulnerable
- Southern Bell Frog *Litoria raniformis* – Vulnerable
- Corben's Long-eared Bat *Nyctophilus corbeni* – Vulnerable
- Common Greenshank *Tringa nebularia* – Endangered, Migratory
- Latham's Snipe, Japanese Snipe *Gallinago hardwickii* – Vulnerable, Migratory
- Sharp-tailed Sandpiper *Calidris acuminata* – Vulnerable, Migratory

Six of these species were recorded within the Subject Land, both incidentally and during targeted surveys, including Chariot Wheels (*Maireana cheelii),* Mossgiel Daisy *(Brachyscome papillosa),* Slender Darling Pea (*Swainsona* murrayana), Southern Bell Frog (*Litoria raniformis)*, Plains-wanderer (*Pedionomus torquatus*) and Pink Cockatoo (*Lophochroa leadbeateri)*.

One additional flora species, Spike-rush (*Eleocharis obicis*) listed as Vulnerable under the EPBC Act, was not returned from the Protected Matters Report however was incidentally recorded within three BAM plots. Additionally, there are a total of 76 BioNet records within 10km of the Subject Land.

Additionally, one fauna species, White-throated Needletail (*Hirundapus caudacutus*) listed as Vulnerable under the EPBC Act, was not returned from the Protected Matters Report, however was generated in the BAM-C as an ecosystem credit associated with four PCTs within the Subject Land.

These species were both added to the habitat table and are considered as part of the impact assessment.

The impact assessment for the above species is provided in section 8.6.2

Balranald intersection upgrade

The EPBC Act Protected Matters Report identified 35 threatened species with the potential to occur within a 10km locality of the Subject Land at this location. No species are considered likely to utilise the habitat found within the Balranald intersection upgrade site due to its exotic nature.

Euston intersection upgrade

The EPBC Act Protected Matters Report identified 38 threatened species with the potential to occur within a 10km locality of the Subject Land at this location. No species are considered likely to utilise habitat found within the Euston intersection upgrade site due to its degraded condition.

5.4 Migratory species

Project Area

The EPBC Act Protected Matters Report identified 14 listed migratory species with the potential to occur within the search area. The full list of species is provided in the Habitat Evaluation Table in Appendix B.2. Of these species, 12 were considered likely to utilise habitat found within the Development Footprint:

- Marsh Sandpiper *Tringa stagnatilis*
- Common Greenshank *Tringa nebularia*
- Wood Sandpiper *Tringa Glareola*
- Caspian Tern *Hydroprogne caspia*
- Gull-billed Tern *Gelochelidon nilotica*
- Yellow Wagtail *Motacilla flava*
- Fork-tailed Swift *Apus pacificus*
- Common Sandpiper *Actitis hypoleucos*
- Sharp-tailed Sandpiper *Calidris acuminata*
- Curlew Sandpiper *Calidris ferruginea*
- Pectoral Sandpiper *Calidris melanotos*
- Latham's Snipe *Gallinago hardwickii*

One additional species, Gull-billed Tern (*Gelochelidon nilotica)* was not returned from the Protected Matters Search report, however was recorded within the Subject Land, during targeted BUS surveys. There were four individuals recorded at one location, within a grassland patch dominated by Spear Grasses (*Austrostipa* spp.), in proximity to planted rows of Old Man Saltbush *(Atriplex nummularia*), in the north of the Project Area.

Balranald intersection upgrade

The EPBC Act Protected Matters Report identified seven listed migratory species with the potential to occur within the search area. None of these species are considered utilise the habitat found within the Euston intersection upgrade site.

Euston intersection upgrade

The EPBC Act Protected Matters Report identified eight listed migratory species with the potential to occur within the search area. None of these species are considered utilise the habitat found within the Euston intersection upgrade site, due to its degraded condition

6. Identifying prescribed biodiversity impacts

6.1.1 Occurrences of karst, caves, crevices and cliffs, rocks and other geological features

As verified by the field inspection, there are no occurrences of karst, caves, crevices, cliffs or rocky outcrops in the Subject Land.

6.1.2 Occurrences of human-made structures and non-native vegetation

The Project Area contains multiple human made structures, including houses, sheds, sheep yards, windmills, powerlines and other structures associated with agricultural production. Raptors have been observed utilising windmills as nest sites (Figure 6-1). These features do not fall within the Subject Land and would not be impacted by the proposal.

There are a number of roads within the Subject Land, including Baldon Road in the southeast of the project area, and a number of formed internal farm tracks which do not contain vegetation. These roads have the potential to be utilised as movement corridors by fauna species however are not considered to provide habitat for threatened species.



Figure 6-1 Raptor nest on old windmill within the Project Area, adjacent to Subject Land

6.1.3 Occurrences of habitat connectivity

The Subject Land is connected to native shrubland and grassland vegetation on the eastern, southern, and western boundaries, allowing the unimpeded movement of wildlife between the Subject Land and habitat in the surrounding area. The Sturt highway is located on the northern boundary of the Subject Land and could be a barrier to ground dwelling fauna. For the purposes of this assessment, no offsite clearing for road upgrades or haulage is considered and there would be no indirect impacts on connectivity from offsite road upgrades.

The Murray River is located 48km southwest of the Project Area. The land between the Murray River and the Project Area is farmland used for cropping and grazing, with native vegetation along waterways forming a connection allowing the movement of wildlife between these areas.

Woodland connectivity is limited with fragmented and isolated woodland patches dispersed across the Subject Land with minimal connection. Habitat connectivity is limited to grassland and shrubland dependent species that do not require trees for movement. Threatened species that could use the shrubland habitat connectivity provided by the Subject Land are;

- Plains-wanderer (*Pedionomus torquatus*)
- Redthroat (Pyrrholaemus brunneus)
- Southern Bell Frog (Litoria raniformis)
- Western Blue-tongued Lizard (Tiliqua occipitalis)
- White-fronted Chat (Epthianura albifrons)

6.1.4 Water bodies, water quality and hydrological processes

There are three streams, 265 canals, 25 wetlands and 182 dams present within the Subject Land. All streams are considered ephemeral with two being 9th Strahler order and one being 1st Strahler order. The canals have been dry when NGH has surveyed the Subject Land due to irrigation no longer being undertaken within the Subject Land. The wetlands are not permanent. There has been water in a number of dams during surveys. These provide habitat for Southern Bell Frogs and a water source for wildlife and livestock. Floating vegetation and riparian vegetation has been noted as being present in dams which had retained water during surveys.

Threatened fauna species that could rely on the waterbodies within the Subject Land for all or part of their life cycle include:

- Southern Bell Frog (*Litoria raniformis*)
- Southern Myotis (*Myotis macropus*)
- Blue-billed Duck (*Oxyura australis*)
- Freckled Duck (*Stictonetta naevosa*)
- Australian Painted Snipe (*Rostratula australis*)
- Gull-billed Tern (*Gelochelidon nilotica*)

Hydrology studies were undertaken to determine the potential impact of heavy rainfall and flooding on the Project Site and surrounds (BMT, 2025). Baseline scenario results indicate that surface flows are of relatively low velocity, due to shallow grades in the catchment and presence of significant storage areas (BMT, 2025). There is a low risk of flooding and sedimentation of threatened flora habitats and the *Natural Grassland of the Murray Valley Plains* TEC following high rainfall events. This would mostly occur as runoff from altered landscapes including new access tracks.

Natural Grasslands of the Murray Valley Plains TEC occurs predominantly on flat, alluvial lowland plains with heavy-textured grey, brown and red clays. Altered hydrology is not a key threatening process to this TEC (TSSC, 2012) and is unlikely to be significantly impacted by any changes in hydrology from construction.

Threatened flora species that have a low likelihood of impact due to altered hydrology include:

- Chariot Wheels *(Maireana cheelii)*
- Spike-rush (*Eleocharis obicis*)
- Mossgiel Daisy *(Brachyscome papillosa)*
- Slender Darling-pea *(Swainsona murrayana)*

The Mossgiel Daisy *(Brachyscome papillosa)* inhabits primarily clay soils on Bladder Saltbush, which occurs in the Project Site. The main potential threats to this species include changes in agricultural practices, which may include altered hydrology, habitat disturbance during road maintenance and grazing by stock (DCCEEW, 2008). Chariot Wheels (*Maireana cheelii*) is found on floodplains in chenopod shrubland and grassland communities on heavy clay soils. Across NSW, the species appears to mostly grow on heavy brown to red-brown clay-loams, hard cracking red clay, and other heavy texture-contrast soils. This species is often found on low-lying sites that become waterlogged (DCCEEW, 2024). The Slender Darling-pea *(Swainsona murrayana)* grows in heavy grey or brown clay, loam, or red clacking clays and often found in depressions. In terms of hydrology impacts, this species is at most risk of habitat salinisation due to urban development, which is unlikely to occur from the described construction activities (DCCEEW, 2008). Spike-rush (*Eleocharis obicis*) is dependent on ephemeral wet areas, such as depressions and drainage lines. Threats to habitat include changes to hydrology and disruptions to waterflows (DCCEEW, 2008).

Abercrombie Creek, a 9th order stream runs East to West across the centre of the Project Area. It drains into lakes and wetlands (Lake Leriwa, Upper Sandhill Lake, Big Sandhill Lake, Lake Merwin) and floodplains of the Edward River and Murrumbidgee River. Tributaries and Lakes that flow into the regulated portion of the Murrumbidgee and Murray River can form part of the *Lower Murray River aquatic ecological community*, listed as Endangered under the Fisheries Management Act (FM Act). This community includes all native fish and aquatic invertebrates that occur within the waterways. Abercrombie Creek, is an ephemeral waterway which was dry during the survey period, and there were no native fish or aquatic invertebrates present.

As threatened species and communities listed under the FM Act are not part of the BAM, impacts, safeguarding and mitigation measures for the *Lower Murray River aquatic ecological community* are addressed in Section 6.3 of the Baldon Wind Farm Environmental Impact Statement (NGH 2024).

6.1.5 Wind farm developments

The operation of wind turbines presents a risk to a range of birds and bats. The main risk is mortality through collision with moving turbine blades (blade-strike), although alienation (behavioural avoidance of suitable habitat near infrastructure) is also an important issue to consider. A summary of the general impact risks to birds and bats from collisions and habitat avoidance is provided below, followed by a summary of the bird and bat species considered likely to be at risk from the project.

Birds and bats flying within or close to the rotor swept area (RSA) are at risk of collision impacts. This is the area of air space defined by the rotation of the turbine blade. As well as direct collision with infrastructure, the rotating blades produce a wake with turbulence, eddies and blade-tip vortices; the wake is principally behind the turbine (Sanderse, 2009). The extent of the wake is influenced by factors including blade design and landscape location. The wake extends behind the turbines at least three blade-diameters (Holland,

2008), attenuating with distance. The lateral extent of the wake appears to be less than a blade length (Maalouf, Dobrev, & Massouh, 2009), but this is not well studied. In summary, the wind turbine primarily presents a collision risk to birds and bats that fly within RSA height. An additional risk occurs for species that are affected by the wake. Therefore, the ground clearance of the RSA relative to the flying height of bird species is a key consideration.

Within a wind farm design layout there is potential for some turbines to contribute a higher collision risk to bird and bat species (Thelander, 2004; Kunz, et al., 2007; Marques, et al., 2014). BUS survey points were chosen to be representative of the habitat types present at a wind farm site and are therefore not conducted at every potential turbine location. Additionally, wind farm design typically changes during the BUS pre-approval period, in response to emerging ecological risks identified during surveys.

Whilst it is challenging to accurately classify all turbines with a risk level on the basis of pre-construction survey data, higher risk turbines are typically located in areas where bird and bat collisions are considered more likely to occur, due to proximity to:

- Steep topography: gully heads, ridge lines, deep valleys and escarpments. These areas can concentrate migrating birds along relatively narrow pathways. They also provide updraughts utilised by swifts, swallows, martins, gulls and raptors. Baldon Wind Farm is within a flat plain and this is not considered a concern for the Project Design.
- Wetlands: marsh, pond, lake, stream, and/or river. Higher concentrations of birds and bats would be encountered near water sources. Water bodies may also provide staging areas for migrating waterbirds. Turbines have not been located in permanent wetland areas minimising risk.
- Dense vegetation areas: woodland, forest, tree lines, tree clusters supporting habitat resources such as hollow-bearing trees. Narrow flight corridors usually occur through gaps between habitat patches. The project design of the wind farm has avoided dense woodland areas.

Alienation impacts

Operational wind turbines may cause changes in bird and bat behaviour (Marques, et al., 2014). Where such behaviour includes avoiding nesting or foraging resources or diverging around the broad area where turbines are located, this is termed an 'alienation' or 'barrier' effect. The turbines in these instances act to 'sterilise' otherwise suitable areas of habitat or movement pathways. Alienation may affect local sedentary birds such as Plains-wanderer (*Pedionomus torquatus)*, White-fronted Chat (*Epthianura albifrons)* in their daily traverses for foraging, roosting and breeding sites or may cause migratory birds such as Gull-billed Tern (*Gelochelidon nilotica)* to shift migratory flyways. Birds and bats may be forced to change their flight behaviour to avoid collisions with turbines, subsequently impacting on their breeding and foraging success (Drewitt & Langston, 2006). The Blue-winged Parrot is a partial migrant, with variable numbers of birds migrating across the Bass Strait in winter. Some birds are known to reach south-eastern New South Wales and eastern Victoria, particularly on southern migration (DCCEEW, 2023). Barrier effects have been demonstrated at offshore wind farms in Europe, however there is little evidence at onshore wind farms (Hull & Muir, 2013; Environment Protection and Heritage Council, 2010; Hull, Starke, Peruzzo, & Sims, 2013). Whilst habitat avoidance may be a potential impact arising from the operation of the wind farm, the particular habitat types found within the Project Area are abundant and widely distributed in the locality and as such, the level of risk of alienation impacts to bird and bat species arising from the wind farm operation is considered to be low.

BUS surveys observed no strong patterns in preferred flight paths are apparent from mapped raptor flight paths (Figure 6-3). Flight paths are largely biased toward BUS points and routes between BUS points. Some species are more widely distributed across the site than others. Black Kite, Nankeen Kestrel, and Wedge-tailed Eagle have the most extensive flight paths, suggesting they are the most mobile and frequently observed across various areas. In contrast, some species, such as the Black Falcon and Spotted Harrier, had more localised and limited flight observations. The site is relatively flat with no ridge lines or slopes generating regular updrafts for raptors to use. Flight paths are likely to be more influenced by preferred hunting habitat and perching and nesting locations rather than topography. Habitats on site are relatively uniform and mosaic, and flight paths are likely to be relatively evenly spread across the site.

The Project Area is located between a number of important wetlands within the region including the Gayini and Edward Wakool systems (approximately 40km north and 40km south respectively). As areas of extensive floodplain wetland complexes representing some of the largest and most ecological significant habitats remaining in the southern Murray-Darling Basin, waterbird species have the potential to fly over the Project Area when moving between these wetlands. Threatened species that have the potential to occur at least as a flyover between these wetlands in the region include:

- Australian Painted Snipe (*Rostratula australis*)
- Australasian Bittern (*Botaurus poiciloptilus*)
- Blue-billed Duck (*Oxyura australis*)
- Common Greenshank (*Tringa nebularia*)

Despite mostly spending their time at ground level, these species may fly at higher altitudes when travelling between these wetlands. Though recent studies show that the site lies within landscape level flyways for several species, current mapping of these flyways is generally at a continental scale, and too broad to draw robust conclusions about the impact of project infrastructure on these flyways. Waterbirds generally prefer to follow waterway corridors when moving between wetlands, rather than long distances over open ground ((McGinness, 2024). There are no prominent waterways connecting wetlands on or adjacent to the Project Area. Due to the lack of large waterbodies within several kilometres of the site, and the distance of the site from the main waterway movement corridors, regular movements of waterbirds over the site in important numbers are unlikely. Given the low frequency of occurrence of waterbird movements across the site and generally lower activity at RSA height, it is considered unlikely that these species would have their flight paths impacted by the wind farm.

Barotrauma impacts

Barotrauma is used to describe injuries caused when an animal encounters a sudden and extreme change in atmospheric pressure. The rapid change in air pressure causes air-containing structures (such as the lungs) to rupture, leading to injuries or death (Baerwald, D'Amours, Klug, & Barclay, 2008). Bat deaths at wind farms have been partly attributed to barotrauma due to the air pressure changes that occur around rotating turbine blades (Baerwald, D'Amours, Klug, & Barclay, 2008). However, recent research has brought this theory into doubt. Rollins et al. (2012) found that bat deaths at wind farms were more likely to be attributed to collisions rather than barotrauma. Houck (2012) found that the pressure changes at rotating wind turbines was minimal and below that which is known to cause barotrauma in other small mammals. Further, the study found that there were few scenarios of movement near rotating blades in which the pressure changes would cause injury. The studies concluded that the majority of deaths of bats at wind farms are likely to be through collisions with turbines rather than from barotrauma.

Typical at-risk species

Generally speaking, birds at risk of collision are those that frequent the RSA (Hull, Starke, Peruzzo, & Sims, 2013). Not all species of bird are at equal risk of collision with turbines. Generally, the identified groups at higher risk are (Kingsley & Whittam, 2003; Kunz, et al., 2007; Marques, et al., 2014):

- Raptors: Soaring birds use landform features such as elevation, ridges and slopes to cruise and take ascendance. Further, they are generally higher order species, meaning they are less abundant and therefore more susceptible to population level impacts.
- Passerines: Passerines have been among the most frequently reported fatalities at wind farms in Europe, America and Australia. Breeding birds in the vicinity of wind farms may be at greater collision risk if displaying aerial courtship. Migrating and nomadic passerines typically fly at altitudes of 150m or higher.
- Waterbirds: waterbird (i.e., grebes, cormorants, ducks, waders, cranes, rails, crakes, gulls, shorebirds) fatalities have been reported worldwide at wind farms close to staging, breeding and wintering areas.

In addition, wind farm sites may be frequented by scavenger species (e.g., crows, raptors), attracted by crops, livestock or carrion, resulting in an increased risk of collisions with turbines.

However, publicly available carcass monitoring data from Australian wind farms, which is restricted mainly to several facilities in Tasmania, have found no single foraging or taxonomic guild to predominate amongst mortalities. Species colliding with wind farms include carnivores, scavengers, nectivores and ground- and aerial-feeders (Cunningham, et al., 2018).

Australian carcass monitoring results reviewed by Hull et al. (2013) suggest that approximately 20% of the bird species present at the wind farm are involved in collisions; common species were found to be at most risk of colliding with turbines rather than rare or threatened species, based on their higher abundance. However, De Lucas et al. (2008) found no clear relationship between species abundance and species mortality (overseas study).

Bats, and more specifically microbats, are the second largest group of vertebrates to be impacted by collision impacts at wind farms worldwide (Cryan & Brown, 2007; Kunz, et al., 2007). In terms of blade-strike, Australian species that appear to be most at risk are those that forage well above canopy height (i.e., in open airspace) and move through their environment at high speeds, such as the White-striped Freetail Bat (*Austronomus australis*). These species are more likely to travel at the RSA. Collisions result either where the individual fails to detect the moving blades or is unable to manoeuvre around them.

Another group of microbats that appears to be at high risk from wind farms, based on international studies, are those that migrate (Baerwald, D'Amours, Klug, & Barclay, 2008). Migrating bats are thought to travel high in the air column on 'auto pilot'. That is they appear to rely less on echolocation when migrating, instead navigating using alternative spatial senses or orographic features such as mountain ranges (Baerwald, D'Amours, Klug, & Barclay, 2008; Popa-Lisseanu & Voight, 2009). Consequently, migrating bats may fail to detect wind turbines.

Based on the above, two groups of Australian bats can be identified as higher risk from blade-strike impacts:

- Non-migrating, high-flying microbats
- Migrating, high-flying microbats, particularly those of conservation concern.

Further information on impacts to birds and bats specific to Baldon Wind Farm is provided in Section 8.3.4. This includes the results of surveys and collision risk assessment at the Project Area.

Targeted surveys and background searches have identified the following threatened and migratory species shown in Table 6-1 as being present on the Subject Land or likely to use or fly over the Subject Land during migration. Assessment of impacts to these species is discussed in Section 8.3.4.

Plains-wanderer (*Pedionomus torquatus)* is predominantly a ground dwelling bird and unlikely to be impacted by turbine collision. However, alienation impacts of this species may occur through the overhead presence of wind turbines. Plains-wanderer (*Pedionomus torquatus)* avoids inhabiting areas in close proximity to trees as a defence strategy to avoid predation by raptors (Commonwealth of Australia, 2016) and turbines could be perceived as a 'tree' or threat by the Plains-wanderer (*Pedionomus torquatus)*. This is an unknown impact with no formal studies have been undertaken as to the impact of wind turbines on Plains-wanderer *(Pedionomus torquatus*). Impacts to matters that are uncertain are addressed in section 8.4.

Table 6-1 Threatened aerial, migratory and raptor species likely to fly over the Subject Land

Species	BC Act listing	EPBC Act listing	Recorded in Project Area?
Threatened Aerial Birds			
Aphelocephala leucopsis Southern Whiteface	Vulnerable	Vulnerable	Yes
Botaurus poiciloptilus Australasian Bittern	Endangered	Endangered	No
Epthianura albifrons White-fronted Chat	Vulnerable	Not listed	Yes
Lophochroa leadbeateri Pink Cockatoo	Vulnerable	Endangered (listed as *Lophochroa leadbeateri leadbeateri*)	Yes
Neophema chrysostoma Blue-winged Parrot	Vulnerable	Vulnerable	Yes
Rostratula australis Australian Painted Snipe	Endangered	Endangered	No
Raptors			
Accipiter fasciatus Brown Goshawk	Not listed	Not listed	Yes
Aquila audax	Not listed	Not listed	Yes

Species	BC Act listing	EPBC Act listing	Recorded in Project Area?
Wedge-tailed Eagle			
Circus approximans Swamp Harrier	Not listed	Not listed	Yes
Circus assimilis Spotted Harrier	Vulnerable	Not listed	Yes
Elanus axillaris Black-shouldered Kite	Not listed	Not listed	Yes
Falco berigora Brown Falcon	Not listed	Not listed	Yes
Falco cenchroides cenchroides Nankeen Kestrel	Not listed	Not listed	Yes
Falco longipennis Australian Hobby	Not listed	Not listed	Yes
Falco peregrinus Peregrine Falcon	Not listed	Not listed	Yes
Falco subniger Black Falcon	Vulnerable	Not listed	Yes
Haliastur sphenurus Whistling Kite	Not listed	Not listed	Yes
Hamirostra melanosternon Black-breasted Buzzard	Vulnerable	Not listed	Yes
Hieraaetus morphnoides Little Eagle	Vulnerable	Not listed	Yes
Milvus migrans Black Kite	Not listed	Not listed	Yes
Migratory Birds			
Actitis hypoleucos	Not listed	Migratory	No

Species	BC Act listing	EPBC Act listing	Recorded in Project Area?
Common Sandpiper			
Apus pacificus Fork-tailed Swift	Not listed	Migratory	No
Calidris acuminata Sharp-tailed Sandpiper	Not listed	Vulnerable Migratory	No
Calidris ferruginea Curlew Sandpiper	Critically Endangered	Critically Endangered Migratory	No
Calidris melanotos Pectoral Sandpiper	Not listed	Migratory	No
Gallinago hardwickii Latham's Snipe	Not listed	Vulnerable Migratory	No
Gelochelidon nilotica Gull-billed Tern	Not listed	Migratory	Yes
Hydroprogne caspia Caspian Tern	Not listed	Migratory	No
Motacilla flava Yellow Wagtail	Not listed	Migratory	No
Tringa Glareola Wood Sandpiper	Not listed	Migratory	No
Tringa nebularia Common Greenshank	Endangered	Endangered Migratory	No
Tringa stagnatilis Marsh Sandpiper	Not listed	Migratory	No

Species	BC Act listing	EPBC Act listing	Recorded in Project Area?
Microbats			
Chalinolobus picatus Little Pied Bat	Vulnerable	Not listed	Yes
Myotis Macropus Southern Myotis	Vulnerable	Not Listed	Potentially
Nyctophilus (Corbenii?) Corben's Long-eared Bat	Vulnerable	Vulnerable	Potentially, due to the genus *Nyctophilus* being recorded
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	Vulnerable	Not listed	Yes
Vespadelus baverstocki Inland Forest Bat	Vulnerable	Not listed	Yes

6.1.6 Vehicle strike

The Subject Land is predominantly agricultural land with limited use by vehicles. There will be an increase in vehicles through the Subject Land, during the construction phase, which has the potential to increase the risk of vehicle strike for fauna species that forage or move across the landscape at vehicle height.

Increased risk of vehicle strike could occur for the following species:

- Southern Bell Frog (*Litoria raniformis*)
- Plains-wanderer (*Pedionomus torquatus*)
- White-fronted chat (*Epthianura albifrons*)
- Pink Cockatoo (*Lophochroa leadbeateri*)
- Superb Parrot (*Polytelis swainsonii*)
- Blue-winged Parrot (*Neophema chrysostoma*)
- Southern Whiteface (*Aphelocephala leucopsis*)
- Freckled Duck (*Stictonetta naevosa*)
- Western Blue-tongued Lizard (*Tiliqua occipitalis*)

For Southern Bell Frog (*Litoria raniformis*), vehicle strike is considered likely to occur where roads separate habitat dams from their nearest neighbouring wetland. For Plains-wanderer (*Pedionomus torquatus)*, there is the potential for vehicle strike to occur across the Subject Land where roads are located in areas of known populations. White-fronted Chats (*Epthianura albifrons)*, Pink Cockatoos (*Lophochroa leadbeateri*), Superb Parrots *(Polytelis swainsonii*), Blue-winged Parrot (*Neophema chrysostoma*) and Southern Whiteface (*Aphelocephala leucopsis*) may forage on ground or at shrub level, and there is potential for vehicle strike to occur in areas of suitable foraging habitat as the bird is taking off from the ground or traversing between canopy cover. Freckled Ducks (*Stictonetta naevosa*) have a potential to be impacted by vehicle strike where roads separate dams and wetlands, and on roads that are in close vicinity to water bodies. For Western Blue-tongues Lizard (*Tiliqua occipitalis*), there is potential for vehicle strike to occur across the Subject Land where roads are located in suitable habitat. Figure 6-2 shows the potential vehicle strike locations for these species (refer to Appendix L.6 for Atlas series).

The main transport haul route into the Subject Land is the Sturt Highway which runs through the northern part of the Project, in an east west direction. The highway is currently used for intra-regional transportation consisting of heavy vehicles and freight vehicles. Upgrades would only be required at the intersection of Sturt Highway and Keri Keri East Road into the Subject Land which provide very little fauna habitat. The proposal is estimated to generate an average of 88 heavy vehicles and 80 light vehicles a day, travelling along the Sturt Highway (Amber, 2024).

Threatened fauna species that have been recorded along the Sturt Highway and are at potential risk of vehicle strike along the Sturt Highway are;

- Spotted Harrier (*Circus assimilis*)
- Little Eagle (*Hieraaetus morphnoides*)
- Black Falcon (*Falcon subniger*)
- South-eastern Hooded Robin (*Melanodryas cucullata cucullata*)
- Regent Parrot (*Polytelis anthopeplus monarchoides*)
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)
- White-fronted chat (*Epthianura albifrons*)
- Pink Cockatoo (*Lophochroa leadbeateri*)
- Superb Parrot (*Polytelis swainsonii*)
- Blue-winged Parrot (*Neophema chrysostoma*)
- Southern Whiteface (*Aphelocephala leucopsis*)

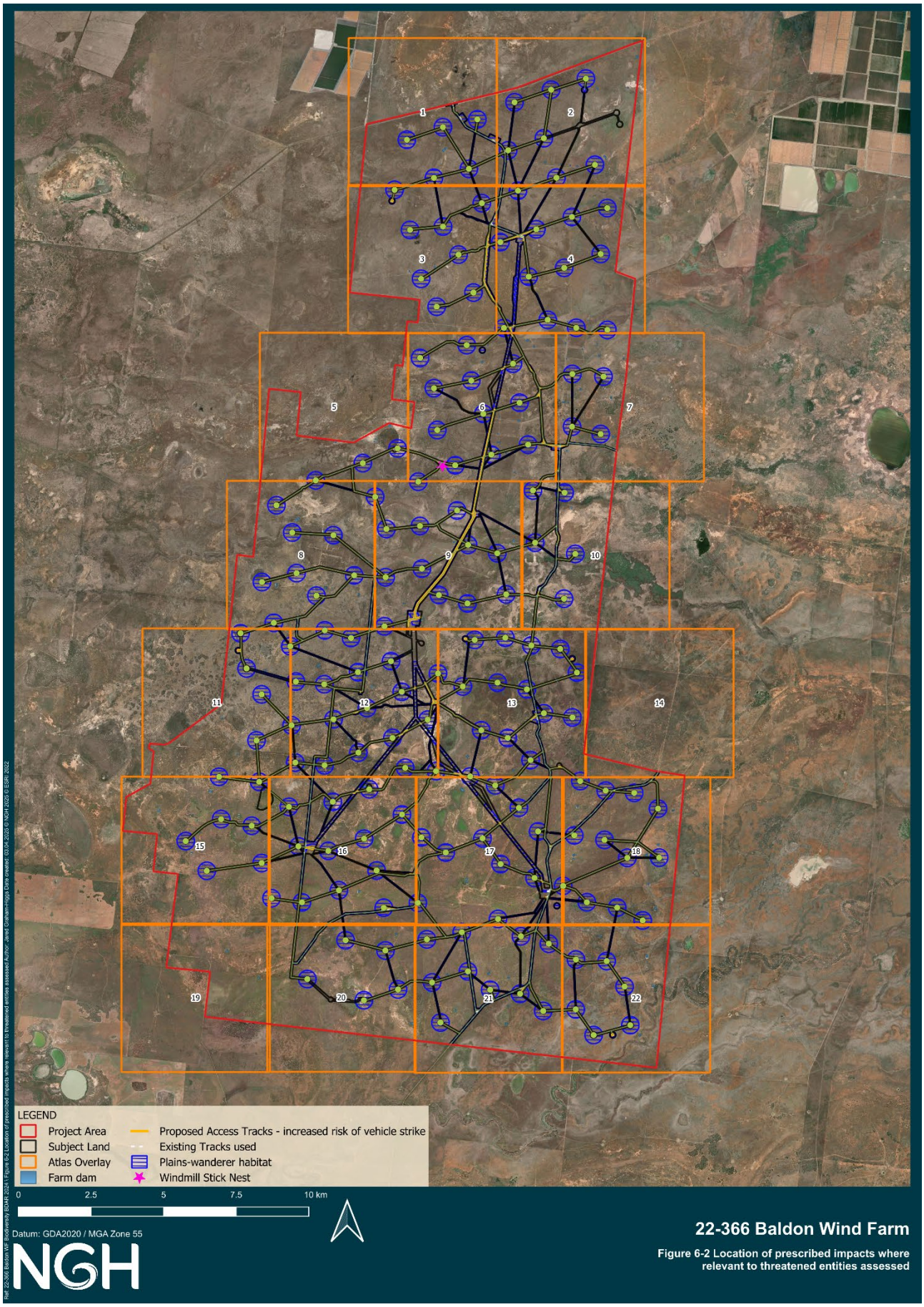


Figure 6-2 Location of prescribed impacts where relevant to threatened entities assessed (refer to Appendix L.6 for Atlas series)

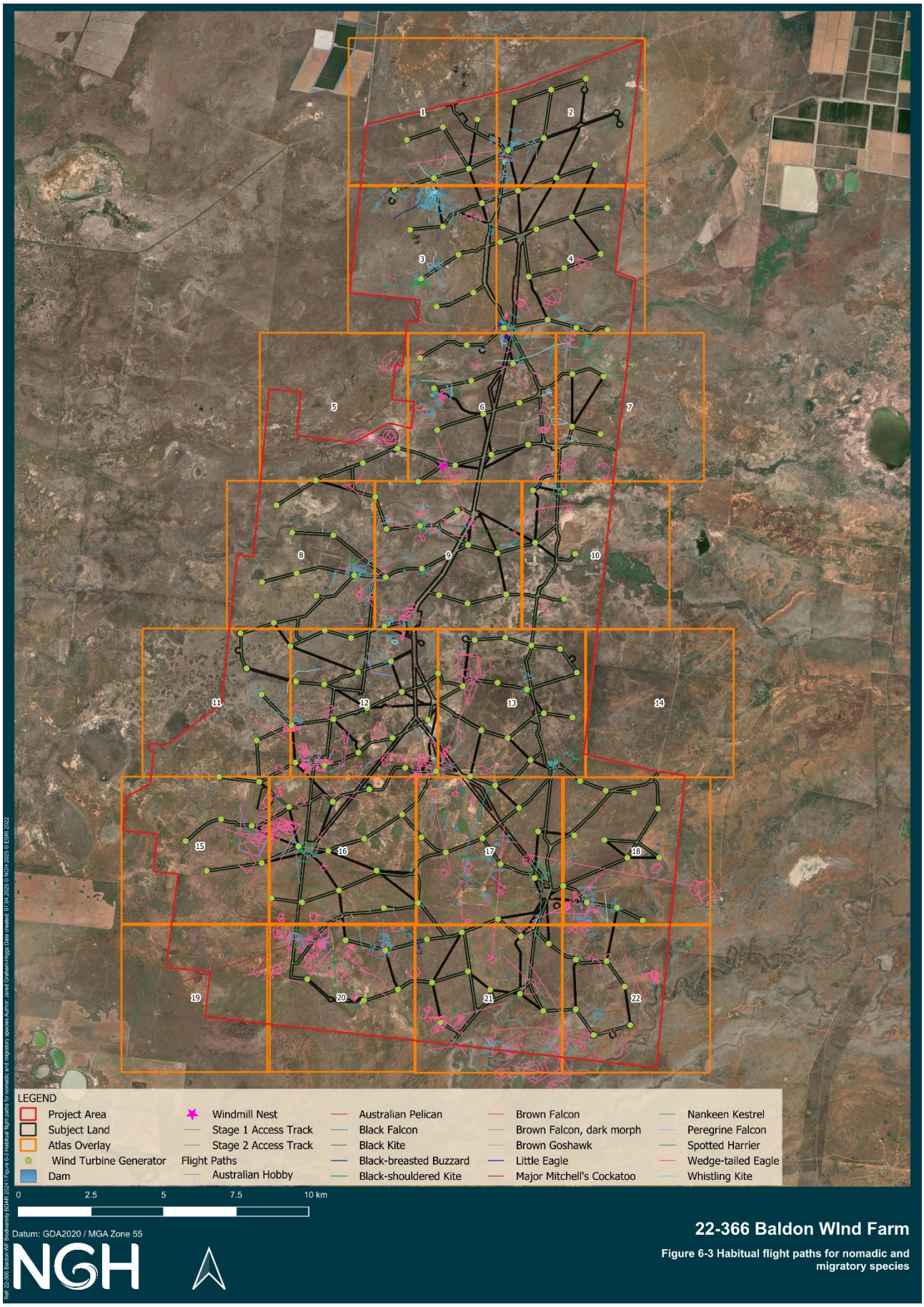


Figure 6-3 Habitual flight paths for nomadic and migratory species (refer to Appendix L.7 for Atlas series)

7. Avoid and minimise impacts

7.1 Avoiding and minimising direct/indirect impacts on biodiversity values

Various options relating to location, design and technology were evaluated in the planning of this development, taking biodiversity values into account, as well as development objectives, strategic needs, and benefits. Preliminary field investigations were undertaken for the Scoping Report for Baldon Wind Farm (Goldwind Australia, 2022) to inform project location and design.

7.1.1 Site selection

The Project Area was selected after an extensive review of alternative sites by the Proponent. A number of key factors were assessed to determine site suitability, identifying the Project Area as the most desirable option:

- Consistently high wind speeds
- Connection to the national electricity grid in close proximity to the wind farm site
- Located within the South West Renewable Energy Zone (REZ)
- Minimal land clearing and tree removal required to support wind farm infrastructure
- Suitable road access available to the wind farm site
- Large land parcels consisting of low levels of residential development
- Willingness for landholders to support wind farm infrastructure
- Minimisation of impact on local amenity.

The Project Area is located within the South West Renewable Energy Zone declared by the NSW government in December 2021, with the intention of providing approximately 4 gigawatts of network capacity.

7.1.2 Alternative technologies

The Australian Government's Largescale Renewable Energy Target and NSW Government's Net Zero Plan outline the commitment by both Australia and NSW more specifically to reducing greenhouse gas emissions and have set targets for increasing the supply of renewable energy. Other forms of largescale renewable energy include solar, hydro, biomass, and tidal energy. The feasibility of wind, solar, biomass, hydro and tidal projects depend on the availability of energy resources and grid capacity. Wind Power is considered most appropriate at this site due to high wind speeds and minimal land clearing required to support turbine infrastructure. Wind farms can usually maintain quite discrete linear disturbance footprints, for tracks, cabling, turbine sites and hard stands and as such the ability to minimise clearing of groundcover is relatively high. The estimated Development Footprint (795 ha) assessed in this BDAR bears this out with approximately 2% of the Project Area (46,259 ha) proposed to be impacted by the Project, reducing to 1% in operation, after construction rehabilitation works are completed. In contrast, solar farms require more extensive clearing and disturbance of groundcover vegetation.

The project will use horizontal-axis wind turbines. The turbine type selected for the Proposal features the biggest rotor and generator in the market, which produced the lowest levelized cost of electricity. Bigger

turbines size requires fewer turbines across the Project Area, therefore reducing overall environmental impact and site disturbance in relation to the energy that is generated.

The proposal will provide a number of benefits at the Commonwealth, State and Local levels. At the Commonwealth and State level, the benefits could include:

- An injection of up to 1,4000 MW of capacity into the national energy market, equating to approximately 3.4GWh of renewable electricity, displacing coal and gas fired generation:.
- This will contribute to the commonwealth Government's commitment to reduce Australia's greenhouse gas emissions to zero by 2050 and 43% below 2005 levels by 2030 by 26-28% by 2030,
- It will contribute the NSW governments greenhouse gas reduction targets and is appropriately located within the NSW South-West REZ created by the NSW government to promote renewable energy development,
- Renewable energy to power equivalent to almost six hundred thousand homes (598,000 based on the average NSW home electricity usage of 5,745kWh).
- Contribute towards the displacement of carbon emissions and therefore have a net-positive impacts towards the environment by helping to mitigate against the detrimental ecological impacts of human-induced climate change

The direct consequence of not proceeding with the Project would be to forgo the benefits, the Project's contribution to: Energy transition progress and associated greenhouse gas emission reductions, Electricity reliability, cost and security benefits, direct and indirect socio-economic benefits. The biodiversity impacts associated with the development and operation of the proposed wind farm would be avoided if the 'do nothing' option was selected. None of these were concluded to be substantive or lead to long term negative impacts to the environment or community. In this case, the potential benefits are considered to outweigh the impacts.

7.1.3 Proposal design

The Biodiversity Assessment Method aims to incentivise the protection of higher conservation value areas, encouraging developers to identify and utilise areas already cleared or disturbed. This occurs in two ways:

- The BAM generates more credits for higher value areas and these credits cost more to 'retire', as part of a project's offset obligation
- The applicant must apply a decision-making process which first avoids these areas, secondly aims to minimise impacts within them and only then considers offsets for the residual impact which cannot be avoided.

The proposed Baldon Wind Farm project has progressed through the following steps to apply the 'avoid and minimise' decision-making process:

1. Early constraints identification and validation of desktop mapping by rapid survey of the broad Project Area to inform the preliminary design for project infrastructure
2. Detailed field surveys to inform updated constraints mapping for a narrower development corridor
3. Constraints workshop to consider overlapping constraints (specifically heritage constraints covering different areas to biodiversity constraints)
4. Avoid and minimise workshop to clarify avoidance strategies and develop further options to minimise impacts, both with the Project team and then with BCS and DCCEEW (Cwth). A further consideration of the layout was undertaken after public exhibition of the EIS, to respond to agency submissions and reflect the results of further investigations.

These four steps are discussed in detail below.

Early constraints areas were identified by rapid survey for the broad Project Area in 2020. Key issues were identified for further investigation including:

- Potential for Serious and Irreversible Impacts to Plains-wanderer (*Pedionomus torquatus*) and Eastern Curlew (*Numenius madagascariensis*)
- *Natural Grasslands of the Murray Valley Plains* CEEC
- Raptor nests, in relation to collision risks
- A preliminary constraints analysis was commissioned to consider a broad range of environmental, cultural and social factors. This work was largely desktop but included rapid 'ground truthing'. It led to some key early decisions aimed at avoiding impacts, such as areas and vegetation with potential to belong to Threatened Ecological Communities, Key Fish Habitat and riparian areas.

Low constraint areas were identified as previously cropped and planted vegetation areas, noting these areas are a very small percentage of the Project Area. Higher constraint areas were identified as potential Threatened Ecological Communities (TECs) (Portions of PCT 46), similarly occupying a small proportion of the Project Area. The large proportion of the Project Area was considered moderate constraints - moderate to good condition native vegetation (shrublands and woodlands) not aligning to a TEC, however could provide habitat for threatened species.

Detailed field surveys to inform updated constraints mapping were then undertaken for the Subject Land, documented in Section 3 of this BDAR. The Subject Land is larger than the required Development Footprint with the intention that identified constraints can be avoided as the final Development Footprint is within it. The Development Footprint (795 ha) represents approximately 28% of the Subject Land (2,847 ha) assessed for the Proposal, or less than 2% of the Project Area (46,259 ha).

After the spring survey program was completed in November 2023, a constraints workshop was held in November 2023 with the applicant and NGH biodiversity, heritage and planning team members, to identify and discuss options to avoid 'Tier 1 and Tier 2 constraints'. Of interest, ecology constraints largely *did not* align with heritage constraints; higher value vegetation / habitat was located in different areas of the Project Area to higher value heritage sites. Furthermore, different ecology constraint areas were widespread across the Subject Land. Utilising a common ranking system was therefore important to prioritise avoidance areas. Tiers were defined as:

TIER 1 Avoid – approval may not be obtained

No Tier 1 ecology matters were identified. Three Tier 1 heritage matters were identified (Anthropogenic Mound Features with or without human remains, Human Remains and/or site complexes that contain human remains and Culturally Modified Tree). These matters were prioritised for avoidance in the updated layout.

TIER 2 Avoid if possible – approval unlikely to be obtained, if an alternative exists

Tier 2 ecology matters were identified (in addition to three additional heritage matters). These were:

- Mossgiel Daisy (*Brachyscome papillosa*) – Prolific and widespread in the north of the Project Area, including areas of dense and more sparse populations.
- Chariot Wheels (*Maireana cheelii*)- Prolific and widespread in the south of the Project Area, including areas of dense and more sparse populations.
- Southern Bell Frog (*Litoria raniformis*) - Prolific and widespread in dams within the Project Area
- Plains-wanderer *(Pedionomus torquatus)* - Identified as likely to use most of the Project Area
- Little Eagle (*Hieraaetus morphnoides*) – One confirmed nest and one potential nest identified within the Project Area

Additional constraints during the RTS phase, were identified as;

- Southern Myotis (*Macropus myotis*) – identified during BBUS surveys and targeted surveys
- Spike-rush (*Eleocharis obicis*) – adjacent records and identified incidentally
- Wedge-tailed Eagle nest – collision risk rating updated to high

In March 2023, an 'Avoid and minimise' workshop was held between the biodiversity and planning team, in view of the updated survey and assessment results to date. The following strategy was developed for each Tier 2 entity and has been refined after it was presented to BCD in April 2024 (noting this has been updated in March 2024, to show additional measures developed during the Response to Submissions phase to further minimise impacts to threatened entities):

Mossgiel Daisy (*Brachyscome papillosa*)

Avoidance measures:

- Redesign of the footprint to avoid dense populations of *Brachyscome papillosa.*
  The footprint has avoided several key populations of *B. papillosa* through removing turbines or cabling where possible, minimising fragmentations. Examples of areas removed are shown in Figure 7-2 and include the removal of cabling between Turbines 24 and 30, as well as the removal of Turbines 12 and 13.

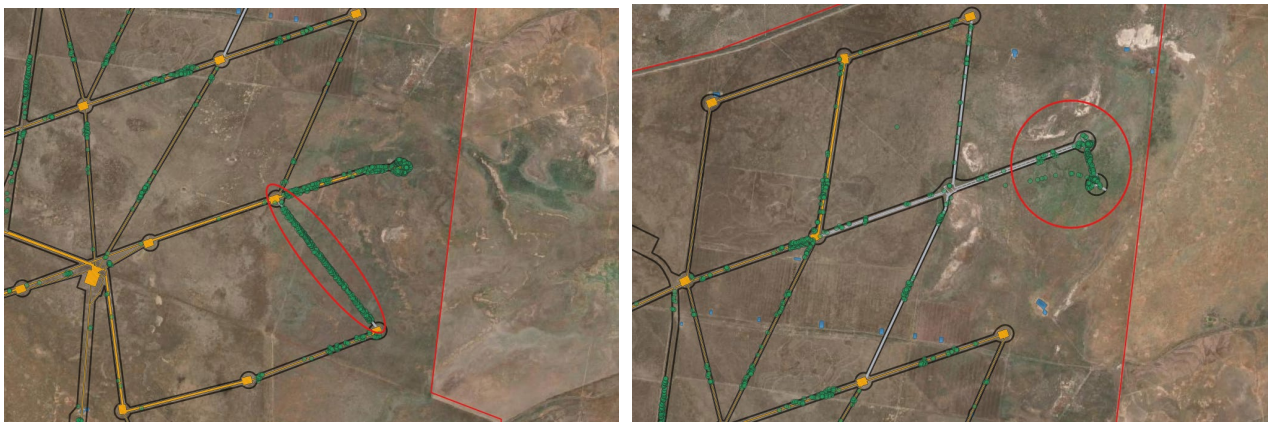


Figure 7-1 Removal of impacts, circled in Red, to dense populations of *Brachyscome papillosa*

- Rationalise impacts in areas where there are prolific populations during detailed design. This will ensure these 'source' populations in the north of the Project Area are retained. As the locations can change seasonally and as final design is yet to be completed, commitments centre on:
  - Minimising track and cable widths, micrositing for cabling trenches, or co-location of access / cabling options in these areas where they run side by side
  - Refinement of 'hot spots' where these measures would be implemented.
- Microsite around sparse populations. As populations are dependent on seasonal conditions, additional surveys in dry conditions may not detect species location and preclearance surveys are not recommended. As final design will continue for several more months, commitments centre on using existing survey data to inform detailed design.
- These avoidance strategies will rely on forward looking commitments for design and pre construction rather than be detailed within the BDAR. The Biodiversity Management Plan will be the vehicle for this.

Minimize long term impacts:

As the species is prolific in the north of the Project Area, there are opportunities to minimise impacts by considering the seed bank present onsite. The commitments here centre on:

- Seed bank protection protocols in rehabilitation strategies (both post construction and for decommissioning). This will include protocols to protect and reuse topsoil to maximise natural recolonisation of areas subject to disturbance.

Post construction rehabilitation strategies will be outlined; by activity type (ie trenching vs bulk earthworks), with species-specific provisions, with consideration of grazing restrictions until areas are stabilized and vegetation established.

Chariot Wheels (*Maireana cheelii*)

Avoidance measures:

- Rationalise impacts in areas where there are prolific populations during detailed design. This will ensure these 'source' populations in the south of the Project Area are retained. As the locations can change seasonally and as final design is yet to be completed, commitments centre on:
    - Minimising track and cable widths, co-location of access / cabling options in these areas where they run side by side
    - Refinement of 'hot spots' where these measures would be implemented.
- Microsite around sparse populations. As populations are dependent on seasonal conditions, additional surveys in dry conditions may not detect species location and pre-clearance surveys are not recommended. As final design will continue for several more months, commitments centre on using existing survey data to inform detailed design.
- These avoidance strategies will rely on forward looking commitments for design and preconstruction rather than being detailed within the BDAR. The Biodiversity Management Plan will be the vehicle for this.

Minimise long term impacts:

As the species is prolific, there are opportunities to minimise impacts by considering the seed bank present onsite. The commitments here centre on:

- Seed collection protocols for areas nominated for direct seeding in rehabilitation strategies (both post construction and for decommissioning)

Post construction rehabilitation strategies will be outlined; by activity type (ie trenching vs bulk earthworks), with species-specific provisions, with consideration of grazing restrictions until areas area stabilized and vegetation established.

Slender Darling Pea (*Swainsona murrayana*)

Avoidance measures:

- A small population of *Swainsona murrayana* occurs along an access track in the Southeastern corner of the Subject Land between Turbines 177 and 178. Access track has been redesigned to occur south of this *S. murrayana* population to avoid impacts to the indivduals (Figure 7-2). Detailed design will microsite around the population.



Figure 7-2 Access track positioned south of the detected *Swainsona murrayana* individuals

Little Eagle (*Hieraaetus morphnoides*)

Avoidance measures:

- Redesign of the footprint to remove wind turbine 169 and approximately 2km of associated access tracks/cabling between Turbines 168 and 170 located near known Little Eagle nest and Black Box Woodland, as shown in Figure 7-3.

Minimize long-term impacts:

- Bird and bat management monitoring protocols will include triggers and adaptive actions to minimise impacts on raptor species.

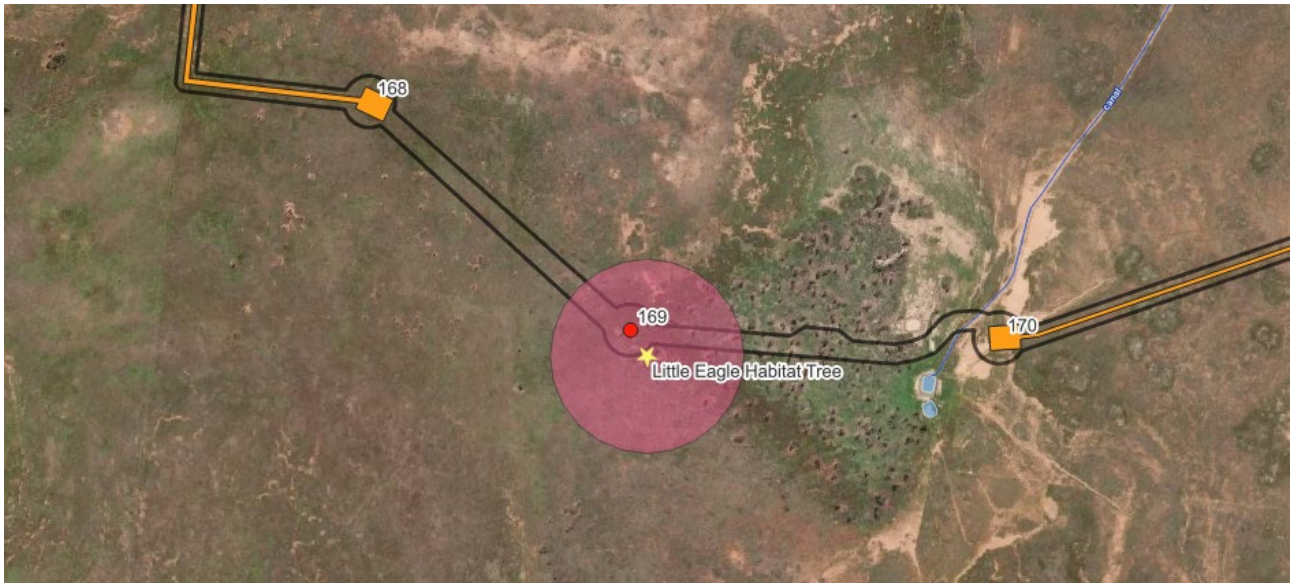


Figure 7-3 Avoidance of Little Eagle habitat by removal of Wind Turbine 169 from footprint

Southern Bell Frog *(Litoria raniformis)*

Avoidance measures:

- Avoid impacts to farm dams. This can be achieved for all of the 51 dams identified within 200m of the Subject Land.

Minimise long term impacts:

- To reduce injury and trampling of habitat, vehicle protocols will include:
    - Tracks and parking areas established first in the construction program and then used to rationalize vehicle movements and ensure no off-track impacts
    - Vehicle speed protocols will be developed to address higher risk periods at night and during/following wet weather
    - Adaptive management plan for Southern Bell Frog implemented to include triggers and adaptive actions.

Plains-wanderer *(Pedionomus torquatus)*

The extent and habitat of Plains-wanderer is difficult to determine within the Project Area. Plains-wanderer are generally sedentary species, living within patch sizes between 1 to 50 ha (DoE, 2016), with an average patch size of 32ha (Nugent, 2022). However, the species can move large distances in response to breeding, changes in habitat or to find more suitable habitat (DoE, 2016)). Most birds have been found recaptured within 400m (DoE, 2016)) but studies of banded Plains-wanderer have shown large scale movements of 124km (Maher, 2017). Observations of Plains-wanderer within the Project Area have been recorded incidentally and during nocturnal survey transects. As only one survey period was undertaken (Spring 2023), and no repeat surveys of transects were conducted it is not confirmed if the observations of Plains-wanderer are of local sedentary populations, or individuals passing through an area. It is also not known if the 21 sightings are some of the same individuals or different individuals. As sightings were recorded on different days and times, it is possible that some individuals were recorded multiple times across different survey nights or times.

The habitat within the Subject Land is not typical habitat of the requirements of the Plains-wanderer. The Plains-wanderer is known to inhabit sparse, treeless, species-rich, lowland native grasslands with approximately 50% bare ground, 40% herbs and grasses and 10% fallen litter, with grass tussocks spaced around 10-20 cm apart and most vegetation less than 5 cm in height (DoE, 2016). This was far from the habitat where it was located in the Subject Land, with the species identified in chenopod shrubland (PCT 153 and 164) which is not a known associated PCT. Bare ground was typically 2 to 35% with around 10 to 20% shrub cover in locations where Plains-wanderer was detected. The Plains-wanderer is known to occur occasionally in other types of habitat such as crops and low sparse, chenopod shrublands however, it is unknown as to whether Plains-wanderers can persist in these habitats over extended timeframe (DoE, 2016)

The Plains-wanderer is a dual credit species, assessed for species credits (important habitat mapping) and ecosystem credits (all other areas the species is likely to occur). Important habitat mapping is restricted to species that are highly mobile and difficult to reliably detect by survey and there is extensive long term data (DPIE, BAM - Important Areas viewer, 2025). There is no mapped important habitat for Plains-wanderer within the Subject Land, and thus the species is considered an ecosystem species, meaning it is likely to use associated habitat within the Subject Land for foraging. Based on habitat within the Subject Land being atypical of its known habitat requirements, no habitat refinements can be made based on the typical habitat of native grasslands with 50% bare ground cover. Thus, the whole Subject Land could provide habitat for the Plains-wanderer.

It is noted that areas of mapped important habitat for Plains-wanderer defined by the NSW legislation can be easily avoided in project design due to having clearly defined mapped areas available. In this case, as no

mapped important habitat is present on site, uncertainty of sightings being mobile or sedentary populations and the whole Subject Land considered ecosystem habitat, redesign of project infrastructure to avoid a sighting may not result in any effective result.

Instead, mitigation measures are implemented to mitigate risks against Plains-wanderer. Key threats to Plains-wanderer are inappropriate grazing caused by overgrazing by livestock and rabbits, and predation by feral species (DoE, 2016). The proposal will be able to implement effective pest management commitments above what is currently being implemented. Ongoing use of the land for sheep grazing by the landowner is envisaged which will assist in maintaining the suitable habitat structure for the Plains-wanderer with opportunities for stewardship sites.

The project has minimised extent of new access tracks, following current tracks where possible and most access tracks following 'out and back' routes. Consideration was undertaken where access tracks could be reduced. One access track (approximately 1.7km) between Turbine 83 and 84, which followed a looped route was removed from the project design to minimise fragmentation in the vicinity of Plains-wanderer sighting locations. Underground cabling is still proposed to be constructed between these turbines, however as this is a short term, temporary disturbance there will be no long term impacts to fragmentation at this location (Figure 7-4).

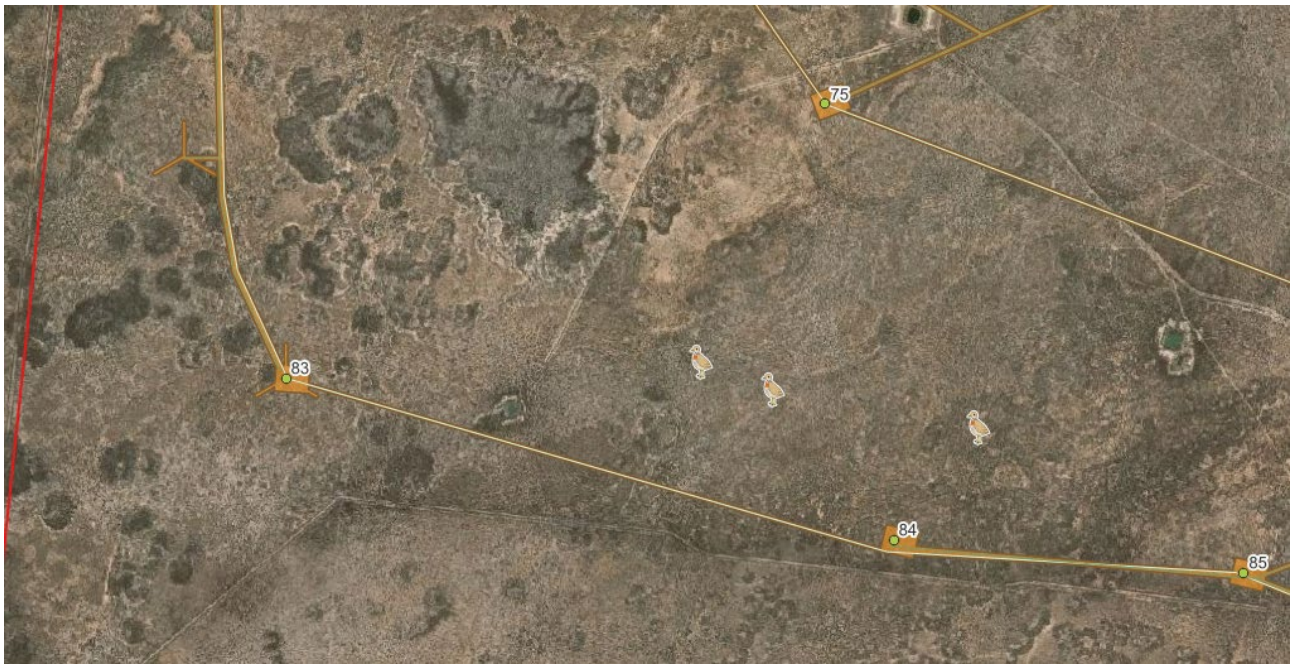


Figure 7-4 Underground cabling only between Turbines 83 and 84 – access track has been removed

Summary of minimisation and avoidance measure for Plains-wanderer include:

- Rationalisation of the use of the Project Area, with no wind farm infrastructure proposed to the available project land (~4982 ha) north of the Sturt Highway (Figure 7-7). This part of the project land is located closest to the Gayini Wetlands reserve where there have been sightings of Plains-wanderer, thereby avoiding potential impacts and fragmentation proximate to the reserve and where there is no existing barrier of the Sturt Hwy between the Gayini Reserve and the Project Area. The Scoping Report originally included wind turbine infrastructure in this area which was subsequently moved to the south of the Highway. This has avoided potential impacts to Plains-wanderer habitat north of the Sturt Highway.
- Redesign of the footprint to reduce fragmentation from access tracks at detected sightings
- Avoid active nests by using a preclearing protocol to:

  - Identify higher risk times (such as breeding season) and locations
  - Implement preclearing inspections ahead of the construction front.

Minimize long term impacts

- Post construction rehabilitation strategies will be outlined; By activity type (ie trenching vs bulk earthworks), with species-specific provisions..
- To reduce injury and trampling of habitat, vehicle protocols will include:
  - Tracks and parking areas established first in the construction program and then used to rationalize vehicle movements to the designated tracks
  - Vehicle speed protocols will apply throughout the Subject Land
- Pest management commitments will apply in construction and operation to reduce the occurrence of foxes, cats and dogs that predate on Plains-wanderer .
- Bird and bat management monitoring protocols will include monitoring for alienation effects around turbines. This will add to the knowledge base on this species.
- A funding allocation will be made available to a research program dedicated to this species (e.g. support PhD grant)
- Ongoing use of the land for sheep grazing by the landowner is envisaged which will assist in maintaining the suitable habitat structure for the Plains-wanderer. Opportunities will be pursued to establish a biodiversity offset area in or adjacent to the Project Area with specific ongoing management measures, including strategic grazing. While this will rely on landholder involvement, the project will pursue this outcome actively.

Additionally, the proposal would be staged to minimise construction impacts occurring simultaneously over a large scale. Two stages would be adopted (Figure 7-8), with Stage 1 constructing access roads, site compounds, connection to the transmission lines and construction of wind turbines within the centre of the site for 45 wind turbines. The Baldon Wind Farm Development Footprint is linear in nature, meaning that as a percentage of the Project Area the overall disturbance is low (around 2% of the Project Area) and well distributed. Furthermore, the construction methodology involves the progression of limited (2-3) construction ‘fronts’ and may be staged. As such, exposed areas of soil will be limited and able to be stabilised and rehabilitated progressively. This staged approach eliminates disturbance across the whole Development Footprint simultaneously, allowing mobile threatened species such as Plains-wanderer to move away from disturbance areas and seek refuge within non-disturbed areas.

Project design has also minimised impacts on vegetation and habitat through;

- Maximising the use of existing tracks within the Project Area – this was considered in early layouts. Where possible existing tracks have been used within the Project Area.
- Access tracks and cabling have been designed to traverse the shortest feasible distance – this was considered in more detailed layout development
- Reducing the width of tracks to the minimum, considering landform and other engineering constraints – this has been locked into mitigation measures
- Maintaining roads as gravel and minimise raising to avoid or minimise changes to onsite hydrology– this has been locked into mitigation measures
- Avoiding all dams – this has been locked into mitigation measures.

These commitments are set out in Section 9 of this BDAR.

Southern Myotis (*Myotis macropus*)

Avoidance measures:

- Avoid impacts to foraging habitat (farm dams). This can be achieved for all of the 51 dams identified within 200m of the Subject Land.

- Redesign of the final footprint by removing approximately 2km of access tracks and cabling between Turbines 168 and 170. This will avoid impacts to 12 hollow bearing trees (HBTs), and prevent fragmentation or indirect impacts within good condition Black Box Woodland (PCT 15_Zone 1) (Figure 7-5).
- Minimising impacts on Hollow Bearing Trees within the Project Footprint. Of 109 HBTS identified in Subject Land, only 16 would be impacted.

Minimise long-term impacts

- To reduce impacts on roosting habitat, protocols will include;
  - Tree clearing protocols to include pre-clearing survey procedures
  - Staged clearing procedures for HBTs, including the presence of a trained ecologist or licensed trained fauna spotter catcher during clearing events.
  - Clearing of HBTs to be timed to avoid critical life-cycle events, such as breeding

Threatened woodland bird and bat species (MNES)

Avoidance measures:

- Footprint was redesigned to avoid impacts to 12 Hollow bearing trees, and prevent fragmentation or indirect impacts within good condition Black Box Woodland (PCT 15_Zone 1) (Figure 7-5). Removing approximately 2km of access tracks and cabling through Black Box woodland will avoid impacts to 2.67 ha of woodland habitat suitable for federally listed woodland species such as Southern Whiteface, Pink Cockatoo, Blue-winged Parrot, South-eastern Hooded Robin and Corben's long-eared Bat.



Figure 7-5 Avoidance of Hollow Bearing Trees within Black Box Woodland (PCT 15_Zone 1).

High Risk Raptors (Wedge-tailed Eagle)

Four Wedge-tailed Eagle Nests were identified within 500m from three turbines.

Avoidance measures:

- Footprint was redesigned to remove wind turbine 126 and associated access tracks/cabling, located within 200m of two Wedge-tailed Eagle Nests (Figure 7-6).

- Microsite turbines 33, 69, 106 and 121 at least 300m away from Wedge-tail Eagle Nests identified to date during final design.

Minimize long-term impacts:

- Bird and bat management monitoring protocols will include triggers and adaptive actions to minimise impacts on raptor species.



Figure 7-6 Minimising collision risks for breeding Wedge-tailed Eagle by removing turbine 126 from footprint

A summary of the avoidance and minimisation measures for the Project is shown in Table 7-1 and Figure 7-7. The proposed Stage 1 and Stage 2 Construction Footprint and Operation Footprint are shown in Figure 7-9 to Figure 7-12.

Table 7-1 Summary of avoidance and minimisation measures

Action	Outcome	Timing	Responsibility
Minimising number of Wind Turbines	The project minimised the number of wind turbines from early project design, minimising clearing and connectivity impacts. Turbines are spaced around 1km apart, minimising pinch points for collision risks.	Early Project Design	Proponent
Wind Turbine Design	Turbine height of 130-180 m and a minimum blade top height of 48m to ensure turbines are above tree canopies and above flight paths of most bird species to minimise collision risks.	Early Project Design	Proponent
Existing tracks utilised where	50km of existing tracks used, minimising fragmentation of vegetation.	Early Project Design	Proponent

Action	Outcome	Timing	Responsibility
possible.			
Underground cabling separate to access tracks to maximise successful regeneration	Underground cabling separated from tracks to minimise width of disturbance. Vegetation disturbance for cabling temporary. Disturbance width for trenching of cabling maximum 1m wide, enabling natural regeneration from adjacent vegetation.	Early Project Design	Proponent
Project Design avoids mapped key fish habitat (Forest Creek) in South East Corner.	No impact occurring to Key Fish Habitat.	Early Project Design	Proponent
Project Design avoids impacts to Abercrombie creek	No infrastructure placed in Abercrombie Creek floodplain Minimal track crossing points over Abercrombie Creek Flood studies (BMT, Baldon Wind Farm - Hydrology and Flooding Assessment, 2025) show no changes to flooding or flood velocity along Abercrombie Creek	Early Project Design	Proponent
Minimising impact on woodland areas	Project site selection avoided woodland areas to minimise tree clearing. Woodland areas generally avoided during early project design. Approximately 228 ha Black Box Woodland in the Project Area has been excluded from the Subject Land (compared to 25 ha ha within the Subject Land with 5.45 ha of this to be impacted). Minimises impacts to Pink Cockatoo breeding habitat Minimises habitat impacts to woodland birds such as Blue-winged Parrot, South Eastern Hooded Robin, Southern Whiteface, Dusky Woodswallow, Pied Honeyeater, Painted honeyeater and Varied Sitella Minimises habitat impacts to Microbats such as Little Pied Bat, Yellow-bellied Sheathtail Bat and Inland Forest Bat.	Early Project Design	Proponent
Project Design avoids impacts to Northern section of Project Area	No windfarm infrastructure proposed in Project area North of Sturt Highway, closest to Gayini Wetlands reserve.	Project Design	Proponent

Action	Outcome	Timing	Responsibility
closest to Gayini Wetlands reserve.	4982ha of habitat, suitable for Plains-wanderer unimpacted North of Sturt Highway. Consolidate impacts to South of the Sturt Highway.		
Minimising Impacts on Hollow Bearing Trees (HBTs)	Project footprint minimises impacts to HBTs. Of 109 HBTs identified in Subject Land, only 16 would be impacted.	Project Design	Proponent
Avoiding Farm Dams	Project design avoided impacts to all farm dams. Avoidance of impacts to Southern Bell Frog breeding habitat. Avoidance of impacts to Southern Myotis foraging habitat (waterbodies).	Project Design	Proponent
Removing WTG 169 and approximately 2km of connecting tracks and cabling from Project Design	Avoidance of impacts to Little Eagle Nest and minimising collision risk for Breeding Little Eagle. Avoidance of impacts to 2.67 ha of Black Box woodland. Avoidance of fragmentation of Black Box Woodland. Avoidance of direct impacts to 12 Hollow bearing trees (HBTs) and indirect impacts to 16 HBTs.	Project Design	Proponent
Removing WTG 126 and approximately 50m of connecting tracks and cabling from Project Design	Minimises turbine collision risk for Breeding Wedge-tailed Eagle and other raptors utilising adjacent Black Box Woodland.	Project Design	Proponent
Removing WTG 12, 13 and 88 and approximately 6.5km of cabling and 2.8km of connecting tracks from project design. **Rerouting cabling between WTG 24 and 30.**	Avoidance of clearing impacts to densest populations of *Brachyscome papillosa* (12.1 ha) Minimises fragmentation of population of *Brachyscome papillosa*	Project Design	Proponent

Action	Outcome	Timing	Responsibility
Removing approximately 1.7km of access track between WTG 83 and 84. **Rerouting cabling between WTG 149 and 138**	Avoidance of impacts to Plains Wanderer habitat at sighted locations. Minimising fragmentation of habitat at sighted locations.	Project Design	Proponent
Rerouting access track between WTG 177 and 178	Avoidance of impacts to population of *Swainsona murrayana.*	Project Design	Proponent
Selection of Haul Route	The haul route selected resulted in minimal impacts to biodiversity values.	Project Design	Proponent
Mitigation measures	Pest animal control to reduce the occurrence of foxes, cats and dogs that predate on threatened species such as Plains Wanderer and Southern Bell Frog.	Operation	Proponent and operator
Mitigation measures	Micro siting with Subject Land in final design where there are populations of *Brachyscome papillosa* or *Maireana cheelii.* Seedbank protection protocols in rehabilitation strategies. Minimises impacts on populations of threatened flora	Operation	Proponent and operator
Mitigation measures	Micro siting within Subject Land in final design to locate turbines at least 300m away from identified Wedge-tail Eagle Nests. Minimises collision risks to Breeding Wedge-tail Eagles.	Operation	Proponent and operator
Adaptive Management Plans	Adaptive management plan for Southern Bell Frog implemented to minimise long term impacts from vehicles strikes	Operation	Proponent and operator
BBAMP	Bird and bat management monitoring protocols will include triggers and adaptive actions to minimise impacts on raptor species.	Operation	Proponent and operator

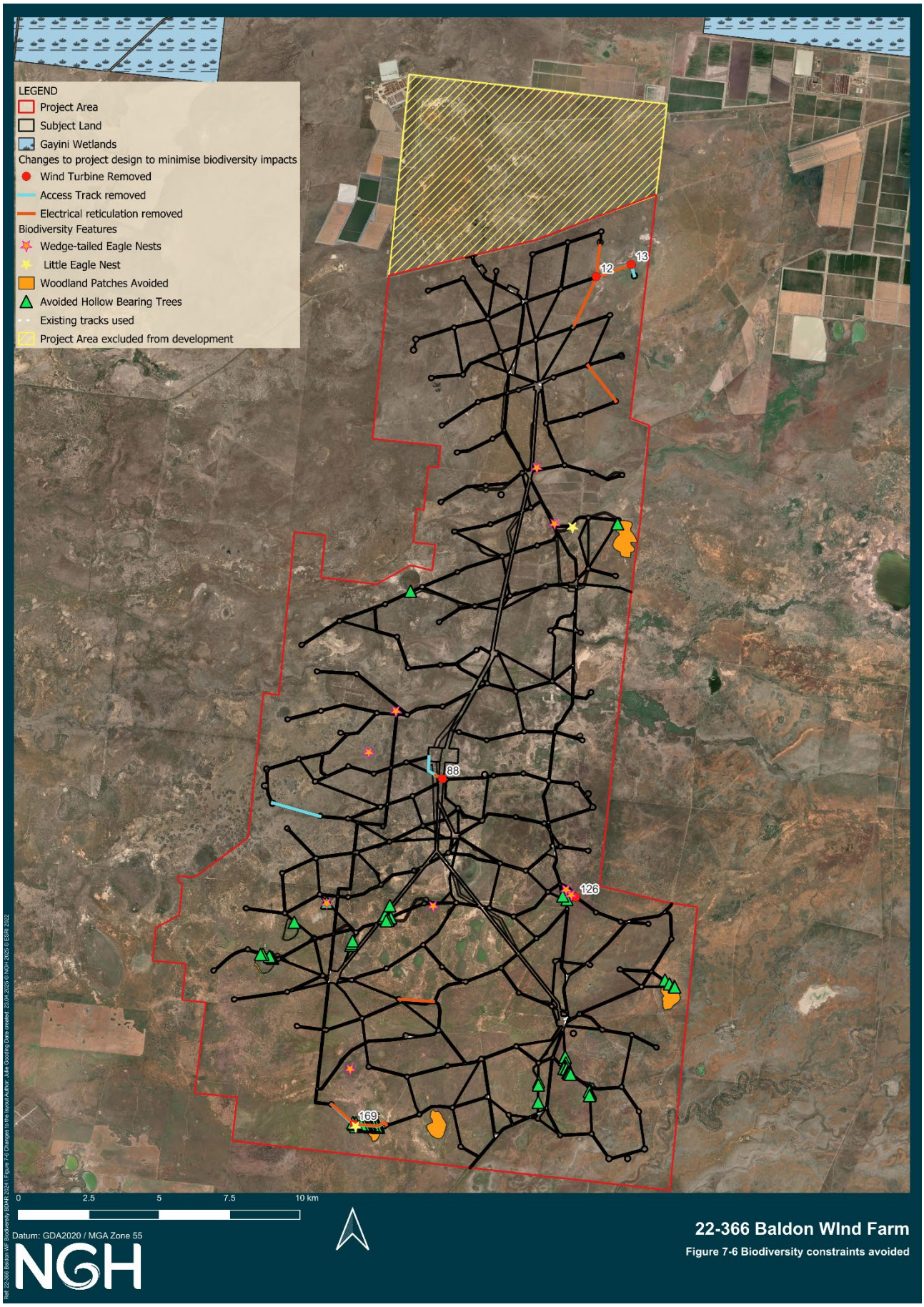


Figure 7-7 Biodiversity constraints avoided

7.2 Avoiding and minimising prescribed impacts

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the NSW Biodiversity Offset Scheme (BOS).

The following prescribed impacts are relevant to the project:

- Impacts of development on human-made structures
- Impacts of development on habitat connectivity
- Impacts of development on water quality, water bodies and hydrological processes
- Impacts of wind turbine strikes
- Impacts of vehicle strikes on threatened fauna

Section 7.1.4 describes the avoid and minimise approach that has been applied to reduce general biodiversity impacts. Specific measures that have been included in the Project design to address prescribed impacts are detailed in Table 7-2.

Table 7-2 Approach taken to avoid and minimise prescribed impacts

Prescribed impact	Avoid and minimise approach
Human-made structures	• Acknowledging that human-made structures provide structures for nests. No human-made structures containing nests would be removed.
Habitat connectivity	• Impacts to connectivity and species movement cannot be avoided in this landscape, given the linear layout of the Project. Grassland and shrubland fragmentation and creation of cleared linear strips has the potential to interrupt wildlife movement passages for ground dwelling fauna, including the Plains-wanderer and Southern Bell Frog. Project design has been considered to minimise fragmentation. Access tracks have been designed to follow existing farm tracks, roads or fence lines where possible to minimise track construction and new impacts required. Where there are no existing tracks, the minimum tracks necessary have been planned to access each wind turbine, so in some cases longer driving routes are required rather than cutting across intact vegetation. A further 6.8km of proposed access tracks were removed from the project design, following redesign in the Response to Submissions phase to minimise impacts on threatened species in key habitat areas. Electrical reticulation is in the form of underground cabling rather than overhead powerlines causing only temporary soil disturbance, to minimise permanent fragmentation. • Disturbed areas from track edges and underground cabling would be rehabilitated, including reapplying the topsoil and where required reseeding with native species representative of the mapped PCT to

Prescribed impact	Avoid and minimise approach
	minimise permanent fragmentation from temporary disturbance. Revegetation measures would be detailed in the Biodiversity Management Plan (BMP).
Water quality, water bodies and hydrological processes	• The Project was designed to avoid and minimise infrastructure near dams which contain habitat for Southern Bell Frog and Southern Myotis. No dams would be removed by the proposal.
Wind turbine strikes	• Turbines 126 and 169 removed from final design to minimise impacts to breeding Little Eagle and Wedge-tailed Eagle observed nesting within 200m of these turbines. • Turbine locations will be microsited around Wedge-tailed Eagle nests identified to date within this report to provide a minimum 300m buffer from turbines. Turbines to be microsited to maximise distance from existing Wedge-tailed Eagle nests are 33, 69, 106 and 121.
Vehicle strikes	• Increased vehicle movements during construction have the potential to result in fauna mortality from vehicle strikes. These potential impacts can be avoided and managed and will be addressed in the Biodiversity Management Plan (BMP) and include setting appropriate work hours and vehicle speed limits. • Adaptive management plan implemented for Southern Bell Frog to include triggers and adaptive actions to minimise impacts from vehicle strikes.

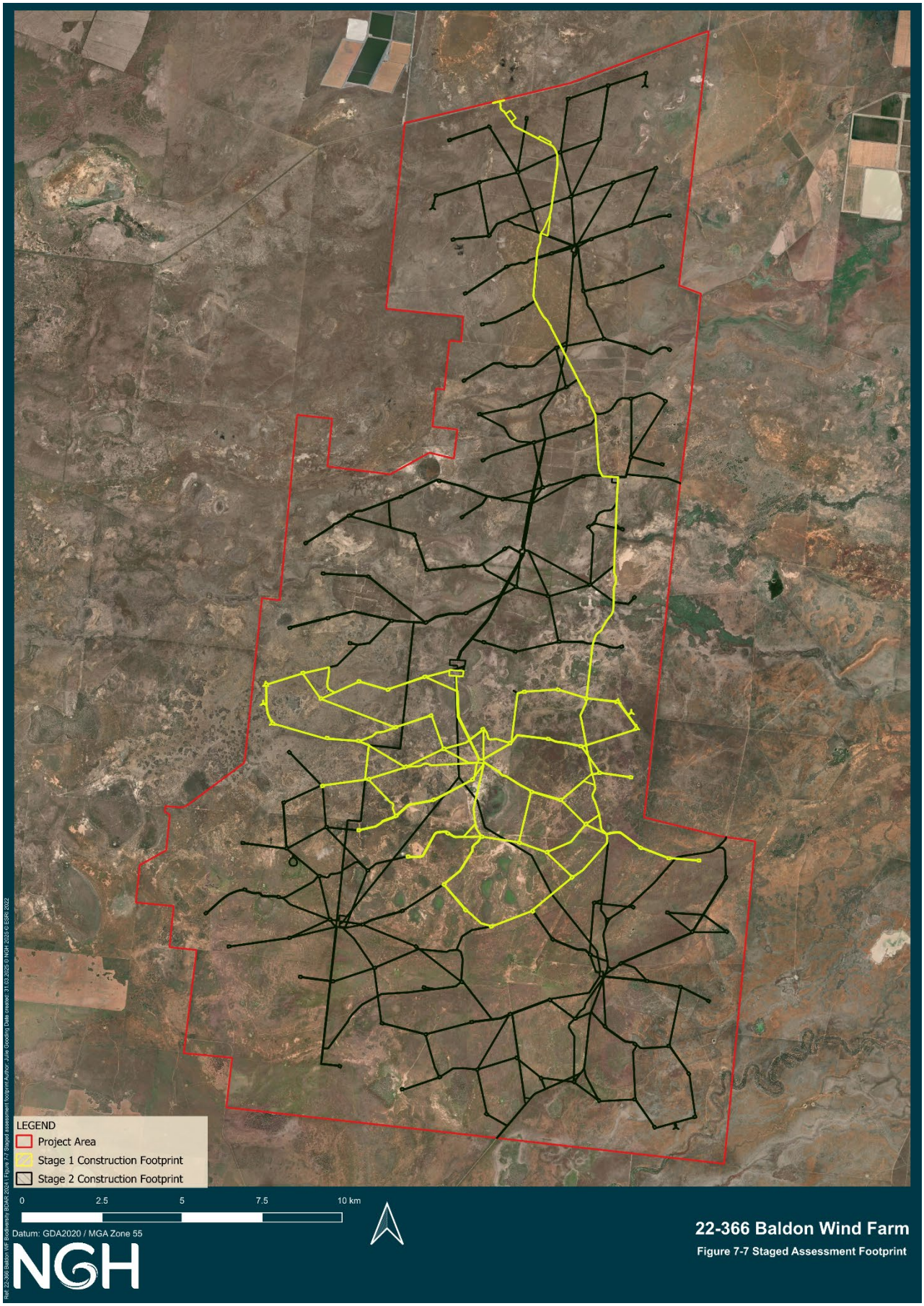


Figure 7-8 Staged Assessment Footprint

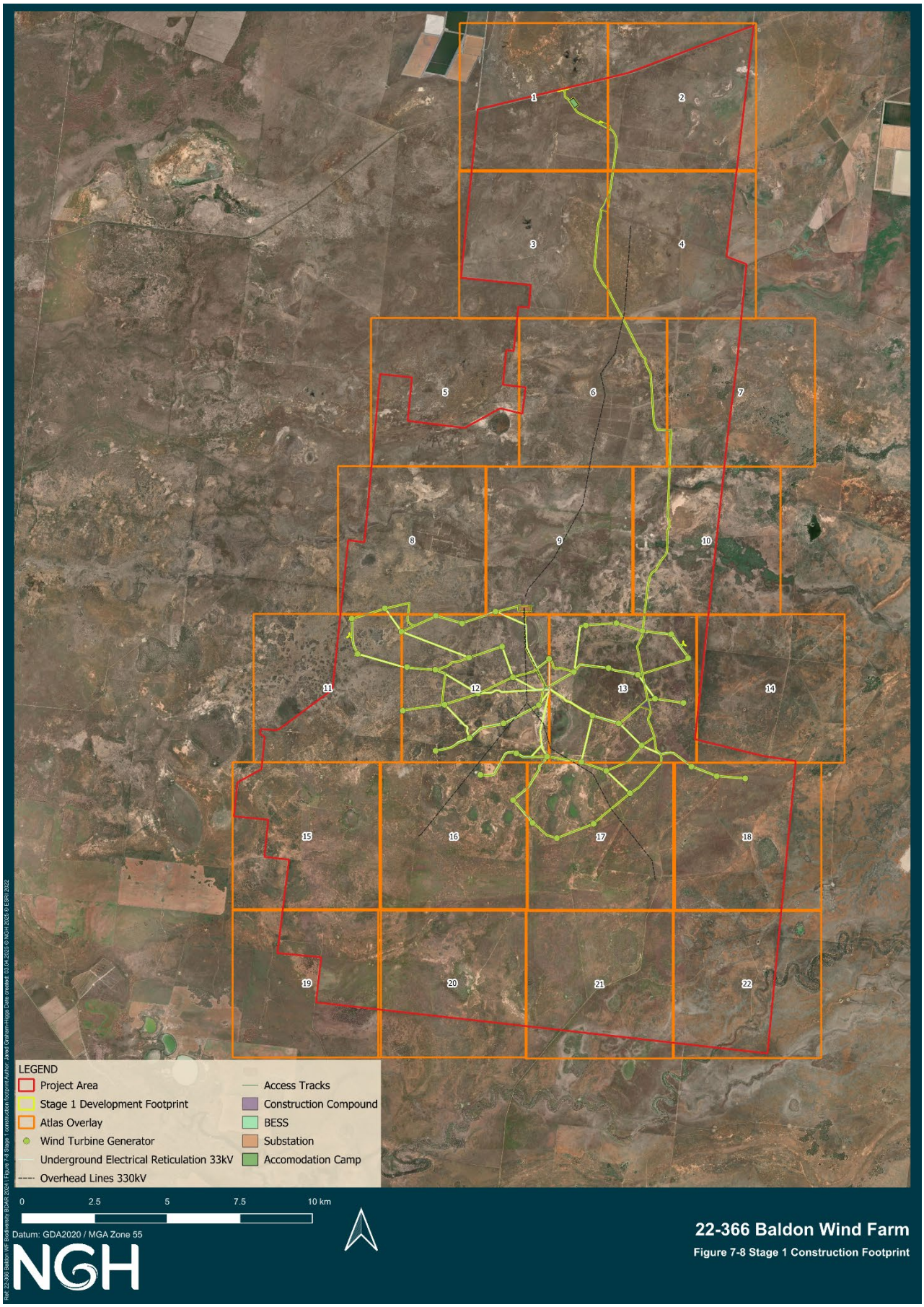


Figure 7-9 Stage 1 Construction Footprint (refer to Appendix L.8 for Atlas series)



Figure 7-10 Stage 1 Construction Footprint - haul route intersections

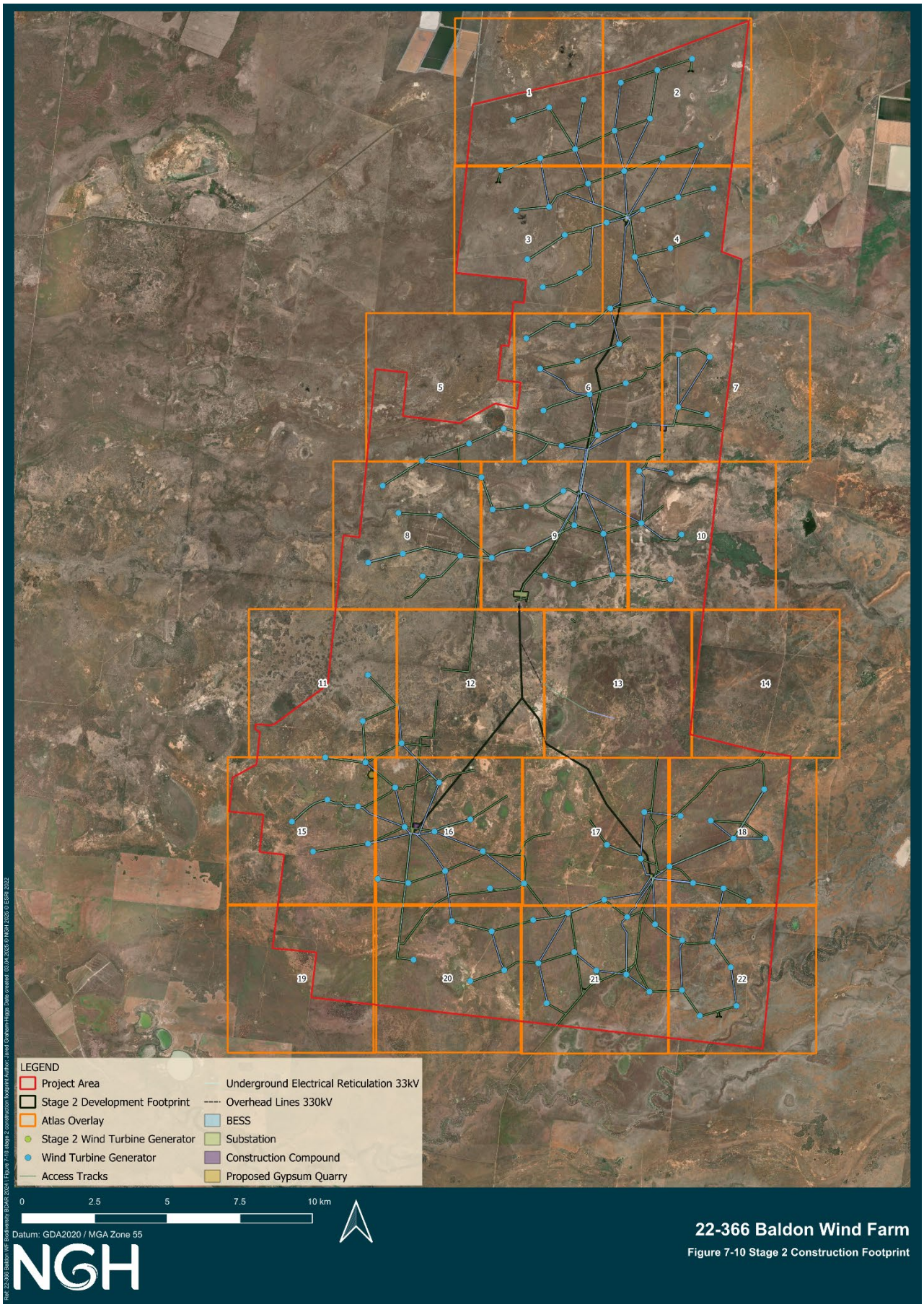


Figure 7-11 Stage 2 Construction Footprint (refer to Appendix L.9 for Atlas series)

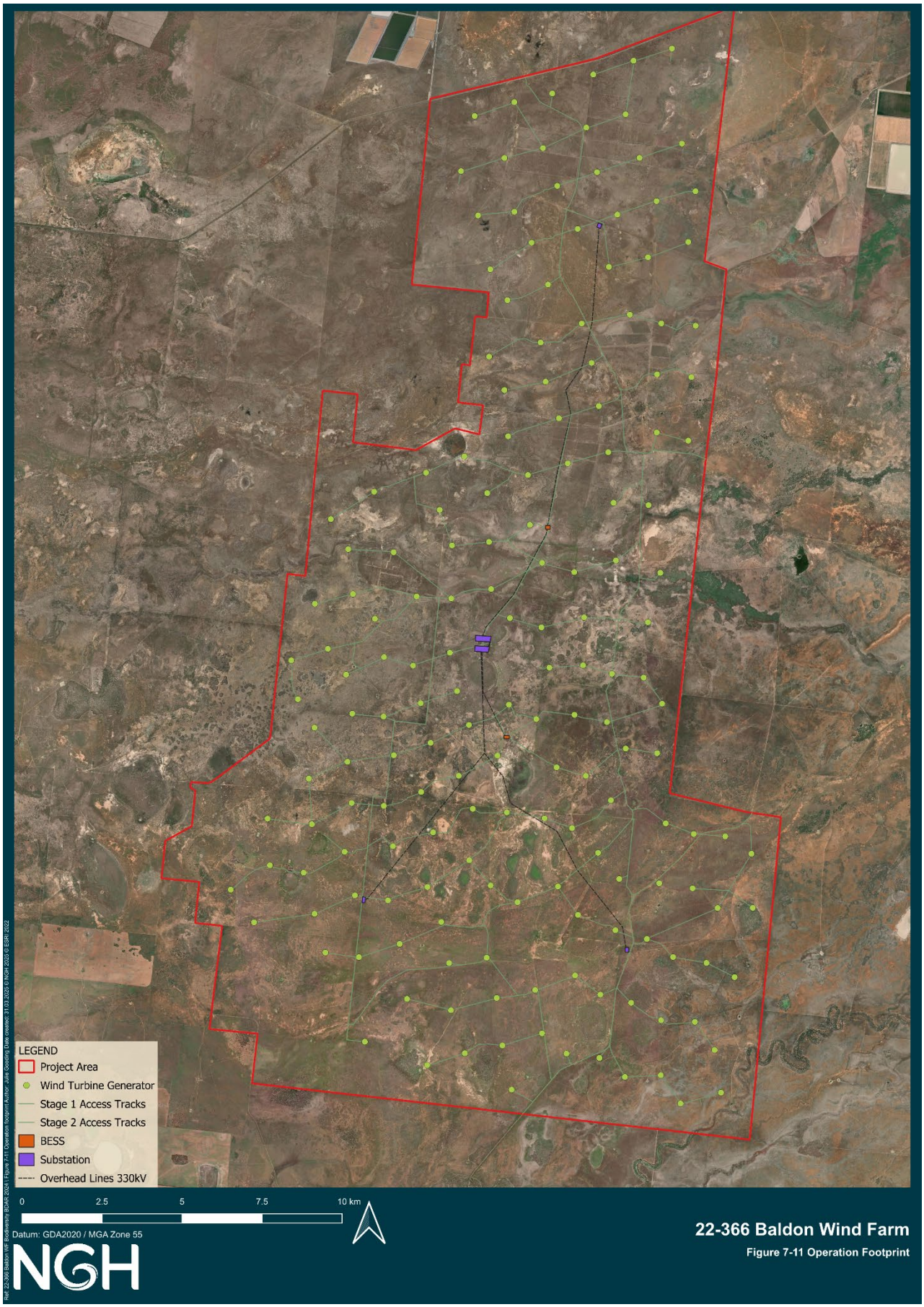


Figure 7-12 Operation Footprint

8. Assessment of impacts

8.1 Direct impacts

The construction and operational phases of the Project have the potential to impact biodiversity values that cannot be avoided. This would occur through direct impacts such as habitat clearance, construction noise and activities, and operational infrastructure and noise which may present a deterrent or barrier to fauna movement or flora growth. These direct impacts are summarised in Table 8-1.

Table 8-1 Direct impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Direct impacts					
Impacts to Native Vegetation for permanent and temporary construction facilities (e.g. turbines, access tracks, site compounds)	A total of 769.35 ha Native vegetation, of which includes: Stage 1 Development Footprint: • Native vegetation clearing of 211.47 ha, including Zone 1: 0.95 ha, Zone 6: 0.24 ha, Zone 7a: 20.53, Zone 9: 0.01 ha, Zone 12: 0.68 ha, Zone 14: 0.55 ha, Zone 15: 7.58 ha, Zone 17: 2.33 ha, Zone 18: 3.35 ha, Zone 19: 174.70 ha, Zone 20: 0.19 ha, Zone 21: 0.16 ha Stage 2 Development Footprint: • Native vegetation clearing of 557.88 ha, including Zone 1: 2.72 ha, Zone 2: 1.78 ha, Zone 3: 4.84 ha, Zone 4: 0.57 ha, Zone 5: 0.98 ha, Zone 6: 4.95 ha, Zone 7a: 20.14 ha,	One-off event in stages throughout Development Footprint	Construction (inclusive of Stage 1 and Stage 2)	• *Natural Grasslands of the Murray Valley Plains* CEEC (within the Stage 2 Development Footprint) • Threatened flora including *Brachyscome papillosa, Convolvulus tedmoorei, Eleocharis obicis Maireana cheelii, Swainsona murrayana* • Threatened fauna detected including Little Eagle, Plains-wanderer, Southern Bell Frog, Southern Myotis, Pink Cockatoo, White-fronted chat, Blue-winged Parrot. • Ecosystem species listed in section 4.2	• Direct loss of native flora and fauna habitat. • Injury and mortality of fauna during clearing of fauna habitat and habitat trees. • Direct loss of threatened flora individuals and habitat

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
	Zone 7b: 1.12 ha, Zone 8: 1.30 ha, Zone 10: 0.27 ha, Zone 11: 6.72 ha, Zone 12: 59.51 ha, Zone 13: 2.38 ha, Zone 14: 6.45 ha, Zone 15: 19.13 ha, Zone 16: 1.11 ha, Zone 17: 1.13 ha, Zone 18: 1.87 ha, Zone 19: 417.92, Zone 20: 2.99 ha • 16 HBTs				
Impacts to Threatened Ecological Communities	1.12 ha of *Natural Grasslands of the Murray Valley Plains*	One-off	Construction and Operation	*Natural Grasslands of the Murray Valley Plains*	Direct loss of native vegetation Direct loss of TEC seedbank
Displacement of resident fauna and fauna habitat loss.	A total of 769.35 ha, of native vegetation which includes: • 211.47 ha within the Stage 1 Development Footprint • 557.88 ha within the Stage 2 Development	One-off event in stages throughout Development Footprint	Construction, operation	• Threatened fauna detected including Little Eagle, Plains-wanderer, Southern Bell Frog, Southern Myotis, Pink Cockatoo, White-fronted chat, Blue-winged parrot • Ecosystem species listed in Section 4.2	Possible displacement to native fauna through vegetation clearing expected to impact on ground dwelling mammals, birds, reptiles and birds relying on tree canopies for nesting sites.

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
	Footprint 16 HBTs within the Stage 2 Development Footprint No waterbodies would be removed by the proposal				
Loss of threatened flora habitat (habitat loss, trampling, loss of individuals)	295.41 ha of *Brachyscome papillosa* habitat 62.66 ha of *Maireana cheelli* habitat 0.17 ha of *Convolvulus tedmoorei* habitat (assumed presence) 53.73 ha of *Eleocharis obicis* habitat (assumed present) 0.38 ha of *Swainsona murrayana* habitat	One-off event in stages throughout Development Footprint	Construction, operation	Threatened flora including *Brachyscome papillosa, Convolvulus tedmoorei, Eleocharis obicis, Maireana cheelii, Swainsona murrayana,*	Loss of flora species, Loss of habitat. Soil seed bank would be retained and protected during construction to minimise loss of seed bank.
Injury or death of fauna	Unknown	Regular	Construction, operation	• Threatened fauna detected including Little Eagle, Plains-wanderer, Southern Bell Frog, Southern Myotis, Pink Cockatoo, White-fronted Chat, Blue-winged Parrot. • Ecosystem species listed in Section 4.2	Possible loss of native fauna expected to be on ground dwelling mammals, birds and amphibians. These species are, however,

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
					mobile and are likely to vacate the Development Footprint into adjacent habitats during construction phase.
Disruption to connectivity	Loss of 769.35 ha of native vegetation, comprising 2% of Project Area. Vegetation fragmentation widths of up to 10m for access tracks and 100m for Wind Turbines	Regular	Construction, operation	• *Natural Grasslands of the Murray Valley Plains* CEEC (within the Stage 2 Development Footprint) • Threatened flora including *Brachyscome papillosa, Convolvulus tedmoorei, Eleocharis obicis, Maireana cheelii, Swainsona murrayana.* • Threatened fauna detected including Little Eagle, Plains-wanderer, Southern Bell Frog, Southern Myotis, Pink Cockatoo, White-fronted Chat, Blue-winged Parrot • Ecosystem species listed in Section 4.2	Disruption and limitation to movements of threatened fauna Disruption and limitation of dispersal of threatened flora
Existence of permanent infrastructure	A total of 339.58 ha within the Operational Footprint.	Regular	Construction, Operation	• *Natural Grasslands of the Murray Valley Plains* CEEC (within the Stage 2 Development Footprint) • Threatened flora including *Brachyscome papillosa, Convolvulus tedmoorei, Eleocharis obicis Maireana cheelii, Swainsona murrayana*	Disruption and limitation to movements of threatened fauna Disruption and limitation of dispersal of threatened flora

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
				• Threatened fauna including Little Eagle, Plains-wanderer, Southern Bell Frog, Southern Myotis, Pink Cockatoo, White-fronted Chat, Blue-winged Parrot	

8.1.1 Loss of Native Vegetation

Vegetation impacts are calculated using the area of native vegetation occurring within the Development Footprint. The Project will generally reduce the vegetation integrity scores in all vegetation zones to zero, assuming complete clearing for construction of tracks, Wind Turbines, substations, site compounds and BESS sites. The Development Footprint is considered the maximum extent of clearing and the impacts to clearing are likely to be less than this area during construction. The installation of underground cabling would require only minor temporary soil disturbance with excavation of trenches to be backfilled immediately following installation. The impact area of the cabling trenches is less than 1m wide and these areas are likely to naturally regenerate over time, from the surrounding native vegetation. However, as a worst-case scenario, areas of underground cabling are assumed to have complete clearing and are calculated with a change in vegetation integrity score to zero.

Table 8-2 shows the changes in VI score within the Stage 1 Development Footprint and Table 8-3 shows the changes in VI score within the Stage 2 Development Footprint.

Table 8-2 Change in VI Score for each vegetation zone within the Stage 1 Development Footprint as a result of identified impacts

Zone ID	PCT/Zone	EEC and/or threatened species habitat?Add	Area impacted (ha)	Current vegetation integrity score	Future vegetation integrity score
1	15_Woodland_high	*Brachyscome papillosa*, *Eleocharis obicis*, Southern Bell Frog	0.95	71.1	0
6	28_Grassland_moderate	*Eleocharis obicis*,	0.24	36.2	0
7a	46_High	*Brachyscome papillosa*	20.53	95.9	0
9	57_High	N/A	0.01	52.8	0
12	153_Moderate	N/A	0.68	49.5	0
14	159_Planted	*Brachyscome papillosa*	0.55	92.1	0
15	160_High	*Brachyscome papillosa*, *Eleocharis obicis*, Southern Bell Frog, Southern Myotis	7.58	88.4	0

Zone ID	PCT/Zone	EEC and/or threatened species habitat?Add	Area impacted (ha)	Current vegetation integrity score	Future vegetation integrity score
17	163_High	*Eleocharis obicis, Maireana cheelii,*	2.53	89	0
18	163_Moderate	*Eleocharis obicis, Maireana cheelii*	3.35	65.2	0
19	164_High	*Brachyscome papillosa, Convolvulus tedmoorei* (Assumed present), *Maireana cheelii, Swainsona murrayana,* Southern Bell Frog, Southern Myotis	174.70	93.7	0
20	164_Moderate	Southern Bell Frog, Southern Myotis	0.19	40.6	0
21	153_Low (Euston)	N/A	0.16	81.4	0
		TOTAL:	**211.47**		

Table 8-3 Change in VI Score for each vegetation zone within the Stage 2 Development Footprint as a result of identified impacts

Zone ID	PCT/Zone	EEC and/or threatened species habitat?	Area impacted (ha)	Current vegetation integrity score	Future vegetation integrity score
1	15_Woodland_high	*Brachyscome papillosa, Eleocharis obicis,* Southern Bell Frog	2.72	72.8	0
2	15_Woodland_low	*Brachyscome papillosa, Eleocharis obicis*	1.78	55.5	0
3	15_Grassland_moderate	*Brachyscome papillosa, , Eleocharis*	4.84	33.9	0

Zone ID	PCT/Zone	EEC and/or threatened species habitat?	Area impacted (ha)	Current vegetation integrity score	Future vegetation integrity score
		obicis, Southern Bell Frog			
4	17_High	*Brachyscome papillosa, Eleocharis obicis*	0.57	85.7	0
5	28_Woodland_moderate	*Eleocharis obicis,* Southern Bell Frog, Southern Myotis	0.98	21.5	0
6	28_Grassland_moderate	*Eleocharis obicis, Maireana cheelii*	4.95	36.7	0
7a	46_High	*Brachyscome papillosa, Maireana cheelii,* Southern Bell Frog, Southern Myotis	20.14	95	0
7b	46_High (TEC)	*Natural grasslands of the Murray Valley Plains – CEEC, Brachyscome papillosa*	1.12	84.2	0
8	46_Moderate	*Brachyscome papillosa*	1.30	57.9	0
10	57_Moderate	Little Eagle	0.27	47.6	0
11	153_High	*Brachyscome papillosa, Maireana cheelii,* Southern Bell Frog	6.72	99.2	0
12	153_Moderate	*Brachyscome papillosa, Maireana cheelii,* Southern Bell Frog	59.51	59.2	0
13	153_Low	*Brachyscome papillosa*	2.38	42. 1	0
14	159_Planted	*Brachyscome papillosa, Maireana cheelii,* Southern Bell Frog	6.45	92.1	0
15	160_High	*Brachyscome papillosa, Eleocharis obicis,* Southern Bell Frog, Southern Myotis	19.13	71.5	0

Zone ID	PCT/Zone	EEC and/or threatened species habitat?	Area impacted (ha)	Current vegetation integrity score	Future vegetation integrity score
16	160_Moderate	*Brachyscome papillosa, Eleocharis obicis,* Southern Bell Frog	1.11	45.5	0
17	163_High	*Brachyscome papillosa, Eleocharis obicis, Maireana cheelii*	1.13	89	0
18	163_Moderate	*Eleocharis obicis, Maireana cheelii*	1.87	52.8	0
19	164_High	*Brachyscome papillosa, Maireana cheelii, Swainsona murrayana,* Little Eagle, Southern Bell Frog, Southern Myotis	417.92	94.8	0
20	164_Moderate	*Brachyscome papillosa,* Southern Bell Frog, Southern Myotis	2.99	51.6	0
		TOTAL:	**557.88**		

8.1.2 Loss of species credit species habitat or individuals

Twelve candidate species have the potential to lose habitat from the proposal. The loss of species credit habitat or individuals due to clearing is shown in Table 8-4 for the Stage 1 Development Footprint and Table 8-5 for the Stage 2 Development Footprint.

Table 8-4 Summary for species credit species loss within the Stage 1 Development Footprint

Species Credit Species	Biodiversity risk weighting	Area of habitat impacted (Ha)
Flora		
Brachyscome papillosa Mossgiel Daisy	2.0	46_High (Zone 7a): 7.74 159_Planted (Zone 14): 0.02 160_High (Zone 15): 6.82 164_High (Zone 19): 77.21
Convolvulus tedmoorei Bindweed	3.0	164_High (Zone 19): 0.17
Eleocharis obicis Spike-Rush	2.0	15_Woodland_high (Zone 1): 0.95 28_Grassland_moderate (Zone 6): 0.24

Species Credit Species	Biodiversity risk weighting	Area of habitat impacted (Ha)
		160_High (Zone 15): 7.58 163_High (Zone 17): 2.53 163_Moderate (Zone 18): 3.35
Maireana cheelii Chariot Wheels	2.0	163_High (Zone 17): 0.90 163_Moderate (Zone 18): 0.03 164_High (Zone 19): 26.29
Swainsona murrayana Slender Darling Pea	2.0	164_High (zone 19): 0.17
Fauna		
Litoria raniformis Southern Bell Frog	2.0	15_Woodland_high (Zone 1): 0.55 160_High (Zone 15): 0.13 164_High (Zone 19): 5.24 164_Moderate (Zone 20): 0.07
Myotis Macropus Southern Myotis	2.0	160_High (Zone 15): 0.13 164_High (Zone 19): 5.17 164_Moderate (Zone 20): 0.07

Table 8-5 Summary for species credit species loss within the Stage 2 Development Footprint

Species Credit Species	Biodiversity risk weighting	Area of habitat impacted (ha)
Flora		
Brachyscome papillosa Mossgiel Daisy	2.0	15_Woodland_high (Zone 1): 0.05 15_Woodland_low (Zone 2): 0.56 15_Grassland_moderate (Zone 3): 1.83 17_High (Zone 4): 0.46 46_High (Zone 7a): 3.99 46_High (Zone 7b): 1.12 46_Moderate (Zone 8): 0.04 153_High (Zone 11): 1.14 153_Moderate (Zone 12): 5.59 153_Low (Zone 13): 2.17 159_Planted (Zone 14): 0.96 160_High (Zone 15): 9.35 160_Moderate (Zone 16): 1.11 163_High (Zone 17): 0.10 164_High (Zone 19): 172.97 164_Moderate (Zone 20): 2.18
Eleocharis obicis Spike-Rush	2.0	15_Woodland_high (Zone 1): 2.72 15_Woodland_low (Zone 2): 1.78

Species Credit Species	Biodiversity risk weighting	Area of habitat impacted (ha)
		15_Grassland_moderate (Zone 3): 4.84 17_High (Zone 4): 0.57 28_Woodland_moderate (Zone 5): 0.98 28_Grassland_moderate (Zone 6): 4.95 160_High (Zone 15): 19.13 160_Moderate (Zone 16): 1.11 163_High (Zone 17): 1.13 163_Moderate (Zone 18): 1.87
Maireana cheelii Chariot Wheels	2.0	28_Grassland_moderate (Zone 6): 1.23 46_High (Zone 7a): 4.00 153_High (Zone 11): 0.19 153_Moderate (Zone 12): 1.56 159_Planted (Zone 14): 0.52 163_High (Zone 17): 0.03 163_Moderate (Zone 18): 0.40 164_High (Zone 19): 27.51
Swainsona murrayana Slender Darling Pea	2.0	164_High (Zone 19): 0.21
Fauna		
Hieraaetus morphnoides Little Eagle	1.5	57_Moderate (Zone 10): 0.19 164_High (Zone 19): 0.55
Litoria raniformis Southern Bell Frog	2.0	15_Woodland_high (Zone 1): 0.57 28_Woodland_moderate (Zone 5): 0.33 46_High (Zone 7a): 0.01 153_High (Zone 11): 0.10 153_Moderate (Zone 12): 2.20 159_Planted (Zone 14): 0.13 160_High (Zone 15): 4.09 164_High (Zone 19): 22.60 164_Moderate (Zone 20): 1.03
Myotis Macropus Southern Myotis	2.0	28_Woodland_moderate (Zone 5): 0.33 46_High (Zone 7a): 0.01 160_High (Zone 15): 4.06 164_High (Zone 19): 22.33 164_Moderate (Zone 20): 1.01

8.1.3 Loss of hollow-bearing trees

Surveys identified 109 HBTs within the Subject Land (Figure 4-13, Appendix L.5 for Atlas series). Based on the Development Footprint, 16 would be removed, all of which are located in the Stage 2 Development Footprint, including:

- 4 HBTs within Vegetation Zone 1 (PCT 15 Woodland High),
- 8 HBTs within Vegetation Zone 2 (PCT 15 Woodland Low),
- 1 HBT within Vegetation Zone 3 (PCT Grassland Moderate),
- 1 HBT within Vegetation Zone 15 (PCT 160 High),
- 2 HBTs within Vegetation Zone 19 (PCT 164 High).

An inventory of HBTs is provided in Appendix H.

8.2 Indirect impacts

Indirect impacts are impacts of the Project that occur beyond the Development Footprint and are anticipated during construction or operation. A buffer for constructability has been included within the Development Footprint which ensures the Development Footprint impact areas include all areas of physical ground disturbance required to construct the Project, vehicle movements, laydowns areas, etc. Areas outside the Development Footprint may be adversely affected by indirect impacts such as edge effects, transport of weeds, construction noise and disturbance or inadvertent impacts on native vegetation. The construction program would be staged, such that no areas are considered likely to be indirectly impacted for the full duration of the construction program.

Once operational, access tracks may fragment habitat, affecting fauna movement or increase pest animal movement. Noise pollution from wind turbine operation may lead to habitat avoidance for fauna species, particularly birds or bats, due to the introduction of airborne load broadband sound which alters the natural acoustic environment (Teff-Seker, Berger-Tal, Lehnardt, & Teschner, 2022). Sound has been shown to affect narrow space / canopy dwelling bats more than open country foraging bat species; the site is habitat for the open country foragers and therefore this presents a lower risk of impacts (EIANZ European bat presentation, February 2024). Furthermore, the risk is present only when turbines are turning. The most sound is generated in windy conditions when less bird and bat activity is anticipated. The average capacity of windfarms is less than 50% (ranging from 25-45%) (DECCW, 2010), presenting a low risk of impact from operational noise. Adaptive management including operational monitoring is a commitment of the Project to address uncertainty. Indirect impacts associated with the project are detailed Table 8-6.

Table 8-6 Potential indirect impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Large patches of native vegetation within the wider Subject Land outside of the Development Footprint.	Moderate	Construction Phase: Short-term Operational phase: Long-term.	• *Natural Grasslands of the Murray Valley Plains* TEC • *Brachyscome papillosa* • *Eleocharis obicis* • *Maireana cheelii* • *Lepidium monoplocoides* • *Swainsona murrayana* • Little Eagle • Southern Bell Frog • Southern Myotis • Pink Cockatoo • Plains-wanderer • White-fronted Chat • Blue-winged Parrot • Other Ecosystem species listed in section 4.2	• Minor direct loss of native flora and fauna habitat • Increased edge effects, which result in potential impacts to connectivity for fauna between patches of native vegetation (Rowley, Edwards, & Kelly, 1993)

Reduced viability of adjacent habitat due to edge effects	Large patches of native vegetation within the wider Subject Land outside of the	High	Operational phase: Long-term.	• *Natural Grasslands of the Murray Valley Plains* TEC
				• *Brachyscome papillosa*
				• *Eleocharis obicis*
				• *Maireana cheelii*
					• Increased edge effects, which result in potential impacts such as:
					  • connectivity for fauna between patches of native vegetation
					  • Increase in pest animals

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
	Development Footprint.			• *Swainsona murrayana* • Southern Bell Frog • Plains-wanderer • White-fronted Chat • Other Ecosystem species listed in Section 4.2	• Weed invasion • Increased noise and movement • Micro-climatic changes (Rowley, Edwards, & Kelly, 1993)
Reduced viability of adjacent habitat due to increased noise	Large patches of native vegetation within the wider Subject Land, outside of the Development Footprint.	Moderate	Construction Phase: Short – term.	• Black Falcon • Black-breasted Buzzard • Blue-winged Parrot • Flame Robin • Inland Forest Bat • Little Eagle • Little Pied Bat • Pink Cockatoo • Plains-wanderer • Southern Bell Frog • Southern Myotis • Southern Whiteface • Spotted Harrier • White-fronted Chat • Yellow Bellied Sheath-tailed Bat • Other ecosystems listed in Section 4.2	• May alter fauna activities and/or movements • Loss of foraging or breeding habitat • Interference with calls resulting in communication complications – particularly birds, bats and frogs (Parris & McCauley, 2016)

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Loss of fauna and fauna habitat due to wind turbine noise	Subject Land and surrounding vegetation	Low	Operational Phase: Long-term	• Black Falcon • Black-breasted Buzzard • Blue-winged Parrot • Flame Robin • Inland Forest Bat • Little Eagle • Little Pied Bat • Pink Cockatoo • Plains-wanderer • Southern Bell Frog • Southern Myotis • Southern Whiteface • Spotted Harrier • White-fronted Chat • Yellow-bellied Sheathtail Bat • Other ecosystem species listed in Section 4.2	• Avoidance of habitat for threatened fauna species • Reduction in fauna species' vocal communication and interference with an animal's ability to detect calls or danger, forage and with communication distance • Potentially higher impact on songbird communication due to frequency interference of calls • Subsequent effects on reproductive success (breeding) therefore potential loss of fauna (Teff-Seker, Berger-Tal, Lehnardt, & Teschner, 2022).
Entrapment of animals	Within reticulation trenches during construction	Low	Construction Phase: Short-term	• Southern Bell Frog • Western Blue-tongued Lizard	• Injury or death of threatened fauna
Transport of weeds and pathogens from	Subject Land and surrounding vegetation	Moderate	Construction and operation phase: Long-term	• *Natural Grasslands of the Murray Valley Plains* TEC • *Brachyscome papillosa*	• Introduction or colonisation of weed species resulting from clearing, topsoil stripping and movement, import and export of

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
the Development Footprint to adjacent vegetation				• *Eleocharis obicis* • *Maireana cheelii* • *Swainsona murrayana* • Southern Bell Frog • Plains-wanderer • White-fronted Chat	soils and via vehicular movements. • Decreased opportunity for regeneration of native vegetation and colonisation of other native flora. • Risk of weed and pathogen spread by the addition of new roads within the Subject Land. • (Transport for NSW, 2019)
Increased risk of starvation, exposure and loss of shade or shelter	Subject Land	Low	Construction and Operational Phase: Short-term.	• Southern Bell Frog • Southern Myotis • Little Eagle • Pink Cockatoo • Plains-wanderer • White-fronted Chat • Blue-winged Parrot • Other Ecosystem species listed in Section 4.2	• Loss of foraging habitat • The impact is expected to be minor. Vegetation removal constitutes less than 2% of the Project Area and similar vegetation exists in the Project Area for fauna to find refuge. There is a small amount (5.45 ha) of woodland habitat to be removed within the Development Footprint which is minimal in the context of the wider Project Area, comprising less than 3% of woodland areas.
Loss of breeding habitat	HBTs not within approved clearing	Low	Construction Phase: Long-Term	• Little Eagle • Southern Bell Frog	• Loss of potential breeding habitat including HBTs

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
	extent Grassland and shrubland not within approved clearing extent Dams not within the approved clearing extent			• Southern Myotis • Pink Cockatoo • Plains-wanderer • White-fronted Chat	• Loss of vegetation close to water, • Loss of nesting habitat within grassland and shrubland communities. • Increased pressure and competition for remaining HBTs resources. • Impacts to water bodies and water quality.
Trampling of threatened flora species	Vegetation not within approved clearing extent	Low	Construction and Operation Phase: Long-Term	• *Brachyscome papillosa* • *Eleocharis obicis* • *Maireana cheelii* • *Swainsona murrayana*	• Loss of individuals within the population which had not been accounted for • Moderate impact if there are additional populations observed within the Development Footprint which were not identified during targeted surveys. • Decreased opportunity for native vegetation regeneration
Inhibition of nitrogen fixation and increased soil salinity	N/A	Rare	Operation Phase: Long-term	N/A	• It is unlikely that any adverse impact on soil microbial life and soil salinity will be made through the development and on-going

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
					operation.
Rubbish dumping	Subject Land and surrounding vegetation.	Low	Construction Phase: Short-term.	• *Natural Grasslands of the Murray Valley Plains* TEC • *Brachyscome papillosa* • *Maireana cheelii* • *Swainsona murrayana* • Southern Bell Frog • Plains-wanderer	• Contamination of surrounding habitat with rubbish associated with construction if this is not managed. • Increased likelihood of weed and pest occurrence. (Transport for NSW, 2019)
Increase in predators	Subject Land and surrounding vegetation.	Low	Operation Phase: Long-term	• Black Falcon • Black-breasted Buzzard • Blue-winged Parrot • Inland Forest Bat • Little Eagle • Little Pied Bat • Pink Cockatoo • Plains-wanderer • Southern Bell Frog • Southern Whiteface • Spotted Harrier • White-fronted Chat • Other ecosystem species listed in Section 4.2	• Feral cats, foxes and other feral predators could increase due to increasing habitat edges and additional tracks created by development increasing movement capacity and success of feral predators • Injury or death of threatened native fauna species • Increased competition resulting in reduced food availability (NSW Environment Protection Authority (EPA), 2021)

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Increase in pest animal populations	Subject Land and surrounding vegetation.	Moderate	Construction and Operation Phase: Long-term	• *Natural Grasslands of the Murray Valley Plains* TEC • *Brachyscome papillosa* • *Maireana cheelii* • Little Eagle • Southern Bell Frog • Plains-wanderer • Other ecosystem species listed in Section 4.2	• Increased human activity within the Development Footprint has the potential to introduce pest animals. • Competition with and predation of native fauna • Reduction in habitat quality • Decreased opportunity for native vegetation regeneration (NSW Environment Protection Authority (EPA), 2021)
Changed fire regimes	Subject Land and surrounding vegetation.	Low	Construction Phase: Short-term Operation Phase: Long-term	• Natural Grasslands of the Murray Valley Plains TEC • *Brachyscome papillosa* • *Maireana cheelii* • *Swainsona murrayana* • Little Eagle • Southern Bell Frog • Plains-wanderer	• Moderate risk of increased fire frequency during construction given use of vehicles and machinery which may cause sparks or leak fuel on dry vegetation. Low chance of altered fire regimes during operation, as vehicles will be restricted to tracks and roads and the access tracks in themselves create improved means to manage any fires that may occur during operations (i.e. improved firefighting access and firebreaks).

8.3 Prescribed impacts

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of the development on human-made structures and non-native vegetation
- Impacts of the development on habitat connectivity
- Impacts of the development on water quality, water bodies and hydrological processes
- Impacts of wind turbine strikes
- Impacts of vehicle strikes on threatened fauna.

These are discussed in detail below, as well as details of any threatened entities potentially impacted by these actions.

8.3.1 Impacts of development on human-made structures and non-native vegetation

Human-made structures located within the Project Area which provide habitat for threatened species include windmills and powerlines. These features are utilised by raptor species as structures for nests, due to the lack of large trees within the locality. In particular, one windmill located in the centre of the Project Area, was observed with a large raptor nest. These human-made structures occur outside the Subject Land and will not be directly removed as a result of the Project. There may be short-term disturbance due to increase traffic during the construction phase within proximity to these habitat features. However, the consequence of impacts of the development on these human-made structures and associated habitat is expected to be low, due to these structures being retained for future use.

8.3.2 Impacts of development on habitat connectivity

Removal of native vegetation and threatened species habitat has the potential to result in fragmentation, with resultant effects on fauna species movement, reproduction and gene flow. Clearing can result in the inability of species to move between patches of suitable habitat and undertake important lifecycle processes, such as breeding and dispersal. This has the potential to increase the vulnerability of flora and fauna populations to stochastic events and extinction. The majority of the Project Area consists of native vegetation, mostly in the form of shrublands and grasslands. Therefore, there is currently habitat connectivity across the entire Project Area and into the broader locality.

The Project has the potential to reduce connectivity through clearing. Connectivity within and across the Subject Land is currently provided for species which do not require a consistent canopy for traversal. In particular, a high number of farm tracks, which vary from being single tyre tracks across vegetation to formed tracks and roads, intersect the Project Area. As such, the Project Area is considered somewhat fragmented, although to a low degree. Habitat connectivity is likely to be impacted for threatened bird, amphibian and reptile species including the following:

- Plains-wanderer *(Pedionomus torquatus)*
- Redthroat *(Pyrrholaemus brunneus)*
- Southern Bell Frog *(Litoria raniformis)*
- Western Blue-tongued Lizard *(Tiliqua occipitalis)*
- White-fronted Chat *(Epthianura albifrons)*

The Southern Bell Frog is at higher risk of reduced habitat connectivity caused by fragmentation by dividing landscapes and increasing vehicle movement through adjacent areas. This threatened species is highly mobile, moving between habitats regularly. Vehicle strike while moving between habitats is its highest risk, which is analysed in Section 0.

Existing movement opportunities for the majority of species within the Project Area will not be reduced by the linear and discrete nature of the wind farm project. There is sufficient adjacent habitat for many of the threatened avifauna species occurring across the Project Area and the likelihood of wind turbines reducing habitat connectivity is low. Wind turbines are proposed to be installed with sufficient distance (>1000m) between each structure, allowing moderately safe passage between habitats with low reduction in connectivity. The potential impacts of wind turbine noise leading to fragmentation are discussed further in Table 8-6. The loss of vegetation associated with the Development Footprint is unlikely to have an impact that could cause a decline to threatened species, with modification of their behaviour over time to move within the retained vegetation and across new tracks associated with the Project more likely.

Potential impacts caused by operating wind turbines and limiting aerial connectivity is addressed in Section 8.3.4.

8.3.3 Impacts of development on water quality, water bodies and hydrological processes

Direct and indirect impacts to waterbodies, water-quality, and hydrological processes, within the Subject Land have been mitigated at the planning stage through the total exclusion of waterbodies (wetlands, ponds, dams) from the proposed Development Footprint. This intentional exclusion will minimise disruption to critical aquatic habitat associated with threatened species such as the Southern Bell Frog (*Litoria raniformis*), Southern Myotis (*Myotis macropus*) and water birds and help to maintain the current level of habitat availability within the broader landscape. It is unlikely there would be any significant impacts to the aquatic habitat of these species.

Hydrology and flood assessments by BMT indicate that surface flows are of relatively low velocity, due to shallow grades in the catchment and presence of significant storage areas. No significant changes to velocity are expected within or outside the site as a result of the proposed development. With consideration of relatively low velocities in existing and developed scenarios, it is expected that there will be limited erosion in the riverbanks, destruction of riparian vegetation or reduction in the stability of riverbanks or watercourses along Abercrombie Creek and The Forest Creek (BMT, 2025).

Flood studies (BMT, 2025) modelled only very minor changes to the current hydrological regimes from the proposed development. The site consists of flood storage and flood fringe categories due to slow-moving water, and the proposal is not expected to cause significant changes to flood function. Modelled scenarios for 5% Annual Exceedance Probability (AEP) demonstrate only minor changes across the Project Area, with an afflux of ±10cm in larger wetland areas and ±2cm along watercourses or smaller wetland areas (Figure 8-1). There are more substantial changes in small areas immediately near proposed infrastructure, with modelled changes of water depth up to +3.7m next to the proposed BESS substation at 5% AEP. This is considered a quirk of the model with detailed design readily able to design for drainage to avoid this scenario.

Regardless, this area contains Mossgiel Daisy (*Brachyscome papillosa*) populations and changes in flooding may impact germination or dispersal of the population. This area is modelled to currently experience flood levels of 1-2m water depth. Based on the low frequency of the flooding events (1 in 20 years) and small area of impact, changes in flooding around the BESS substation area are unlikely to significantly reduce the

population of Mossgiel Daisy. Flood modelling for 1%, 0.5% and 0.2% AEP also demonstrates negligible changes to flood regimes and is considered a minor risk. No significant flood impacts are modelled to occur outside the site. The minor changes in hydrological flow are unlikely to impact the threatened flora populations, Mossgiel Daisy, Chariot Wheels, Spike-rush and Slender Darling-pea or TEC currently present within the Project Area.

Flood studies (BMT, 2025) modelled only very minor changes to the current hydrological regimes from the proposed development. The site consists of flood storage and flood fringe categories due to slow-moving water, and the proposal is not expected to cause significant changes to flood function. The most notable impacts are observed to be localised around the proposed infrastructure. Modelled scenarios for 5% Annual Exceedance Probability (AEP) demonstrate only minor changes across the Project Area, with an afflux of ±10cm in larger wetland areas and ±2cm along watercourses or smaller wetland areas (Figure 8-1). There are more substantial changes in small areas near proposed infrastructure, with changes of water depth up to +3.7m near the proposed BESS substation at 5% AEP. This area contains Mossgiel Daisy (*Brachyscome papillosa*) populations and changes in flooding may impact germination or dispersal of the population. This area is modelled to currently experience flood levels of 1-2m water depth. Based on the low frequency of the flooding events (1 in 20 years) and small area of impact, changes in flooding around the BESS substation area are unlikely to significantly reduce the population of Mossgiel Daisy. Flood modelling for 1%, 0.5% and 0.2% AEP also demonstrates negligible changes to flood regimes and is considered a minor risk. No significant flood impacts are modelled to occur outside the site. The minor changes in hydrological flow are unlikely to impact the threatened flora populations, Mossgiel Daisy, Chariot Wheels, Spike-rush and Slender Darling-pea or TEC currently present within the Project Area.

However, while the hydrology of the Subject Land is unlikely to be significantly impacted during construction, the dispersed nature of intended Project infrastructure (sub-stations, transmission lines, staff accommodation, BESS, wind turbine platforms) will require new and upgraded roads to provide appropriate accessibility throughout the Project Area. Runoff from heavy rainfall on new access tracks across the Project Site during construction, may impact habitat for *Natural Grasslands of the Murray Valley Plains* TEC or threatened flora species: Mossgiel Daisy, Chariot Wheels, Spike-rush and Slender Darling-pea. Mitigation measures such as dust management and monitoring programs including sediment controls and rehabilitation of disturbed areas along tracks outline in section 9 would minimise the risk of any additional sedimentation to these species.

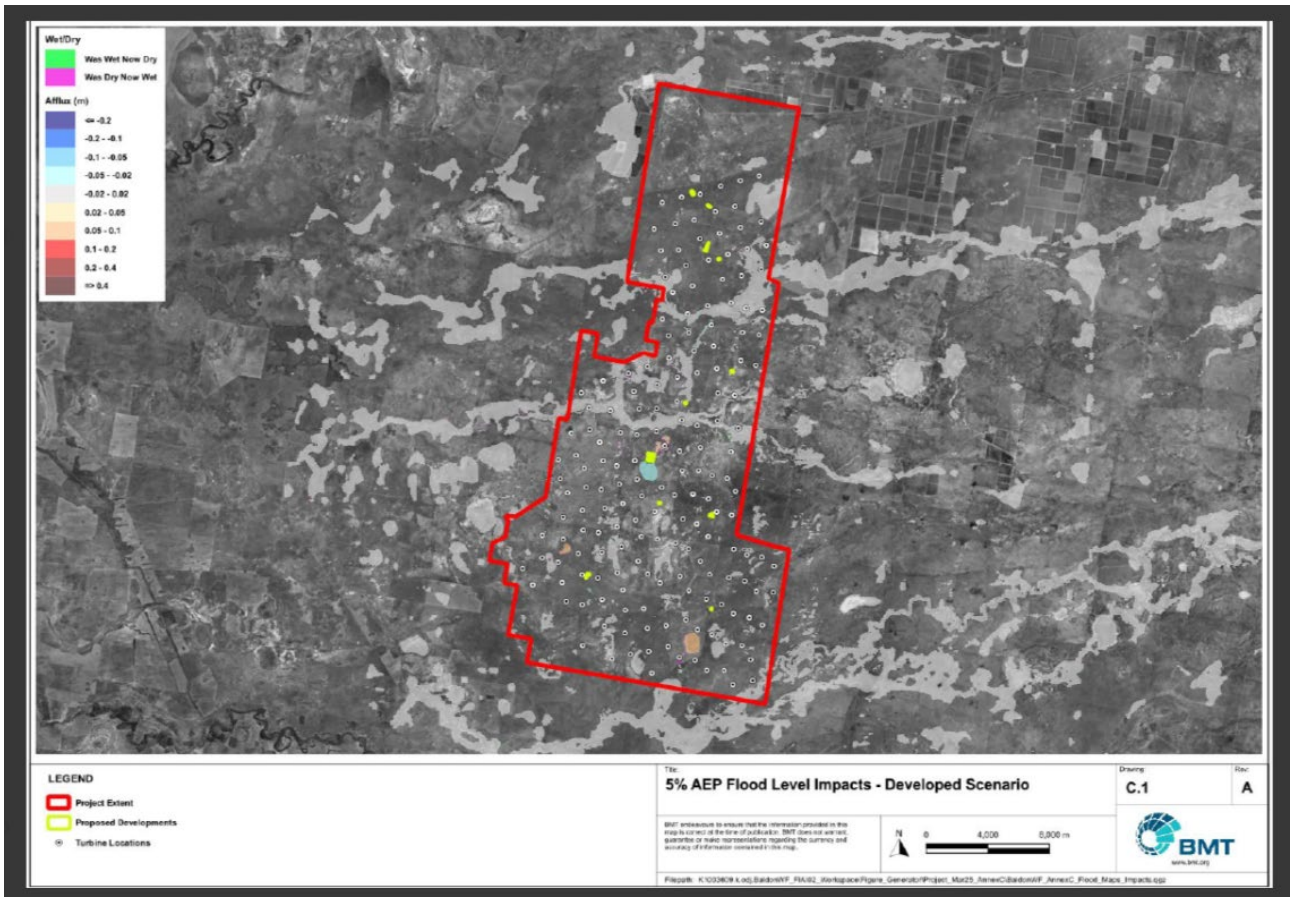


Figure 8-1 Modelled flood level impacts for 5% AEP Peak Velocity (Sourced from BMT, 2025)

8.3.4 Impacts of wind turbine strikes

In order to assess the potential for the Project to impact bird and bat species, a two year bird and bat utilisation survey was undertaken by subconsultants, Nature Advisory from Summer 2023 to Summer 2025. Seasonal reports from the two year period are provided in full in Appendix J

The Bird and Bat assessment targeted species of concern, which are those that:

- are known, likely or have the potential to occur on the wind farm site, and
- that are also listed as threatened or migratory under the EPBC Act and/or BC Act, or
- are known to be particularly vulnerable to wind turbine impacts (turbines located in key movement pathways, flight behaviour, or other ecological traits).

BUS surveys

Bird utilisation survey (BUS) methodology, effort and limitations are covered in Section 4.1.3. BUS survey locations are shown in Figure 6-3.

A total of 72 species of birds as well as four genera were recorded across all seasons in the two-year survey period, which comprised of 21,013 individual bird observations. In the first year of surveys, 8,364 individual bird observations were recorded, while in the second year of surveys 12,649 individual bird observations were recorded. Eight species observed through the BUS methodology have been identified as threatened under the EPBC Act and/or the BC Act and one species is listed as migratory under the EPBC Act. Two additional threatened species were observed incidentally, totalling ten threatened and one migratory bird

species in the Project Area. The Project Area supports a range of common and widespread species found in representative habitat in the region. The most common bird species detected during BUS include the following:

- White-winged Fairy-wren (*Malurus leucopterus*)
- Common Starling (*Sturnus vulgaris)*
- Brown Songlark (*Cincloramphus cruralis)*
- Galah (*Cacatua roseicapillus*)
- Australian Pipit (*Anthus australis*)

Diversity of species was influenced by vegetation and seasonality. Typically, survey points within or adjacent to patches of tall shrubland or scattered trees returning a higher diversity than points in open grassland dominated locations. Higher diversity was also recorded in Winter as compared to Autumn and Summer, which is likely due to availability of foraging resources and water within the Project Area.

The majority of birds observed at impact sites (91%) were observed outside the RSA height, with only 9% of observations within the RSA (48 – 300 m AGL). Tree Martin was the most common observed species at RSA height, followed by Straw-necked Ibis, Wedge-tailed Eagle and Common Starling. Martins, including Tree Martin, Fairy Martin and unidentified Martin species, collectively accounted for 37% of all observations at RSA height

Raptors are at risk of collision with operating turbines. A total of 14 raptor species were recorded across the Project Area both incidentally and through formal BUS surveys. The number of observations from the formal BUS surveys is 1,527 with a further 573 incidental observations.

Raptor presence varied between seasons, in line with diversity of all species, which would suggest availability of foraging resources was also a factor. During formal BUS, 771 observations of Nankeen Kestrel (*Falco cenchroides)* were made, making it the most abundant raptor species on site. This was followed by the Wedge-tailed Eagle (*Aquila audax)*, which was observed 339 times during formal BUS. Black Kite (*Milvus migrans)* was observed incidentally 215 times and Nankeen Kestrel (*Falco cenchroides)* was observed incidentally 154 times, making these two species the most common raptors observed incidentally. Nankeen Kestrel (*Falco cenchroides*) and Wedge-tailed Eagle (*Aquila audax*) are amongst the most vulnerable species to collision with operating turbines due to their soaring and hovering hunting methods.

Of the total of 1,527 raptor observations, 17.8% occurred at RSA height. The Wedge-tailed Eagle (*Aquila audax)* was observed 181 times at RSA height (66.3%) and was the most abundant raptor species observed at RSA followed by Nankeen Kestrel (*Falco cenchroides)* and Brown Falcon (*Falco berigora*) with 34 and 23 records respectively.

Nine waterbird species were recorded, comprising 518 observations. These species included:

- Australian Pelican *(Pelecanus conspicillatus)*
- Australian Pratincole *(Stiltia isabella)*
- Great Cormorant *(Phalacrocorax carbo)*
- Grey Teal (*Anas gracilis*)
- Gull-billed Tern *(Gelochelidon nilotica)*
- Straw-necked Ibis *(Threskiornis spinicollis)*
- Banded Lapwing *(Vanellus tricolor)*
- White-faced Heron *(Egretta novaehollandiae)*
- White-necked Heron *(Ardea pacifica)*

Overall, the majority of waterbirds were observed during summer surveys. The Straw-necked Ibis was the most abundant species of waterbird with a total of 270 observations. The Banded Lapwing was the second most abundant waterbird with 139 observations.

Of the nine waterbird species recorded, seven were recorded flying at RSA height, with a total of 285 observations (55%). Straw-necked Ibis was the most abundant species recorded at this height with 209 observations (73.3%), while the Australian Pelican was the second most abundant species flying at RSA height with 54 observations (18.9%). Grey Teal and Gull-billed Tern were the only two waterbird species not recorded at this height.

Bat surveys

Seasonal bat surveys (Song Meter Mini deployment) were undertaken by Nature Advisory in July (Winter) 2022, and from April (Autumn) 2023 to January (Summer) 2025. Surveys were unable to be undertaken during Spring 2022 due to flooding and restricted site access. Bat survey methodology, effort and limitations are covered in Section 4.1.3.

A total of 14 microbat species, including two BC Act listed bat species, and one species complex call (*Nyctophilus* sp.), were recorded as positively identified calls on-site in the first year of surveys (Appendix J). In the second year of surveys, 15 microbat species were positively-identified recorded calls on-site, with again one species complex call (*Nyctophilus* sp.). Four BC Act listed bat species were also identified on-site, the same species identified during the first year of surveys – Inland Forest Bat *(Vespadelus baverstocki)*, Little Pied Bat *(Chalinolobus picatus)*,Yellow-bellied sheath-tailed Bat *(Saccolaimus flaviventris)* and Southern Myotis (*Myotis Macropus*).

Listed threatened and migratory species

A total of eight threatened species under the BC Act and/or EPBC Act and one migratory species under the EPBC Act were recorded during formal BUS surveys with a total of 1,056 observations. White-fronted Chat (*Epthianura albifrons*) is listed as Vulnerable under the BC Act and was the most abundant threatened bird species observed, consisting of 83% of all threatened bird species observations (875 observations). One incidental observation of Flame Robin (*Petroica phoenicea*) listed as Vulnerable under the BC Act was also recorded.

Four species listed under both the BC Act and the EPBC Act were observed during formal BUS surveys, including:

- Two observations of Blue-Winged Parrot *(Neophema chrysostoma)*
- 112 observations of Southern Whiteface *(Aphelocephala leucopsis)*
- 30 observations of Pink Cockatoo *(Lophochroa leadbeateri)*
- Two incidental observations of Plains-wanderer (*Pedionomus torquatus*).

Four observations of Gull-billed Tern *(Gelochelidon nilotica)* listed as migratory under the EPBC Act were also recorded during formal BUS surveys.

Included in the threatened species recorded during formal BUS surveys were four Vulnerable (BC Act) species of raptors, namely two observations of Little Eagle (*Hieraaetus morphnoides*), nine observations of Black Falcon (*Falco subniger*), 21 observations of Spotted Harrier (*Circus approximans*), and one observation of Black-breasted Buzzard (*Hamirostra melanosternon)*

Four Vulnerable (BC Act) species of microbat were also confirmed in the Project Area through acoustic recordings. Species presence included 108 confirmed observations of Inland Forest Bat *(Vespadelus*

baverstocki), two confirmed observations of Yellow-bellied sheath-tailed Bat *(Saccolaimus flaviventris),* 10 confirmed observations of Little Pied Bat *(Chalinolobus picatus)* and 22 confirmed observations of Southern Myotis (*Myotis macropus*). One species of bat was identified by call to a genus level only - *Nyctophilus* genus. A precautionary assumption of presence was applied to the Vulnerable listed (BC Act and EPBC Act Corben's Long-eared Bat (*Nyctophilus corbeni)*, as this species has the potential to occur within the Project Area.

Risk of impact during wind farm operation

The SEARs and BAM require an impact assessment to migratory species and resident raptors that may be subject to impacts associated with blade strike during the operational phase of the project. Nature Advisory (2022d) conducted an initial desktop-based risk assessment to measure the overall risk of a potential impact event on the local population of any species of concern known or likely to occur to inform initial constraints, followed by a final risk assessment after completion of the two years of bird and bat surveys (Appendix J.21). The revised risk assessment used the NSW government draft Turbine Risk Assessment and Avoidance Guidance to determine collision risk ratings.

Whilst the majority of birds at the Subject Land were common farmland and woodland species, nine species of threatened birds and five species of threatened bats were identified during BUS or associated incidental surveys (denoted in Table 8-7 with an asterisk). One of these bats was identified by call to a genus level only, *Nyctophilus,* and a precautionary approach was applied to the listed Vulnerable listed (BC Act and EPBC Act) *Nyctophilus corbeni* (Corben's Long-eared Bat) as this species has the potential to occur within the Project Area.

Table 8-7 Collision risk for bird and bat species of concern (known or likely to occur)

Species of concern	Collision risk
Aphelocephala leucopsis Southern Whiteface*	The species typically forage on the ground and shrubs for invertebrates and seeds (Cayley, 1946; Menkhorst, et al., 2019). Risk of collision from operating turbines is **low** and indirect disturbance considered unlikely, being a ground feeding bird (Nature Advisory, 2025).
Botaurus poiciloptilus Australasian Bittern	The species has not been recorded on site. The Australian Bittern's preferred habitat is freshwater wetlands with dense vegetation cover. In NSW the species is frequently recorded in the Murray-Darling Basin (Cwth DCCEEW, 2022a) Dispersing individuals may periodically pass through the site but there are no identified regular flight paths within the project area and there is limited potential stop-over habitat within the site, consisting of small farm dams with ephemeral water and vegetation. Although the likelihood of collision with turbines is unlikely, the species was assigned a **moderate risk** due to its Endangered listing status (Nature Advisory, 2025).
Epthianura albifrons	This species was recorded as one of the five most abundant within the Project Area at formal BUS survey points, and was the most abundant

Species of concern	Collision risk
White-fronted Chat *	threatened species making up 83% of all threatened species observations. White-fronted Chat was observed twice above the minimum proposed RSA height (>52m above ground) however this is expected to be a rare instance. This species forages primarily on or close to ground level and inhabits low growing vegetation. Due to the general behaviour of this species, it presents a **moderate** collision risk (Nature Advisory, 2025).
Lophochroa leadbeateri Pink Cockatoo *	Recorded on 30 occasions during formal BUS and two active nests were incidentally detected outside of the Subject Land. Pink Cockatoo is mainly sedentary in areas of permanent water and available large hollows for breeding, but usually nomadic in arid zones movements and numbers are relative to foraging resource availability. It is noted that even when traveling long distances, Pink Cockatoos move by a "series of short flights from one tree, or clump of trees, to the next" (HANZAB, 2023). Formerly widespread, but range contraction has occurred in many regions due to fragmentation of habitat, loss of HBTs and agricultural monoculture not providing adequate dietary requirements. Typically flies at or just above the canopy height, which is well below RSA height. Pink Cockatoo was assigned a **high risk** due to being confirmed on site during BUS surveys as well as being listed as Endangered under the EPBC Act (Nature Advisory, 2025).
Neophema chrysostoma Blue-winged Parrot *	Recorded in the Project Area by Nature Advisory staff. Blue-winged Parrot breeding season occurs between October to February. Outside of the breeding season, they can be found in sparse populations across most of the south, centre and east of Australia, including western New South Wales where the study area is located. Birds are known to move more than 100km inland during winter to feed in semi-arid chenopod shrubland and sparse grassland. This species may be an annual visitor to the study area. Risk to Blue-winged Parrot from the Project is considered to be **moderate risk** (Nature Advisory, 2025).
Pedionomus torquatus Plains-wanderer *	Recorded in first year of surveys by Nature Advisory and by NGH. Plains Wanderer is highly sensitive to changes in grassland cover and density. There are three historical records from the search region including one from the Project Area, north of the Sturt Highway. Suitable habitat is present within the Project area. Has been recorded in Project area and surrounds by NGH during targeted surveys. The NSW government draft Turbine Risk Assessment and Avoidance Guidance consequence of impacts is based on national and state

Species of concern	Collision risk
	conservation status rather than direct consideration of impacts. Therefore, despite the likelihood of collision with turbines being unlikely, the species was assigned a **moderate risk** due to being a Critically Endangered species under the EPBC Act and a SAII entity under the BC Act (Nature Advisory, 2025).
Rostratula australis Australian Painted Snipe	The species has not been recorded on site. The Riverina region of Victoria and NSW appears to be a stronghold for this species. The species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (Cwth DCCEEW, 2022b). Dispersing individuals may periodically pass through the site but there are no identified regular flight paths within the Project Area and there is limited potential stop-over habitat, consisting of small farm dams with ephemeral water and vegetation. Although the likelihood of collision with turbines is unlikely, the species was assigned a **moderate risk** due to its Endangered listing status (Nature Advisory, 2025).
Stagonopleura guttata Diamond Firetail	The species has not been recorded on site during surveys, however it is associated with PCTs present within the Subject Land. The species has never been observed flying at RSA height and the risk of collision from operating turbines is considered **low risk** (Nature Advisory, 2025).
Raptors	
Accipiter fasciatus Brown Goshawk	Commonly occurring raptor species recorded to collide with turbines include Nankeen Kestrel, Brown Falcon and Black-shouldered Kite (Nature Advisory, 2024). Other species of raptor may collide with turbines infrequently. Raptors appear not to be deterred by the presence of operating turbines and occur regularly at other wind farms in NSW (Nature Advisory, 2024). Overall, the risk from collision with turbines to these raptors is considered to be **moderate risk** (Nature Advisory, 2025) as these species are widespread and common, making local population impacts unlikely as affected individuals would be readily replaced.
Circus approximans Swamp Harrier	
Elanus axillaris Black-shouldered Kite	
Falco berigora Brown Falcon	
Falco cenchroides	

Species of concern	Collision risk
cenchroides Nankeen Kestrel	
Falco longipennis Australian Hobby	
Falco peregrinus Peregrine Falcon	
Haliastur sphenurus Whistling Kite	
Milvus migrans Black Kite	
Circus assimilis Spotted Harrier *	The Spotted Harrier was recorded at below proposed RSA height and is low risk of collision. The species' propensity to hunt at low height over shrublands and grasslands generally places it at below proposed RSA height at the Project Area. The species is likely resident at low density within the Project Area and regionally. Spotted Harrier is therefore considered to be **moderate risk** (Nature Advisory, 2025).
Falco subniger Black Falcon *	Black Falcon has been recorded within the Project Area, including at formal BUS survey points. Collision between operating turbines and Black Falcon could occur as they do fly at or above minimum RSA height and have been recorded colliding with wind turbines at other windfarm sites. The current records and predicted distribution of this species indicates that the species could be affected locally, by operating turbines. The risk to Black Falcon is therefore considered to be **high risk** (Nature Advisory, 2025).
Hamirostra melanosternon Black-breasted Buzzard *	A single individual was observed (incidentally) during formal BUS surveys and was not observed at or above the minimum proposed RSA height (>52m above ground). As with other raptors this species is likely to fly within RSA height, but the likelihood of a strike remains low due to the sparse distribution of the population. The risk to Black-breasted Buzzard is therefore considered to be **low risk** (Nature Advisory, 2025).
Hieraaetus morphnoides	Recorded in the Project Area by Nature Advisory staff. Little Eagle are distributed throughout the Australian mainland except in the most

Species of concern	Collision risk
Little Eagle *	densely forested parts of the Great Dividing Range. Turbine strikes of this raptor species could occur. Suitable habitat is available locally and there are records from the region. It is expected that regular collision is unlikely in NSW given its very low population densities. The risk to Little Eagle was therefore considered to be **moderate risk** (Nature Advisory, 2024).
Falco hypoleucos Grey Falcon	Not recorded during surveys. It flies at RSA height while hunting and collision is likely but very infrequent due to the rarity of the species in the region. The risk to Grey Falcon was therefore considered to be **low risk** (Nature Advisory, 2025).
Aquila audax Wedge-tailed Eagle	The species was recorded on site during BUS surveys as well as incidentally and is a species most exposed to collision risks as it soars at RSA while searching for foraging opportunities. The risk of turbine collision to the Wedge-tailed Eagle is therefore considered to be **high risk** (Nature Advisory, 2025).
Migratory birds	
Actitis hypoleucos Common Sandpiper	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The population that migrates to Australia breeds in the Russian far east. Global populations of this species are estimated to be 2 – 4 million individuals, with the non-breeding population that migrates to Australia at around 3,000 individuals (DCCEEW, 2024). It is unlikely that this species will be a regular seasonal visitor to the region, with such a large extent of suitable habitat within the preferred range of northern Australia. The species was not assessed as part of the risk analysis undertaken by Nature Advisory.
Apus pacificus Fork-tailed Swift	The Fork-tailed Swift is a non-breeding migrant to Australia. It is widespread across Australia and territories arriving in north west Australia in October and November. Forages aerially for insects, sometimes in mixed feeding flocks with other aerial foragers. Believed to roost on the wing. It is recorded in all regions of NSW (DCCEEW, 2024). While this species may be impacted on occasion by the Project, the large extent of suitable habitat within Australia, and the low likelihood of a strike remains low due to the sparse distribution of the population, it is considered to be **low risk** (Nature Advisory, 2025)..

Species of concern	Collision risk
Calidris acuminata Sharp-tailed Sandpiper	The Sharp-tailed Sandpiper is migratory, breeding in northern Siberia and moving in flocks of less than a thousand, to non-breeding areas south of the Equator. During the non-breeding season, most of the world population of Sharp-tailed Sandpipers occurs in Australia. After arriving in Australia, most birds move slowly south across the continent to south-east Australia. Movements occur during the non-breeding period where birds appear to be dispersive, moving to temporary or flooded wetlands and leaving them when they dry. Numbers are generally not stable in southern Australia where they are found on intertidal mudflats between December to March, possibly because inland wetlands are dry (DCCEEW, 2024). It is unlikely that this species will be a regular seasonal visitor to the region, with such a large extent of suitable habitat within the preferred range of northern and eastern Australia. It is therefore considered to be **low risk** (Nature Advisory, 2025)..
Calidris ferruginea Curlew Sandpiper	Curlew Sandpipers 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. This species is migratory and does not breed in Australia. During the non-breeding season this species travels to Australia's north in late August to early September. After a stopover in northern Australia migration continues on a direct route to south-east Australia, and small numbers occur regularly in south-west NSW from early August. Approximately 13% of the global population occurs in the East Asian-Australasian Flyway (DCCEEW, 2024). No records have been recorded within the Project Area. It is therefore considered to be **low risk** (Nature Advisory, 2025).
Calidris melanotos Pectoral Sandpiper	The Pectoral Sandpiper breeds in northern Russia and North America. In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The Pectoral Sandpiper is found in Australia from September to June (DCCEEW, 2024). It is unlikely that this species will be a regular seasonal visitor to the Project Area, with such a large extent of suitable habitat within the preferred range of northern and eastern Australia. It is therefore considered to be **low risk** (Nature Advisory, 2025).

Species of concern	Collision risk
Gallinago hardwickii Latham's Snipe	This species is considered Vulnerable (date effective 05/01/2024) and migratory under the EPBC Act. This species is a non-breeding visitor to south-eastern Australia, and is considered a potential infrequent visitor to the region of the Project. During migration this species move slowly southward on their arrival in Australia, traveling along the coastline and through regions near to the coast to the south-eastern region of Australia. They are thought to disperse in response to rainfall and foraging resource availability, and will abandon seasonally drying wetlands in favour of more permanent habitats elsewhere (DCCEEW, 2024). Although small numbers of this species may visit the region during abundant, wet years, it is unlikely this species will be a permanent resident in the region. It is therefore considered to be **low risk** (Nature Advisory, 2025).
Gelochelidon nilotica Gull-billed Tern *	Four Gull-billed Terns were recorded during surveys, however, this species is unlikely to come into contact with turbines during foraging but may be negatively impacted during migration if large numbers of birds transit the site. The records of this species in the Project Area are likely the result of very wet conditions throughout 2023. The frequency of this species foraging and transiting across the Project Area remains unclear as there are few records from the Project Area. Multiple records occur from the lower Murrumbidgee River wetlands northeast of Balranald and north of the Project Area (DCCEEW, 2024) . Although small numbers of this species may visit the region during abundant, wet years, it is unlikely this species will be a permanent resident in the region. It is therefore to be **low risk** (Nature Advisory, 2025).
Hydroprogne caspia Caspian Tern	In Australia, the Caspian Tern is a resident and present throughout the year at sites where breeding occurs year round and also at some sites where breeding is protracted. They usually forage by shallow plunging, hovering up to 15 m above the water, with their bill pointing down, they flex their wings, then dive, fully submerging, and quickly re-emerge. There is very limited suitable breeding or foraging habitat within the Project Area (DCCEEW, 2024). Although small numbers of this species may visit the region during abundant, wet years, it is unlikely this species will be a permanent resident in the region. It is therefore considered to be **low risk** (Nature Advisory, 2025).
Motacilla flava Yellow Wagtail	The Yellow Wagtail is a regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. The species is considered a vagrant to Victoria, South Australia and southern Western

Species of concern	Collision risk
	Australia (DCCEEW, 2024). Although small numbers of this species may visit the region during abundant, wet years, it is unlikely this species will be a permanent resident in the region. It is therefore to be **low risk** (Nature Advisory, 2025).
Tringa glareola Wood Sandpiper	The Wood Sandpiper breeds across Eurasia, mostly in Scandinavia, the Baltic countries and Russia. The non-breeding areas are mainly in tropical and subtropical Africa, south Asia to south China, Philippines, Indonesia and Australia. The Wood Sandpiper has its largest numbers recorded in north-west Australia, with all areas of national importance located in Western-Australia (DCCEEW, 2024). No records of this species occur within the region. It is therefore considered to be **low risk** (Nature Advisory, 2025).
Tringa nebularia Common Greenshank	This species is considered Endangered (date effective 05/01/2024) and migratory under the EPBC Act. This species is a non-breeding visitor to south-eastern Australia, and is considered a potential infrequent visitor to the region of the Project. The species is not globally threatened and is considered secure due to its extensive breeding range. It is therefore considered to be **low risk** (Nature Advisory, 2025).
Tringa stagnatilis Marsh Sandpiper	The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia. It breeds from eastern Europe to eastern Siberia. The Marsh Sandpiper is not globally threatened. Birds arrive in Australia from September and apparently move south across the continent from September–December. Inland records exist for Murray Valley, around Barmah, Kerang-Swan Hill and Mildura (DCCEEW, 2024). Although small numbers of this species may visit the region during abundant, wet years, it is unlikely this species will be a permanent resident in the region. It is therefore to be **low risk** (Nature Advisory, 2025).
Microbats	
Austronomus australis White-striped Freetail Bat*	Common and widespread across southern Australia and is not listed as threatened. White-striped Freetail Bat has been recorded and has been regularly recorded colliding with turbines at other wind farms in south-eastern Australia. It is expected that there will be regular collisions with turbines and therefore is at **high risk** (Nature Advisory, 2025).
Chalinolobus gouldii Gould's Wattled Bat*	Common and widespread across southern Australia and not listed as threatened. These Wattled Bat species have been recorded in the

Species of concern	Collision risk
Chalinolobus morio Chocolate Wattled Bat*	Project Area and have been regularly recorded colliding with turbines at other wind farms in south-eastern Australia. It is expected that there will be regular collisions with turbines. Gould's Wattled Bat is considered to be at **high risk** and Chocolate Wattled Bat is considered to be at **moderate risk** (Nature Advisory, 2025).
Chalinolobus picatus Little Pied Bat *	Little Pied bat Is listed as Vulnerable under the BC Act. This species is found from south-eastern Australia to northern Queensland. It was recorded flying in the Project Area, however does not regularly fly at RSA heights, therefore collision with turbines is unlikely. The risk to Little Pied Bat is considered to be **moderate risk** (Nature Advisory, 2025).
Myotis macropus Southern Myotis *	Southern Myotis is listed as Vulnerable under the BC Act. The species wasrecorded from acoustic recordings. Suitable habitat for the species within the Subject Land is restricted to small farm dams and no mortalities of this species have been recorded at other wind farms. Therefore, irrespective of the presence of the species, it is considered to be at **low risk** (Nature Advisory, 2025).
Nyctophilus sp. *	Corben's Long-eared Bat *Nyctophilus corbeni* is listed as Vulnerable under the BC Act and the EPBC Act and may occur within the Project Area. Therefore a precautionary approach has been applied to this unidentified *Nyctophilus* spp. call as it could be the threatened species. It occurs in a wide variety of habitats usually associated with water courses and permanent water (Churchill, 2008). It roosts in tree hollows, crevices and under loose bark. NSW distribution mapping does not show it occurring within this Project Area (DPIE 2022). The species is slow-flying and agile, prefers to fly in the understorey foraging on non-flying prey and will even crawl along the ground to hunt (OEH 2022). It is unlikely to fly at typical RSA heights and therefore unlikely to collide with turbines. The risk to Corben's Long-eared Bat is considered to be **moderate risk** (Nature Advisory, 2025).
Ozimops (Mormopterus) petersi Inland Freetail Bat*	This species is commonly recorded at wind farms in NSW and has been recorded in the Project Area. The species was not detected at RSA heights and there are no known records of this species colliding with turbines at other wind farm sites, therefore is at **low risk** (Nature Advisory, 2025).
Ozimops (Mormopterus)	Common and widespread across southern Australia and is not listed as threatened. South-eastern Freetail Bat has been recorded in the Project

Species of concern	Collision risk
planiceps South-eastern Freetail Bat*	Area and has been regularly recorded colliding with turbines at other wind farms in south-eastern Australia. It is expected that there will be regular collisions with turbines, however is at **low risk** (Nature Advisory, 2025).
Ozimops (Mormopterus) ridei Ride's Free-tailed Bat*	Ride's Free-tailed Bat is a common species present across eastern Australia. It was recorded at two sites during the Winter 2022 Bat Utilisation surveys. It is considered to be **low risk** (Nature Advisory, 2025).
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat*	Likely to be an occasional visitor to the site when weather conditions are favourable, may only be a summer visitor. This species is known to occur at RSA height and collisions have occurred at other wind farm sites in NSW. It is expected that there will be collisions with turbines and therefore is at **moderate risk** (Nature Advisory, 2025).
Scotorepens greyii Little Broad-nosed Bat*	The Little Broad-nosed Bat is a common species and occurs across eastern, northern, central and north-Western Australia. It was recorded in the Project Area during the winter 2022 Bat Utilisation Survey. It is considered to be **low risk** (Nature Advisory, 2025).
Vespadelus baverstocki Inland Forest Bat *	Inland Forest Bat is listed as Vulnerable under the BC Act. Known to roost in very small hollows in stunted trees only a few metres tall, including Mallee, Mulga and River Red Gum. The foraging behaviour of this species will likely bring it into the RSA height, as it is known to fly rapidly and cover extensive foraging areas, feeding on flying insects. This species is considered at **moderate risk** (Nature Advisory, 2025).
Vespadelus darlingtoni Large Forest Bat*	Both species are common and widespread across southern Australia and neither are listed as threatened. Large Forest Bat was not recorded within RSA height within the Project Area, however has been recorded colliding with turbines at other wind farms in south-eastern Australia. Southern Forest Bat has also been recorded colliding with turbines at other wind farms, with its foraging behaviour bringing it into RSA height. It is expected that there will be collisions with turbines for both of these species, however they are considered to be at **low risk** (Nature Advisory, 2025).
Vespadelus regulus Southern Forest Bat*	

In summary, eight species and one group have been assessed as having moderate risk associated with collisions with turbine blades during the operation of the project and five species have been assessed as having a high risk associated with collisions with turbine blades:

- White-fronted Chat (*Epthianura albifrons*) – moderate
- Blue-winged Parrot (*Neophema chrysostoma*) – moderate
- Plains-wanderer (*Pedionomus torquatus*) – moderate (due to the conservation status of the species despite turbine strike being an unlikely event to occur)
- Chocolate Wattled Bat (*Chalinolobus morio*) – moderate
- Little Pied Bat (*Chalinolobus picatus*) – moderate
- Corben's Long-eared Bat *(Nyctophilus corbeni)* – moderate
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) – moderate
- Inland Forest Bat (*Vespadelus baverstocki*) – moderate
- Other raptor species (Australian Hobby, Brown Falson, Nankeen Kestrel and Black-shouldered Kite) – moderate
- Little Eagle *(Hieraaetus morphnoides*) – high
- Pink Cockatoo (*Lophochroa leadbeateri*) – high
- Wedge-tailed Eagle (*Aquila audax*) – high
- White-striped Freetail Bat *(Austronomus australis*) – high
- Gould's Wattled Bat (*Chalinolobus gouldii*) – high

The revised risk assessment from the second year of BBUS surveys compared to the preliminary risk assessment resulted in an overall risk level increase for threatened species. This is due to using the NSW government draft Turbine Risk Assessment and Avoidance Guidance instead of the previous AusWEA (2005). The consequence criteria for the draft Turbine Risk Assessment and Avoidance Guidance are based on national and statewide conservation status assessments rather than any direct consideration of impacts on local and regional populations. This approach is precautionary as it places potential impacts of the Project in the context of observed declines from all threats affecting the species. However, this approach fails for some endangered and critically endangered species such as those that are rarely recorded in the region and that are unlikely to occur within the Project Area, or a turbine collision being unlikely to occur such as the case with Plains-wanderer. Due to their high conservation status these species are automatically assigned to a high-risk category, which inappropriately directs attention towards impacts that are unlikely to eventuate (Nature Advisory, 2025).

8.3.5 Impacts of vehicle strikes on threatened fauna or fauna part of a TEC

The project will increase vehicle movement with the Subject Land through the construction of access tracks. Tracks will be most heavily utilised during construction for movement of heavy vehicles and machinery through the Subject Land, but will be retained during operation for maintenance vehicles. It is anticipated that during peak construction the Project would generate up to 134 light vehicles and 142 heavy vehicles accessing the site per day. However, the average anticipated traffic volumes during construction are up to 80 light vehicles and 88 heavy vehicles per day. During operation the Project is expected to generate a lower amount of traffic with up to 35 maintenance workers accessing the site each day in standard light vehicles, to carry out monitoring, maintenance and land management actions at a limited number of wind turbines. Most of the traffic entering the Subject Land during construction and operation would go directly to and from the project office. The residual traffic volumes would be spread across the Development Footprint and typically focussed on a handful of wind turbine locations on any given day. Species that may be at risk of increased vehicle strike are shown in section 6.1.6.

The Southern Bell Frog (*Litoria raniformis*) is considered a capable traveller able to move hundreds of metres over short periods of time (Hamer, Lane, & Mahony, 2008). Dispersal is generally constrained to the breeding

season (August-March) when the species migrates from terrestrial refugia to aquatic habitat to breed (Pyke, 2002), inter-wetland movement also occurs during this period; with movement events generally constrained to after sunset when the risk of predation and dehydration are reduced.

Infrastructure associated with modified landscapes, such as roads and rail, can pose nearly insurmountable barriers to dispersal for some species (Garcia-Gonzalez, Campo, Pola,, & Garcia-Vazquez, 2012). Amphibians in particular are reported to be at high risk of mortality at road and rail crossing points compared to other similar-sized endothermic taxa (Glista, DeVault, & DeWoody, 2008). This is attributed to their low visibility to drivers and the time spent (retention) by individuals to cross a road.

A lack of scientific investigation into the impact of vehicle strikes on Australian amphibians limits our ability to predict strike rates. Further compromising the utility of comparative studies conducted in other countries/eco-regions is the difference in mobility between amphibian species. A study of vertebrate mortalities in Indiana (USA) calculated 6.7 kills/km surveyed for herpetofauna between March 2005-July 2006 (Glista, DeVault & DeWoody, 2008), this is compared to 0.24 kills/km surveyed for mammals. The applicability of these number to Southern Bell Frog, a large, mobile species is unclear, particularly in the absence of relevant transport data.

Landscape modification associated with human activity can increase inter-patch distance and landscape resistance, such as by the loss of intermediate wetlands or contiguous terrestrial spaces, disrupts natural emigration (Vos, Antonisse-de Jong, Goedhart, & Smulders, 2001); (Cayuela, Lambrey, Vacher, & Miaud, 2015). Increased landscape resistance for amphibians has consistently been reported to impact genetic diversity (Garcia-Gonzalez, Campo, Pola,, & Garcia-Vazquez, 2012), impede recolonisation of available habitat (Semlitsch, Conner, Hocking, T.A., & Harper, 2008), and decrease local amphibian richness and abundance (Glista, DeVault & DeWoody, 2008).

The long-term impact of increased risk of increased mortality through vehicular fauna strikes, where new roads and tracks are developed during and post construction, can be mitigated through limitations to nocturnal driving within the Development Footprint, particularly during periods of peak migration (detailed in an Adaptive Management Plan in section 9.2). Without a direct loss of aquatic habitat and with appropriate mitigation measures in place to minimise disruption to broader landscape connectivity, it is unlikely that the Subject Land will see a decline in Southern Bell Frog (*Litoria raniformis*) numbers from the robust population which was observed while surveying.

Plains-wanderer (*Pedionomus torquatus)* is a ground-dwelling sedentary species. Vehicle strikes are not listed as a threating process to Plains-wanderer within the National Recovery Plan (Commonwealth of Australia, 2016), and it is considered likely to run away from vehicle movements during both day or night, based on field observations during the site survey. However, Plains-wanderer (*Pedionomus torquatus)* may be unaccustomed to high number of vehicle movements during construction. Implementation of limiting vehicle speeds to 40km/hour, and ensuring vehicles sticking to formed tracks would reduce the risk of vehicle strike to Plains-wanderer (*Pedionomus torquatus)*.

Similarly, other threatened fauna – White-fronted Chat *(Epthianura albifrons)*, Pink Cockatoo (*Lophochroa leadbeateri)*, Superb Parrot *(Polytelis swainsonii* , Blued-winged Parrot *(Neophema chrysostoma*) Freckled Duck (*Stictonetta naevosa)* and Western Blue-tongued Lizard (*Tiliqua occipitalis*) that are unaccustomed to high vehicle movements within the Subject Land may be at risk of vehicle strike. The above mentioned mitigation measures would minimise risks to these species.

It is not anticipated that there will be a high level of nocturnal traffic, or vehicles travelling at significant speeds across the Subject Land at night when nocturnal species such as; Southern Bell Frogs (*Litoria*

raniformis) or Plains-wanderer (*Pedionomus torquatus)* are active due to industry limitations and proposed impact mitigation measures. Construction activities are mostly expected to be limited to 6am-6pm. Operational maintenance activities would usually be limited to daytime activities.

Limited vehicle speed/traffic to 40km/hour, restricting vehicle movements to established tracks and avoidance of existing waterbodies and fragmenting woodland patches should significantly reduce the potential for vehicle strikes during construction. Operation traffic will be low volume and unlikely to present significant biodiversity risks. In light of this it is unlikely that the road infrastructure proposed will substantially increase the risk of vehicle strike of the threatened fauna species recorded within the Subject Land.

The increase in vehicles along the Sturt Highway haulage route could increase the risk of vehicle strike to some degree. However, the additional traffic is only a small proportion of the current traffic volumes, which is an average of 1289 vehicles per day (Amber, 2024). The main increase in vehicles would occur during the construction phase, with a negligible change to the Sturt Highway traffic volumes during operation. Threatened fauna species in the vicinity of the Sturt Highway would be used to the high volume and high speeds of traffic along the Sturt Highway. Threatened fauna species are at risk of vehicle collision due to increased traffic volumes, but not to the extent that it would impact a local population. There would be a low risk of any additional indirect impacts to Yanga State Conservation Area or Gayini Wetands. The haulage route is not expected to substantially increase the risk of vehicle strike to threatened fauna species.

8.4 Cumulative Impacts

The Biodiversity Assessment Method used to assess clearing impacts considers the landscape context of the Project and the rarity and risk factors for biodiversity entities at a catchment level. In this way, the Project's assessment of 'serious and irreversible' impacts and the candidate species returned for the Project reflect the cumulative clearing impacts of the state. The tool used to assess the impacts and calculate offset obligations is updated regularly to reflect increasing knowledge about species and threats.

The Project has avoided and minimised impacts where possible to ensure that its cumulative contribution to the state's clearing is as low as possible. It will contribute to in perpetuity biodiversity offsets calculated to be commensurate with this impact.

Positive cumulative impacts are highly likely to occur as well:

- As the extensive biodiversity management planning process that accompanies construction and operation of State Significant Developments will provide opportunities to address existing weed and pest animal populations locally.
- As new stewardship sites are established locally to meet the credit requirements of these large projects. The Project has investigated a number of strategies to maximise these local benefits of strategic offsets.
- As greater information is gained about the distribution and habitat preferences of local species identified in the extensive surveys accompanying these large projects.
- As operational monitoring addresses current assumptions about species collision risk profiles.

Specific to the movement patterns, and cumulative collision and alienation risks of other wind farms in the vicinity, the bird and bat risk assessments have considered the ability of species to avoid collision and to withstand losses. No set migration paths have been identified in the region. It is much more likely that these patterns will change in response to ephemeral resources and seasonal conditions that are difficult to

predict. Adaptive management of operational monitoring addresses current assumptions and options such as 'sector curtailment' where turbines can be switched off in high-risk periods are always a last resort option if required.

Table 8-8 below shows the projects considered most relevant as part of the assessment of cumulative impacts from other wind farm projects in the region.

Of these, projects more than 100km from the site were considered sufficiently distant as to be unlikely to contribute to significant cumulative impacts to local biodiversity in combination with Baldon Wind Farm.

We have therefore considered 'Cumulative Impacts' for schemes located within 100km radius of the proposed Baldon Wind Farm:

Table 8-8 Surrounding proposed windfarms, if approved likely to interact with Baldon Wind Farm

Project	Status	Location	Timeline	Project Summary	Potential for Cumulative Impacts
Tchelery Wind Farm	Prepare EIS	Adjacent to the Project area to the east	Pre-Construction: Start Q1 2026 Construction: Q1 2026 to Q4 2027 Commissioning: Q2 2028 to Q4 2028	120 wind turbines with a maximum tip height of 285m	• **Likely:** - Cumulative impacts due to disturbance to Plains Wanderer during construction and operation - Cumulative impacts due to collision with bat and avifauna during operation • **Potential**: - Cumulative impacts due to removal of habitat
Keri Keri Wind Farm	Response to submissions	Adjacent to the Project area to the west	Not provided 24 month construction period indicated in the EIS with peak at 12 months.	155 wind turbines with a maximum tip height of 291.5m	• **Likely:** - Disturbance to Plains Wanderer during construction and operation - Collisions with bat and avifauna during operation • **Potential:** - Cumulative impacts due to removal of habitat
Wilan Wind Farm	Prepare EIS	6.8km west	Pre-Construction: Late 2024	138 wind turbines with a maximum tip height of	• **Likely:** - Collision with bat and avifauna during operation

Project	Status	Location	Timeline	Project Summary	Potential for Cumulative Impacts
			Construction: Early 2025 for 24-30 months Commissioning: No stated	300m	• **Potential:** - Disturbance to Plains Wanderer during construction and operation - Cumulative impacts due to removal of habitat
Bullawah Wind Farm	Prepare EIS	80.0km east	Pre-Construction: Not stated Construction: 2025 over 24 months Commissioning: 2026 - 2027	170 wind turbines with a maximum tip height of 300m	• **Potential:** - Collision with bat and avifauna during operation - Cumulative impacts due to removal of habitat
Junction Rivers Wind Farm	Prepare EIS	22.5km west	Pre-Construction: Not stated Construction: 2023 (now passed) over 24 - 36 months Commissioning: Not stated	107 wind turbines with a maximum tip height of 300m	• **Likely:** - Collision with bat and avifauna during operation • **Potential:** - Cumulative impacts due to removal of habitat
The Plains Wind Farm	Response to submissions	40.6km east	Pre-Construction: Starting January 2027 (2 months) Construction: Starting March 2027 over 40 months) Commissioning: Starting November 2027	188 wind turbines with a maximum tip height	• **Likely:** - Collision with bat and avifauna during operation • **Potential:** - Cumulative impacts due to removal of habitat

Project	Status	Location	Timeline	Project Summary	Potential for Cumulative Impacts
			over 18 months		
Boorooban (Saltbush) Wind Farm Pottinger Wind Farm	Prepare EIS	54.3km east	Pre-Construction: Starting 2028 Construction: 2028 for 30 months Commissioning: Mid 2030	70 wind turbines with a maximum tip height of 280m	• **Likely:** - Collision with bat and avifauna during operation • **Potential:** - Cumulative impacts due to removal of habitat
Pottinger Wind Farm (Someva / Pottinger Renewables Pty Ltd)	Exhibition	66.8km east	Pre-Construction: Not stated Construction: Q4 2026 – Q3 2027 over 55 months Commissioning: Q3 2027 over 36 months	247 wind turbines with a maximum tip height of 280m	• **Likely:** - Collision with bat and avifauna during operation • **Potential:** - Cumulative impacts due to removal of habitat
Koorakee Energy Park	Prepare EIS	90.6km north west	Pre-Construction: Not stated Construction: Not stated, 24 – 36 months forecasted Commissioning: 2028-2029	167 wind turbines with a maximum tip height of 270m	• **Potential:** - Collision with bat and avifauna during operation - Cumulative impacts due to removal of habitat

Limitations and assumptions

- Many of these projects are in the planning phase, or with respective EIS still in preparation, and therefore the level of direct impacts to native vegetation, threatened ecological communities, and threatened and migratory species is unknown.

- It is considered likely that cumulative impacts will increase the loss in extent of native vegetation, and decrease the availability of habitat for threatened species in the region. However, it is understood that measures may be undertaken by landholders at Baldon Wind farm to enhance grassland habitat through land management practices with the aim of improving this for Plains Wanderer.
- It is considered that the increase in wind farm turbines will increase the overall level of risk to collision impacts to bird and bat species in the region.
- It is unlikely that all projects currently being assessed will be built as there is a >75% excess of projects seeking approval compared to the grid capacity available (~20GW of projects in SWREZ vying for <5GW of available grid capacity).. For the purposes of this assessment, we have assumed that all projects and turbines detailed in Table 1 will be approved, but it is likely that the eventual actual impacts will be lower.

Species of concern

The bird and bat risk assessment identified the following key species to be at risk of collision with wind turbines at Baldon Wind farm, which may lead to potential cumulative impacts in combination with other wind farms in the vicinity;

Australasian Bittern and Australian Painted Snipe are considered to be of Moderate risk due to collision with operating turbines. Neither species were recorded within the Project Area and turbine strikes are considered unlikely. The species has not been recorded within the Project Area though they may periodically pass through the site, however suitable habitat has not been identified within the Project Land. Neither species have mortality records in operational wind farms in southeastern Australia (Nature Advisory, 2025) and the risk of cumulative impacts to these species in the region is considered low.

Black Falcon is considered to be of High risk due to collision with turbines. This species occurs in relatively low and transient numbers but is relatively common in the region. Turbine strikes are considered likely, but irregular. Given the species is threatened and occurs in low numbers, cumulative impacts to the species in the region could arise if repeated impacts occurred at multiple projects in the region. However, it is expected that higher numbers of strikes would occur during boom years, when implications to the population are not as great.

Blue-winged Parrot and White-fronted Chat are considered to be of Moderate risk due to collision with turbines. Blue-winged Parrot was recorded on site and may be an annual visitor to the Project Area. Turbine strikes are considered possible and this species has recorded mortalities from other operational wind farms (Nature Advisory, 2025). Although primarily a ground dwelling species, one mortality of White-fronted Chat has been recorded at another wind farm (Nature Advisory, 2025) and impacts may be more likely at the Baldon Wind Farm site due to the large resident population present. Cumulative impacts to both of these species in the region could arise if repeated impacts occurred at multiple projects in the region.

Spotted Harrier and Little Eagle are considered to be at Moderate risk due to collision with turbines. These species occur across the majority of mainland Australia, at relatively low densities. The risk of cumulative impacts to these species in the region is considered low. However, there have been significant declines in these species' populations over three generations, and if these populations continue to decline, then the risk of cumulative impacts may increase as more wind farm projects become operational in the region.

Pink Cockatoo is considered to be at High risk due to collision with turbines, and if turbine RSAs are built at sufficient height (RSA height >48m) across projects in the region, it is considered that the risk of cumulative impacts to the population due to collision, is low. This species is reliant on trees with suitable nesting hollows,

for breeding habitat. If such hollowed trees are removed at sufficient quantities across multiple projects, this may lead to a cumulative impacts on the species in the region through loss of habitat. Therefore, projects should avoid removal of suitable woodland habitat, and especially hollowed trees.

Plains Wanderer is considered to be at Moderate risk. This is due to the NSW government draft Turbine Risk Assessment and Avoidance Guidance consequence of impacts being based on national and state conservation status rather than direct consideration of impacts. The event of collision with turbines is considered unlikely and cumulative impacts due to collision are also unlikely. The species may be at risk due to disturbance during the construction, operational and de-commissioning stage of a wind farm project, and due to habitat loss. As the spatial extent of disturbance sources may be large across the Baldon Windfarm footprint, and across other windfarms in the vicinity, and potentially long term, there is a risk of cumulative impacts to the species in the region through this impact pathway. Turbine locations and infrastructure should avoid and or minimise impacts to good quality native grassland habitats favoured by this species.

Wedge-tailed Eagle is considered to be at High risk due to collision with turbines. This species is among the species most exposed to collision risk as it habitually soars within RSA height while searching for foraging opportunities. This species accounts for a substantial proportion of recorded mortalities at other wind farms (Nature Advisory, 2025). The risk of cumulative impacts may increase as more wind farm projects become operational within the region.

Other non-threatened raptor species are considered to be of Moderate risk due to collision with turbines. Collision between operating turbines and commonly occurring raptors, such as Australian Hobby, Brown Falcon, Black-shouldered Kite and Nankeen Kestrel are likely as these species are resident within the Project Area and often fly at typical RSA heights. Collisions of these species were regularly recorded in operational wind farms across southeastern Australia (Nature Advisory, 2025). The risk of cumulative impacts may increase as more wind farm projects become operational within the region.

Corben's Long-eared Bat, Chocolate Wattled Bat, Inland Forest Bat, Little Pied Bat and Yellow-bellied Sheath-tail Bat are considered to be of Moderate risk due to collision with turbines. All of these species were recorded on site with turbine strikes are considered possible for all species except Chocolate Wattled Bat which is considered likely. Most of these species have been recorded as mortalities at operational windfarms within their distribution. The risk of cumulative impacts to all of these species may increase as more wind farm projects become operational within the region.

Gould's Wattled Bat and White-striped Free-tailed Bat are considered to be of High risk due to collision with turbines. Both of these species are common and widespread and make up 20% and 42% respectively of microbat mortality at operational wind farms across southeastern Australia (Nature Advisory, 2025). Turbine strikes for both species are almost certain. The risk of cumulative impacts are likely to increase as more wind farm projects become operational within the region.

Detailed, adaptive management plans, such as an operational Bird and Bat Adaptive Management Plan, will be developed and implemented to effectively monitor these species, and potential impacts to them. These will include strategies to manage and mitigate construction and operational issues in order to reduce the likelihood of the Baldon Windfarm contributing to cumulative impacts in the region. A working draft of the Bird and Bat Adaptive Management Plan (BBAMP) can be viewed in Appendix J.1.

8.5 Impacts to biodiversity values that are uncertain

Impacts to biodiversity values such as the removal of foraging habitat or HBTs are readily quantifiable. However, impacts such as vehicle strikes, are uncertain. Mitigation measures and an adaptive management strategy for such impacts are detailed in Section 9.

The impacts to Plains-wanderer (*Pedionomus torquatus)* from the presence of wind turbines are currently unknown. This species mostly occupies low vegetation, however have been observed flying as high as 40m above ground (HANZAB 2023). Whilst impacts from turbines are unlikely, no formal studies have been undertaken as to the impact of wind turbines on Plains-wanderer (*Pedionomus torquatus)*. Mitigation measures for this species would consider adaptive management and post construction surveys.

8.6 Impacts to Matters of National Environmental Significance

An EPBC Act habitat assessment evaluation (Appendix .B.2) was undertaken for species predicted to occur within the broader study locality (10km radius). The evaluation drew on NGH's detailed understanding of this Project Area's habitat, based on vegetation and flora and fauna surveys documented in Sections 3 and 4. Due to the potential direct and indirect impact on EPBC Act listed fauna species, flora species and TEC from land clearing and potential for bird strike from wind turbines, the entire project was referred under the EPBC Act (EPBC2024/09722).

DCCEEW (Cth) determined the project is a controlled action under Part 7 of the EPBC Act, and the project will require assessment and approval under the EPBC Act before it can proceed. The project will be assessed in accordance with the bilateral assessment agreement with NSW (Amending Agreement No 1), allowing the NSW BAM and BDAR to be a suitable assessment pathway.

This section addresses potential impacts to EPBC Act listed TECs, threatened and migratory species and Appendix B.6 provides a summary of impacts.

8.6.1 Threatened ecological communities

One TEC, *Natural Grasslands of the Murray Valley Plains* CEEC, was recorded within the Subject Land. The EPBC listed form of this TEC covers 7.07 ha within the Subject Land. The extent of this community within the Project Area could be higher, however it is unknown as surveys were not conducted across the entire area.

The Project would directly remove approximately 1.12 ha of this community, or 15.84% of the community within the Subject Land. Mitigation measures such as designating 'no-go zones' and machinery hygiene procedures will ensure that there will be no impacts to the potential extent of this TEC outside of the Development Footprint.

An Assessment of Significance (AoS) was undertaken for this CEEC which determined that there is potential for the proposed action to have a significant impact, however provided that all mitigation measures are followed it is unlikely to result in a significant impact. The AoS can be viewed in Appendix B.3. This community will be offset as an ecosystem credit under the BAM for the associated vegetation zone (refer to Section 11).

8.6.2 Threatened species

A habitat assessment was conducted for EPBC Act listed threatened species returned from the Protected Matters Search Report. Sixteen species are considered likely to utilise the habitats within the Subject Land and may be impacted by the Proposal. These are:

Flora

- *Brachyscome papillosa* Mossgiel Daisy
- *Eleocharis obicis* Spike-Rush
- *Maireana cheelii* Chariot Wheels
- *Swainsona murrayana* Slender Darling Pea

Fauna

- *Aphelocephala leucopsis* Southern Whiteface
- *Lophochroa leadbeateri* Pink Cockatoo (eastern)
- *Pedionomus torquatus* Plains-wanderer
- *Neophema chrysostoma* Blue-winged Parrot
- *Melanodryas cucullata cucullata* South-eastern Hooded Robin
- *Litoria raniformis* Southern Bell Frog
- *Calidris ferruginea* Curlew Sandpiper
- *Nyctophilus corbeni* Corben's Long-eared Bat
- *Stagonopleura guttata* Diamond Firetail
- *Tringa nebularia* Common Greenshank
- *Gallinago hardwickii* Latham's Snipe, Japanese Snipe
- *Calidris acuminata* Sharp-tailed Sandpiper

An AoS has been conducted for each of the above species to characterise the significance of impacts the Project may have on these species. These AoS's was undertaken using the Commonwealth Significant Impact Guidelines (DoE, 2013) and can be viewed in Appendix .B.3. The AoS determined that a significant impact was considered unlikely to occur to the any of the entities listed above.

A further 12 species were returned from the supplementary SEARs that were determined to be absent either through surveys (outlined in Section 4) or the lack of suitable habitat as per the habitat assessment (Appendix B.2).

An additional two EPBC Act listed fauna species have also been assessed for potential impacts as one species, Superb Parrot (*Polytelis swainsonii*), was not listed in the supplementary SEARs however was returned from the Protected Matters Search Report and generated in the BAM-C, and the second species, White-throated Needletail (*Hirundapus caudacutus*), was also not listed in the supplementary SEARs nor returned from the Protected Matters Search Report, however was generated in the BAM-C as an ecosystem credit associated with four PCTs within the Subject Land.

The potential impacts to all of these threatened species are outlined in Table 8-9. Impacts to these species have also been addressed in Section 8.1, 8.2 and 8.3.

Table 8-9 Potential impacts to EPBC Act listed threatened species

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
Flora					
Brachyscome papillosa Mossgiel Daisy	Vulnerable	295.41 ha of habitat where *Brachyscome papillosa* has been recorded would be directly impacted by the Project. The extent outside the Development Footprint is not known however the species was widespread and observed in consistent abundance outside the Development Footprint. Species has persisted within the Project Area despite previous disturbance history (which included high grazing pressure). The Project will not impact habitat or individuals outside of the Development Footprint area. Impacts to this species include direct loss of individuals and habitat within the Development Footprint.	91.79 (Stage 1) 203.62 (Stage 2)	Life of the Project	Unlikely to be significantly impacted provided that mitigation measures are followed. Species will be offset as species credits under the BAM.
Eleocharis obicis Spike Rush	Vulnerable	53.73 ha of habitat were *Eleocharis obicis* has been recorded and assumed present would be directly impacted by the Project. The extent outside the Development Footprint is not known however there are 73 existing records within 10km of the Project	14.65 (Stage 1) 39.08 (Stage 2)	Life of the Project	Unlikely to be significantly impacted provided that mitigation measures are followed. Species will be offset as

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		Area (OEH, n.d.(b)). The species was not detected during targeted surveys due to conditions being too dry with known populations not being present. As such, the species could not be ruled out and is assumed present. Species has persisted within the Project Area despite previous disturbance history (which included high grazing pressure). As such, the Project is considered unlikely to impact habitat or individuals outside of the Development Footprint area. Impacts to this species include direct loss of individuals and habitat within the Development Footprint.			species credits under the BAM.
Lepidium monoplocoides Winged Peppercress	Endangered	Species was not detected within the Subject Land during targeted surveys. Direct and indirect impacts to habitat determined not to support the species will occur.	Negligible as species was not recorded within the Subject Land during targeted surveys.	Life of the Project.	No offsetting required as the species has been determined to be absent via targeted surveys.
Maireana cheelii Chariot Wheels	Vulnerable	62.66 ha of habitat where *Maireana cheelii* has been recorded would be directly impacted by the Project. The extent outside the Development Footprint is not	27.22 (Stage 1) 35.44 (Stage 2)	Life of the Project	Unlikely to be significantly impacted provided that mitigation measures are

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		known however the species was widespread and observed in consistent abundance outside the Development Footprint. Species has persisted within the Project Area despite previous disturbance history (which included high grazing pressure). As such, the Project is considered unlikely to impact habitat or individuals outside of the Development Footprint area. Impacts to this species include direct loss of individuals and habitat within the Development Footprint.			followed. Species will be offset as species credits under the BAM.
Swainsona murrayana Slender Darling Pea	Vulnerable	A small population of seven individuals were detected within the Southeast Corner of the Subject Land. All of these individuals occur outside of the Development Footprint, however 0.21ha of adjacent suitable habitat occurs within the footprint. No other individuals were recorded across the Subject Land and the extent outside of the Development Footprint is not known however there are 221 existing records within 10km of the Project Area (OEH, n.d.(b)). Additionally, 0.17ha of suitable habitat at the site entrance intersection was unable to be surveyed and so the species has been assumed present within this area.	0.17 (Stage 1) 0.21 (Stage 2)	Life of the Project	Unlikely to be significantly impacted provided that mitigation measures are followed. Species will be offset as species credits under the BAM.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		Species has persisted within the Project Area despite previous disturbance history (which included high grazing pressure). As such, the Project is considered unlikely to impact habitat or individuals outside of the Development Footprint area. Impacts to this species include direct loss of potential habitat within the Development Footprint and indirect impacts include the trampling of the species.			
Fauna					
Aphelocephala leucopsis Southern Whiteface	Vulnerable	This species was recorded in a number of locations across the Subject Land during BUS surveys. This species is a ground foraging species, therefore the risk of collision from operating turbines is low (Nature Advisory, 2025). Impacts to this species include direct loss of associated due to the clearing associated with the Development Footprint, and potential vehicle strikes due to increased vehicle movement across the Project Area. Direct loss of habitat comprises 1.7% of the Project Area.	211.31 (Stage 1) 557.88 (Stage 2)	Life of the Project.	Unlikely to be significantly impacted. Species will be offset as ecosystem credits under the BAM due to associated PCTs being present.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
Botaurus poiciloptilus Australasian Bittern	Endangered	Species was not detected during BUS surveys over multiple seasons across two years, however one record exists within 10km of the Project Area from 2010 (OEH, n.d.(b)). The species is not considered to occur. Risk of collision from a turbine is considered moderate for the species, however it has been assessed that it is unlikely this would occur (Nature Advisory, 2025).	7.58 (Stage 1) 20.81 (Stage 2)	Life of the Project.	Species is not considered likely to occur, however will be offset as ecosystem credits under the BAM due to associated PCTs being present.
Calidris acuminata Sharp-tailed Sandpiper	Vulnerable	Not recorded during BUS surveys. Six existing records totalling 331 individuals occur within 10 km of the Balranald intersection upgrade (OEH, n.d.(b)). Impacts to this species include collision risks with operating turbines. It is unlikely that this species will be a regular seasonal visitor to the region and risks are considered low (Nature Advisory, 2025).	Negligible	Life of the Project	Unlikely to be significantly impacted. No offsetting required.
Calidris ferruginea Curlew Sandpiper	Critically Endangered, Migratory	This species is a non-breeding visitor to Australia, and there is no known permanent population within the Project Area. During the non-breeding season this species travels to Australia's north in late August to early September. After a stopover in northern Australia migration continues on a direct route to south-east Australia, and small numbers occur regularly in south-	Negligible	Life of the Project	Unlikely to be significantly impacted. No offsetting required.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		west NSW from early August. Approximately 13% of the global population occurs in the East Asian-Australasian Flyway (SPRAT 2024). The Project Area is within the East Asian-Australasian Flyway. Impacts to this species include collision risks with operating turbines. No records of this species have been recorded within the Project Area and impacts are considered to be a low risk (Nature Advisory, 2025).			
Climacteris picumnus victoriae Brown Treecreeper (south-eastern)	Vulnerable	The species is not associated with any of the PCTs present within the Subject Land. As such, the species is not considered to occur and no risk analysis has been undertaken for this species.	Negligible	Life of Project	No offsetting required as the species is not associated with the PCTs present within the Subject Land.
Falco hypoleucos Grey Falcon	Vulnerable	The species is associated with PCTs present within the Subject Land, however has not been recorded within 10km of the Project Area nor during BUS surveys. Low potential for direct and indirect impacts to habitat as the species is not considered to occur. Risk of collision from a turbine is considered low for the species (Nature Advisory, 2025).	21147 (Stage 1) 557.88 (Stage 2)	Life of Project	Species is not considered likely to occur, however will be offset as ecosystem credits under the BAM due to associated PCTs being present.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
Gallinago hardwickii Latham's Snipe	Vulnerable	Not recorded during BUS surveys and no existing records occur within 10 km of the Subject Land (OEH, n.d.(b)). Minimal habitat was observed for this species. Because of its migratory nature individuals of this species could occur at any time during their residency in SE Australia. Impacts to this species include collision risks with operating turbines. Should a collision occur, there would be little impact on the overall population estimated at a 30,000 birds (DCCEEW, 2024). The risk of collision is considered to be low (Nature Advisory, 2025).	Negligible	Life of the Project	Unlikely to be significantly impacted. No offsetting required.
Grantiella picta Painted Honeyeater	Vulnerable	The species is associated with PCTs present within the Subject Land, however has not been recorded within 10km of the Project Area nor during BUS surveys. Low potential for direct and indirect impacts to habitat as the species is not considered to occur. Risk of collision from a turbine is considered low for the species (Nature Advisory, 2025).	1.20 (Stage 1) 15.54 (Stage 2)	Life of the Project	Species is not considered likely to occur, however will be offset as ecosystem credits under the BAM due to associated PCTs being present.
Hemiaspis damelii Grey Snake	Endangered	Species was not detected within the Subject Land during targeted surveys.	Negligible	Life of the Project	Species has been determined to be absent

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		Direct and indirect impacts to habitat determined not to support the species will occur.			through surveys. No offsetting required.
Hirundapus caudacutus White-throated Needletail	Vulnerable	The species is associated with PCTs present within the Subject Land, however has not been recorded within 10km of the Project Area nor during BUS surveys. Low potential for direct and indirect impacts to habitat as the species is not considered to occur. Risk of collision from a turbine is considered low for the species (Nature Advisory, 2025).	29.61 (Stage 1) 59.16 (Stage 2)	Life of the Project	Species is not considered likely to occur, however will be offset as ecosystem credits under the BAM due to associated PCTs being present.
Lathamus discolor Swift Parrot	Critically Endangered	The species is associated with PCTs present within the Subject Land, however has not been recorded within 10km of the Project Area nor during BUS surveys. Low potential for direct and indirect impacts to habitat as the species is not considered to occur. Risk of collision from a turbine is considered low for the species (Nature Advisory, 2025).	0.95 (Stage 1) 9.34 (Stage 2)	Life of the Project	Species is not considered likely to occur, however will be offset as ecosystem credits under the BAM due to associated PCTs being present.
Leipoa ocellata Malleefowl	Vulnerable	The species is not associated with any of the PCTs present within the Subject Land. As such, the species is not considered to occur. It is unlikely the Project will result in any impacts to the	Negligible	Life of Project	No offsetting required as the species is not associated with the PCTs present.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		species due to the lack of habitat. Risk of collision from a turbine is considered low for the species (Nature Advisory, 2025).			
Litoria raniformis Southern Bell Frog	Vulnerable	This species was recorded as present in significant numbers within surveyed watercourses (dams, ponds, canals). Surveyed watercourses were those bodies located within 200 m from the Development Footprint and were spread across the breadth of the Project Area. A semi-aquatic species, this species relies on suitably linked terrestrial and aquatic habitat throughout its life history; as well as inter-connected watercourse to maintain broader population connectivity. Impacts to this species include a direct loss of associated habitat (37.05 ha within 200m of a waterbody) and a decline in habitat connectivity due an increase in landscape resistance / barriers in the form of roads, and other infrastructure. A moderate risk of injury and fatality is also associated with vehicle strikes with the expected increase in vehicle movement across the Project Area. Due to the interconnected nature of the population within the Project Area we do not anticipate project	5.99 (Stage 1) 31.06 (Stage 2)	Construction impact = 37.05 ha Operational impact = 18.28 ha	Unlikely to be significantly impacted. Species will be offset as species credits under the BAM.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		works to increase the risk of disease spread across the Project Area.			
Lophochroa leadbeateri Pink Cockatoo (eastern)	Endangered	This species was recorded in a number of locations across the Project Area, both during BUS surveys and opportunistically. This species typically flies at or just above the canopy height, which is bellow RSA height, and therefore the risk of collision from operating turbines is low. Two nests were incidentally detected during BUS surveys, however both of these nests were outside of the Subject Land and more than 500m from a turbine. No signs of breeding were detected within the Subject Land during targeted surveys. Impacts to this species include direct loss of foraging habitat due to the clearing associated with the Development Footprint, and potential vehicle strikes due to increased vehicle movement across the Project Area. Risk of collision from a turbine is considered high for the species (Nature Advisory, 2025).	8.73 (Stage 1) 93.60 (Stage 2)	Life of the Project	Unlikely to be significantly impacted. Species will only be offset as ecosystem credits under the BAM as no breeding was observed within the Subject Land.
Maccullochella macquariensis	Endangered	No suitable habitat is present within the Subject Land for this species and the Subject Land is not within the mapped distribution on NSW Fisheries Spatial Data	Negligible	During construction only	No offsetting required as the species is not considered to occur due to lack of habitat.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
Trout Cod		Portal. Minimal indirect impacts may occur, such as a change in water quality.			
Maccullochella peelii Murray Cod	Vulnerable	No suitable habitat is present within the Subject Land for this species and the Subject Land is not within the mapped distribution on NSW Fisheries Spatial Data Portal.	Minimal indirect impacts may occur, such as a change in water quality.	During construction only	No offsetting required as the species is not considered to occur due to lack of habitat.
Melanodryas cucullata cucullata South-eastern Hooded Robin	Endangered	This species has not been recorded within the Project Area, however has associated habitat with PCTs present within the Subject Land. This species tends to forage on ground dwelling species (such as insects and small lizards). Impacts to this species include direct loss of habitat due to the clearing associated with the Development Footprint, and potential vehicle strikes due to increased vehicle movement across the Project Area.	1.20 (Stage 1) 15.54 (Stage 2)	Life of the Project	Unlikely to be significantly impacted. Species will be offset as ecosystem credits under the BAM due to associated PCTs being present.
Neophema chrysostoma Blue-winged Parrot	Vulnerable	This species was recorded at one location within the Subject Land during BUS surveys. The species has been recorded flying at RSA height	211.47 (Stage 1) 557.88 (Stage 2)	Life of the Project	Unlikely to be significantly impacted. Species will be offset as ecosystem credits under the

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		with mortalities of the species being recorded at other wind farms previously. The risk of collision from operating turbines is moderate (Nature Advisory, 2025). Other impacts to this species include direct loss of foraging habitat due to the clearing associated with the Development Footprint, and potential vehicle strikes due to increased vehicle movement across the Project Area.			BAM due to associated PCTs being present.
Nyctophilus corbeni Corben's Long-eared Bat	Vulnerable	The genus Nyctophilus has been recorded via acoustic surveys (Nature Advisory, 2024), however this is not enough to confirm species presence for *N. corbeni*. Direct trapping of bats would be the only way to confirm if the calls belong to *N. corbeni.* It occurs in a wide variety of habitats usually associated with water courses and permanent water (Churchill, 2008). It roosts in tree hollows, crevices and under loose bark. NSW distribution mapping does not show it occurring within this Project Area (DPIE 2022). The species is slow-flying and agile, prefers to fly in the understorey foraging on non-flying prey and will even crawl along the ground to hunt (OEH 2022). The risk of collision with operating turbines is considered to be moderate	0.25 (Stage 1) 6.20 (Stage 2)	Life of the Project	Unlikely to be significantly impacted. Species will be offset as ecosystem credits under the BAM due to associated PCTs being present.

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		(Nature Advisory, 2025). Impacts to this species include direct loss of foraging habitat due to the clearing associated with the Development Footprint.			
Phascolarctos cinereus Koala	Endangered	Species was not detected within the Subject Land during targeted surveys. Direct and indirect impacts to habitat determined not to support the species will occur.	Negligible	Life of the Project	Species has been determined to be absent through surveys. No offsetting required.
Pedionomus torquatus Plains-wanderer	Critically Endangered	This species has been recorded in multiple locations across the Project Area. It is generally a ground dwelling or low flying species, although has been known to fly as high as 40 m above ground. Risk to this species from operating turbines is considered moderate (Nature Advisory, 2025). Other impacts to this species include direct loss of habitat due to clearing associated with the Development Footprint, and potential vehicle strikes due to increased vehicle movement across the Project Area.	201.30 (Stage 1) 446.47 (Stage 2)	Construction impact = 647.77 ha Operational impact = 339.58 ha Operational impact = 339.58 ha	Unlikely to be significantly impacted provided that mitigation measures are followed. Species will be offset as ecosystem credits only as per the BAM.
Polytelis swainsonii	Vulnerable	Species was not detected during BUS surveys over	20.77 (Stage 1)	Life of the	Species is not considered

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
Superb Parrot		multiple seasons across two years nor during targeted surveys for breeding habitat. No records exist within 10km of the Project Area. The species is a dual credit species under the BAM. No impacts are considered to occur to breeding habitat and there is low potential for direct and indirect impacts to foraging habitat as the species is not considered to occur. Risk of collision from a turbine is considered low for the species (Nature Advisory, 2025).	28.49 (Stage 2)	Project.	likely to occur, however will be offset as ecosystem credits under the BAM due to associated PCTs being present.
Rostratula australis Australian Painted Snipe	Endangered	Species was not detected during BUS surveys over multiple seasons across two years, nor are there any records within 10km of the Project Area. The species is not considered to occur. Low potential for direct and indirect impacts to habitat as the species is not considered to occur. Risk of collision from a turbine is considered moderate for the species (Nature Advisory, 2025).	7.58 (Stage 1) 20.81 (Stage 2)	Life of the Project	Species is not considered likely to occur, however will be offset as ecosystem credits under the BAM due to associated PCTs being present.
Stagonopleura guttata Diamond Firetail	Vulnerable	This species has not been recorded within the Project Area, however has associated habitat with PCTs present within the Subject Land. The species has never been observed flying at RSA	20.78 (Stage 1) 28.76 (Stage 2)	Life of the Project	Unlikely to be significantly impacted. Species will be offset as ecosystem credits under the

Species	EPBC Act listing	Potential Impacts	Extent of impact (ha)	Duration of impact	Impact requires offsetting? (Significant or not)
		height and the risk of collision from operating turbines is considered low (Nature Advisory, 2025). Impacts to this species include direct loss of habitat due to the clearing associated with the Development Footprint, and potential vehicle strikes due to increased vehicle movement across the Project Area.			BAM due to associated PCTs being present.
Tringa nebularia Common Greenshank	Endangered	Not recorded during BUS surveys. One existing record occurs within 10 km of the Euston intersection upgrade (OEH, n.d.(b)). The species is known to visit farm dams in arid areas. Suitable habitat occurs for this species. Because of its migratory nature, individuals of this species could occur at any time during their residency in SE Australia. If this species transits through the Subject Land it is likely to be at RSA height. Impacts to this species include collision risks with operating turbines, however it is an infrequent visitor to the region and risks are considered low (Nature Advisory, 2025).	Negligible	Life of the Project	Unlikely to be significantly impacted. No offsetting required.

8.6.3 Migratory species

A habitat assessment was conducted for migratory species returned from the protected matters report. Twelve of these species are considered likely to occur, as detailed in Appendix B.2.

The migratory species likely to be impacted by the project include:

- *Actitis hypoleucos* Common Sandpiper
- *Apus pacificus* Fork-tailed Swift
- *Calidris acuminata* Sharp-tailed Sandpiper
- *Calidris ferruginea* Curlew Sandpiper
- *Calidris melanotos* Pectoral Sandpiper
- *Gallinago hardwickii* Latham's Snipe
- *Gelochelidon nilotica* Gull-billed Tern
- *Hydroprogne caspia* Caspian Tern
- *Motacilla flava* Yellow Wagtail
- *Tringa glareola* Wood Sandpiper
- *Tringa nebularia* Common Greenshank
- *Tringa stagnatilis* Marsh Sandpiper

Potential collision risk from operating turbines for these species is outlined in Section 8.3.4 (Table 8-7). The majority of these species are considered to have a low risk of collision, as they are not likely to be permanent residents of the Project Area and are considered to be infrequent visitors to the region of the Project. Impacts to Curlew Sandpiper (*Calidris ferruginea)* are addressed in

Table 8-9.

Other impacts to this species include direct loss of habitat due to clearing associated with the Development Footprint (refer to section 8.1.1), and potential vehicle strikes due to increased vehicle movement across the Project Area (refer to section 8.3.5).

8.7 Assumptions and limitations

Climatic conditions may influence the species present within the Subject Land at any one time (see Section 4.6 for weather conditions during surveys). Where survey has been undertaken for candidate species requiring confirmation of presence or absence, this has been done employing appropriate methods and timing, as required under the BAM. Nevertheless, it is an unavoidable limitation that not all species that utilise an area will be detected. This is generally due to their cryptic nature or mobility and unpredictable movement throughout their habitat and prevailing climatic conditions. The results in this assessment are based on the proper application of the BAM and therefore are considered sufficient to inform the development of the Project's mitigation strategies and offset obligation.

The calculation of HBTs, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows (Gibbons and Lindenmayer 2000). Additional mitigation has been recommended to address this limitation.

Where survey for candidate species requiring confirmation of presence or absence was not undertaken, this is stated explicitly in the assessment, and measures identified to address the limitation are identified, i.e., assumption of occurrence of the species. This is the case for all flora species where additional areas were added to the Development Footprint after the survey effort had been completed and outside of the species required survey timing.

9. Mitigating and managing impacts

9.1 Mitigation measures

Impacts that cannot be avoided must be mitigated. A general summary of the key measures required to mitigate the impacts of the Project are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure, and an analysis of the consequences of any residual impacts are provided in Table 9-1.

9.1.1 Direct impacts (clearing of vegetation and threatened species habitat)

1. Clearing of HBTs be timed to avoid critical life cycle events, such as breeding and nursing
2. Clear physical demarcation of boundary between retained and cleared areas, including threatened flora habitat or aquatic areas.
3. Clearing protocols to include pre-clearing survey procedures, and staged clearing procedures for HBTs, including the presence of a trained ecologist or licensed trained fauna spotter catcher during clearing events.
4. Relocation of habitat features (e.g. fallen timber, hollow logs etc) within construction footprint to adjacent retained habitat.
5. Induct all staff prior to construction to identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance.
6. Existing survey data for *Brachyscome papillosa* and *Mairena cheelii* to inform detailed design to minimise footprint in areas of core habitat, such as micrositing for cabling routes or reducing track width.
7. Seed bank protection protocols, to protect threatened flora seedbank for natural recolonisation of areas subject to disturbance.
8. Disturbed areas must be rehabilitated as soon as practicable and with consideration to native revegetation requirements.
9. Pre-construction surveys for Bindweed (*Convolvulus tedmoorei*) in areas of assumed presence.

9.1.2 Indirect impacts

10. Adoption of clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance.
11. Daily/seasonal timing of construction activities to reduce impacts of noise such as avoiding night works except where strictly necessary, particularly during the breeding/calling season for the Southern Bell Frog.
12. Development of underground cabling installation methodology which aims to complete trenching and same-day backfill to reduce potential impacts to threatened native species
13. Lighting at construction compounds, concrete batching plants, substations and the accommodation camp will be designed and operated in accordance with AS4282-2019 Control of the obtrusive effects of outdoor lighting. Lighting is to generally be minimised or avoided where feasible.
14. Using adaptive dust management and monitoring programs to minimise the generation and spread of dust

15. Using hygiene protocols to prevent the spread of weeds or pathogens between infected and uninfected areas
16. Training staff and conducting site briefings to communicate environmental features to be protected and measures to be implemented
17. Establishment of a Pest Management Plan to target pest animal species that impact Plains-wanderer *(Pedionomus torquatus)* (i.e cats, foxes). This would involve pest animal control as well as monitoring.
18. Preparation of an Environmental Management Strategy (EMS) which will include a Biodiversity Management Plan for the Project

9.1.3 Prescribed impacts

19. Disturbed areas from track edges and underground cabling would be rehabilitated, including reapplying the topsoil and where required reseeding with native species representative of the mapped PCT to minimise permanent fragmentation from temporary disturbance. Revegetation measures would be detailed in the Biodiversity Management Plan (BMP).
20. No dams would be removed by the proposal to minimise impacts to Southern Bell Frog (*Litoria raniformis)* and Southern Myotis (*Myotis macropus*) that rely on water bodies.
21. Turbine micrositing locations must remain at least 300m distance from Little Eagle (*Hieraaetus morphnoides)* and Wedge-tailed Eagle (*Aquila audax*) nests identified to date within this report.
22. Establishment and implementation of a Bird and Bat adaptive management plan (BBAMP).
23. Pre-clearance surveys for Plains-wanderer active breeding sites within the Construction Footprint by an ecologist. Cease works if detected, and apply a 200m buffer to the identified nest area.
24. Vehicle impacts to fauna will be reduced by:
    a. Limiting vehicle speeds to 40 km/h to reduce risk of vehicle strike with Plains-wanderer *(Pedionomus torquatus)* or other threatened fauna.
    b. Vehicle speeds will be further reduced during wet weather and night works, to reduce the risk of vehicle strike with Southern Bell Frog (*Litoria raniformis)*
    c. Vehicle movement will be restricted to the final disturbance footprint and established tracks only, which will avoid off-track impacts.
    d. Construction activities (aside from approved Out of Hours Works) will be limited to daylight hours to reduce vehicle strikes of nocturnal fauna

Table 9-1 Mitigation measures proposed to avoid and minimise direct, indirect and prescribed impacts on native vegetation and habitat

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	Direct Impacts: displacement of resident fauna through vegetation clearing and habitat removal						
B1	Timing clearing of HBTs to avoid critical life cycle events such as breeding or nursing	• Hollow-bearing tree and stick nest tree removal should be timed to avoid August-November - breeding season for the highest number of species. • Pre-clearance surveys by a suitably qualified ecologist should be conducted prior to clearing HBTs to check hollows and nests for fauna. • If HBTs or Stick nest trees must be removed during the breeding season, then the tree must be thoroughly inspected and monitored to confirm it is not harbouring a nesting/breeding species before it can be removed.	Short-Term: November -July (Construction)	One off	Construction contractor	Moderate	**High Risk** • Injury or death to hollow-dependent fauna, stick nest fauna and threatened amphibians. • Decline in species presence • Interruption of breeding cycle
B2	Clear physical demarcation of	• Approved clearing limits to be clearly delineated prior to	Short-Term: Construction	One off	Construction contractor	Moderate	**Low Risk** • Incidental

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	boundary between retained and cleared areas, including threatened flora habitat and riparian areas	construction commencing in that area. • No stockpiling or storage outside of the final construction footprint. • No stockpiling or storage within riparian buffers.					clearing of native vegetation and fauna habitat intended for conservation. • Reduction in habitat quality.
B3	Instigating clearing protocols including pre-clearing survey procedures and staged clearing procedures for HBTs, including the presence of a trained ecologist or licensed trained fauna spotter catcher during clearing events	Clearing protocols for arboreal nesting birds include: • Pre-clearing surveys undertaken by a suitably qualified ecologist should be conducted prior to clearing to check hollows and nests for fauna. • Staged clearing of HBTs, supervised by suitably qualified ecologist or trained spotter catcher to allow for resident fauna to relocate or be relocated where required. • Development of a pre-clearing	Short-Term: Construction	Prior to each construction stage	Construction contractor	Moderate	**High Risk** • Injury or death of fauna • Injury or death of threatened species

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
		checklist and tree clearing procedure					
B4	Relocation of habitat features (fallen timber, hollow logs) from within the Development Footprint to adjacent retained vegetation.	Fallen timber and hollow logs should be relocated outside of the Development Footprint within adjacent areas within the Subject Land under the supervision of an Ecologist or spotter catcher.	Short-Term: Construction	Regular	Construction contractor	Low	**Moderate Risk** • Reduced suitable habitat • Decreased chance of relocation due to high exposure and/or predation • Reduced habitat quality
B5	Induct all staff prior to construction to identify vegetation to be retained, prevent inadvertent damage, protect top soil and	• Toolbox talks and induction of staff on site • Approved clearing limits to be clearly delineated prior to construction commencing in that area. • No stockpiling or storage within	Long-Term: Pre-construction and construction	Regular	Construction Contractor	High	**Low Risk** • Clearing of native vegetation and fauna habitat

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	reduce soil disturbance.	dripline of any mature trees. • No stockpiling or storage within riparian buffers.					intended for conservation • Soil erosion • Decreased habitat quality
B6	Existing survey data for Mossgiel Daisy (*Brachyscome papillosa*) and Chariot Wheels (*Maireana cheelii*) to inform detailed design, to minimise footprint where possible in areas of core habitat.	• During detailed construction design, minimise footprint in areas of core habitat, such as micro siting for cabling trenches or minimising track widths. Core habitat will be identified from survey data collected in this BDAR. •	Short-Term: Pre-construction for each stage	Prior to each construction stage	Contractor	Moderate	**Moderate Risk** • Reduced occupancy of threatened species in suitable habitat • Reduced habitat quality
B7	Seed bank protection protocols, to protect threatened flora seedbank for natural	• Seed bank protection protocols in rehabilitation strategies. • Protect and reuse top soil to maximise natural recolonisation of	Long-term: Post-construction and Operation	Following each construction stage	Contractor	Moderate	**Moderate Risk** • The Project Area has recovered

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	recolonisation of areas subject to disturbance.	areas subject to disturbance. Stockpiles must be no higher than 2m • Stabilise and rehabilitate disturbance areas progressively during construction activities.					into threatened species habitat from previous agricultural disturbance with no intervention and is expected to recover with appropriate mitigation measures.
B8	Disturbed areas must be rehabilitated as soon as practicable and with consideration to native revegetation requirements.	• Post construction rehabilitation strategies will be outlined with area specific provisions in BMP • Stabilise and rehabilitate disturbance areas progressively during construction activities. • Rehabilitation strategies should align to species representative of native	Long-term: Post-construction and Operation	Following each construction stage	Contractor	Moderate	**Moderate Risk** • Invasion of weed species • Invasion of pest species • Reduced

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
		plant community types in the Subject Land. • Ongoing treatment of weed infestations generally within the Development Footprint is required throughout construction and as part of rehabilitation strategies.					chance of colonisation of native species •
B9	Pre-construction surveys for Bindweed (*Convolvulus tedmoorei*) in areas of assumed presence	• Ecologist will undertake pre-construction surveys in areas where presence has been assumed for Bindweed (*Convolvulus tedmoorei*)along the Sturt Highway at the site entrance intersection. . • If the species is detected within these areas, individuals will be avoided or translocated.	Short-Term: Pre-construction	One-off	Construction contractor	Moderate	**Low Risk** • Injury or death to threatened flora • Reduced species occupancy
	Indirect impacts: on native vegetation and habitat						
B10	Clearing protocols that identify vegetation to be retained, prevent	Documented clearance protocols to include demarcation (e.g. use of pickets) of vegetation to be retained. Clearing	Short-Term: Pre-construction	Regular	Construction contractor	High	**High Risk** • Incidental injury or

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	inadvertent damage and reduce soil disturbance.	limits must be delineated prior to proposed commencement of clearing at each area. Inform personnel of the purpose of demarcation. Consider Tree Protection Zones in accordance with Australian Standard *AS 4970-2009 Protection of trees on development sites* if necessary and demarcate these zones if required.					death to fauna • Reduction of suitable habitat • Reduced species occupancy
B11	Daily/seasonal timing of construction activities to reduce impacts of noise	Measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible. Avoidance of excess night construction noise within 2km of Southern Bell Frog species polygons during the breeding/calling season (September to April) for Southern Bell Frog Standard noise minimisation measures will be applied throughout construction (e.g. turn off plant when not required for	Short-Term: Construction	Regular	Contractor	Low	**Moderate Risk** • Disruption to the life cycle of threatened amphibians •

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
		operation)					
B12	Development of underground cabling installation methodology for trenching and same day back-fill to reduce potential for impacts to threatened native flora or fauna species.	Excavation and back-fill of trenches to be completed within the same day where possible to minimise impacts to threatened native species. If trenches are left open overnight: • Ramps or ladders will be installed to allow trapped fauna to escape. • Trenches to be checked the following morning and any trapped fauna removed and relocated to suitable habitat outside of the works area. Relocations are to be recorded. • Any death or injury to threatened species are to be reported to BCS. Topsoil would be returned to retain seed bed and maximise rehabilitation and revegetation.	Short-Term: Construction	Irregular	Construction contractor	Low	**Moderate Risk** • Injury or death of threatened amphibians and threatened flora

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
B13	Lighting designed and operated in accordance with AS4282-2019 Control of the obtrusive effects of outdoor lighting.	Lighting at construction compounds, concrete batching plants, substations and the accommodation camp will be designed and operated in accordance with AS4282-2019 Control of the obtrusive effects of outdoor lighting. Lighting is to generally be minimised or avoided where feasible.	Long-Term: Construction and Operation	Regular	Contractor	Moderate	Injury or death of threatened amphibians and nocturnal birds
B14	Adaptive dust management and monitoring programs to minimise the generation and spread of dust	EMS to include Dust management protocols to minimise the spread of dust. This could include measures such as; Keep stockpiles covered with material to prevent the generation of dust. Apply dust suppression techniques such as wetting surface soils during dust generating activities. Install temporary erosion and sediment controls in accordance with Landcom (2004).	Long-Term: Construction and Operation	Regular	Contractor	Moderate	With effective implementation of this protocol, risk of decrease in air quality is low

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
B15	Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Ensure machinery and equipment is clean and free from pathogens, and weeds prior to entering site. Ensure footwear is clean and treated with disinfectant before workers sign in on site to prevent spread of Amphibian Chytrid fungus impacting Southern Bell Frog. Imported fill (if required) or other materials is to be weed free, with appropriate certification/validation. Restrict the use of vehicles to the final construction footprint. Vehicles must use the formed access tracks once these are established. Soil and cleared vegetation stockpile sites will be separated for areas with high weed cover compared to higher quality vegetation.	Long-Term: Construction	Regular	Construction contractor	Moderate	With effective implementation of this protocol, risk of weed invasion is considered low. Injury or death of threatened amphibians due to the spread of pathogens.
B16	Staff training and site briefing to communicate	Site induction. Prior to site entry, all relevant site personnel including contractors shall be appropriately trained	Long-Term: Construction	Regular	Contractor	Moderate	Deleterious impacts to threatened

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	environmental features to be protected and measures to be implemented	and made aware of biodiversity features. This will include; • Relevant plans such as the BMP • Vegetation and trees to be retained • Site speed limits and their enforcement in minimising fauna strike. • Vehicle hygiene and biosecurity risks and procedures including Amphibian Chytrid fungus protocols. • Weed control measures. • General flora and fauna management measures. • Specific responsibilities for the protection of flora and fauna.					amphibians if staff training not followed
B17	Establishment of a Pest Management Plan to target pest animal species that could impact Plains-	Pest animal monitoring and responsive management program, which may include shooting, trapping and baiting. Pest animal management will be sympathetic to land use (i.e., presence of	Long-Term: Construction & Operation	One off	Developer	Moderate	With effective implementation of this protocol, risk is considered low.

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	wanderer (i.e. cats, foxes).	working dogs on site) in consultation with the landowners and will, where possible, be coordinated with pest management activities conducted by neighbouring land managers					
B18	Preparation of a Environmental Management Strategy (EMS) for the Project, including the preparation of a Biodiversity Management plan (BMP).	EMS will require endorsement from DCCEEW (NSW) and DCCEEW (Cwth) as well as relevant agencies. It will include detailed sub-plans to address specific environmental issues including: • Soil and water management plan including dust management measures. • Heritage management plan • Bushfire management • Fire safety study • Noise management plan • Traffic management plan • Emergency response and safety planing • Waste management.	Long-Term: Construction & Operation	One off	Developer	Moderate	With effective implementation of this protocol, risk to threatened flora and fauna is considered low.

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
		Staff training and site briefing to communicate impacts on traffic strikes. BMP to include measures for: • Fauna management • Vegetation management • Restoration and rehabilitation • Weed, pest and pathogen management • Specific mitigation measures for prescribed impacts Refer to details of EMS and BMP in section 9.1.4 below					
	Prescribed biodiversity impacts						
B19	Disturbed areas from track edges and underground cabling would be rehabilitated, including reapplying the topsoil and where required reseeding	Revegetation measures would be detailed in the BMP, including; Areas disturbed during construction that are no longer required for operations (e.g. laydown areas and road batters, cabling routes and temporary facilities) are stabilised and rehabilitated	Long-Term: Post-construction	One off	Developer	Moderate	With effective implementation of this protocol, will minimise permanent fragmentation from temporary

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	with native species representative of the mapped PCT.	progressively during construction. Implement seedbank protection protocols to protect and reuse topsoil to maximise natural recolonisation. Rehabilitation within disturbed areas will include local indigenous species representative of mapped PCTs					disturbance.
B20	No dams would be removed by the proposal to minimise impacts to Southern Bell Frog and Southern Myotis that rely on water bodies.	No construction works to be undertaken within 5 m of any dam. Avoid nightwork construction within 200m of farm dams (Southern Bell Frog and Southern Myotis).	Short-Term: Construction	Regular	Developer Contractor	Moderate	Injury or death of threatened amphibians
B21	Turbine micrositing locations must remain at least 300m distance from identified Little Eagle (*Hieraaetus morphnoides)* and Wedge tailed Eagle	Turbine micrositing locations must remain at least 300 m distance from the Wedge-tailed Eagle (*Aquila audax*) nests identified to date in this report. Turbines to be microsited to maximise distance from existing Wedge-tailed	Short-Term: Pre-construction	One off	Developer	Moderate	With effective implementation of this protocol, risk to breeding Little Eagle and Wedge-tailed Eagle individuals

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	(*Aquila audax*) nests.	Eagle nests are 33, 69, 106 and 121.					is low.
B22	Monitor bird and bat impact from wind turbine strike	Bird and Bat Adaptive Management Plan (BBAMP) to be finalised prior to commissioning of wind turbines. The BBAMP would include monitoring methodology, trigger mechanisms, action response plan and reporting requirements, including annual provision of mortality search results to BCD and monitoring for alienation effects around wind turbines. Refer to section 9.2.1 for details of the draft BBAMP.	Short-Term: Pre-construction	As per BBAMP	Contractor	Moderate	Injury or death of fauna species
B23	Pre-clearance surveys for Plains-wanderer active breeding sites by an ecologist	Ecologist will undertake pre-clearance surveys to detect active breeding sites ahead of construction front and minimise impacts where possible. Cease works if active breeding sites are detected (until the eggs have hatched or the incubation period has lapsed) and apply a 200m buffer to the identified nest	Short-Term: Pre-construction	One-off	Construction contractor	Moderate	Injury or death to Plains-wanderer within breeding sites if nests are undetected.

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
		area.					
B24	Reducing vehicle impacts	Vehicle impacts to fauna will be reduced by: • Limit vehicle speeds to 40 km/h to reduce the risk of vehicle strike with Plains-wanderer or other threatened fauna. • Vehicle speeds will be further reduced to 20km/h during wet weather and night works, to reduce the risk of vehicle strike with Southern Bell Frog • Vehicle movement will be restricted to the final disturbance footprint and established tracks only, which will avoid off-track impacts. • Construction activities (except for approved Out of Hours Works) are limited to daylight hours to reduce vehicle strikes of nocturnal fauna or further reduction in speed limit (20km/h) during these hours	Long-Term: Construction & Operation	Regular	Contractor	Moderate	Vehicle strike to Plains-wanderer and Southern Bell Frog. With effective implementation of this protocol, risk will be reduced.

No.	Mitigation measure/Action	Proposed techniques/Outcome	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
		• Adherence to the Southern Bell Frog adaptive management plan (Section 9.2.2).					

9.1.4 Post Approval Plans

The following plans would be finalised prior to the commencement of the construction phase;

Environmental Management Strategy

An Environmental Strategey (EMS) will be developed for the Project and require endorsement from DCCEEW (NSW), as well as relevant agencies. This will include measures to address specific environmental issues:

- Soil and water management including dust and air quality management.
- Heritage management
- Bushfire management
- Fire safety
- Noise management
- Visual amenity
- Traffic
- Emergency response and safety plan
- Waste management,

Measures required to manage biodiversity during construction will be detailed in a Biodiversity Management Plan, as set out below. Some measures to protect biodiversity will overlap other plans, such as restricted speed limits in the traffic plan to management risk of vehicle strike and erosion control measures.

Biodiversity Management Plan

A Biodiversity Management Plan (BMP) will be developed with input from NSW Biodiversity Conservation Division (BCD) and DCCEEW(Cwth) prior to commencement of the action. The BMP will include detailed specifications of mitigation measures described in section 9.1

9.1.5 Operational stage mitigation and management

Many of the construction management plans and protocols will be carried over and adapted for the lesser risks and site activity during the operation of the Project. These include:

- Dust management protocols
- Bushfire management
- Fire safety
- Noise management
- Traffic management
- Emergency response and safety
- Waste management.

It is common for the Biodiversity Management Plan to include operation as well as construction, to provide greater certainty and continuity as the Project transitions to operations. For example:

- Continuation of weed and pest animal management.
- Continuation of rehabilitation monitoring and management from the construction stage to ensure that site rehabilitation and weed management objectives are met.

The key additional requirement of the operational plan is the Bird and Bat Adaptive Management Plan (BBAMP).

Bird and Bat Adaptive Management Plan

A Bird and Bat Adaptive Management Plan (BBAMP) will be developed in consultation with DCCEEW and BCD to address inherent uncertainty in relation to the impacts to specific bird and bat populations and to identify appropriate adaptive mitigation measures in the case that impacts are greater than predicted. The BBAMP is discussed in Section 9.2.1 below and a draft can be viewed in Appendix J.1

9.2 Adaptive management strategy for uncertain biodiversity impacts

Adaptive management during construction and operation will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and is key to the successful implementation of the relevant management plans. This will allow ongoing flexibility to manage objectives, allow for relevant feedback and modifications. Construction management plans will contain management measures for flora and fauna, which will have an adaptive management component. This includes measures to monitor impacts of vehicle strikes, thresholds for species mortality, based on relevant literature, which will trigger adaptive management actions, and any measures proposed to mitigate potential impacts.

9.2.1 BBAMP

The objective of the BBAMP is the minimise and manage the impact of operation of the wind farm on birds and bats that occur within the vicinity. The environmental outcomes that this BBAMP aim to achieve are:

- minimising the impacts from the wind farm on threatened and migratory bird and bat species listed under the EPBC Act and/or threatened under the BC Act
- improving understanding of the risk of turbine collision on listed threatened and migratory bird and bat species that are regularly recorded on the Project Site
- improving understanding of whether or how project site usage by listed threatened and migratory bird species that are regularly recorded, changes due to wind farm construction and operation
- monitoring for the timely identification of turbine collisions and the timely collection and analysis of data
- timely and regularly validating and updating the impact assessment framework for listed threatened and migratory bird and bat species that are regularly recorded on the Project Site, using monitoring data to support a robust adaptive management approach to reducing impacts, where possible

- where required, developing and implementing tangible, on-ground management actions to promote a long-term reduction in the risk of turbine collision impacts on listed threatened and migratory bird and bat species.

The environmental outcomes listed above will be achieved through implementation of the monitoring program, the implementation of mitigation and management measures and ongoing monitoring, reporting and investigations. A working draft document has been provided in Appendix J.1 and summarised below. BBAMP monitoring will be undertaken for a minimum of two years after the commencement of wind farm operations. The first annual report will be prepared after 12 months of monitoring, with a focus on presenting results from each year of carcass monitoring. The second annual report will comprehensively analyse two years of monitoring. Full details of report inclusions are described in Section 5 of the BBAMP (Appendix J.1).

Baseline data

The BBAMP will include baseline data on threatened bird and bat species as well as any non-threatened species considered at risk of collision impacts from the Project. Baseline investigations have been ongoing within the Project Area since 2022, including seasonal and targeted surveys. Bird and Bat Utilisation Surveys undertaken by Nature Advisory can be viewed in Appendix J. Targeted surveys undertaken by NGH can be viewed in Section 4.6.3. During the baseline surveys, the following species were identified on site, occurred regularly at RSA height and are potentially vulnerable to collisions:

<u>Birds</u>

- Black Falcon *(Falco subniger)* - BC Act: Vulnerable
- Little Eagle *(Hieraaetus morphnoides)* - BC Act: Vulnerable
- Spotted Harrier *(Circus assimilis)* - BC Act: Vulnerable
- Black-breasted Buzzard *(Hamirostra melanosternon)* - BC Act: Vulnerable
- Wedge-tailed Eagle *(Aquila audax)* - Not threatened

<u>Bats</u>

- Inland Forest Bat *(Vespadelus baverstocki)* - BC Act: Vulnerable
- Little Pied Bat *(Chalinolobus picatus)* - BC Act: Vulnerable
- Yellow-bellied sheath-tailed Bat *(Saccolaimus flaviventris)* - BC Act: Vulnerable
- White-striped Freetail bat *(Austronomus australis)* - Not threatened
- Gould's Wattled bat *(Chalinolobus gouldii)* - Not threatened
- Corben's Long-eared Bat *(Nyctophilus corbeni)* - EPBC Act: Vulnerable; BC Act: Vulnerable
- Southern Myotis *(Myotis macropus)* - BC Act: Vulnerable

Additionally, the following two species are unlikely to be at risk of collision from turbines, however were identified as potentially having indirect impacts associated with the Project:

- Plains-wanderer *(Pedionomus torquatus)* - EPBC Act: Critically Endangered; BC Act: Endangered
- Pink Cockatoo *(Lophochroa leadbeateri)* - EPBC Act: Endangered; BC Act: Vulnerable

Post-construction surveys

Bird and bat utilisation surveys will be conducted post-construction to compare the persistence of bird and bat species during operation to baseline data. Post-construction bird utilisation surveys will be conducted for a period of two years during four seasons each year to replicate pre-construction surveys.

Post-construction bat surveys will be conducted during the first year of commissioning in all four seasons with replicated methodology of the initial pre-construction surveys. Both the bird and the bat utilisation surveys will provide further information to determine whether the site continues to be utilised by the range of species identified in the pre-construction surveys and whether any turbines pose a particular risk to listed species.

Targeted species surveys will also be undertaken for the above listed bird species for a period of two years. The Pink Cockatoo and the Plains-wanderer will be surveyed as a precaution and to monitor indirect impacts from the wind farm as they are unlikely to be at risk of collision. Survey methodology is detailed in Appendix J.1.

Carcass monitoring will also be undertaken in the post-construction surveys. The results of the monitoring program will be analysed to provide information on species, number, age and sex of birds and bats struck by turbine blades, in addition to spatial or temporal variation in strike numbers. Three approaches will be implemented:

1) Incidental carcass detection
   During the commissioning phase, personnel working on site may incidentally find carcasses as a result of collision with stationary structures. Carcasses are to be handled according to the Carcass Detection Proposal and the Bird and Bat Handling Protocol outlined within Appendix 1 of the BBAMP (in Appendix J.1).
2) Interim carcass search program
   As turbine operation will commence progressively, interim carcass searches will be undertaken in accordance with the turbine selection approach. While these interim searches are not part of the full carcass search program, these are a core element of the BBAMP to ensure that impacted birds and bats can be recorded prior to commencement of the formal carcass search program.
3) Formal carcass search program
   Commencement of this program will begin within one month of the completion of reliability tests of all turbines, when the windfarm is in full operation and supplying electricity. This monitoring will be undertaken monthly for a minimum of two years, after which a detailed report will be prepared, including recommendations. The report will be reviewed with the regulator to determine methods and timing of continuation of the monitoring program.

Given the large size of the Project (up to 175 turbines), a subset of 25% of turbines (i.e. 45 turbines) will be searched for bird and bat carcasses. Turbines will initially be preselected at random with all turbines having an equal chance to be selected. Adjustments may be made due to accessibility constraints and to ensure even distribution across the site. Once turbines are selected, they will not be changed during the two-year monitoring period. In addition to the randomly selected turbines, impact triggers may prompt temporal searches on unselected turbines.

Impact triggers

An Impact Trigger for a listed species occurs if a bird or bat (or recognisable parts thereof) listed as threatened and/or migratory under the EPBC Act or listed as threatened under the BC Act is found dead or injured during any mortality search or incidentally during commissioning or operation. Once triggered, further investigation will commence immediately including notification to BCS via email within two working days, and reporting requirements outlined in the decision-making framework will be undertaken.

For further information refer to Figure 3 of the BBAMP (in Appendix J.1). The procedure to respond adaptively to impact triggers will be implemented at any time throughout the life of the Project that an impact trigger is detected.

An Impact Trigger for a non-listed species occurs if a bird or bat (or recognisable parts thereof) is found dead or injured during any mortality search or incidentally during commissioning or operation more than four times under the same or adjacent turbines during a two-month period. In the case of the Wedge-tailed Eagle *(Aquila audax),* the impact trigger is set at two or more carcasses found under the same turbine within two months. Once triggered, further investigation will commence immediately, including notification to BCS within seven working days, and reporting requirements outlined in the decision-making framework will be undertaken. For further information refer to Figure 4 of the BBAMP (in Appendix J.1). The impact trigger for non-listed species will not apply to ravens, magpies or introduced species such as Common Starling *(Sturnus vulgaris)*; however, any detected mortalities for these species will still be reported as part of the annual reporting process.

Preventative management measures will be implemented to reduce the risk of an impact trigger occurring. This includes carcass removal, prohibiting lighting on turbines (unless specifically required by regulatory authorities or included as a condition of the Planning Permit Approval), avoid facility lighting within 500 m of turbines, and minimise tractor activity and stubble burning.

Depending on the nature, cause and significance of the impact triggers, mitigation and offsetting may be required. Potential mitigation measures are outline in Section 3.1.3 of Appendix J.1. A monitoring program will be implemented to assess the effectiveness of ongoing mitigation measures, with an appropriate duration and frequency to effectively evaluate their success or failure. In the unlikely event that a significant impact occurs to an EPBC Act listed species, as a result of the operation of the wind farm, offsetting will be investigated and implemented. Offsets will be implemented in accordance with EPBC Act Environmental Offset Policy 2012 (DSEWPaC 2012). Any offset will be developed in consultation with, and approved by, DCCEEW (Cwth). Any required investigation, and recommended management, mitigation and offsetting measures, will be documented in a final management plan, consistent with the consent conditions of the Planning Permit Approval.

9.2.2 Southern Bell Frog

Vehicle strike impacts to the Southern Bell Frog *(Litoria raniformis)* has been determined as highly likely by BCS, prompting the need for an adaptive management plan to address impacts that are infrequent or difficult to measure. The objective of the adaptive management plan is to avoid and minimise impacts from vehicle strike to the Southern Bell Frog by creating adaptable methods with performance criteria to measure success of the plan.

The Southern Bell Frog faces multiple key threatening processes, many of which are listed in the assessment of impacts (Section 8). These include loss and degradation of habitat, barriers to movement, disease and predation. Threats and processes that influence the objectives of the adaptive management plan for the Southern Bell Frog includes barriers to movement. Vehicle strike impacts are listed as highly likely to impact this threatened species and would prevent movement throughout the site. The Southern Bell Frog is a highly mobile species that can move at least one kilometre in 24 hours (Hamer, Lane, & Mahony, 2008). Fences, roads and unsuitable habitat create barriers to movement between waterbodies, breeding habitat and non-breeding habitat (Clemann & Gillespie, 2012). For this reason, frog fencing would not be suitable to install and therefore is not a proposed measure to achieve the objective of the plan. The actions proposed in the plan aim to meet the overall objective of avoiding and/or minimising vehicle strike impacts to this threatened species, using a set of measurable performance criteria that will be tied to monitoring requirements listed in Table 9-3.

Impact to the Southern Bell Frog as a result of vehicle strike has been assessed in Table 9-2 below. An adaptive management plan is described in Table 9-3 to avoid, minimise and offset the associated impact. Where death or injury occurs despite the implementation of the adaptive management plan, these residual impacts are to be offset through additional credits (above the credit requirement generated by BAM-C for direct impacts).

Table 9-2 Extent, likelihood of impact and consequences of vehicle strike to the Southern Bell Frog

Impact	Extent	Likelihood of impact	Consequences
Vehicle strike to the Southern Bell Frog	Development Footprint and within wider Subject Land	Highly likely	• Injury to Southern Bell Frog • Incidental death to Southern Bell Frog • Death at a later date, as a result of severe injury from vehicle strike • Reduction in population of SBF on site

Table 9-3 Adaptive management plan for vehicle strike to the Southern Bell Frog (SBF)

Management procedure	Performance criteria	Trigger for additional actions	Action proposed	Monitoring and/or reporting requirements	Timing	Responsibility
Vehicle speed/movement	• No impact to SBF habitat • No injuries to SBF individuals • No deaths to SBF individuals	• A SBF is injured • An accidental death occurs	• Vehicle speed limit to be reduced to 20 km/h during wet weather and night works to avoid injury/deaths to SBF moving across site. Speed limits are to be enforced within two kilometres of all SBF threatened species polygons and where sightings have occurred. • Speed limit posts are to be installed within two-kilometre proximity of each SBF threatened species polygon and where sightings have occurred. • Hi-beams to be activated during wet weather and night works (if safe to do so) to avoid injury/deaths by identifying potential SBFs in line of travel. • Vehicle movements to be restricted to the final disturbance footprint and established tracks to minimise areas of impact across the site. • Prepare species profile for SBF to increase awareness among staff and contractors on-site.	• All amphibian interactions, including observed and unobserved injuries and fatalities, will be reported to the Site Officer / Project Manager and stop works immediately. • Undertake incident investigation if injury or death occurs to SBF. • Record location (latitudes and longitudes), time, date and action that resulted in injury or death to SBF. • Undertake reviews every 6 months to analyse total injuries/deaths from vehicle strike. Display locations on a map. • Undertake reviews every 6 months of speed limits across the Project Site in correlation with SBF vehicle strike, and reduce/update speed limits accordingly.	Construction Operation	Site Officer / Project Manager All contractors and subcontractors to adhere to speed limits and protocols for injured/death individuals.

9.2.3 Plains-wanderer

Pre-clearance surveys will be undertaken for threatened species whose biodiversity impacts are uncertain, including Plains-wanderer (*Pedionomus torquatus).* For Plains-wanderer (*Pedionomus torquatus)*, pre-clearing surveys will be undertaken to determine the presence of any nests within the Development Footprint. If nests are recorded, stop-work protocols will be undertaken, and a 200m buffer will be placed around the nesting area.

Targeted surveys will be conducted during the post-construction phase of the wind farm for two years to monitor the occurrence of the Plains-wanderer as part of the BBAMP. Surveys aim to detect the presence of individuals in the area and any indications of indirect disturbance. This is particularly relevant as the species is known to avoid treed areas (e.g., may avoid areas up to 370m from tall trees; Baker-Gabb 2017) and it is unknown whether landscapes altered by turbines might similarly affect habitat use.

It is understood that to address unknown impacts and contribute to future understanding of Plains-wanderer within wind turbine sites, a funding allocation for research into Plains-wanderer monitoring post construction is being considered by the Applicant. For example, the Project could contribute $50,000 per annum for 3 years post construction to support further research into the potential indirect impact of wind turbines to Plains-wanderers in the region. This research would ideally be coordinated by a relevant research body in line with the National Recovery Plan for the Plains-wanderer. If implemented, it would be highly beneficial, not only to better understand and manage the impacts of this Project but to understanding the cumulative impact of other projects on this species in the REZ.

10. Serious and irreversible impacts (SAII)

The BAM identifies that there are some threatened species or communities that are most at risk of extinction from development impacts (NSW DPIE, 2019). The principles used to determine if a development will have SAII include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

10.1 Potential serious and irreversible impact entities

Two SAII entities have been detected or assumed present within the Subject Land. Further assessment has been undertaken below for the following SAII entities:

- Plains-wanderer (*Pedionomus torquatus*)
  The BioNet Threatened Biodiversity Database Collection (TBDC) (DPE, 2025) defines “the area mapped as important habitat is the area identified as a potential SAII”. No mapped important habitat occurs within the Subject Land and thus, no area of SAII is identified and a SAII assessment is not required. However, due to the number of sightings recorded, a SAII assessment was undertaken to review the impacts.
- Bindweed (Convolvulus tedmoorei)
  Extensive surveys have been undertaken for this species within the Subject Land and not detected, however 0.17 ha of vegetation has not been surveyed at the site intersection entrance off the Sturt Highway. In accordance with the BAM, this species has been assumed present in this location.

10.1.1 Threatened species

An assessment of impacts to SAII threatened species is provided in Table 10-1 and Table 10-2. Figure 4-12 and Figure 4-13 show the predicted areas of these species within the Development Footprint (refer to Appendix L.4 and Appendix L.5 for Atlas series).

Table 10-1 Plains-wanderer (*Pedionomus torquatus*) SAII Assessment

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
1.The assessor is required to provide further information in the BDAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
sections of the BDAR or BCAR.
The Plains-wanderer (*Pedionomus torquatus*) was detected within the Project Area, both during targeted surveys and incidentally during general site surveys. Targeted surveys were conducted as per BCD advice, led by Plains-wanderer expert David Parker. According to the NSW Scientific Committee (NSW Scientific Committee, 2009), the species inhabits native grasslands with 40% vegetation cover, ~50% bare ground and 10% litter. In the Project Area, it was detected in areas that did not exhibit the expected habitat features by having differing levels of ground cover and varying vegetation structure. The direct impacts to the Plains-wanderer within the Development Footprint are comprised of the clearing of native vegetation and the risk of vehicle strike. No areas of mapped important habitat for the Plains-wanderer would be impacted. Indirect impacts include reduced habitat quality in adjacent vegetation due to edge effects, noise impacts, transport of weeds and pathogens, loss of breeding habitat, and increase in predators (including pest animals) (see Section 8 for more information). Unknown impacts include the effect of wind turbines over Plains-wanderer habitat and whether the Plains-wanderer would avoid areas within the vicinity of wind turbines based on a perceived threat. Plains-wanderer appears to avoid inhabiting areas in close proximity to trees as a defence strategy to avoid predation by raptors (Commonwealth of Australia, 2016) and turbines could be perceived as a 'tree' or threat by the Plains-wanderer. No studies have been done on these impacts. Vegetation clearing and the associated indirect impacts may affect the species primarily during the construction phase of the Project through clearing access tracks, and wind turbine pads. Vehicle strike or wind turbine proximity are impacts which may affect the species throughout the operation of the Project. Post construction, the species would continue to be able to move within the wider Project Area, and not cause a fragmentation of populations. The current grazing management within the wider Project Area that has favoured the establishment of Plains-wanderer habitat would be maintained and the Project would not change grazing regimes within the Project Area. Impacts to the population have been avoided where possible. To reduce the risk of vehicle strike during the construction and operation of the Project, vehicle speeds will be limited to 40 km/h across the Development Footprint. Access tracks have been minimised where possible to minimise impacts of fragmentation, with some extra amendments made during the RTS phase to further reduce potential fragmentation impacts. To mitigate the impacts of clearing, targeted pre-clearance surveys will be conducted for each section of clearing and works would cease if the species or its nest is detected. Mitigation measures also include using hygiene protocols to prevent the spread of weeds or pathogens, and training staff to communicate environmental features to be protected and measures to be implemented. To address unknown impacts and contribute to future understanding of Plains-wanderer, a post construction monitoring plan of Plains-wanderer occupancy within the wind turbine locality is being considered (refer to Section 9.2). A key mitigation measure will be the establishment of a pest animal management plan, which will reduce the number of predators within the Project Area. Details on mitigation measures can be found in Section 9.
2. The assessor must consult the TBDC and/or other sources to report on the current population of

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
the species including: **a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:** **i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or** **ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites**
The TBDC database states a population reduction of >=80% in 10 years or three generations (OEH, n.d.(d)). The TBDC does not contain details about the current population of the Plains-wanderer. The site states that the species was fairly common prior to 1920, but its distribution in NSW is now restricted to the western Riverina (OEH, 2019). National Recovery Plan for the species also states that the species used to be more common and widespread, and that some populations have undergone reductions of more than 90% in the last two decades (Commonwealth of Australia, 2016). The NSW Scientific Committee states that fewer than 10 Plains-wanderers have been reported annually in 2000-2009 within a sample of their known range (NSW Scientific Committee, 2009). Populations have also been found to decline by up to 75-80% during drought years as well as in years of increased rainfalls, demonstrating that seasonal conditions strongly impact the species (Commonwealth of Australia, 2016). Some population increases have been recorded, driven by immigration from other populations and local breeding. However, state-level data shows an overall decline in 2005-2015, and the trend is uncertain for 2015-2018 (National Environmental Science Program Threatened Species Research Hub, 2019). Evidence shows that habitat loss, inappropriate grazing, small population sizes, predation by feral species, pesticide use, and planting and natural recruitment of trees in or near native grasslands are the primary threats causing a decline in population of the species (Commonwealth of Australia, 2016). As the species relies on sparse native grasslands for its habitat, the ongoing conversion of native grasslands to cultivation or sown exotic pasture has led to a large reduction in suitable habitat (Commonwealth of Australia, 2016). Inappropriate grazing and predation impact >90% of the species' range (National Environmental Science Program Threatened Species Research Hub, 2019).
b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: **i. an estimate of the species' current population size in NSW, and** **ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and** **iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations**

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
The Plains-wanderer is not listed as a SAII species under Principal 2.
c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: **i. extent of occurrence** **ii. area of occupancy** **iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and** **iv. whether the species' population is likely to undergo extreme fluctuations**
The Plains-wanderer is not listed as a SAII species under Principal 3.
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: **i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g., species is clonal) on, a biodiversity stewardship site** **ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g., karst systems) on a biodiversity stewardship site, or** **iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g., frogs severely impacted by chytrid fungus).**
The Plains-wanderer is not listed as a SAII species under Principal 4.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.
There is no data provided in the TBDC for Principle 1. Information has been sourced from relevant literature described in Section 10.1.3.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: **a. the impact on the species' population (Principles 1 and 2) presented by:** **i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the Subject Land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and** **ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or**

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal
Plains-wanderer surveys were conducted within the Project Area as per advice by species expert David Parker. The targeted surveys consisted of nocturnal spotlighting across 11 one-kilometre transects which were representative of every PCT in the Subject Land. Eleven (11) mature (and no immature) Plains-wanderers were detected during the targeted surveys. Additionally, six observations of the species within the Project Area were made incidentally outside of the targeted surveys. These included five sightings of adults, and one sighting of an adult with four juveniles. Despite a rigorous survey methodology, it is possible that some individuals were not observed in the surveys due to the mobility of the species. However, it is also possible that some individuals were recorded multiple times across different survey nights, as some records were in close proximity to one another as shown in Figure 4-13, Plains-wanderer sightings (refer to Appendix L.10 for Atlas series). An estimate of the NSW Plains-wanderer population is not provided in the TBDC. The NSW Scientific Committee state that the global population of Plains-wanderer ranges from 2,000 in years with poor conditions to 5,500 after several good seasons. There were 17 sightings of Plains-wanderers in the Project Area, one including an adult with four juveniles, totalling in 21 sightings. The Plains-wanderer has the potential to be impacted by the development, primarily through vegetation clearing. No mapped important habitat would be impacted by the proposal. As the Plains-wanderer was found in typically non-associated habitat all areas of PCT 46, 164 and 164 are considered suitable habitat. The proposal would impact 647.77ha of this habitat, which comprises 1.4% of the suitable habitat within the Project Area. To mitigate the impacts from vegetation clearing, targeted surveys for active breeding sites will be conducted prior to clearing. If nests are located during the surveys or during a clearing event, a 200 metre buffer will be applied. Furthermore, as the species is mobile and many of these sightings occurred outside of the Development Footprint, it is highly unlikely that any individuals of the species will be impacted by the construction of the Project. Discussions with Plains-wanderer expert, David Parker, identified European foxes and feral cats as a key threat to the species in the Subject Land. An indirect impact of the Project may be the increase of feral animal populations. Therefore, a pest animal management plan is proposed as a mitigation measure for reducing fox and cat populations. Controls may include baiting and shooting, and on-going monitoring of feral animal populations. This mitigation measure will reduce the impact of predators on the local population of Plains-wanderers by reducing the number of European foxes and feral cats. To mitigate the impacts of vehicle strike during the construction and operation of the Project, vehicle speeds will be limited to 40 km/h across the Subject Land. Furthermore, the native vegetation that will remain in the Project Area will allow the local population of Plains-wanderers to persist in other areas, reducing the risk of vehicle strike or indirect impacts from the development.
b. impact on geographic range (Principles 1 and 3) presented by: **i. the area of the species' geographic range to be impacted by the proposal in hectares, and a**

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
percentage of the total AOO, or EOO within NSW **ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted** **iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g., seed dispersal) and pollination distance for the species** **iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.**
In Australia, Plains-wanderers occur as a single population on the flat grassy plains of the semi-arid and arid zones of inland south-eastern Australia, mainly in the Riverina (NSW Scientific Committee, 2009). The species was not expected to occur within the Project Area, as minimal 'associated habitat' was present within the Subject Land and it is outside of the mapped core geographic range. No mapped important areas or core areas will be impacted by the Project (NSW National Parks and Wildlife Service, 2002). The Plains-wanderer global Extent of Occurrence (EOO) has been estimated as 3,500,00 ha and its Area of Occupancy (AOO) as 10,000 ha. In NSW, the EOO is estimated to be 1,300,000 ha and AOO 65,000 ha. However, in years with less suitable climatic conditions (very wet or very dry), the AOO may drop to 13,000-26,000 ha as the area of suitable habitat decreases (NSW Scientific Committee, 2009). The clearing of native vegetation in the construction phase of the Project will impact 43.09 ha of PCT 46, which is the listed suitable Plains-wanderer habitat (OEH, n.d.(d)). However, the species was recorded utilising multiple habitat types within the Project Area and as a worst case the species is also considered to be associated with all zones of PCT 163 and 164 where it was located. Potential area of impact of PCT 163 and PCT 164 within the Development Footprint is up to 604.68 ha, totalling 647.77 ha with PCT 46. The cleared habitat is a small proportion of the species' NSW EOO (0.05%). The cleared area would make up 1% of the AOO in NSW, or up to 2.49% of the AOO in NSW in years with less suitable climatic conditions. However, the Project Area is located outside of the species' AOO. Therefore, none of the species' known AOO will be impacted by the development. No mapped important habitat would be impacted. Due to the targeted pre-clearance surveys as well as the species' ability to re-locate, it is unlikely that any of Plains-wanderers will be impacted during the construction phase of the Project. Vehicle speed limits are proposed to reduce the risk of vehicle strike, and a several mitigation measures will be put in place to reduce indirect impacts (see Section 9). No habitat fragmentation or changes to fire regimes will occur as a result of this development. Individual Plains-wanderers occupy home ranges of ~12 ha (NSW Scientific Committee, 2009). Ranges of

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
males and females overlap by 50% (NSW Scientific Committee, 2009). Survey data shows that population density on the Riverine Plain has varied between one individual per 2.2 km – 20 km, with seasonal conditions and stocking rates as contributing factors to the variation (Baker-Gabb, 1998). The individuals recorded in the Project Area were not in areas typical of their usual habitat, but in vegetation of varying levels of ground cover and different vegetation types. Therefore, the native vegetation that will remain in the Project Area (approximately 45,464 ha) is likely to sustain the population of 21 birds that were detected. A detailed assessment of direct and indirect impacts to the Plains-wanderer can be found in Section 8 of this BDAR. Proposed mitigation measured are outlined in Section 9. The Plains-wanderer is not listed as a SAII species under Principal 3.
5. The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAII, is inaccurate.
N/A

Table 10-2 *Convolvulus tedmoorei* (Bindweed) SAII Assessment

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
1.The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.
Bindweed (*Convolvulus tedmoorei*) is a perennial forb that occurs in self-mulching grey soils on the floodplains of the Darling and Murrumbidgee Rivers (OEH, 2022a). It was not detected within the Subject Land during targeted surveys, with approximately 2,500 ha surveyed. Not all suitable habitat was able to be surveyed during the survey window, as additional areas at the site entrance intersection on the Sturt Highway were added to the Development Footprint after the survey window. The species was assumed present in its associated PCTs within this area as per the BAM (Figure 10-1, Appendix L.10 for Atlas series), an area totalling 0.17 ha. The major threats to Bindweed are habitat loss, its restricted distribution, and an insufficient understanding of its ecology, distribution and abundance, and threatening processes (OEH, 2022b). Impacts to this SAII species have been avoided where possible. The Project may impact the species through clearing native vegetation in 0.17 ha of suitable habitat. To mitigate this, areas of assumed presence will be surveyed prior to clearing. If the species is identified, the population would be avoided where possible or impacts minimised through micrositing of infrastructure. Indirect impacts may include reduced habitat quality in adjacent vegetation due to edge effects, and the transport of weeds and pathogens to the site (see Section 8 for more information). The proposed

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
mitigation measures taken to avoid indirect impacts on Bindweed include using hygiene protocols to prevent the spread of weeds or pathogens, and providing ecological rehabilitation of retained native vegetation. Details on mitigation measures can be found in Section 9.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: **a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:** **i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or** **ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites**
Bindweed is not listed as a SAII species under Principal 1.
b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: **i. an estimate of the species' current population size in NSW, and** **ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and** **iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations**
The TBDC states that in NSW, Bindweed contains <50 individuals or <250 individuals where threats are known (OEH, n.d.(c)). In NSW, Bindweed has been recorded in two areas on the Murrumbidgee and Darling River floodplains in central-western NSW, and in two areas east of Broken Hill (OEH, 2022a). Very little is known about the species as it has not been collected in NSW since 1971, and only two collections exist from before this time (OEH, 2021). There is a lack of information about the species' current population size in NSW, on estimates of the decline in population size, or where and how many populations exist (OEH, n.d.(c); OEH, 2021; Saving Our Species, n.d.).
c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: **i. extent of occurrence** **ii. area of occupancy** **iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single**

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
threatening event may rapidly affect all species occurrences), and **iv. whether the species' population is likely to undergo extreme fluctuations**
Bindweed is not listed as a SAII species under Principal 3.
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: **i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g., species is clonal) on, a biodiversity stewardship site** **ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g., karst systems) on a biodiversity stewardship site, or** **iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g., frogs severely impacted by chytrid fungus).**
Bindweed is not listed as a SAII species under Principal 4.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.
TBDC provides data for Principal 2. Further information has been sourced from relevant literature described in section 10.1.3.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: **a. the impact on the species' population (Principles 1 and 2) presented by:** **i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the Subject Land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and** **ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or** **iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal**
Bindweed has been recorded in several locations in NSW in the past, but there are no known populations currently (OEH, 2022a; OEH, 2021; OEH, n.d.(c)). Targeted surveys for Bindweed have been conducted in the majority of the Subject Land, and the species was not detected. 2,500.59 ha of suitable habitat was surveyed in the entirety of the Subject Land. The species was assumed present within its associated PCTs in the remaining areas at the site access intersection along the Sturt Highway, as per the BAM. In these

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
areas, 0.17 ha of suitable habitat will be cleared. It is not possible to estimate the number of individuals that may be present within the Subject Land due to the lack of knowledge about the species' distribution and abundance nation-wide (OEH, 2022b). The areas of the Subject Land in which the species has been assumed present (as per the BAM) will be surveyed prior to vegetation clearing. If the species is found, work will cease, and individuals would be avoided or translocated. Therefore, it is very unlikely that any individuals of the species will be impacted by the clearing of native vegetation. If present outside of the Subject Land, individuals of the species may be affected by indirect impacts of the development. These are reduced habitat quality due to edge effects, and the transport of weeds and pathogens across the Subject Land. The proposed mitigations for these impacts include using hygiene protocols to prevent the spread of weeds or pathogens, and providing ecological rehabilitation of retained native vegetation. Details on mitigation measures can be found in Section 9. Therefore, although some individuals of the species may be indirectly impacted by the development if present, the mitigation measures will minimise these risks.
b. impact on geographic range (Principles 1 and 3) presented by: **i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW** **ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted** **iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g., seed dispersal) and pollination distance for the species** **iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.**
Bindweed is not listed as a SAII species under Principles 1 or 3.
5. The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAII, is inaccurate.
N/A

10.1.2 SAII assumptions and limitations

Targeted surveys were unable to be undertaken across the entire extent of the Subject Land during the required survey timelines for *Convolvulus tedmoorei* (Bindweed). Presence was assumed for *Convolvulus tedmoorei* (Bindweed) within areas where the targeted survey was not undertaken, but associated PCTs were present. As such, is it unknown what the size of any potential populations within Subject Land are, or if any populations exist. To avoid direct impacts on individuals of these species, targeted surveys in areas of assumed presence will be conducted prior to construction. If either species is detected, the population would be avoided where possible or impacts minimised through micrositing of infrastructure. As such, it is considered unlikely that any individuals of *Convolvulus tedmoorei* (Bindweed) would be impacted by the Project.

It was not possible to estimate the number of individuals of *Convolvulus tedmoorei* (Bindweed) that may be present within Subject Land due to the lack of knowledge about the species' distribution and abundance nation-wide and that it hasn't been identified in the Subject Land to date. This species was assumed to be present in all areas of associated PCTs which had not been surveyed during targeted surveys.

10.1.3 Data and information used in SAII assessment

The following sources of information were used for assessing impacts to the Plains-wanderer (*Pedionomus torquatus*):

- TBDC Descriptive text & photos (OEH, 2019) and Ecological Data (OEH, n.d.(d))
- NSW Scientific Committee, *Plains-wanderer* Pedionomus torquatus: *Review of Current Information in NSW*, June 2009 (NSW Scientific Committee, 2009)
- *National Recovery Plan for the Plains-wanderer (*Pedionomus torquatus*)*, June 2016 (Commonwealth of Australia, 2016)
- *Plains-wanderer (*Pedionomus torquatus*) Recovery Plan, Draft for Public Comment*, October 2002 (NSW National Parks and Wildlife Service, 2002)
- *Threatened Species Strategy – Year 3 Priority Species Scorecard (2018)* (National Environmental Science Program Threatened Species Research Hub, 2019)
- *Native Grassland and the Plains-Wanderer* (Baker-Gabb, 1998)

The following sources of information were used for assessing impacts to Bindweed (*Convolvulus tedmoorei*):

- TBDC Descriptive text & photos (OEH, 2022b) and Ecological Data (OEH, n.d.(c))
- Convolvulus tedmoorei *(a perennial plant) - endangered species listing*, NSW Scientific Committee (OEH, 2021)
- Threatened biodiversity profile (OEH, 2022a)
- *Help save the Bindweed*, Saving Our Species (Saving Our Species, n.d.)

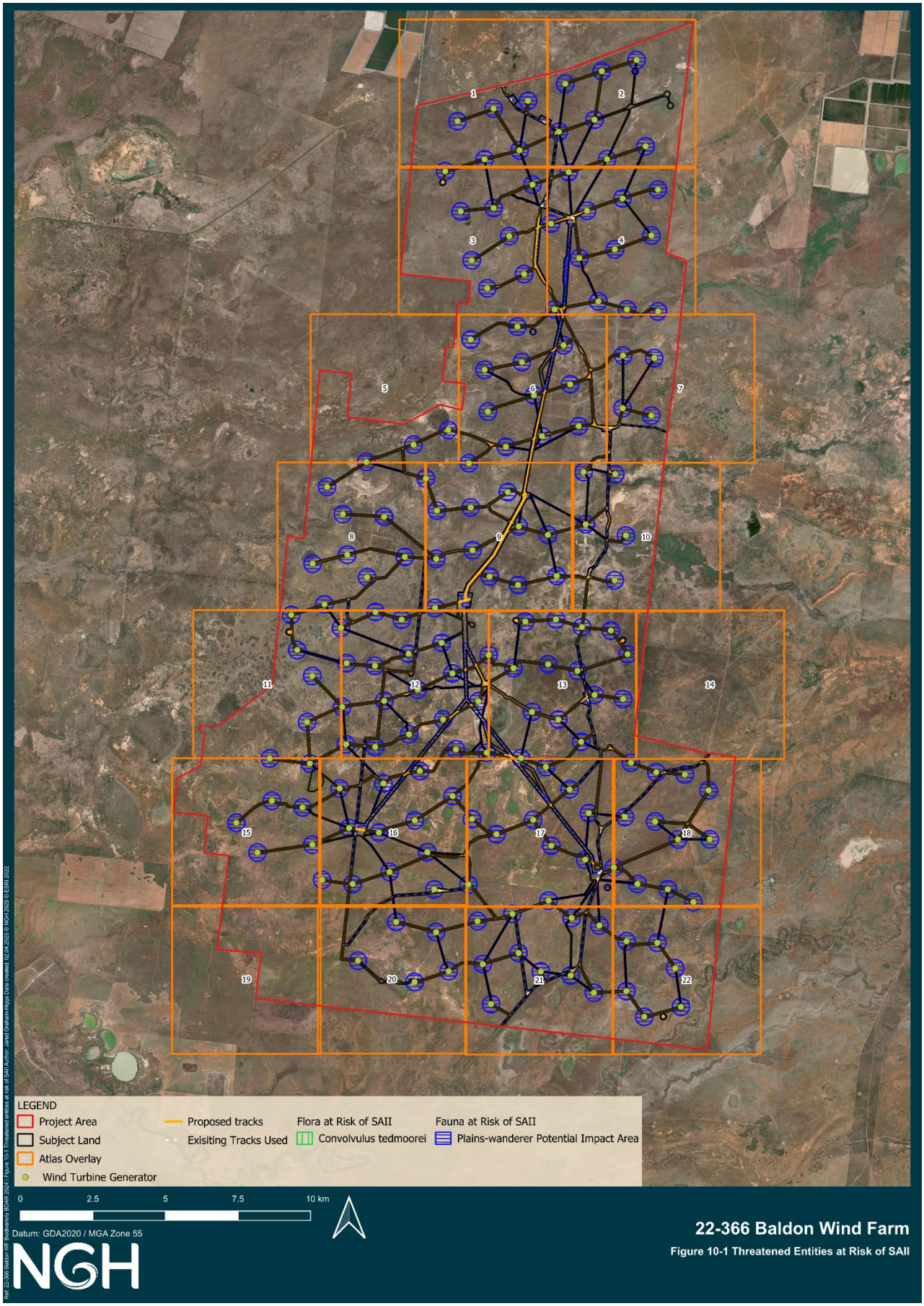


Figure 10-1 Map of threatened entities at risk of SAII (refer to Appendix L.10 for Atlas series)

11. Offset requirement

11.1 Impacts requiring offset

Impacts to ecosystems or threatened species that cannot be avoided or mitigated must be offset with biodiversity credits. The following credits are required for the Project.

11.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) A vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or
b) A vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or
c) A vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset, and the ecosystem credits required, are documented in Table 11-1 for the Stage 1 Development Footprint and Table 11-2 for the Stage 2 Development Footprint and mapped in Figure 3-21 (refer to Appendix L.1 for Atlas series). All vegetation zones within the Development Footprint meet the thresholds, and therefore ecosystem credits have been generated for all vegetation zones and offsets are required across the entire Development Footprint.

The full Biodiversity Credit Report generated by the BAM-C is provided in Appendix C.

Table 11-1 PCTs and vegetation zones that require offsets within the Stage 1 Development Footprint

Zone ID	PCT ID	Zone Condition	PCT name	TEC	Impact area (ha)	Vegetation integrity score	Future Vegetation Integrity Score	Ecosystem credits required
1	15	Woodland high	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	0.95	71.1	0	10
6	28	Grassland moderate	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Not a TEC	0.24	36.2	0	3
7a	46	High	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Not a TEC	20.53	95.9	0	492
9	57	High	Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	Not a TEC	0.01	59.3	0	1
12	153	Moderate	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Not a TEC	0.68	49.5	0	8

Zone ID	PCT ID	Zone Condition	PCT name	TEC	Impact area (ha)	Vegetation integrity score	Future Vegetation Integrity Score	Ecosystem credits required
14	159	Planted	Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	Not a TEC	0.55	92.1	0	25
15	160	High	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Not a TEC	7.58	88.4	0	168
17	163	High	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Not a TEC	2.53	89	0	56
18	163	Moderate	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Not a TEC	3.35	65.2	0	55
19	164	High	Cotton Bush open shrubland of the semi-arid (warm) zone	Not a TEC	174.70	89.6	0	4,094
20	164	Moderate	Cotton Bush open shrubland of the semi-arid (warm) zone	Not a TEC	0.19	40.6	0	2
21 – Intersection upgrade	153	Low	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Not a TEC	0.16	81.4	0	3

Table 11-2 PCTs and vegetation zones that require offsets within the Stage 2 Development Footprint

Zone ID	PCT ID	Zone Condition	PCT name	TEC	Impact area (ha)	Vegetation integrity score	Future Vegetation Integrity Score	Ecosystem credits required
1	15	Woodland high	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	2.72	72.8	0	62
2	15	Woodland low	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	1.78	55.5	0	31
3	15	Grassland moderate	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	4.84	33.9	0	51
4	17	High	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and	Not a TEC	0.57	85.7	0	15

Zone ID	PCT ID	Zone Condition	PCT name	TEC	Impact area (ha)	Vegetation integrity score	Future Vegetation Integrity Score	Ecosystem credits required
			Murray Darling Depression Bioregion)					
5	28	Woodland moderate	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Not a TEC	0.98	21.5	0	8
6	28	Grassland moderate	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Not a TEC	4.95	36.7	0	68
7a	46	High	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Not a TEC	20.14	96.0	0	478
7b	46	High	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	*Natural Grasslands of the Murray Valley Plains* (CEEC – C'wth)	1.12	84.2	0	47
8	46	Moderate	Curly Windmill Grass - speargrass - wallaby grass	Not a TEC	1.30	57.9	0	19

Zone ID	PCT ID	Zone Condition	PCT name	TEC	Impact area (ha)	Vegetation integrity score	Future Vegetation Integrity Score	Ecosystem credits required
			grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion					
10	57	Moderate	Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion	Not a TEC	0.27	47.6	0	3
11	153	High	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Not a TEC	6.72	99.2	0	167
12	153	Moderate	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Not a TEC	59.51	59.2	0	881
13	153	Low	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	Not a TEC	2.38	42.1	0	25
14	159	Planted	Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	Not a TEC	6.45	92.1	0	297
15	160	High	Nitre Goosefoot shrubland wetland on clays of the	Not a TEC	19.13	71.5	0	342

Zone ID	PCT ID	Zone Condition	PCT name	TEC	Impact area (ha)	Vegetation integrity score	Future Vegetation Integrity Score	Ecosystem credits required
			inland floodplains					
16	160	Moderate	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Not a TEC	1.11	45.5	0	13
17	163	High	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Not a TEC	1.13	89	0	25
18	163	Moderate	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Not a TEC	1.87	52.8	0	25
19	164	High	Cotton Bush open shrubland of the semi-arid (warm) zone	Not a TEC	417.92	94.8	0	9,908
20	164	Moderate	Cotton Bush open shrubland of the semi-arid (warm) zone	Not a TEC	2.99	51.6	0	39

11.1.2 Species credits

The BAM credit calculator generated offset obligations for 16 candidate species, with the offsets required in the Stage 1 Development Footprint listed in Table 11-3 and the offsets required in the Stage 2 Development Footprint listed in Table 11-4.

Table 11-3 Candidate species requiring offsets Stage 1 Development Footprint

Species Credit Species	Biodiversity risk weighting	BC Act Status	EPBC Act Status	Area of habitat	Species credits required	Suitable IBRA subregion for offset
Flora						
Brachyscome papillosa Mossgiel Daisy	2.0	V	V	7.74 ha (Zone 7a: PCT 46_High) 0.02 ha (Zone 14: PCT 159_Planted) 6.82 ha (Zone 15: PCT 160_High) 77.21 ha (Zone 19: PCT 164_High)	4,292	All of NSW
Convolvulus tedmoorei Bindweed (SAll species) (Assumed present)	3.0	E	-	0.17 ha (Zone 19: PCT 164_High)	5	All of NSW
Eleocharis obicis Spike-rush	2.0	V	V	0.95 ha (Zone 1: PCT 15_Woodland_high) 0.24 ha (Zone 6: PCT 28_Grassland_moderate) 7.58 ha (Zone 15: PCT 160_High) 2.53 ha (Zone 17: PCT 163_High) 3.35 ha (Zone 18: PCT 163_Moderate)	577	All of NSW
Maireana cheelii Chariot Wheels	2.0	V	V	0.90 ha (Zone 17: PCT 163_High)	1,273	All of NSW

Species Credit Species	Biodiversity risk weighting	BC Act Status	EPBC Act Status	Area of habitat	Species credits required	Suitable IBRA subregion for offset
				0.03 ha (Zone 18: PCT 163_Moderate) 26.29 ha (Zone 19: PCT 164_High)		
Swainsona murrayana Slender Darling Pea	2.0	V	V	0.17 ha (Zone 19: PCT 164_High)	8	All of NSW
Fauna						
Litoria raniformis Southern Bell Frog	2.0	E	V	0.55 ha (Zone 1: PCT 15_Woodland_high) 0.13 ha (Zone 15: PCT 160_High) 5.24 ha (Zone 19: PCT 164_High) 0.07 ha (Zone 20: PCT 164_Moderate)	262	All of NSW
Myotis Macropus Southern Myotis	2.0	V	-	0.13 ha (Zone 15: PCT 160_High) 5.17 ha (Zone 19: PCT 164_High) 0.07 ha (Zone 20: PCT 164_Moderate)	249	All of NSW

Table 11-4 Candidate species requiring offsets Stage 2 Development Footprint

Species Credit Species	Biodiversity risk weighting	BC Act Status	EPBC Act Status	Area of habitat	Species credits required	Suitable IBRA subregion for offset
Flora						
Brachyscome papillosa Mossgiel Daisy	2.0	V	V	0.05 ha (Zone 1: PCT 15_Woodland_high) 0.56 ha (Zone 2: PCT 15_Woodland_low) 1.83 ha (Zone 3: PCT 15_Grassland_moderate) 0.46 ha (Zone 4: PCT 17_High) 3.99 ha (Zone 7a: PCT 46_High) 1.12 ha (Zone 7b: PCT 46_High TEC) 0.04 ha (Zone 8: PCT 46_Moderate) 1.14 ha (Zone 11: PCT 153_High) 5.59 ha (Zone 12: PCT 153_Moderate) 2.17 ha (Zone 13: PCT 153_Low) 0.96 ha (Zone 14: PCT 159_Planted) 9.35 ha (Zone 15: PCT 160_High) 1.11 ha (Zone 16: PCT 160_Moderate) 0.10 ha (Zone 17: PCT 163_High) 172.97 ha (Zone 19: PCT 164_High)	9,240	All of NSW

Species Credit Species	Biodiversity risk weighting	BC Act Status	EPBC Act Status	Area of habitat	Species credits required	Suitable IBRA subregion for offset
				2.18 ha (Zone 20: PCT 164_Moderate)		
Eleocharis obicis Spike-rush	2.0	V	V	2.72 ha (Zone 1: PCT 15_Woodland_high) 1.78 ha (Zone 2: PCT 15_Woodland_low) 4.84 ha (Zone 3: PCT 15_Grassland_moderate) 0.57 ha (Zone 4: PCT 17_High) 0.98 ha (Zone 5: PCT 28_Woodland_moderate) 4.95 ha (Zone 6: PCT 28_Grassland_moderate) 19.13 ha (Zone 15: PCT 160_High) 1.11 ha (Zone 16: PCT 160_Moderate) 1.13 ha (Zone 17: PCT 163_High) 1.87 ha (Zone 18: PCT 163_Moderate)	1,164	All of NSW
Maireana cheelii Chariot Wheels	2.0	V	V	1.23 ha (Zone 6: PCT 28_Grassland_moderate) 4.00 ha (Zone 7: PCT 46_High) 0.19 ha (Zone 11: PCT 153_High) 1.56 ha (Zone 12: PCT 153_Moderate) 0.52 ha (Zone 14: PCT 159_Planted) 0.03 ha (Zone 17: PCT 163_High)	1,608	All of NSW

Species Credit Species	Biodiversity risk weighting	BC Act Status	EPBC Act Status	Area of habitat	Species credits required	Suitable IBRA subregion for offset
				0.40 ha (Zone 18: PCT 163_Moderate) 27.51 ha (Zone 19: PCT 164_High)		
Swainsona murrayana Slender Darling Pea	2.0	V	V	0.21 ha (Zone 19: PCT 164_High)	10	All of NSW
Fauna						
Hieraaetus morphnoides Little Eagle	1.5	V	-	0.19 ha (Zone 10: PCT 57_Moderate) 0.55 ha (Zone 19: PCT 164_High)	23	All of NSW
Litoria raniformis Southern Bell Frog	2.0	E	V	0.57 ha (Zone 1: PCT 15_Woodland_high) 0.33 ha (Zone 5: PCT 28_Woodland_moderate) 0.01 ha (Zone 7a: PCT 46_High) 0.10 ha (Zone 11: PCT 153_High) 2.20 ha (Zone 12: PCT 153_Moderate) 0.13 ha (Zone 14: PCT 159_Planted) 4.09 ha (Zone 15: PCT 160_High) 22.60 ha (Zone 19: PCT 164_High) 1.03 ha (Zone 20: PCT 164_Moderate)	1,347	All of NSW

Species Credit Species	Biodiversity risk weighting	BC Act Status	EPBC Act Status	Area of habitat	Species credits required	Suitable IBRA subregion for offset
Myotis Macropus Southern Myotis	2.0	V	-	0.33 ha (Zone 5: PCT 28_Woodland_moderate) 0.01 ha (Zone 7a: PCT 46_High) 4.06 ha (Zone 15: PCT 160_High) 22.33 ha (Zone 19: PCT 164_High) 1.01 ha (Zone 20: PCT 164_Moderate)	1,235	All of NSW

11.1.3 Offsets required under the EPBC Act

Due to the MNES which are likely to be impacted by the Project, the entire project has been referred under the EPBC Act (EPBC 2024/09772). A decision was made on 27th May 2024 (Appendix B.3) that the Project is a controlled action and assessment and approval under the EPBC Act is required. The assessment is to be assessed under the NSW BAM as part of the Bilateral Assessment Agreement with DCCEEW (Cwth) and NSW Government. EPBC Act offset obligations would be undertaken in accordance with the NSW BOS. No additional offsets for MNES are required. Biodiversity offsets for MNES are shown below in Table 11-5 for the Stage 1 Development Footprint and

Table 11-6 for the Stage 2 Development Footprint.

MNES likely to be impacted by the Project include:

Ecosystem credit entities

- *Natural Grasslands of the Murray Valley Plains* CEEC
- *Aphelocephala leucopsis* Southern Whiteface
- *Botaurus poiciloptilus* Australasian Bittern
- *Falco hypoleucos* Grey Falcon
- *Grantiella picta* Painted Honeyeater
- *Hirundapus caudacutus* White-throated Needletail
- *Lathamus discolor* Swift Parrot
- *Lophochroa leadbeateri* Pink Cockatoo (eastern)
- *Melanodryas cucullata cucullata* South-eastern Hooded Robin
- *Neophema chrysostoma* Blue-winged Parrot
- *Nyctophilus corbeni* Corben's Long-eared Bat, South-eastern Long-eared Bat
- *Pedionomus torquatus* Plains-wanderer
- *Polytelis swainsonii* Superb Parrot
- *Rostratula australis* Australian Painted Snipe
- *Stagonopleura guttata* Diamond Firetail

Species credit entities

- *Brachyscome papillosa* Mossgiel Daisy
- *Eleocharis obicis* Spike-Rush
- *Maireana cheelii* Chariot Wheels
- *Swainsona murrayana* Slender Darling Pea
- *Litoria raniformis* Southern Bell Frog

Summary of impacts to MNES is provided in Appendix B.6.

Table 11-5 MNES entities requiring offsets Stage 1 Development Footprint

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Flora				
Brachyscome papillosa Mossgiel Daisy	PCT 46_High PCT 159_Planted PCT 160_High PCT 164_High	7.74 (PCT 46_High) 0.02 (PCT 159_Planted) 6.82 (PCT 160_High) 77.21 (PCT 164_High) **Total = 91.79**	4,292 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Eleocharis obicis Spike-Rush	PCT 15_Woodland_high PCT 28_Grassland_moderate PCT 160_High PCT 163_High PCT 163_Moderate	0.95 (PCT 15_Woodland_high) 0.24 (PCT 28_Grassland_Moderate) 7.58 (PCT 160_High) 2.53 (PCT 163_High) 3.35 (PCT 163_Moderate) **Total = 14.65**	577 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Maireana cheelii Chariot Wheels	PCT 163_High PCT 163_Moderate	0.90 (PCT 163_High) 0.03 (PCT 163_Moderate)	1,273 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 164_High	26.29 (PCT 164_High) **Total = 27.22**		Biodiversity Stewardship Site.
Swainsona murrayana Slender Darling Pea	PCT 164_High	0.17 (PCT 164_High) **Total = 0.17**	8 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Fauna				
Aphelocephala leucopsis Southern Whiteface	PCT 15_Woodland_High PCT 28_Grassland_Moderate PCT 46_High PCT 57_High PCT 153_Moderate PCT 159_Planted PCT 160_High PCT 163_High PCT 163_Moderate	0.95 (PCT 15_Woodland_High) 0.24 (PCT 28_Grassland_Moderate) 20.53 (PCT 46_High) 0.01 (PCT 57_High) 0.68 (PCT 153_Moderate) 0.55 (PCT 159_Planted) 7.58 (PCT 160_High) 2.53 (PCT 163_High) 3.35 (PCT 163_Moderate)	4,914 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 164_High PCT 164_Moderate	174.70 (PCT 164_High) 0.19 (PCT 164_Moderate) **Total = 211.31**		
Botaurus poiciloptilus Australasian Bittern	PCT 160_High	7.58 (PCT 160_High) **Total = 7.58**	168 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Falco hypoleucos Grey Falcon	PCT 15_Woodland_High PCT 28_Grassland_Moderate PCT 46_High PCT 57_High PCT 153_Moderate PCT 153_Low (Euston) PCT 159_Planted PCT 160_High PCT 163_High	0.95 (PCT 15_Woodland_High) 0.24 (PCT 28_Grassland_Moderate) 20.53 (PCT 46_High) 0.01 (PCT 57_High) 0.68 (PCT 153_Moderate) 0.16 (PCT 153_Low (Euston)) 0.55 (PCT 159_Planted) 7.58 (PCT 160_High) 2.53 (PCT 163_High)	4,917 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 163_Moderate PCT 164_High PCT 164_Moderate	3.35 (PCT 163_Moderate) 174.70 (PCT 164_High) 0.19 (PCT 164_Moderate) **Total = 211.47**		
Grantiella picta Painted Honeyeater	PCT 15_Woodland_High PCT 28_Grassland_Moderate PCT 57_High	0.95 (PCT 15_Woodland_High) 0.24 (PCT 28_Grassland_Moderate) 0.01 (PCT 57_High) **Total = 1.20**	14 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Hirundapus caudacutus White-throated Needletail	PCT 15_Woodland_High PCT 46_High PCT 159_Planted PCT 160_High	0.95 (PCT 15_Woodland_High) 20.53 (PCT 46_High) 0.55 (PCT 159_Planted) 7.58 (PCT 160_High) **Total = 29.61**	695 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Lathamus discolor Swift Parrot	PCT 15_Woodland_High	0.95 (PCT 15_Woodland_High) **Total = 0.95**	10 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
				Site.
Litoria raniformis Southern Bell Frog	PCT 15_Woodland_high PCT 160_High PCT 164_High PCT 164_Moderate	0.55 (PCT 15_Woodland_high) 0.13 (PCT 160_High) 5.24 (PCT 164_High) 0.07 (PCT 164_Moderate) **Total = 5.99**	262 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Lophochroa leadbeateri Pink Cockatoo (eastern)	PCT 15_Woodland_High PCT 28_Grassland_Moderate PCT 57_High PCT 153_Low (Euston) PCT 153_Moderate PCT 159_Planted PCT 163_High PCT 163_Moderate	0.95 (PCT 15_Woodland_High) 0.24 (PCT 28_Grassland_Moderate) 0.01 (PCT 57_High) 0.16 (PCT 153_Low (Euston)) 0.68 (PCT 153_Moderate) 0.55 (PCT 159_Planted) 2.53 (PCT 163_High) 3.35 (PCT 163_Moderate) **Total = 8.47**	161 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Melanodryas cucullata	PCT 15_Woodland_High	0.95 (PCT 15_Woodland_High)	14 (ecosystem credits)	Payment into the

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
cucullata South-eastern Hooded Robin	PCT 28_Grassland_Moderate PCT 57_High	0.24 (PCT 28_Grassland_Moderate) 0.01 (PCT 57_High) **Total = 1.20**		Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Neophema chrysostoma Blue-winged Parrot	PCT 15_Woodland_High PCT 28_Grassland_Moderate PCT 46_High PCT 57_High PCT 153_Moderate PCT 153_Low (Euston) PCT 159_Planted PCT 160_High PCT 163_High PCT 163_Moderate PCT 164_High PCT 164_Moderate	0.95 (PCT 15_Woodland_High) 0.24 (PCT 28_Grassland_Moderate) 20.53 (PCT 46_High) 0.01 (PCT 57_High) 0.68 (PCT 153_Moderate) 0.16 (PCT 153_Low (Euston)) 0.55 (PCT 159_Planted) 7.58 (PCT 160_High) 2.53 (PCT 163_High) 3.35 (PCT 163_Moderate) 174.70 (PCT 164_High) 0.19 (PCT 164_Moderate) **Total = 211.47**	4,917 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Nyctophilus corbeni Corben's Long-eared Bat	PCT 28_Grassland_moderate PCT 57_High	0.24 (PCT 28_Grassland_Moderate) 0.01 (PCT 57_High) **Total = 0.25**	4 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Pedionomus torquatus Plains-wanderer	PCT 46_High PCT 163_High PCT 163_Moderate PCT 164_High PCT 164_Moderate	20.53 (PCT 46_High) 2.53 (PCT 163_High) 3.35 (PCT 163_Moderate) 174.70 (PCT 164_High) 0.19 (PCT 164_Moderate) **Total = 201.30**	4,699 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Polytelis swainsonii Superb Parrot	PCT 28_Grassland_Moderate PCT 46_High	0.24 (PCT 28_Grassland_Moderate) 20.53 (PCT 46_High) **Total = 20.77**	495 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Rostratula australis	PCT 160_High	7.58 (PCT 160_High)	168 (ecosystem credits)	Payment into the Biodiversity Conservation

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Australian Painted Snipe		**Total = 7.58**		Fund or establishment of a Biodiversity Stewardship Site.
Stagonopleura guttata Diamond Firetail	PCT 28_Grassland_Moderate PCT 46_High PCT 57_High	0.24 (PCT 28_Grassland_Moderate) 20.53 (PCT 46_High) 0.01 (PCT 57_High) **Total = 20.78**	496 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Table 11-6 MNES entities requiring offsets Stage 2 Development Footprint

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Threatened Ecological Community				
Natural Grasslands of the Murray Valley Plains CEEC	PCT 46_High (TEC)	1.12 (PCT 46_High (TEC)) **Total = 1.12**	47 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
				Biodiversity Stewardship Site.
Flora				
Brachyscome papillosa Mossgiel Daisy	PCT 15_Woodland_high PCT 15_Woodland_low PCT 15_Grassland_moderate PCT 17_High PCT 46_High PCT 46_High (TEC) PCT 46_Moderate PCT 153_High PCT 153_Moderate PCT 153_Low PCT 159_Planted PCT160_High PCT 160_Moderate	0.05 (PCT 15_Woodland_high) 0.56 (PCT 15_Woodland_low) 1.83 (PCT 15_Grassland_moderate) 0.46 (PCT 17_High) 3.99 (PCT 46_High) 1.12 (PCT 46_High (TEC)) 0.04 (PCT 46_Moderate) 1.14 (PCT 153_High) 5.59 (PCT 153_Moderate) 2.17 (PCT 153_Low) 0.96 (PCT 159_Planted) 9.35 (PCT160_High) 1.11 (PCT 160_Moderate)	9,240 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 163_High PCT 164_High PCT 164_Moderate	0.10 (PCT 163_High) 172.97 (PCT 164_High) 2.18 (PCT 164_Moderate) **Total = 203.62**		
Eleocharis obicis Spike-Rush	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 17_High PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 160_High PCT 160_Moderate PCT 163_High PCT 163_Moderate	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) 0.57 (PCT 17_High) 0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 19.13 (PCT 160_High) 1.11 (PCT 160_Moderate) 1.13 (PCT 163_High) 1.87 (PCT 163_Moderate)	1,164 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
		Total = 39.08		
Maireana cheelii Chariot Wheels	PCT 28_Grassland_moderate PCT 46_High PCT 153_High PCT 153_Moderate PCT 159_Planted PCT 163_High PCT 163_Moderate PCT 164_High	1.23 (PCT 28_Grassland_moderate) 4.00 (PCT 46_High) 0.19 (PCT 153_High) 1.56 (PCT 153_Moderate) 0.52 (PCT 159_Planted) 0.03 (PCT 163_High) 0.40 (PCT 163_Moderate) 27.51 (PCT 164_High) **Total = 35.44**	1,608 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Swainsona murrayana Slender Darling Pea	PCT 164_High	0.21 (PCT 164_High) **Total = 0.21**	10 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Fauna				

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Aphelocephala leucopsis Southern Whiteface	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 17_High PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 46_High PCT 46_High (TEC) PCT 46_Moderate PCT 57_Moderate PCT 153_High PCT 153_Moderate PCT 153_Low PCT 159_Planted PCT 160_High PCT 160_Moderate PCT 163_High	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) 0.57 (PCT 17_High) 0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 20.14 (PCT 46_High) 1.12 (PCT 46_High (TEC)) 1.30 (PCT 46_Moderate) 0.27 (PCT 57_Moderate) 6.72 (PCT 153_High) 59.51 (PCT 153_Moderate) 2.38 (PCT 153_Low) 6.45 (PCT 159_Planted) 19.13 (PCT 160_High)	12,504 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 163_Moderate PCT 164_High PCT 164_Moderate	1.11 (PCT 160_Moderate) 1.13 (PCT 163_High) 1.87 (PCT 163_Moderate) 417.92 (PCT 164_High) 2.99 (PCT 164_Moderate) **Total = 557.88**		
Botaurus poiciloptilus Australasian Bittern	PCT 17_High PCT 160_High PCT 160_Moderate	0.57 (PCT 17_High) 19.13 (PCT 160_High) 1.11 (PCT 160_Moderate) **Total = 20.81**	370 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Falco hypoleucos Grey Falcon	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 17_High PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) 0.57 (PCT 17_High) 0.98 (PCT 28_Woodland_Moderate)	12,504 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 46_High PCT 46_High (TEC) PCT 46_Moderate PCT 57_Moderate PCT 153_High PCT 153_Moderate PCT 153_Low PCT 159_Planted PCT 160_High PCT 160_Moderate PCT 163_High PCT 163_Moderate PCT 164_High PCT 164_Moderate	4.95 (PCT 28_Grassland_Moderate) 20.14 (PCT 46_High) 1.12 (PCT 46_High (TEC)) 1.30 (PCT 46_Moderate) 0.27 (PCT 57_Moderate) 6.72 (PCT 153_High) 59.51 (PCT 153_Moderate) 2.38 (PCT 153_Low) 6.45 (PCT 159_Planted) 19.13 (PCT 160_High) 1.11 (PCT 160_Moderate) 1.13 (PCT 163_High) 1.87 (PCT 163_Moderate) 417.92 (PCT 164_High) 2.99 (PCT 164_Moderate) **Total = 557.88**		

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Grantiella picta Painted Honeyeater	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 57_Moderate	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) 0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 0.27 (PCT 57_Moderate) **Total = 15.54**	223 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Hirundapus caudacutus White-throated Needletail	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 17_High PCT 46_High PCT 46_High (TEC) PCT 46_Moderate	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) 0.57 (PCT 17_High) 20.14 (PCT 46_High) 1.12 (PCT 46_High (TEC))	1,355 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 159_Planted PCT 160_High PCT 160_Moderate	1.30 (PCT 46_Moderate) 6.45 (PCT 159_Planted) 19.13 (PCT 160_High) 1.11 (PCT 160_Moderate) **Total = 59.16**		
Lathamus discolor Swift Parrot	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) **Total = 9.34**	144 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Litoria raniformis Southern Bell Frog	PCT 15_Woodland_high PCT 28_Woodland_moderate PCT 46_High PCT 153_High PCT 153_Moderate PCT 159_Planted	0.57 (PCT 15_Woodland_high) 0.33 (PCT 28_Woodland_moderate) 0.01 (PCT 46_High) 0.10 (PCT 153_High) 2.20 (PCT 153_Moderate) 0.13 (PCT 159_Planted)	1,347 (species credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 160_High PCT 164_High PCT 164_Moderate	4.09 (PCT 160_High) 22.60 (PCT 164_High) 1.03 (PCT 164_Moderate) **Total = 31.06**		
Lophochroa leadbeateri Pink Cockatoo (eastern)	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 57_Moderate PCT 153_High PCT 153_Moderate PCT 153_Low PCT 159_Planted PCT 163_High PCT 163_Moderate	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) 0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 0.27 (PCT 57_Moderate) 6.72 (PCT 153_High) 59.51 (PCT 153_Moderate) 2.38 (PCT 153_Low) 6.45 (PCT 159_Planted)	1,643 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
		1.13 (PCT 163_High) 1.87 (PCT 163_Moderate) **Total = 93.60**		
Melanodryas cucullata cucullata South-eastern Hooded Robin	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 57_Moderate	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate) 0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 0.27 (PCT 57_Moderate) **Total = 15.54**	223 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Neophema chrysostoma Blue-winged Parrot	PCT 15_Woodland_High PCT 15_Woodland_Low PCT 15_Grassland_Moderate PCT 17_High	2.72 (PCT 15_Woodland_High) 1.78 (PCT 15_Woodland_Low) 4.84 (PCT 15_Grassland_Moderate)	12,504 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 46_High PCT 46_High (TEC) PCT 46_Moderate PCT 57_Moderate PCT 153_High PCT 153_Moderate PCT 153_Low PCT 159_Planted PCT 160_High PCT 160_Moderate PCT 163_High PCT 163_Moderate PCT 164_High PCT 164_Moderate	0.57 (PCT 17_High) 0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 20.14 (PCT 46_High) 1.12 (PCT 46_High (TEC)) 1.30 (PCT 46_Moderate) 0.27 (PCT 57_Moderate) 6.72 (PCT 153_High) 59.51 (PCT 153_Moderate) 2.38 (PCT 153_Low) 6.45 (PCT 159_Planted) 19.13 (PCT 160_High) 1.11 (PCT 160_Moderate) 1.13 (PCT 163_High) 1.87 (PCT 163_Moderate) 417.92 (PCT 164_High)		

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
		2.99 (PCT 164_Moderate) **Total = 557.88**		
Nyctophilus corbeni Corben's Long-eared Bat	PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 57_High	0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 0.27 (PCT 57_Moderate) **Total = 6.20**	79 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Pedionomus torquatus Plains-wanderer	PCT 46_High PCT 46_High (TEC) PCT 46_Moderate PCT 163_High PCT 163_Moderate PCT 164_High PCT 164_Moderate	20.14 (PCT 46_High) 1.12 (PCT 46_High (TEC)) 1.30 (PCT 46_Moderate) 1.13 (PCT 163_High) 1.87 (PCT 163_Moderate) 417.92 (PCT 164_High) 2.99 (PCT 164_Moderate) **Total = 446.47**	10,541 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Polytelis swainsonii Superb Parrot	PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 46_High PCT 46_High (TEC) PCT 46_Moderate	0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 20.14 (PCT 46_High) 1.12 (PCT 46_High (TEC)) 1.30 (PCT 46_Moderate) **Total = 28.49**	620 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Rostratula australis Australian Painted Snipe	PCT 17_High PCT 160_High PCT 160_Moderate	0.57 (PCT 17_High) 19.13 (PCT 160_High) 1.11 (PCT 160_Moderate) **Total = 20.81**	370 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.
Stagonopleura guttata Diamond Firetail	PCT 28_Woodland_Moderate PCT 28_Grassland_Moderate PCT 46_High PCT 46_High (TEC)	0.98 (PCT 28_Woodland_Moderate) 4.95 (PCT 28_Grassland_Moderate) 20.14 (PCT 46_High)	623 (ecosystem credits)	Payment into the Biodiversity Conservation Fund or establishment of a Biodiversity Stewardship Site.

Threatened entity under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
	PCT 46_Moderate PCT 57_Moderate	1.12 (PCT 46_High (TEC)) 1.30 (PCT 46_Moderate) 0.27 (PCT 57_Moderate) **Total = 28.76**		

11.2 Impacts not requiring offset

Impacts to PCTs that do not meet the thresholds identified in Section 10.1.1 of the BAM do not require offsets. All vegetation zones within the Development Footprint meet the thresholds, and therefore ecosystem credits have been generated for all vegetation zones.

11.3 Areas not requiring assessment

There are a number of existing roads within the Development Footprint which do not require offsetting. These include Baldon Road, which is located in the southeast of the Subject Land, and a number of formed internal farm tracks which do not contain native vegetation. These roads have the potential to be utilised for fauna movement, and therefore have been assessed as prescribed impacts with appropriate mitigation measures to be put in place.

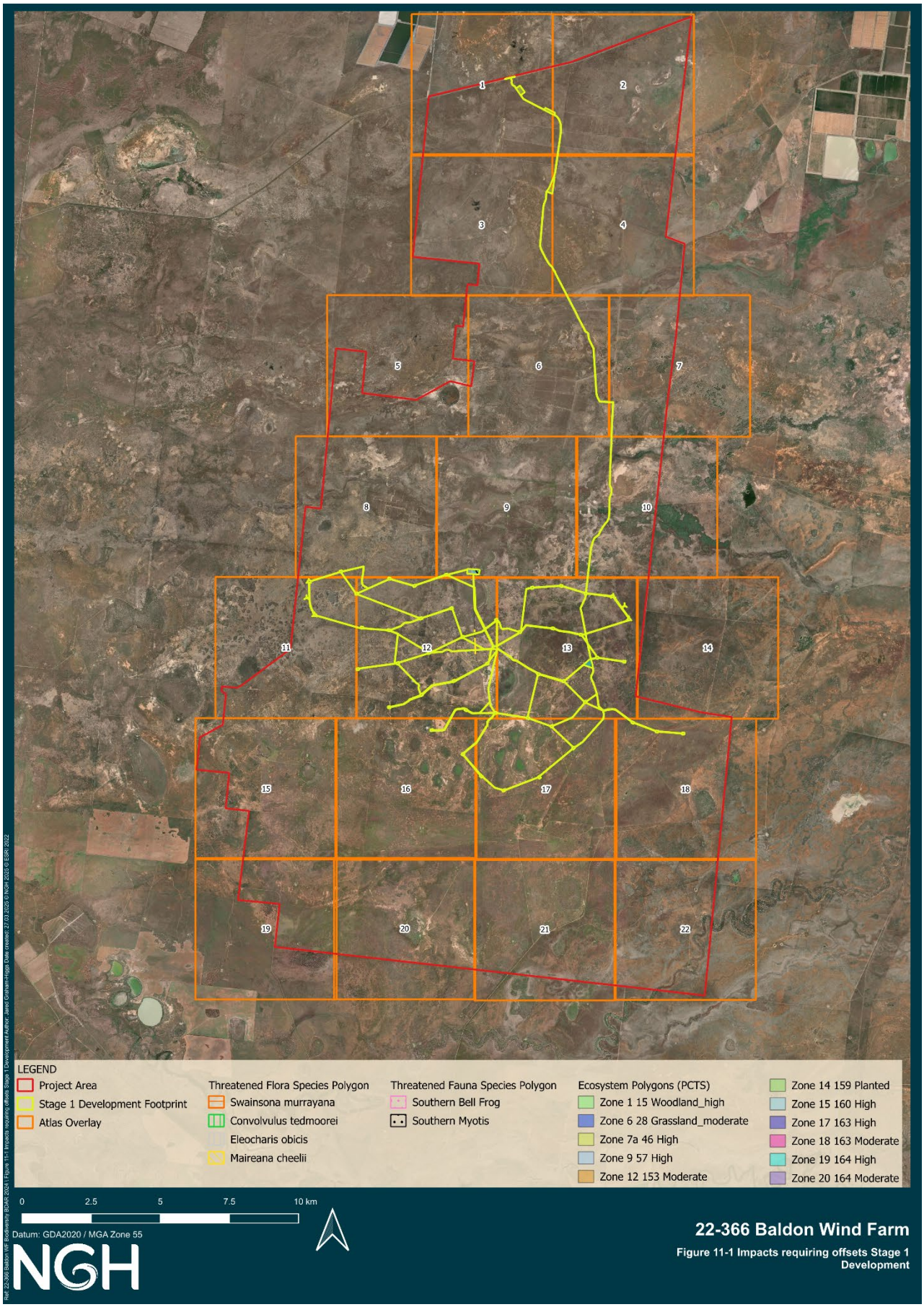


Figure 11-1 Impacts requiring offsets Stage 1 Development (refer to Appendix L.11 for Atlas series)



Figure 11-2 Impacts requiring offsets Stage 1 Development - Haul route intersections

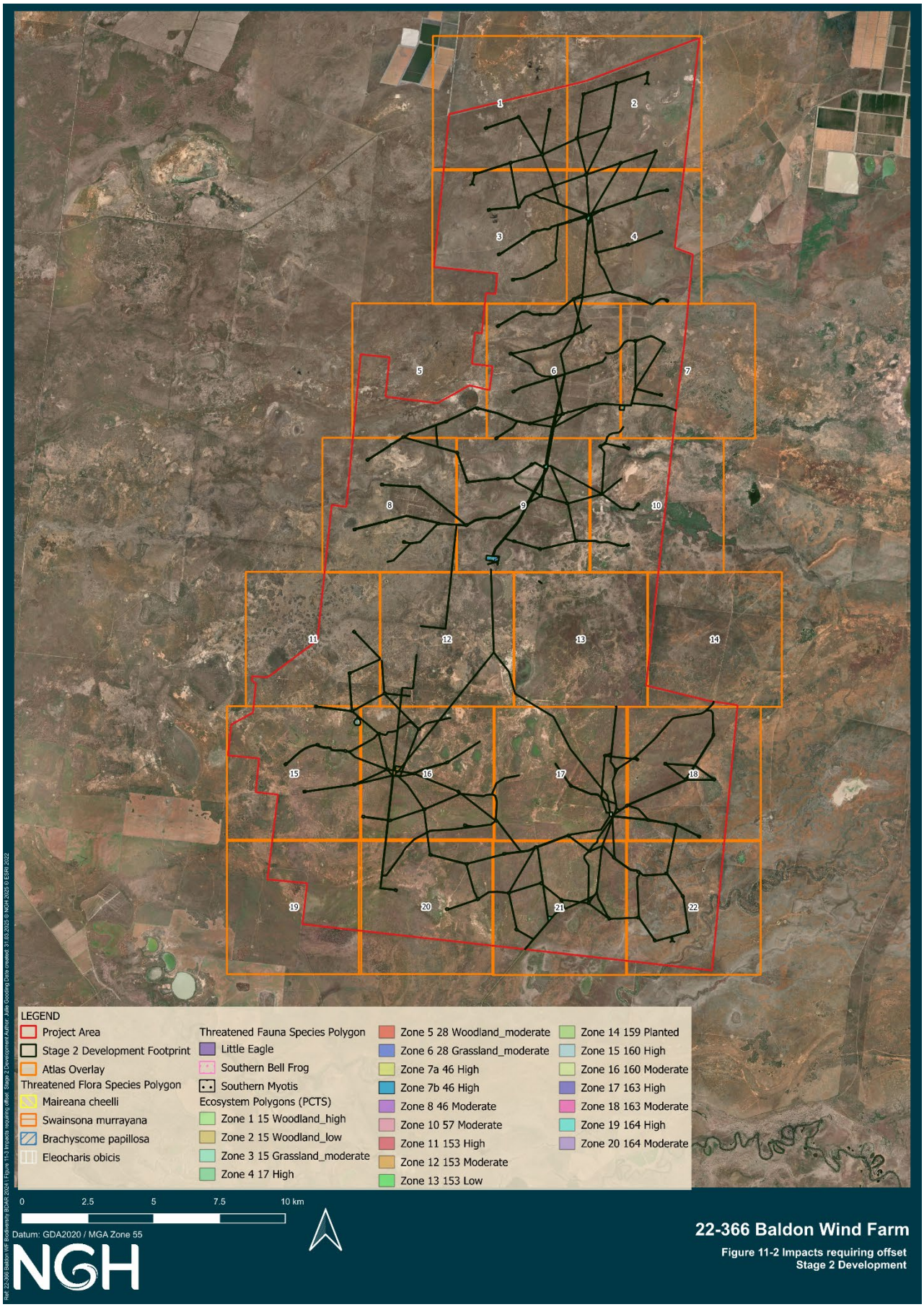


Figure 11-3 Impacts requiring offset Stage 2 Development (refer to Appendix L.12 for Atlas series

12. Conclusion

NGH has prepared this BDAR on behalf of Baldon Wind Farm Pty Ltd to assess the biodiversity impacts of the Project using the Biodiversity Assessment Method (BAM, 2020) as required under the *Biodiversity Conservation Act, 2016* The Baldon Wind Farm project is classified as a State Significant Development as detailed in the Planning Systems State Environmental Planning Policy (SEPP (2021). This BDAR Version 2.0 addresses comments from Biodiversity Conservation & Science Group (BCS) following exhibition of the Development Application and BDAR on 14th August 2024. This update reflects the removal of five turbines from the proposed Development and minor changes to access and reticulation to further avoid potential ecological and hydrological impacts.

The Project is expected to be completed in two stages. As such, these two stages have been entered as two separate assessments within the BAM-C, and are referred to as the Stage 1 Development Footprint and Stage 2 Development Footprint.

In this BDAR, biodiversity impacts have been assessed through comprehensive mapping and assessment completed in accordance with the BAM (2020). Using state vegetation mapping and on-ground vegetation stratification, ten PCTs were identified within the Subject Land, eight of which are within the Stage 1 Development Footprint and ten of which are within the Stage 2 Development Footprint. None of these PCTs conformed to a TEC under the BC Act., however one PCT conforms to the EPBC Act listed CEEC *Natural Grasslands of the Murray Valley Plains*

A total of 109 HBTs were identified within the Subject Land. Of these, 16 are located within the Stage 2 Development Footprint and are proposed to be removed. There are no HBTs located within the Stage 1 Development Footprint. There were no threatened species identified as utilising HBTs within the Subject Land during the targeted surveys.

Targeted surveys were undertaken for candidate species within the Subject Land. Six candidate species were identified within the Subject Land during targeted surveys, which included Mossgiel Daisy (*Brachyscome papillosa),* Chariot Wheels *(Maireana cheelii),* Slender Darling Pea (*Swainsona murrayana*), Little Eagle (*Hieraaetus morphnoides),* Southern Myotis (*Myotis macropus*) and Southern Bell Frog (*Litoria raniformis)*. Spike-Rush (*Eleocharis obicis*) was detected incidentally but unable to be surveyed due to unsuitable conditions. It has been assumed present. Additional intersection upgrade areas were added to the Development Footprint after the threatened flora survey periods were completed. As such Bindweed (*Convolvulus tedmoorei)* and Slender Darling Pea were unable to be surveyed for at the site access intersection and has been assumed present in 0.17 ha of roadside vegetation.

Twelve ecosystem species were also detected within the Subject Land during targeted surveys and Bird Utilisation surveys These species were; Black Falcon (*Falco subniger*), Spotted Harrier (*Circus assimilis*), Black Breasted Buzzard (*Hamirostra melanosternon*), Blue-winged Parrot (*Neophema chrysostoma*), Pink Cockatoo (*Lophochroa leadbeateri)*, White-fronted Chat (*Epthianura albifrons)*, Plains-wanderer (*Pedionomus torquatus)*,Flame Robin (*Petroica* phoenicea), Southern Whiteface (*Aphelocephala leucopsis*), Little Pied Bat (*Chalinolobus picatus*), Inland Forest Bat (*Vespadelus baverstocki*), Yellow-bellied sheath-tailed Bat (*Saccolaimus flaviventris*). As ecosystem species, these are already assumed present in the calculation of ecosystem credits for the Project.

The Project has the potential to impact on a number of MNES, including:

- One Critically Endangered Ecological Community - *Natural Grasslands of the Murray Valley Plains*

- Two Critically Endangered threatened species – Curlew Sandpiper *(Calidris ferruginea*) and Plains-wanderer *(Pedionomus torquatus*)
- Three Endangered threatened species – Pink Cockatoo (eastern) *(Lophochroa leadbeateri)*, South-eastern Hooded Robin (*Melanodryas cucullata cucullata)* and Common Greenshank (*Tringa nebularia*)
- Eleven Vulnerable threatened species – Mossgiel Daisy (*Brachyscome papillosa),* Spike-rush (*Eleocharis obicis*), Chariot Wheels (*Maireana cheelii),* Slender Darling Pea (*Swainsona murrayana*), Southern Whiteface (*Aphelocephala leucopsis)*, Sharp-tailed Sandpiper *(Calidris* acuminata), Latham's Snipe *(Gallinago* hardwickii), Southern Bell Frog (*Litoria raniformis)*, Blue-winged Parrot *(Neophema chrysostoma*), Corben's Long-eared Bat (*Nyctophilus corbeni*) and Diamond Firetail *(Stagonopleura guttata*)
- 12 Migratory species – Common Sandpiper *(Actitis hypoleucos)*, Fork-tailed Swift (Apus *pacificus*), Sharp-tailed Sandpiper (*Calidris acuminata)*, Curlew Sandpiper *(Calidris ferruginea*), Pectoral Sandpiper (*Calidris melanotos*), Latham's Snipe (*Gallinago hardwickii*), Gull-billed Tern (*Gelochelidon nilotica)*, Caspian Tern (*Hydroprogne caspia*), Yellow Wagtail (*Motacilla flava*), Wood Sandpiper (*Tringa Glareola*), Common Greenshank (*Tringa nebularia)* and Marsh Sandpiper (*Tringa stagnatilis)*.

Due to the nature of the project, and the MNES which have the potential to be impacted by the Project, the entire Project was referred under the EPBC Act. DCCEEW (Cwth) determined the Project is a controlled action and the assessment can be assessed under the NSW BAM as part of the Bilateral Agreement with DCCEEW (Cwth) and NSW Government. This report has addressed all Cwth matters in order to support a Commonwealth approval.

Avoidance and minimisation of impacts has been conducted through the planning phase, including:

- The Project Area was selected after an extensive review of alternative sites by the proponent.
- Early constraints identification and validation of desktop mapping by rapid survey of the broad Project Area, which included potential for Serious and Irreversible Impacts to Plains-wanderer (*Pedionomus torquatus*) and Eastern Curlew (*Numenius madagascariensis*), and raptor nests which may pose collision risks.
- Detailed field surveys to inform constraints mapping for the narrower Subject Land.
- Constraints workshop to consider overlapping constraints (specifically heritage constraints covering different areas to biodiversity constraints).
- Avoid and minimise workshops to clarify avoidance strategies and develop further options to minimise impacts, both with the Project team and then with BCS and DCCEEW (Cwth).

The key biodiversity impact for this Project is the potential to have ongoing population impacts on birds or bats that are either excluded from the Development Footprint or injured by operational turbines. Extensive bird and bat utilisation data and risk assessment modelling has been undertaken to ensure that turbine placements minimise this risk and that actual impacts are as low as possible. To address the inherent uncertainty however, a Bird and Bat Adaptive Management Plan to identify specific adaptive mitigation measures has been developed.

Specific impacts associated with Plains-wanderer (*Pedionomus torquatus*) include direct loss of habitat due to clearing associated with the Development Footprint and potential vehicle strikes due to increased vehicle movement across the Subject Land. Mitigation measures for Plains-wanderer (*Pedionomus torquatus*) include undertaking pre-clearance surveys for active breeding sites by an ecologist, and ceasing works if

detected and buffer the identified nest area. A Pest Management Plan will also be established to target pest animal species that impact Plains-wanderer (*Pedionomus torquatus*) (i.e. cats, foxes).

Based on the above, the ecosystem credit requirement for the Project has been defined in Table 12-1 and the species credit requirement has been defined in Table 12-2. The credits will be retired in accordance with the Biodiversity Offset Scheme.

Mitigation measures have been outlined to reduce the direct, indirect, and prescribed impacts to biodiversity. These include:

- Clearing of HBT activities to avoid critical life cycle events for fauna such as breeding and nursing
- Clearing protocols including pre-clearing surveys, and staged clearing for HBTs and the presence of a trained ecologist or licensed trained fauna spotter catcher during clearing events
- Clear physical demarcation of boundary between retained and cleared areas, including threatened flora habitat or aquatic areas.
- Relocation of habitat features (e.g. fallen timber, hollow logs etc) within construction footprint to adjacent retained habitat.
- Induct all staff prior to construction to identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance.
- Existing survey data to be used for *Brachyscome papillosa* and *Mairena cheelii* during detailed design to minimise footprint where possible in areas of core habitat, such as micrositing for cabling routes or reducing track width
- Seed bank protection protocols, to protect threatened flora seedbank for natural recolonisation of areas subject to disturbance
- Disturbed areas must be rehabilitated as soon as practicable and with consideration to native revegetation requirements.
- Pre-construction surveys for Bindweed (*Convolvulus tedmoorei*) in areas of assumed presence along Sturt Highway at site entrance intersection
- Daily/seasonal timing of construction activities to reduce impacts of noise such as avoiding night works except where strictly necessary, particularly during the breeding/calling season for the Southern Bell Frog
- Lighting at construction compounds, concrete batching plants, substations and the accommodation camp will be designed and operated in accordance with AS4282-2019 Control of the obtrusive effects of outdoor lighting
- Using adaptive dust management and monitoring programs to minimise the generation and spread of dust.
- Using hygiene protocols to prevent the spread of weeds or pathogens.
- Training staff and conducting site briefings to communicate environmental features to be protected and measures to be implemented
- Establishment of a Pest Management Plan to target pest animal species that impact Plains-wanderer *(Pedionomus torquatus)* (i.e cats, foxes). This would involve pest animal control as well as monitoring.
- Development of a Biodiversity Management Plan, Construction Environmental Management Plan, and Bird and Bat Adaptive Management Plan
- No dams would be removed by the proposal to minimise impacts to Southern Bell Frog (*Litoria raniformis)* and Southern Myotis (*Myotis macropus*) which rely on water bodies.

- Turbine micrositing locations must remain at least 300m distance from the identified Wedge-tailed Eagle (*Aquila audax)* nests.
- Reducing vehicle impacts by limiting vehicle speeds and establishing tracks and parking areas prior to construction.

Impacts unable to be avoided will be offset. The Ecosystem credit summary for each stage is shown in Table 12-1 and Table 12-2. The retirement of the credits for all entities will be carried out in accordance with the NSW BOS, and will be achieved by either:

a) Retiring credits under the BOS based on the like-for-like rules, or
b) Making payments into the Biodiversity Conservation Fund using the Biodiversity Conservation Fund Charge System, or
c) Creating a local stewardship site within the Project Area or neighbouring sites to create local credits, or
d) Funding a biodiversity action that benefits the threatened entities impacted by the development.

An Offset Strategy has been developed with input from local and agency stakeholders to inform these options and maximise benefits associated with the considerable offset obligation.

Provided the recommended mitigation measures are implemented and required biodiversity offset credits are retired the Project would not result in a significant impact to threatened flora or fauna, threatened ecological communities or MNES and is considered an acceptable risk to the environment.

Table 12-1 Ecosystem credit summary requirement for Stage 1 and Stage 2 Development Footprints

PCT ID	PCT Name	TEC	Offset Trading Group	Stage 1 Development Footprint			Stage 2 Development Footprint			IBRA Subregion Trading Group
				Impact Area (ha)	Credit Obligation	Hollow Bearing Trees ?	Impact Area (ha)	Credit Obligation	Hollow Bearing Trees?	
15	'Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)'	Not a TEC	Inland Floodplain Woodlands - ≥ 50% - < 70% cleared group	0.95	10	Yes	2.72	62	Yes	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.
15			Inland Floodplain Woodlands - ≥ 50% - < 70% cleared group	0	0	No	6.62	82	No	
17	'Lignum shrubland wetland of the	Not a TEC	Inland Floodplain Shrublands -	0	0	n/a	0.57	15	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower

PCT ID	PCT Name	TEC	Offset Trading Group	Stage 1 Development Footprint			Stage 2 Development Footprint			IBRA Subregion Trading Group
				Impact Area (ha)	Credit Obligation	Hollow Bearing Trees ?	Impact Area (ha)	Credit Obligation	Hollow Bearing Trees?	
	semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)'		≥ 50% - < 70% cleared group							Slopes, Murray Fans, Robinvale Plains and South Olary Plain.
28	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone'	Not a TEC	Riverine Sandhill Woodlands - ≥ 70% - <90% cleared group	0.24	3	No	5.93	76	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.

PCT ID	PCT Name	TEC	Offset Trading Group	Stage 1 Development Footprint			Stage 2 Development Footprint			IBRA Subregion Trading Group
				Impact Area (ha)	Credit Obligation	Hollow Bearing Trees ?	Impact Area (ha)	Credit Obligation	Hollow Bearing Trees?	
46	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion’	Not a TEC	Riverine Plain Grasslands - < 50% cleared group	20.53	492	No	21.44	497	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.
46	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina	*Natural Grasslands of the Murray Valley Plains*	*Natural Grasslands of the Murray Valley Plains*	0	0	n/a	1.12	47	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.

PCT ID	PCT Name	TEC	Offset Trading Group	Stage 1 Development Footprint			Stage 2 Development Footprint			IBRA Subregion Trading Group
				Impact Area (ha)	Credit Obligation	Hollow Bearing Trees ?	Impact Area (ha)	Credit Obligation	Hollow Bearing Trees?	
	Bioregion'									
57	'Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion'	Not a TEC	Semi-arid Sand Plain Woodlands - < 50% cleared group	0.01	1	No	0.27	3	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.
153	Black Bluebush low open shrubland of the alluvial plains and sandplains of	Not a TEC	Aeolian Chenopod Shrublands - < 50% cleared group	0.68	8	n/a	68.61	1,073	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.

PCT ID	PCT Name	TEC	Offset Trading Group	Stage 1 Development Footprint			Stage 2 Development Footprint			IBRA Subregion Trading Group
				Impact Area (ha)	Credit Obligation	Hollow Bearing Trees ?	Impact Area (ha)	Credit Obligation	Hollow Bearing Trees?	
	the arid and semi-arid zones'									
153	Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones' (Euston intersection)	Not a TEC	Aeolian Chenopod Shrublands - < 50% cleared group	0.16	3	n/a	n/a	n/a	n/a	Robinvale Plains , Murray Fans, Murray Scroll Belt, Murrumbidgee and South Olary Plain.
159	'Old Man Saltbush shrubland mainly of the semi-arid (warm)	Not a TEC	Riverine Chenopod Shrublands - ≥ 90% cleared	0.55	25	No	6.45	297	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and

PCT ID	PCT Name	TEC	Offset Trading Group	Stage 1 Development Footprint			Stage 2 Development Footprint			IBRA Subregion Trading Group
				Impact Area (ha)	Credit Obligation	Hollow Bearing Trees ?	Impact Area (ha)	Credit Obligation	Hollow Bearing Trees?	
	climate zone (south western NSW)'		group							South Olary Plain.
160	'Nitre Goosefoot shrubland wetland on clays of the inland floodplains'	Not a TEC	Inland Floodplain Shrublands - < 50% cleared group	7.58	168	No	20.24	355	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.
163	'Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones'	Not a TEC	Riverine Chenopod Shrublands - < 50% cleared group	5.88	111	No	3.00	50	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.

PCT ID	PCT Name	TEC	Offset Trading Group	Stage 1 Development Footprint			Stage 2 Development Footprint			IBRA Subregion Trading Group
				Impact Area (ha)	Credit Obligation	Hollow Bearing Trees ?	Impact Area (ha)	Credit Obligation	Hollow Bearing Trees?	
164	'Cotton Bush open shrubland of the semi-arid (warm) zone'	Not a TEC	Riverine Chenopod Shrublands - < 50% cleared group	174.89	4,096	No	420.91	9,947	No	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain.

Table 12-2 Species credit requirements summary for Stage 1 and Stage 2 Development Footprints

Species	BC Act Status	EPBC Act Status	Biodiversity Risk Weighting	IBRA region trading group	Stage 1 Development Footprint		Stage 2 Development Footprint	
					Impact Area (ha)	Credit obligation	Impact Area (ha)	Credit obligation
Flora								
Brachyscome papillosa Mossgiel Daisy	V	V	2	Any in NSW	91.79	4,292	203.62	9,240
Convolvulus	E	-	3	Any in NSW	0.17	5	0	n/a

Species	BC Act Status	EPBC Act Status	Biodiversity Risk Weighting	IBRA region trading group	Stage 1 Development Footprint		Stage 2 Development Footprint	
					Impact Area (ha)	Credit obligation	Impact Area (ha)	Credit obligation
tedmoorei Bindweed (SAII species) (assumed present)								
Eleocharis obicis Spike-Rush	V	V	2	Any in NSW	14.65	577	39.08	1,164
Maireana cheelii Chariot Wheels	V	V	2	Any in NSW	27.22	1,273	35.44	1,608
Swainsona murrayana Slender Darling Pea	V	V	2	Any in NSW	0.17	8	0.21	10
Fauna								
Hieraaetus morphnoides *Little Eagle*	V	-	1.5	Any in NSW	0	0	0.74	71

Species	BC Act Status	EPBC Act Status	Biodiversity Risk Weighting	IBRA region trading group	Stage 1 Development Footprint		Stage 2 Development Footprint	
					Impact Area (ha)	Credit obligation	Impact Area (ha)	Credit obligation
Litoria raniformis Southern Bell Frog	E	V	2	Any in NSW	5.99	262	31.06	1,347
Myotis Macropus Southern Myotis	V	-	2	Any in NSW	5.37	249	27.74	1,235

13. References

Amber. (2024). *Baldon Wind Farm Traffic Impact Assessment.* Amber.

Auld, T. (1996). Ecology of the Fabaceae in the Sydney region: fire, ants and the soil seedbank. *Cunninghamia* , 531-551.

Baerwald, E. F., D'Amours, G. H., Klug, B. J., & Barclay, R. M. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. *Current Biology, 18* , 695-6. doi:10.1016/j.cub.2008.06.029

Baker-Gabb, D. (1998). *Native Grasslands and the Plains-wanderer.* Wingspan.

BMT. (2025). *Baldon Wind Farm - Hydrology and Flooding Assessment.* BMT.

BMT. (2025). *Baldon Wind Farm - Hydrology and Flooding Assessment.* BMT.

BoM. (2024). *Daily Weather Observations*. Retrieved from Bureau of Meterology: http://www.bom.gov.au/climate/dwo/IDCJDW3077.latest.shtml

BOM. (2024, April 03). *Monthly Rainfall: Balranald (Rsl)*. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=049002

BOM. (2025, February 24). *Monthly Rainfall*. Retrieved from Balranald (Rsl): http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=049002

Cayley, N. W. (1946). *What bird is that? A Guide to the Birds of Australia.* Sydney: Angus and Robertson.

Cayuela, H., Lambrey, J., Vacher, J., & Miaud, C. (2015). Highlighting the effects of land-use change on a threatened amphibian in a human-dominated landscape. *Population Ecology*, 433-443.

Churchill, S. (2008). *Australian Bats.* Allen and Unwin.

Clemann, N., & Gillespie, G. (2012). *National Recovery Plan for the Southern Bell Frog Litoria raniformis.* Melbourne: Department of Sustainability and Environment.

Commonwealth of Australia. (2016). *National Recovery Plan for the Plains-wanderer (Pedionomus torquatus).* Commonwealth of Australia.

Cryan, P. M., & Brown, A. C. (2007). Migration of bats past a remote island offers clues toward the problem of bat fatalities at wind turbines. *Biological Conservation, 139*, 1–11.

Cunningham, C. X., Johnson, C. N., Barmuta, L. A., Hollings, T., Woehler, E. J., & Jones, M. E. (2018). Top carnivore decline has cascading effects on scavengers and carrion persistence. *Proceedings of the Royal Society, 285*(1892). doi:https://doi.org/10.1098/rspb.2018.1582

Cwth DCCEEW. (2022a). *National Recovery Plan for the Australasian Bittern (Botaurus poiciloptilus).* Canberra: Department of Climate Change, Energy, the Environment and Water.

Cwth DCCEEW. (2022b). *National Recovery Plan for the Australian Painted Snipe (Rostratula australis).* Canberra: Department of Climate Change, Energy, the Environment and Water.

Cwth DCCEEW. (2025a). *Swainsona murrayana — Slender Darling-pea, Slender Swainson, Murray Swainson-pea*. Retrieved from Species Profile and Threats Database: https://environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=6765

DAWE. (2020). *Australia's IBRA bioregions and subregions*. Retrieved from Department of Climate Change, Energy, the Environment and Water: http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps

DAWE. (2022). *Onshore Wind Farms – Interim Advice.* Canberra: Department of Agriculture, Water and the Environment.

DCCEEW. (2008). *Approved Conservation Advice for Brachyscome papillosa (Mossgiel Daisy).* Canberra. Retrieved from https://environment.gov.au/biodiversity/threatened/species/pubs/6625-conservation-advice.pdf

DCCEEW. (2008). *Approved Conservation Advice for Eleocharis obicis.* Canberra: DCCEEW.

DCCEEW. (2008). *Approved Conservation Advice for Swainsona murrayana (Slender Darling-pea).* Canberra: Australian Government. Retrieved from https://environment.gov.au/biodiversity/threatened/species/pubs/6765-conservation-advice.pdf

DCCEEW. (2018, August 16). *NSW Threatened Species Profiles*. Retrieved from https://threatenedspecies.bionet.nsw.gov.au/profile?id=10106

DCCEEW. (2021). *Directory of important wetlands in Australia*. Retrieved from Department of Climate Change, Energy, the Environment and Water: www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands

DCCEEW. (2023). *Conservation Advice for Lophochroa leadbeateri leadbeateri (eastern Major Mitchell's cockatoo).* Retrieved from Species Profile and Threats Database: https://www.environment.gov.au/biodiversity/threatened/species/pubs/82926-conservation-advice-31032023.pdf

DCCEEW. (2023). *Conservation Advice for Neophema chrysostoma (blue-winged parrot).* Retrieved from Species Profile and Threats Database: https://www.environment.gov.au/biodiversity/threatened/species/pubs/726-conservation-advice-31032023.pdf

DCCEEW. (2024). *Conservation Advice for Maireana cheelii (chariot wheels).* Canberra: Australian Government. Retrieved from https://environment.gov.au/biodiversity/threatened/species/pubs/8008-conservation-advice-20082024.pdf

DCCEEW. (2024). *Species Profiles and Threats Database*. Retrieved from Department of Climate Change, Energy, the Environment and Water: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DCCEEW. (2025). *Swainsona murrayana — Slender Darling-pea, Slender Swainson, Murray Swainson-pea Species Profiles and Threats Database*. Retrieved from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=6765

DCCEEW. (n.d.). *Protected matters search tool*. Retrieved from Department of Climate Change, Energy, the Environment and Water: www.environment.gov.au/epbc/protected-matters-search-tool

DCCEEW. (n.d.). *Species profile and threats database*. Retrieved from Department of Climate Change, Energy, the Environment and Water: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DCCEEW, N. (2024). *Draft Native Vegetation Regulatory Map.* Retrieved from https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=DraftNVRmap

De Lucas, M., Janss, G. F., Whitfield, J. P., & Ferrer, M. (2008). Collision fatality of raptors in wind farms does not depend on raptor abundance. *Journal of Applied Ecology, 45*(6), 1695-1703. doi:https://doi.org/10.1111/j.1365-2664.2008.01549.x

Debus, S. (2017). *Australasian Eagles and Eagle-like Birds.* Melbourne: CSIRO Publishing.

DECCW. (2002). *Descriptions for NSW (Mitchell) Landscapes, Version 2*. Retrieved from Descriptions for NSW (Mitchell) Landscapes, Version 2: https://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf

DECCW. (2010). *The Wind Energy Fact Sheet.* Sydney: NSW Government.

Department of Primary Industries . (n.d.). *Fisheries Spatial Data Portal*. Retrieved from https://www.dpi.nsw.gov.au/fishing/fisheries-research/spatial-data-portal

Department of Sustainability, Environment, Water, Population and Communities. (2012). *Approved Conservation Advice for Natural Grasslands of the Murray Valley Plains ecological community.* Canberra: Australian Government.

Department of the Environment, Water, Heritage and the Arts. (2017). *Survey guidelines for Australia's threatened birds.* Australian Government.

DEWHA. (2010). *Survey Guidelines for Australia's threatened Bats.* Australian Government.

DoE. (2013). *Matters of National Environmental Significance: Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999.* Canberra: Commonwealth Department of Environment.

DoE. (2014). *EPBC Act referral guidelines for the vulnerable koala*. Retrieved from Department of Climate Change, Energy, the Environment and Water: https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/epbc-act-referral-guidelines-vulnerable-koala

DoE. (2016). *National Recovery Plan for the Plains-wanderer .* Commonwealth of Australia.

DPE. (2010). *NSW Wetlands*. Retrieved from Sharing and Enabling Environmental Data: https://datasets.seed.nsw.gov.au/dataset/nsw-wetlands047c7

DPE. (2020). *The Biodiversity Assessment Method*. Retrieved from NSW Department of Planning and Environment: www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/accredited-assessors/biodiversity-assessment-method-2020

DPE. (2022). *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide.* NSW Department of Planning and Environment.

DPE. (2025). *NSW BioNet*. Retrieved from NSW Department of Planning and Environment: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet

DPE. (n.d.). *Search NSW Threatened Species Scientific Committee final determinations*. Retrieved from NSW Department of Planning and Environment: www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/nsw-threatened-species-scientific-committee-final-determinations

DPI. (2016). *Fish Communities and Threatened Species Distributions of NSW.* NSW Department of Primary Industries.

DPI. (n.d.). *Threatened species lists*. Retrieved from NSW Department of Primary Industries: www.dpi.nsw.gov.au/fishing/threatened-species/what-current

DPIE. (2019). *BioNet Vegetation Information System*. Retrieved from NSW Department of Planning, Industry and Environment: https://www.environment.nsw.gov.au/research/vegetationinformationsystem.htm

DPIE. (2020). *Guidance for Assessors and Decision-makers in applying modified benchmarks to assessments of vegetation integrity.* State of NSW.

DPIE. (2020). *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method.* Department of Planning, Industry and Environment.

DPIE. (2020b). *NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method.* Sydney: NSW Government.

DPIE. (2021). *Species Credit threatened bats and their habitat - NSW Guide for the Biodiversity Assessment Method.* NSW Government.

DPIE. (2021). *'Species credit' threatened bats and their habitats - NSW survey guide for the Biodiversity Assessment Method.* Department of Planning, Industry and Environment.

DPIE. (2022). *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide.* Parramatta: Department of Planning and Environment.

DPIE. (2025). *BAM - Important Areas viewer*. Retrieved from https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas

Drewitt, A. L., & Langston, R. H. (2006). Assessing the impacts of wind farms on birds. *Ibis – international journal of avian science, 148*(1), 29-42. doi:https://doi.org/10.1111/j.1474-919X.2006.00516.x

DSEWPC. (2011). *Survey guidelines for Australia's threatened mammals.*

EnergyCo. (2023, September 5). *'PORT TO REZ' AGREEMENT PAVES THE WAY FOR SMOOTH ENERGY TRANSITION.* Retrieved from https://www.energyco.nsw.gov.au/sites/default/files/2023-09/EnergyCo%20Media%20Release%20-%20MOU%20with%20TfNSW_0.pdf

Environment Protection and Heritage Council. (2010). *National Wind Farm Development Guidelines – Draft.* EPHC, Council of Australian Governments. Retrieved from https://www.nepc.gov.au/sites/default/files/2022-09/draft-national-wind-farm-development-guidelines-july-2010.pdf

EPA, N. G. (n.d.). *Contaminated land record of notice*. Retrieved from https://apps.epa.nsw.gov.au/prclmapp/searchregister.aspx

ERA. (2024). *Baldon Wind Farm - Targeted Austral Pillwort surveys.* ERA.

eSpade. (n.d.). *NSW Soil and Land Information*. Retrieved from www.environment.nsw.gov.au/eSpade2WebApp#

Foreman, P. (2005). *Threatened Species and Farming - Chariot Wheels Ecology and conservation in the context of agriculture – Preliminary investigations into population ecology.* Melbourne: Victorian Department of Primary Industries.

Garcia-Gonzalez, C., Campo, D., P. I., & Garcia-Vazquez, E. (2012). Rural road networks as barriers to gene flow for amphibians: Species-dependent mitigation by traffic calming. *Landscape and Urban Planning*, 171-180.

Geoscience Australia and Australian Stratigraphy Commission. (2023). *Australian Stratigraphic Units Database*. Retrieved from https://www.ga.gov.au/data-pubs/datastandards/stratigraphic-units

Glista, D., DeVault, T., & DeWoody, J. (2008). Vertebrate road mortality predominantly impacts amphibians. *Herpetological Conservation and Biology*, 77-87.

Hamer, A., Lane, S., & Mahony, M. (2008). Movement patterns of adult green and golden bell frogs Litoria aurea and the implications for conservation management. *Journal of Herpetology*, 397-407.

HANZAB. (2023). *Handbook of Australian, New Zealand & Antarctic Birds*. Retrieved from Birdlife Australia: https://hanzab.birdlife.org.au/

Holland, R. (2008). *Attachment A: Wind turbines, wake turbulence and separation.*

Houck, D. (2012). Computational fluid dynamics simulations of bats flying near operating wind turbines: Quantification of pressure-time histories of likely flight paths. U.S. DOE Office of Science, Office of Workforce Development for Teachers and Scientists Application Review System (WARS).

Hull, C., & Muir, S. (2013). Behaviour and Turbine Avoidance Rates of Eagles at Two Wind Farms in Tasmania, Australia. *Wildlife Society Bulletin*, 49-58.

Hull, C., Starke, E., Peruzzo, S., & Sims, C. (2013). Avian collisions at two wind farms in Tasmania, Australia: taxonomic and ecological characteristics of colliders versus non-colliders. *New Zealand Journal of Zoology, 40*, 47-62.

HydroSpatial Pty Ltd. (2019). *Moulamein Flood Study: Final Report.* Murray River Council.

Kingsley, A., & Whittam, B. (2003). *Wind Turbines and Birds - A Guidance Document for Environmental Assessment.: Prepared for Canadian Wildlife Service Environment Canada Bird Studies.*

Kunz, T. H., Arnett, E. B., Cooper, B. M., Erickdon, W. P., Larkin, R. P., Mabee, T., . . . Szewczak, J. M. (2007). Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. *Journal of Wildlife Management(71)*, 2449-2486.

Ltd, G. W. (2022). *Baldon Wind Farm Scoping Report.*

Maalouf, B., Dobrev, I., & Massouh, F. (2009). *Vortex structure in the wake of a wind turbine rotor.* Maison de al Mecanique.

Marques, A., Batalah, H., Rodrigues, S., Costa, H., Pereira, M., Fonseca, C., . . . Bernardino, J. (2014). Understanding bird collisions at wind farms: An updated review on the causes and possible mitigation strategies. *Biological Conservation, 179*, 40-52.

Mavromihalis, J. (2010). *National Recovery Plan for the .* Melbourne: Victorian Government Department of Sustainability and Environment (DSE) .

McGinness, e. a. (2024). *Extensive tracking of nomadic waterbird movements reveals an inland flyway. Ecology and Evolution.* CSIRO.

Menkhorst, P., Rogers, D., Clarke, R., Davies, J., Marsack, P., & Franklin, K. (2019). *The Australian Bird Guide.* Clayton South : CSIRO Publishing.

Michael, D. R., NImmo, D. G., Stevens, E., Schlen, T., & Wassens, S. (2023). Finding Ngabi (Hemiaspis damelii): factors affecting the use of modified floodplain wetlands by an endangered snake. *WIldlife Research, 50*(12), 1131 - 1140.

National Environmental Science Program Threatened Species Research Hub. (2019). *Threatened Species Strategy Year 3 Scorecard – Plains-wanderer.* Canberra: Australian Government. Retrieved from https://www.dcceew.gov.au/environment/biodiversity/threatened/species/20-birds-by-2020/plains-wanderer

Nature Advisory. (2024). *Baldon Wind Farm - Revised Bird and Bat Risk Assessment.* Nature Advisory.

Nature Advisory. (2024). *Baldon Wind Farm Bird Utilisation Survey – 1st Year Report.*

Nature Advisory. (2025). *Baldon Wind Farm - Revised Bird and Bat Risk Assessment.*

NPWS. (2003). *The Bioregions of New South Wales: their biodiversity, conservation and history.* Hurstville: NSW National Parks and Wildlife Service.

NSW DCCEEW. (2022). *NSW State Vegetation Type Map.* Retrieved from https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map

NSW DCCEEW. (2023, 12). NSW State Vegetation Type Map. NSW Government.

NSW DCCEEW. (2024). *Draft Turbine Risk Assessment and Avoidance Guidance .* NSW Department of Climate Change, Enery, the Environment and Water.

NSW DCCEEW. (2024). *Threatened Biodiversity Data Collection*. Retrieved from https://profile.bionet.nsw.gov.au/account/login?ForceLogin=1

NSW DPIE. (2019). *Guidance to assist a decision maker to determine a serious and irreversible impact.*

NSW Environment Protection Authority (EPA). (2021). *Invasive Species*. Retrieved from NSW State of the Environment: https://www.soe.epa.nsw.gov.au/all-themes/biodiversity/invasive-species

NSW Gov. (2021). *BAM Calculator*. Retrieved from NSW Government: www.lmbc.nsw.gov.au/bamcalc

NSW Gov. (n.d.). *Biodiversity values map and threshold tool*. Retrieved from NSW Government: www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

NSW Gov. (n.d.). *Project EnergyConnect (NSW - Eastern Section)*. Retrieved from https://www.planningportal.nsw.gov.au/major-projects/projects/project-energyconnect-nsw-eastern-section

NSW Gov. (n.d.). *State significant development Keri Keri wind farm* . Retrieved from https://www.planningportal.nsw.gov.au/major-projects/projects/keri-keri-wind-farm

NSW Government . (n.d.). *Major Projects Portal*. Retrieved from https://www.planningportal.nsw.gov.au/major-projects

NSW National Parks and Wildlife Service. (2002). *Plains-wanderer (Pedionomus torquatus) Draft Recovery Plan.* Hurstville: NSW National Parks and Wildlife Service.

NSW Scientific Committee. (2009). *Plains-wanderer Pedionomus torquatus. Review of current information in NSW. June 2009. Unpublished report arising from the Review of the Schedules of the Threatened Species Conservation Act 1995.* Hurstville: NSW Scientific Committee.

Nugent, B.-G. G. (2022). *Multi-scale habitat selection by a cryptic, critically endangered grassland bird—The Plains-wanderer (Pedionomus torquatus): Implications for habitat management and conservation.* Austral Ecology.

OEH. (2019, June 20). *Descriptive text & photos [Pedionomus torquatus]*. Retrieved March 22, 2024, from BioNet Atlas: https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/LinksEdit.aspx?pId=10588&pType=SpeciesCode

OEH. (2021, June 9). *Convolvulus tedmoorei (a perennial plant) - endangered species listing*. Retrieved March 26, 2024, from Environment and Heritage: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2000-2003/Convolvulus-tedmoorei-a-perennial-plant-endangered-species-listing

OEH. (2022a, August 16). *Bindweed - profile*. Retrieved March 26, 2024, from Threatened biodiversity profile search: https://threatenedspecies.bionet.nsw.gov.au/profile?id=10173

OEH. (2022b, August 16). *Descriptive text & photos [Convolvulus tedmoorei]*. Retrieved March 26, 2024, from BioNet Atlas: https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/LinksEdit.aspx?pId=10173&pType=SpeciesCode

OEH. (2024a, March 20). *Austral Pillwort - profile*. Retrieved March 26, 2024, from Threatened biodiversity profile search: https://threatenedspecies.bionet.nsw.gov.au/profile?id=10628

OEH. (2024b, March 20). *Descriptive text & photos [Pilularia novae-hollandiae]*. Retrieved March 26, 2024, from BioNet Atlas: https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/LinksEdit.aspx?pId=10628&pType=SpeciesCode

OEH. (n.d.(a)). *Threatened biodiversity profile search*. Retrieved from Office of Environment & Heritage: https://www.environment.nsw.gov.au/threatenedSpeciesApp/

OEH. (n.d.(b)). *BioNet Atlas*. Retrieved March 22, 2024, from BioNet Atlas: https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/Default.aspx

OEH. (n.d.(c)). *Ecological data [Convolvulus tedmoorei]*. Retrieved March 26, 2024, from BioNet Atlas: https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/ProfileEdit.aspx?pId=10173&pType=SpeciesCode

OEH. (n.d.(d)). *Ecological data [Pedionomus torquatus]*. Retrieved March 22, 2024, from BioNet Atlas: https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/ProfileEdit.aspx?pId=10588&pType=SpeciesCode

OEH. (n.d.(e)). *Ecological data [Pilularia novae-hollandiae]*. Retrieved March 27, 2024, from BioNet Atlas: https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/ProfileEdit.aspx?pId=10628&pType=SpeciesCode

Office of Environment and Heritage. (2023, November 03). *Southern Bell Frog - profile*. (NSW Government) Retrieved from Threatened species: https://threatenedspecies.bionet.nsw.gov.au/profile?id=10491

Parris, D., & McCauley, R. (2016, February 04). *Noise pollution and the environment*. Retrieved from Australian Academy of Science: https://www.science.org.au/curious/earth-environment/noise-pollution-and-environment

PlantNet. (n.d.). *Pilularia novae-hollandiae A.Braun*. Retrieved March 26, 2024, from PlantNet: https://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Pilularia~novae-hollandiae

PlantNET. (n.d.). *NSW flora online*. Retrieved from PlantNET: https://plantnet.rbgsyd.nsw.gov.au

Popa-Lisseanu, A., & Voight, C. C. (2009). Bats on the move. *Journal of mammology, 90*(6), 1283-1289. doi:https://doi.org/10.1644/09-MAMM-S-130R2.1

Pyke, G. (2002). A review of the biology of the Southern Bell Frog Litoria raniformis (Anura: Hylidae). *Australian Zoologist*, 32-48.

Rina Aleman, M. J. (2015). Influence of seed dimorphism and provenance on seed. *Australian Journal of Botany,*, 705–713.

Rollins, K. E., Meyerholz, D. K., Johnson, G. D., Capparella, A. P., & Loew, S. S. (2012). A Forensic Investigation Into the Etiology of Bat Mortality at a Wind Farm: Barotrauma or Traumatic Injury? *Veterinary Pathology, 49*(2), 362–371. doi:https://doi.org/10.1177/0300985812436745

Rowley, L., Edwards, R., & Kelly, P. (1993). *Edges - their effect on vegetation and wildlife.* (D. o. Environment, Ed.) Retrieved from SWIFT: https://www.swifft.net.au/resources/23_edges%20and%20their%20effect%20on%20vegetation%20&wildlife.pdf

Sanderse, B. (2009). Aerodynamics of wind turbine wakes: literature review. Energy Research Centre of the Netherlands. Retrieved from http://www.ecn.nl/docs/library/report/2009/e09016.pdf

Saving Our Species. (n.d.). *Help save Austral Pillwort Pilularia novae-hollandiae.* NSW Government.

Saving Our Species. (n.d.). *Help save the Bindweed Convolvulus tedmoorei.* NSW Government. Retrieved March 26, 2024, from https://www.environment.nsw.gov.au/savingourspeciesapp/project/491

SEED. (2021). *The central resource for sharing and enabling environmental data in NSW*. Retrieved from NSW Government: https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU

SEED. (2022). *SEED the change: growing knowledge with NSW environmental data*. Retrieved from The central resource for sharing and enabling environmental data in NSW: www.seed.nsw.gov.au

Semlitsch, R., Conner, C., Hocking, D., T.A., R., & Harper, E. (2008). Effects of timber harvesting on pond-breeding amphibian persistence: Testing the evacuation hypothesis. *Ecological Applications*, 283–289.

Spatial Services. (2023). DEM. NSW Government.

Teff-Seker, Y., Berger-Tal, O., Lehnardt, Y., & Teschner, N. (2022). Noise pollution from wind turbines and its effect on wildlife: A cross-national analysis of current policies and planning regulations. *Renewable and Sustainable Energy Reviews, 168*.

Thackway, R., & Cresswell, I. (1995). *An interim biogeographic regionalisation for Australia: A framework for establishing the national system of reserves, Version 4.0.* Canberra: Australian Nature Conservation Agency.

Thelander, C. (2004). Bird fatalities in the Altamont Pass Wind Resource Area: a case study. *Proceedings of the Wind Energy and Birds/Bat Workshop: understanding and resolving bird and bat impacts*, 18-19.

Transport for NSW. (2019). *Weed Management and Disposal Guide.* NSW Government.

TSSC. (2012). *Commonwealth Listing Advice on Natural Grasslands of the Murray Valley Plains.* Canberra: Department of Sustainability, Environment, Water, Population and Communities.

Vazquez-Tarrío, D., Díez-Herrero, A., Ruiz-Villanueva, V., Garrote, J., Benito, G., Calle, M., & Lucía, A. (2024). Effects of sediment transpot on flood hazards: Lessons learned and remaining challenges. *Geomorphology, 446*.

Vos, C., Antonisse-de Jong, A., Goedhart, P., & Smulders, M. (2001). Genetic similarity as a measure for connectivity between fragmented populations of the moor frog (Rana arvalis). *Heredity*, 598-608.

Appendix A Field Surveys

A.1 BAM/VI plot data

A.2 VI plot photos

A.3 Gilgai investigations

A.4 BAM plot locations relevant to Stage 1 Development Footprint

The following section describes justification for BAM plots used in the Stage 1 Development Footprint that occurred outside the Stage 1 Footprint.

Vegetation Zones

Zone 9: PCT 57 High

Only a small proportion (0.01ha) of this vegetation zone occurs in the Subject Land with all vegetation occurring in the Stage 1 Development Footprint. The BAM plot (137) for this zone is located 1.6km to the East, occurring in a previous design of the Subject Land. The vegetation in the Stage 1 Development Footprint is a small patch of Western Rosewood (*Alectryon oleifolius*) (confirmed by rapid assessment) in similar condition to the woodland patch surrounding BAM plot 137. Woodland patches are distinctive in this landscape, which is typically dominated by chenopod shrubland. BAM plot 137 occurs in a similar homogenous landscape and locality and is considered to adequately represent the vegetation zone in the Stage 1 Development Footprint. It has been used in the BAM-C for this assessment



Figure 13-1 BAM 137 located in similar landscape and locality to PCT 57_high in Stage 1 Development Footprint (Circled in Red).

Zone 12: PCT 153 Moderate

This zone covers an area of 0.68 ha in the Stage 1 Development Footprint and requires one BAM plot. This patch is adjacent to the same zone in the Stage 2 Development Footprint and occurs in a similar homogenous landscape and locality (Figure 13-2). BAM plot 305 occurs in the adjacent patch and was considered to adequately represent the vegetation zone in the Stage 1 Development Footprint.

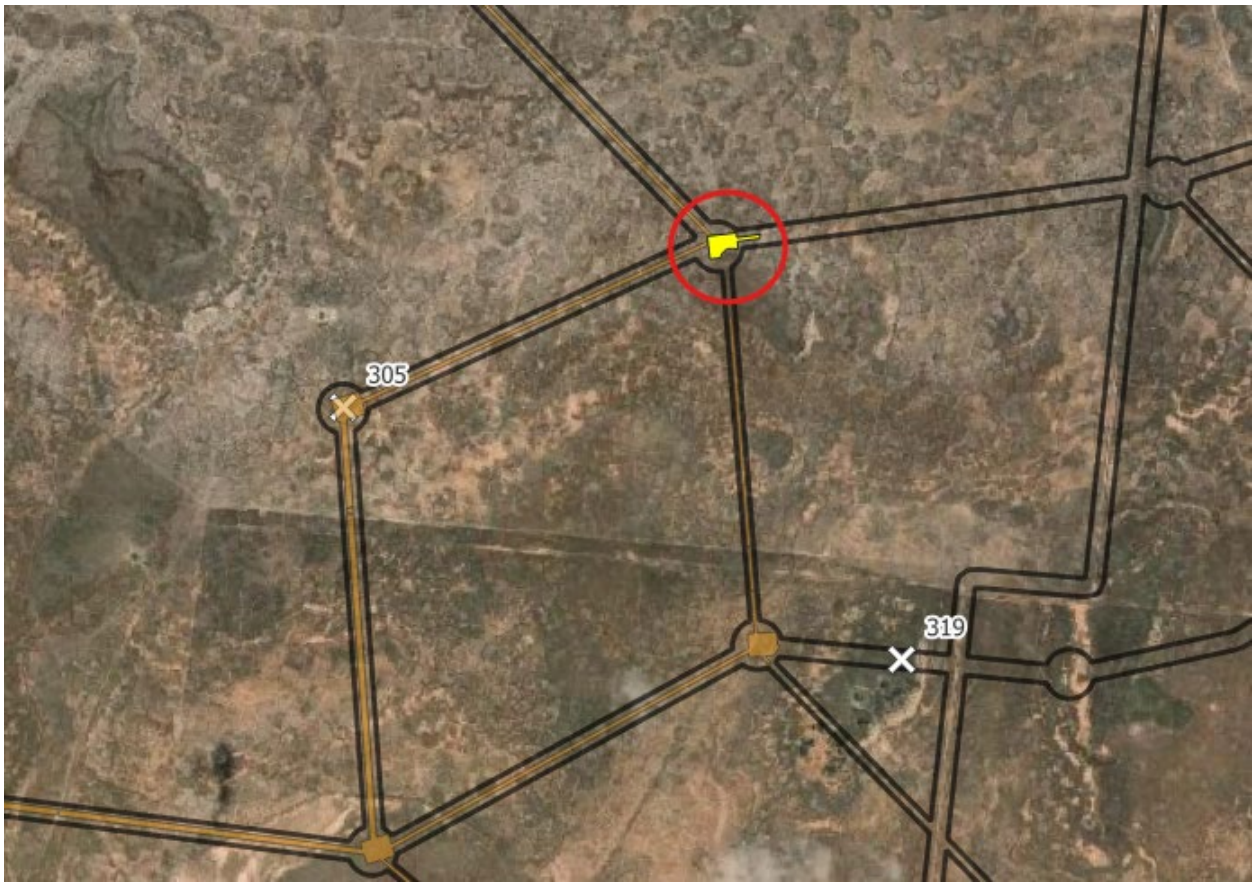


Figure 13-2 BAM plot 305 located in similar landscape and locality to PCT 153_moderate in Stage 1 Development Footprint (Circled in Red).

Zone 14: PCT159_High

This zone is comprised of rows of planted old man Saltbush (*Atriplex nummularia*). Plantings have occurred across the Project Area in large expanses, using the same species. As a planted community, it is considered a homogenous vegetation zone across the whole Subject Land with little variation within the rows of planted saltbush. BAM plots located in Stage 2 Development Footprint are considered to adequately represent the vegetation zone in the Stage 1 Development Footprint.

Zone 15: PCT 160_high

This zone covered an area of 7.58 ha in the Stage 1 Development Footprint and requires 3 BAM plots. BAM Plot 138 and 1005 are located within the Stage 1 Development Footprint. BAM plot 303, located in Stage 2 Development Footprint occurs in the same vegetation patch as the Stage 1 vegetation zone and occurs in a similar homogenous landscape and locality (Figure 13-3). It is considered to adequately represent this vegetation zone in Stage 1 and has been used in the BAM-C for this assessment



Figure 13-3 BAM plot 303 located in same vegetation patch as PCT 160_high in Stage 1 Development Footprint (Circle in red).

Zone 17: PCT 163_high

Three BAM plots (209, 210 and 411) have been undertaken in the vegetation zone for PCT 163_High, of which the patch occurs across both the Stage 1 and Stage 2 Development Footprint (Figure 13-4). The vegetation zone in the Stage 1 Development Footprint occurs in a similar homogenous landscape and locality to the BAM plots located in the Stage 2 Development Footprint. The BAM plots 209, 210 and 411 are considered to adequately represent the vegetation in Stage 1 and have been used in the BAM-C for this assessment.



Figure 13-4 BAM plot 209, 210 and 411 in similar landscape and locality to Stage 1 Vegetation zone PCT 163_High (highlighted in green)

Zone 20: PCT 164_moderate

One BAM plot (301) has been undertaken in the vegetation zone for PCT164_Moderate, of which the patch occurs across both the Stage 1 and Stage 2 Development Footprint. This patch is shown in purple in Figure 13-5 below. BAM plot 301 is located in the Stage 2 Development Footprint but occurs in a similar homogenous landscape and locality to Stage 1 and is considered to adequately represent the zone in the Stage 1 Footprint.



Figure 13-5 BAM plot 301 in similar landscape and locality to Stage 1 Vegetation zone PCT 164_moderate (highlighted in Yellow)

A.5 Austral Pilwort surveys – subconsultants results

Appendix B Commonwealth MNES assessment

B.1 Protected matters search report

B.1.1 Project Area

B.1.2 Balranald intersection upgrade

B.1.3 Euston intersection upgrade

B.2 MNES habitat assessment

B.3 Assessment of Significance

B.4 Natural Grasslands of the Murray Valley Plains

Species present in Patch 5 (Highlighted in Yellow) representative of Table 1 from *Commonwealth Listing Advice on Natural Grasslands of the Murray Valley Plains* (TSSC, 2012)

Table 1: Native plant species characteristic of grassland ecological communities in south-western NSW. Species more frequent in the Natural Grasslands of the Murray Valley Plains ecological community are listed in part (**A**); and species more frequent in grassland vegetation not considered to be the ecological community are listed in part (**B**). Species in part **(A)** are absent or infrequent in grasslands derived from former *Acacia pendula* woodlands or chenopod shrublands, that overlap with the northern extent of the ecological community. Based on McDougall, 2008 and further analysis of the raw data from this study.

(A) – Species more frequent in the Natural Grasslands of the Murray Valley Plains ecological community in NSW	**(B) – Species more frequent in grassland vegetation not considered to be the ecological community in NSW**
Alternanthera sp. A Flora of New South Wales (M.Gray 5187) J.Palmer (may be recorded in the region as *Alternanthera denticulata*)	*Atriplex lindleyi*
	Atriplex pseudocampanulata
Arthropodium fimbriatum	*Atriplex vesicaria*
Arthropodium milleflorum (formerly *A. minus*[1])	*Austrostipa scabra*
Asperula conferta	*Boerhavia dominii*
Rytidosperma duttonianum (formerly *Austrodanthonia duttoniana*[1])	*Brachyscome smithwhitei*
	Bulbine semibarbata
Austrostipa aristiglumis	*Calandrinia eremaea*
Austrostipa nodosa	*Calotis hispidula*
Brachyscome chrysoglossa	*Chenopodium nitrariaceum*
Bulbine bulbosa	*Crassula sieberiana*
Calocephalus citreus	*Cressa australis*[1] (formerly *C. cretica*)
Chrysocephalum apiculatum	*Einadia nutans*
Crassula decumbens	*Enchylaena tomentosa*
Eryngium plantagineum	*Eragrostis australasica*
Hyalosperma glutinosum	*Geococcus pusillus*
Leiocarpa panaetioides	*Leiocarpa leptolepis*[1] (formerly *Ixiolaena leptolepis*)
Leptorhynchos squamatus	*Malacocera tricornis*
Linum marginale	*Marsilea drummondii*
Maireana excavata	*Minuria cunninghamii*
Myriocephalus rhizocephalus	*Nitraria billardierei*
Plantago gaudichaudii	*Podolepis muelleri*
Ptilotus nobilis subsp. *nobilis* (formerly *P. exaltatus*[1])	*Rhagodia spinescens*
Pycnosorus globosus	*Rumex tenax*
Swainsona behriana	*Scleroblitum atriplicinum*
Swainsona murrayana	*Sclerolaena brachyptera*
Swainsona plagiotropis	*Sclerolaena diacantha*
Swainsona procumbens	*Sclerolaena muricata*
Triptilodiscus pygmaeus	*Sclerolaena stelligera*
Wahlenbergia gracilenta	*Sclerolaena tricuspis*
Wurmbea dioica	*Senecio glossanthus*
	Sida intricata
	Sida trichopoda
	Sporobolus caroli
	Zygophyllum glaucum

B.5 Commonwealth DCCEEW Referral Decision

B.6 Summary of impacts to MNES

Project Description and Background

Baldon Wind Farm Pty Ltd (the Proponent) is proposing to develop Baldon Wind Farm across approximately 795 ha of the 46,259 ha Project Area. The Project would comprise the installation of a wind farm that would generate in excess of 1GW of renewable energy for the national electricity grid enough to power over 500,000 NSW homes. Additional details can be found in Section 1.1 of the BDAR and Section 3 of the EIS.

An EPBC Act habitat assessment (Appendix B.2) evaluation was undertaken for species predicted to occur within the broader study locality (10 km radius). The evaluation drew on NGH's detailed understanding of this Project Area's habitat, based on vegetation and flora and fauna surveys documented in Sections 3 and 4 of the BDAR. Due to the potential direct and indirect impact on EPBC Act listed fauna species, flora species and TEC from land clearing and potential for bird strike from wind turbines, the entire project was referred under the EPBC Act (EPBC2024/09722).

DCCEEW (Cwth) determined the project is a controlled action under Part 7 of the EPBC Act, and the project will require assessment and approval under the EPBC Act before it can proceed. The project will be assessed in accordance with the bilateral assessment agreement with NSW (Amending Agreement No 1), allowing the NSW BAM and BDAR to be a suitable assessment pathway.

Table 13-1 outlines the requirements for the bilateral assessment with reference to where to find further information within this BDAR as well as the associated EIS.

Impacts to EPBC Listed Entities

The Project has the potential to impact on a number of MNES, including:

- One Critically Endangered Ecological Community - *Natural Grasslands of the Murray Valley Plains*
- Two Critically Endangered threatened species – Curlew Sandpiper *(Calidris ferruginea*) and Plains-wanderer *(Pedionomus torquatus*)
- Three Endangered threatened species – Pink Cockatoo (eastern) *(Lophochroa leadbeateri)*, South-eastern Hooded Robin (*Melanodryas cucullata cucullata)* and Common Greenshank (*Tringa nebularia*)
- Eleven Vulnerable threatened species – Mossgiel Daisy (*Brachyscome papillosa),* Spike-rush (*Eleocharis obicis*), Chariot Wheels (*Maireana cheelii),* Slender Darling Pea (*Swainsona murrayana*), Southern Whiteface (*Aphelocephala leucopsis)*, Sharp-tailed Sandpiper *(Calidris* acuminata), Latham's Snipe *(Gallinago* hardwickii), Southern Bell Frog (*Litoria raniformis)*, Blue-winged Parrot *(Neophema chrysostoma*), Corben's Long-eared Bat (*Nyctophilus corbeni*) and Diamond Firetail *(Stagonopleura guttata*)
- 12 Migratory species – Common Sandpiper *(Actitis hypoleucos)*, Fork-tailed Swift (Apus *pacificus*), Sharp-tailed Sandpiper (*Calidris acuminata)*, Curlew Sandpiper *(Calidris ferruginea*), Pectoral Sandpiper (*Calidris melanotos*), Latham's Snipe (*Gallinago hardwickii*), Gull-billed Tern (*Gelochelidon nilotica)*, Caspian Tern (*Hydroprogne caspia*), Yellow Wagtail (*Motacilla flava*),

Wood Sandpiper (*Tringa Glareola*), Common Greenshank (*Tringa nebularia)* and Marsh Sandpiper (*Tringa stagnatilis)*.

An Assessment of Significance (AoS) was undertaken for all Critically Endangered, Endangered and Vulnerable entities listed above. These AoS's was undertaken using the Commonwealth Significant Impact Guidelines (DoE, 2013) and can be viewed in Appendix B.3. The AoS determined that a significant impact was considered unlikely to occur to the entities listed above.

Refer to Section 8.6 of the BDAR for a list of these entities and the extent and consequences of impacts. Table 11-5 and

Table 11-6 include the below information for the Stage 1 Development Footprint and the Stage 2 Development Footprint respectively:

- Associated PCTs with the MNES entity
- Total habitat impact area for each MNES entity
- Credit obligation for each MNES entity (assessed in accordance with the bilateral assessment agreement with NSW) and the offset approach for each entity.

The location of the Development Footprint and Subject Land in relation to all MNES entities detected or assumed to be impacted are provided on maps in Appendix L of the BDAR.

Several species identified as potentially of impact in the referral documentation (by the Australian Government) have been ruled out through habitat assessments provided in Appendix B.2 and targeted surveys outlined in Section 4 of the BDAR.

Avoidance, mitigations and offsetting

In the planning of this development, various options relating to location, design, and technology were evaluated. This process included a thorough assessment of biodiversity values alongside development objectives, strategic needs, and benefits. These evaluations were conducted with the specific aim of avoiding and minimizing impacts on Matters of National Environmental Significance (MNES) entities. By integrating these considerations into the planning process, it was ensured that the development aligns with environmental protection standards and promotes sustainable outcomes. Further details of the avoid and minimise actions undertaken are provided in Section 7 of the BDAR.

Section 9 of the BDAR outlines mitigation measures for direct, indirect, and prescribed impacts on MNES. For direct impacts, measures clearing protocols, minimising habitat destruction through careful construction practices, and restoring disturbed areas. Indirect impact measures focus on clearing protocols to prevent inadvertent damage to vegetation outside the Development Footprint, timing of construction to avoid key breeding times and the development of various management plans. Prescribed impact measures involve species-specific adaptive management plans and vehicle impact mitigation measures. Refer to Section 9 of the BDAR for detailed mitigation measures.

The assessment is to be assessed under the NSW BAM as part of the Bilateral Assessment Agreement with DCCEEW (Cwth) and NSW Government. EPBC Act offset obligations would be undertaken in accordance with the NSW BOS. The BAM and BAM-C has been used correctly to identify the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity. No additional offsets for MNES are required.

The BAM and BAM-C has been used correctly to identify the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity. A summary of the biodiversity credits generated to offset MNES is given in the following table.

A summary of offset requirements are outlined in Table 11-5 for the Stage 1 Development Footprint and

Table 11-6 for the Stage 2 Development Footprint.

Residual Impacts

Residual impacts to Matters of National Environmental Significance (MNES) entities include several threats. During clearing operations, hollow-dependent fauna face risks of injury or death due to habitat destruction. Bird and bat populations are particularly vulnerable to injury or fatality from turbine strikes, which can occur frequently in wind farm areas. The Plains-wanderer, is at risk of injury or death within breeding sites if nests go undetected during habitat disturbance activities. Additionally, vehicle strikes pose a significant threat to both the Plains-wanderer and the Southern Bell Frog. The risk and consequence of all potential residual impacts are outlined in Table 9-1 of the BDAR. All residual impacts will be offset in accordance with the NSW BOS. Additionally, adaptive management plans have been developed and can be viewed in Section 9.2.

Relationship of the Project with other developments

Other actions that are being taken or have been approved in the region with EPBC Act referrals include:

- EPBC 2023/09617 - Tchelery Wind Farm;
- EPBC 2022/09437 - Wilan Wind Farm; and
- EPBC 2022/9176 - Keri Keri Wind Farm.

Discussion of cumulative impacts of windfarms have been addressed in Section 8.4 of the BDAR.

Table 13-1 BCS Bilateral Assessment Information and data requirements

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
1. Background and description of action	

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
1.1 Descriptions and maps of the operational and construction footprints of the project that relate to MNES.	A description of the Project can be found in Section 1.1 of this BDAR, with further information regarding staging and phases (e.g. construction, operation) of the Project provided within Section 3 of the EIS. Figure 3-21 and its associated atlas series in Appendix L.1 shows broad PCT mapping and associated TECs Figure 3-23 and its associated atlas series in Appendix L.2 show the vegetation zones under the BAM 2020 and associated TECs Figure 4-12 and its associated atlas series in Appendix L.4 shows threatened flora species locations including *Lepidium monoplocoides*, *Brachyscome papillosa*, *Maireana Cheelii* and *Swainsona murrayana.* Figure 4-13 and its associated atlas series in Appendix L.5 shows threatened fauna locations including Southern Bell Frog, Plains-wanderer, Blue-winged Parrot and Pink Cockatoo. Figure 11-1 and its associated atlas series in Appendix L.11 shows the Stage 1 Development Footprint. Figure 11-3 and its associated atlas series in Appendix L.12 shows the Stage 2 Development Footprint.
1.2 Descriptions and maps of staging and timing of the action that may impact on MNES	A description of the Project can be found in Section 1.1 of this BDAR, with further information regarding staging and phases (e.g. construction, operation) of the Project provided within Section 3 of the EIS. Table 8-9 summaries the potential impacts, the extent of impact within the different stages and the duration of impact for MNES. Figure 11-1 and its associated atlas series in Appendix L.11 shows the Stage 1 Development Footprint. Figure 11-3 and its associated atlas series in Appendix L.12

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
	shows the Stage 2 Development Footprint.
1.3 Maps of the Subject Land boundary showing the final proposal and disturbance footprint with regards to MNES	Figure 11-1 and its associated atlas series in Appendix L.11 shows the Stage 1 Development Footprint. Figure 11-3 and its associated atlas series in Appendix L.12 shows the Stage 2 Development Footprint.
1.4 Submit GIS shapefiles of all maps that relate to MNES	All MNES related spatial data such as threatened species locations and TEC mapping has been re-submitted with the updated BDAR.
2. Landscape context of the MNES	
Ensure that the 'Establishing the site context' of BAM 2020 (Section 3) have been fully met in the BDAR in relation to MNES	Section 2 of the BDAR outlines the Landscape Context of the Project Area including, but not limited to, connectivity features. Section 5 of the BDAR outlines EPBC Act listed TECs and associated vegetation types, as well as distance to the closest Ramsar Wetlands. Appendix B.2 of the BDAR is a habitat assessment undertaken for threatened and migratory species which assesses the likelihood of occurrence based on habitat present within the Subject Land.
3. EPBC Act listed threatened species and communities	
3.1 Demonstration that field-based survey effort meets BCS survey guidelines and, where available, Commonwealth survey guidelines	Most candidate species generated by the BAM-C that are also EPBC Act listed were surveyed as per the BAM 2020 guidelines and can be viewed in Section 4.6.3 as follows: • Flora species: Table 4-15 to Table 4-17 • Southern Bell Frog: Table 4-18 • Diurnal bird species: Table 4-22 EPBC Act listed candidate species that were generated by

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
	the BAM-C that didn't meet survey guidelines are outlined below, detailing why: • Grey Snake did not have survey guidelines. Consultation was undertaken with BCD (Appendix G.2) and survey effort were proposed to follow the methodology outlined by Michael *et. al.* (2023). Table 4-19 provides detail of the methodology. • Plains-wanderer is a dual credit species under the BAM, assessed for species credits within the important habitat map. No survey is required for this species under the BAM as species credits are determined by the important habitat mapping, thus no survey guidelines are provided. The Subject Land is not within mapped important habitat, however numerous incidental sightings warranted further investigation into the abundance and distribution of Plains-wanderer in the Subject Land. Consultation was undertaken with DCCEEW – Cwth and BCD, led by Plains-wanderer expert David Parker (Appendix G.1). Table 4-21 provides more detail of the methodology. • Under the BAM 2020, Koala is required to have two different survey methodologies applied. Due to the degraded nature of the Subject Land, only one method was undertaken and approved after consultation with BCS (Appendix G.4). Table 4-24 provides more detail of the methodology. Additionally, Table 8-9 provides a summary of survey methodologies and guidelines used for EPBC Act listed species.
3.2 Demonstration of access and use of supporting databases (e.g. NSW BioNet Vegetation Classification, NSW BioNet Threatened Biodiversity Data Collection,	Supporting databases were used to inform the BDAR. A list of databases used is provided in Section 1.4. Background searches were also undertaken as outlined in

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
NSW BioNet Atlas, Commonwealth Species Profile and Threats Database search results)	Section 4.1 within a 10km radius of the Project Area to assess other potential species not generated by the BAM-C.
3.3 Demonstration of access and use of published peer-reviewed literature	Peer reviewed literature has been accessed and used throughout this BDAR. This includes but is not limited to, the methodology used for Grey Snake surveys and impacts to native species from wind farms. A full list is provided in the References section of the BDAR.
3.4 Demonstration of access and use of local data (if relevant)	A BioNet search was undertaken which identified species recorded within 10km of the Project Area that weren't generated within the BAM-C or returned from the PMST search. Two MNES were identified from these searches being *Eleocharis obicis* (Spike-Rush) and *Gelochelidon nilotica* (Gull-billed Tern). Refer to Section 4.1.1 and Table 4-1 for more information.
3.5 Demonstration of appropriate mapping of all EPBC Act-listed threatened species and communities in accordance with the relevant Commonwealth listing advice	Figure 3-21 and its associated atlas series in Appendix L.1 shows broad PCT mapping and associated TECs Figure 3-23 and its associated atlas series in Appendix L.2 show the vegetation zones under the BAM 2020 and associated TECs Figure 4-12 and its associated atlas series in Appendix L.4 shows threatened flora species locations including *Lepidium monoplocoides*, *Brachyscome papillosa*, *Maireana Cheelii* and *Swainsona murrayana.* Figure 4-13 and its associated atlas series in Appendix L.5 shows threatened fauna locations including Southern Bell Frog, Plains-wanderer, Blue-winged Parrot and Pink Cockatoo. Figure 11-1 and its associated atlas series in Appendix L.11 shows the Stage 1 Development Footprint.

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
	Figure 11-3 and its associated atlas series in Appendix L.12 shows the Stage 2 Development Footprint.
3.6 Demonstration of consideration of important populations and critical habitat as defined in Approved Listing Advice, Approved Conservation Advice and Recovery Action Plans	AoS were undertaken for 17 entities. These AoS considered important populations and critical habitat as defined within the Approved Listing Advice, Approved Conservation Advice and Recovery Action Plans for the entities. These AoS can be viewed in Appendix B.3.
3.7 A list of all EPBC Act listed threatened species and communities that occur on the Subject Land, or in the vicinity (including species that are 'ecosystem credits' in BAM)	Section 11.1.3 lists the EPBC Act listed entities either confirmed or predicted to occur within the Subject Land (both species credits and ecosystem credits). Appendix B.2 lists all EPBC Act entities returned from the PMST search and their likelihood of occurrence based on habitat features, recent records and surveys undertaken.
3.8 A discussion, with data and analysis where any species and communities identified by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) referral documents have been ruled out as occurring on or near the subject site	A list of entities identified by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) referral documents can be viewed in Section 1.3. Table 13-2 provides a summary of the entities listed in the referral document and their likelihood of occurrence based on surveys undertaken.
4. Avoidance, minimisation, mitigation, and management	
4.1 The demonstration of all feasible alternatives and efforts to avoid and minimise impacts on EPBC Act listed threatened species and communities (including direct, indirect, and prescribed impacts) including an analysis of alternative: a) designs and engineering solutions	Section 7 of the BDAR outlines and demonstrates the steps undertaken to avoid and minimise impacts to biodiversity, including MNES. This includes changes to the design of the proposal (Section 7.1.3) based on high biodiversity constraints including, but not limited to: • Avoiding dense populations of *Brachyscome papillosa* • Reducing fragmentation for Plains-wanderer at

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
b) modes or technologies c) routes and locations of facilities d) sites within the subject site e) the identification of any other site constraints in determining the location and design of the proposal (such as bushfire protection requirements, flood planning levels, servicing constraints, etc)	detected sightings • Avoiding impacts to 12 HBTs and preventing further fragmentation in good condition woodland (PCT 15) for threatened woodland species such as Pink Cockatoo. Figure 7-7 shows areas that were added or removed to the layout of the Project to avoid these high constraint areas.
4.2 A discussion and justification of all feasible measures to avoid, mitigate and/or manage impacts on EPBC Act listed threatened species and communities (including direct, indirect, and prescribed impacts) including: a) techniques, timing, frequency, and responsibility b) identify measures for which there is risk of failure c) evaluate the risk and consequence of any residual impacts d) any adaptive management strategy proposed to monitor and respond to impacts	Direct impacts are outlined in Section 8.1 and summarised in Table 8-1. Indirect impacts are outlined in Section 8.2 and summarised in Table 8-6. Prescribed impacts are outlined in Section 8.3 and Appendix J contains a risk analysis of wind turbine strikes on birds and bats. Section 8.6 outlines the impacts specifically to MNES and Table 8-9 summaries the potential impacts, the extent of impact within the different stages and the duration of impact for MNES. Mitigation measures are outlined in Section 9 and summarised in Table 9-1 for direct, indirect and prescribed impacts. This includes: • Proposed techniques, timing, frequency and responsibility for implementing the measures • Risk of failure • Analysis of consequences of any residual impacts Adaptive Management Strategies are outlined in Section 9.2. This includes: • A Bird and Bat Adaptive Management Plan (Section 9.2.1)

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
	• Southern Bell Frog Adaptive Management Plan (Section 9.2.2) • Plains-wanderer Adaptive Management Plan (Section 9.2.3)
5. Impact assessment	
5.1 Identification of the residual adverse impacts likely to occur to each EPBC Act listed threatened species and/or community after the proposed avoidance and mitigation measures are considered	Mitigation measures are outlined in Section 9 and summarised in Table 9-1 for direct, indirect and prescribed impacts. This includes: • Proposed techniques, timing, frequency and responsibility for implementing the measures • Risk of failure • Analysis of consequences of any residual impacts Adaptive Management Strategies are outlined in Section 9.2. This includes: • A Bird and Bat Adaptive Management Plan (Section 9.2.1) • Southern Bell Frog Adaptive Management Plan (Section 0) • Plains-wanderer Adaptive Management Plan (Section 9.2.3)
5.2 Justification and evidence for the predicted level of impact, with reference to the Commonwealth's '*Significant Impact Guidelines 1.1 - Matters of National Environmental Significance*'[1] and DPIE's 'Guidance to Assist a Decision- Maker to Determine a Serious and Irreversible Impact'[2].	All MNES species at risk of impact by the proposal were assessed in accordance with the *Significant Impact Guidelines* (DoE, 2013). A total of 17 entities were assessed comprised of one CEEC and 16 threatened species and can be viewed in Appendix B.3.

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
5.3 Provide a summary table with the following information: a) Name of EPBC Act listed entity b) Nature & consequence of impact (direct/indirect) c) Duration of impact (e.g. construction, operation, life of project) d) Quantum of impact. e) Consequence of impact (local, state & national scales) f) Impacts requiring offsetting? (Significant or not)	Table 8-9 outlines the MNES species at risk of impact including: a) The name of the entity b) The EPBC Act listing of the entity c) The potential impacts including direct and indirect d) The extent of impact in ha per stage of the Project e) The duration of the impact f) The AoS results (if it is significant or not)
5.4 Provide data and justification where any EPBC Act-listed threatened species or communities to be considered in the BDAR are considered to be at low risk of impact during the assessment	A habitat assessment was carried out on all EPBC Act listed species or communities and can be viewed in B.2. Species were assessed by taking into account the habitat present, the number of records within the locality, targeted surveys and BUS surveys. Some species that the supplementary SEARs predicted to potentially be at impact were ruled out based on this habitat assessment.
6. Offsets	
6.1 The identification of any MNES that have not been offset using the BAM.	Species listed in Table 8-9 considered to have a negligible extent of impact will not be offset under the BAM.
6.2 Details of how impacts requiring offset correlate to the MNES impacts	All MNES species with proposed impacts are listed as threatened under the BC Act and as such, will be offset under the BOS as per the bilateral agreement. Additionally, although the CEEC is not listed under the BC Act, it will still be offset as ecosystem credits as per the vegetation zone. Table 11-5 shows the offsetting requirements for the Stage

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
	1 Development Footprint and Table 11-6 shows the offsetting requirements for the Stage 2 Development Footprint.
6.3 Details of the PCTs that require offsetting and the number and type of ecosystem credits required for impacts to MNES	Table 11-5 shows the offsetting requirements for the Stage 1 Development Footprint and Table 11-6 shows the offsetting requirements for the Stage 2 Development Footprint.
6.4 Details of threatened species requiring offset and the number of species credits required for impacts to MNES	Table 11-5 shows the offsetting requirements for the Stage 1 Development Footprint and Table 11-6 shows the offsetting requirements for the Stage 2 Development Footprint.
6.5 A demonstration of the correct uses the BAM (and BAM calculator) to identify the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity	The BAM and BAM-C were overseen by a BAM accredited assessor and were used correctly. The credit reports can be viewed in Appendix C.
6.6 Any details of ecological rehabilitation and/or biodiversity conservation actions proposed for offsetting	Not applicable as all credits will be offset under the BOS via payment into the Biodiversity Conservation Fund or the establishment of a Biodiversity Stewardship Site.
6.7 The identification of any other offsetting approach proposed, such as land-based offsets, retiring credits by payment into the Biodiversity Conservation Fund and/or through supplementary measures	All species will be offset under the bilateral agreement and the BOS by payment into the Biodiversity Conservation Fund.
6.8 Provide a summary table with the	The following information is summarised in Table 11-5 for the Stage 1 Development Footprint and Table 11-6 for the

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
following information: a) Threatened species/communities listed under the EPBC Act b) PCTs associated with the ecosystem credit species/ecological community (if applicable) c) Area of impact (ha) d) Credits required e) Offsetting approach f) Reference (EIS/BDAR)	Stage 2 Development Footprint: a) Threatened species/communities listed under the EPBC Act b) PCTs associated with the ecosystem credit species/ecological community (if applicable) c) Area of impact (ha) d) Credits required e) Offsetting approach
7. Other considerations	
7.1 Consideration of all relevant Commonwealth guidelines and policy statements that are appliable to the action and listed threatened species and/or communities, including but not limited to: a) International environmental obligations b) Recovery Plans c) Approved Conservation Advice d) Threat Abatement Plans	AoS were undertaken for 17 entities. These AoS considered important populations and critical habitat as defined within the Approved Listing Advice, Approved Conservation Advice and Recovery Action Plans for the entities. These AoS can be viewed in Appendix B.3.
7.2 An assessment for each EPBC Act listed threatened species and/or community, that has been adequately informed by applicable Commonwealth guidelines and/or policy statements. For example, the interaction between the proposed action and important populations or critical habitat identified in policy documents and/or the interaction	AoS were undertaken for 17 entities. These AoS considered the proposed action on important populations and critical habitat as defined within the Approved Listing Advice, Approved Conservation Advice and Recovery Action Plans for the entities. These AoS can be viewed in Appendix B.3.

BCS Bilateral Assessment information and data requirements (Appendix C of BCS Advice)	Relevant section where addressed
between the proposed action and threatening processes or recommended conservation actions outlined in Commonwealth policies and plans	

Table 13-2 List of entities identified within the supplementary SEARs and the justification for further assessment

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
Natural Grasslands of the Murray Valley Plains	Critically Endangered Ecological Community	Present – the species was recorded within the Subject Land	• Rapid vegetation assessments • BAM plots • Desktop assessment against the Key Diagnostic Criteria and Condition Thresholds	*Commonwealth Listing Advice on Natural Grasslands of the Murray Valley Plains* (TSSC, 2012)	PCT 46 is associated with this TEC, however only one patch (Patch 5) meets the criteria outlined within the listing advice. As a result, only one vegetation zone, Zone 7b, meets this criteria	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Community will be offset under the BAM as ecosystem credits.
Brachyscome papillosa (Mossgiel Daisy)	Vulnerable	Present – the species was recorded within the Subject Land	• Targeted threatened flora survey using the two phase grid based survey approach as well as 10m parallel transects • Incidental sightings	*Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020)	Targeted surveys detected numerous records within the Subject Land. A species polygon as per the BAM 2020 was applied.	Yes – AoS undertaken and was determined to be unlikely to significantly impacted. Species will be offset under the BAM as species credits.
Eleocharis obicis (Spike-Rush) *	Vulnerable	Present – the species was recorded within the Subject Land	• Targeted threatened flora survey using the two phase grid based survey approach as well as 10m parallel transects • Incidental sightings	*Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020)	The species was incidentally recorded within the Subject Land during BAM Plots. Targeted surveys did not locate any additional or known populations and the species is assumed present.	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as species credits.
Lepidium monoplocoides (Winged Peppercress)	Endangered	Possible – not recorded within the Subject Land during targeted surveys, however was detected within the broader Project Area.	• Targeted threatened flora survey using the two phase grid based survey approach as well as 10m parallel transects • Incidental sightings	*Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020)	One record incidentally recorded outside of the Subject Land. Not recorded within the Development Footprint.	No – not considered to occur within the Development Footprint due to targeted surveys No offsetting required.
Maireana cheelii (Chariot Wheels)	Vulnerable	Present – the species was recorded within the Subject Land	• Targeted threatened flora survey using the two phase grid based survey approach as well as 10m parallel transects • Incidental sightings	*Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020)	Targeted surveys detected numerous records within the Subject Land. A species polygon as per the BAM 2020 was applied.	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as species credits.
Swainsona murrayana	Vulnerable	Present – the species was	• Targeted threatened flora survey using the two phase	*Surveying threatened plants and their habitats: NSW survey guide*	Targeted surveys detected seven individuals within the Subject	Yes – AoS undertaken and was determined to be unlikely to be

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
(Slender Darling Pea)		recorded within the Subject Land	grid based survey approach as well as 10m parallel transects • Incidental sightings	*for the Biodiversity Assessment Method* (DPIE, 2020)	Land. The Development Footprint was redesigned to avoid impacts to the individuals. A species polygon of a 100m buffer around the records was applied after consultation with BCS.	significantly impacted. Species will be offset under the BAM as species credits.
Aphelocephala leucopsis (Southern Whiteface)	Vulnerable	Present – the species was recorded within the Subject Land	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was detected at numerous locations during BUS surveys. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as ecosystem credits.
Botaurus poiciloptilus (Australasian Bittern)	Endangered	Possible – habitat present within the Subject Land	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur. Risk of collision from a turbine is considered **moderate** for the species (Nature Advisory, 2025) (see Appendix J.21).	No – species is not considered to occur within the Subject Land. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits
Calidris acuminata (Sharp-tailed Sandpiper)	Vulnerable	Possible – potential suitable habitat is present within the Subject Land	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms –*	Species was not detected during BUS surveys over multiple seasons across two years, however the species may occur on site on occasion. It has been assessed as **low** risk of collision (Nature Advisory, 2025) (see	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. No significant impact likely, species not required to be offset under the BAM

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
				interim guidance on bird and bat management (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Appendix J.21).	
Calidris ferruginea (Curlew Sandpiper)	Critically Endangered	Possible – potential suitable habitat is present within the Subject Land	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years, however the species may be at risk of turbine strike if it were to occur. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. No significant impact likely, species not required to be offset under the BAM
Climacteris picumnus victoriae (Brown Treecreeper (south-eastern))	Vulnerable	Possible – potential suitable habitat is present within the Subject Land, however it is not associated with the PCTs present	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur.	No – species is not considered to occur within the Subject Land. No offsetting required as it is not associated with the PCTs present.
Falco hypoleucos (Grey Falcon)	Vulnerable	Possible – some potential foraging habitat is present however no breeding habitat is present and the species has not been recorded within the locality	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat*	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see	No – species is not considered to occur within the Subject Land. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits.

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
				management (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Appendix J.21).	
Gallinago hardwickii (Latham's Snipe, Japanese Snipe)	Vulnerable	Possible – potential habitat is present within the Subject Land	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years, however the species may occur on site on occasion. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2024) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. No significant impact likely, species not required to be offset under the BAM
Grantiella picta (Painted Honeyeater)	Vulnerable	Unlikely – minimal habitat present on site	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see Appendix J.21).	No – not considered to occur within the Subject Land. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits
Hemiaspis damelii (Grey Snake)	Endangered	Possible – suitable habitat is present within the Subject Land	• Targeted surveys of 250m long transects approximately 10m adjacent to the edge of the water. Surveys occurred between 1900h and 2400h and were repeated over four consecutive nights.	No published State or Federal government guidelines for this species were available prior to survey. Consultation with BCD and a literature review were undertaken. Methodology outlined within Michael *et. al.* (2023) were followed.	Targeted surveys undertaken in October and November 2023 did not detect the species. It is not considered to occur.	No – not considered to occur within the Subject Land due to targeted surveys No offsetting required due to targeted surveys.

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
Hirundapus caudacutus (White-throated Needletail) *	Vulnerable	Possible – associated with PCTs on site, however	• BUS Surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur. Risk of collision from a turbine is considered **low** or the species (Nature Advisory, 2025) (see Appendix J.21).	No – not considered to occur within the Subject Land. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits
Lathamus discolor (Swift Parrot)	Critically Endangered	Unlikely – minimal habitat present on site	• BUS surveys • Incidental sightings	*Australis threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur. Risk of collision from a turbine is considered **low** or the species (Nature Advisory, 2025) (see Appendix J.21).	No – not considered to occur within the Subject Land. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits
Leipoa ocellata (Malleefowl)	Vulnerable	Unlikely – No habitat present within or directly adjacent to the Subject Land that is suitable or would support this species. No mounds or evidence of presence observed.	• BUS surveys • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	The species is not considered to occur within the Subject Land due to no suitable habitat and not being recorded during BUS surveys. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see Appendix J.21).	No – not considered to occur within the Subject Land No offsetting required as it is not associated with the PCTs present.

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
Litoria raniformis (Southern Bell Frog)	Vulnerable	Present – the species was recorded within the Subject Land	• Targeted audio-visual surveys along a 500m transect in suitable breeding habitat • Incidental sightings	*NSW Guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE, NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method, 2020b)	Targeted surveys detected numerous records within the Subject Land. A species polygon as per the BAM 2020 was applied.	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as species credits.
Lophochroa leadbeateri leadbeateri (Pink Cockatoo (eastern))	Endangered	Present – the species was recorded within the Subject Land	• BUS surveys • Targeted surveys for breeding habitat involving stag watches of suitably sized hollows for the species within the Subject Land • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	The species was recorded during BUS surveys as well as incidentally. Two nests were incidentally detected during BUS surveys, however both of these nests were outside of the Subject Land and more than 500m from a turbine. No signs of breeding were detected within the Subject Land during targeted surveys. Risk of collision from a turbine is considered **high** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as ecosystem credits.
Maccullochella macquariensis (Trout Cod)	Endangered	Unlikely – No suitable habitat is present within the Subject Land for this species and the Subject Land is not within the mapped distribution on NSW Fisheries Spatial Data Portal	No surveys were undertaken, however a review of the NSW fisheries spatial data portal was undertaken to determine likelihood of occurrence.	*Fisheries NSW Spatial Data Portal* (Department of Primary Industries , n.d.) which included the distribution map Distribution maps within the *Fish Communities and Threatened Species Distributions of NSW* (DPI, 2016)	Subject Land is not within the mapped distribution of the species on the NSW Fisheries Spatial Data Portal.	No – not considered to occur within the Subject Land. No offsetting required.
Maccullochella peelii (Murray Cod)	Vulnerable	Unlikely – No suitable habitat is present within the Subject Land for this species and the Subject Land is not within the mapped distribution on NSW Fisheries	No surveys were undertaken, however a review of the NSW fisheries spatial data portal was undertaken to determine likelihood of occurrence.	N/A	Subject Land is not within the mapped distribution of the species on the NSW Fisheries Spatial Data Portal.	No – not considered to occur within the Subject Land. No offsetting required.

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
		Spatial Data Portal				
Melanodryas cucullata cucullata (South-eastern Hooded Robin)	Endangered	Possible – habitat is present within the Subject Land	• BUS surveys • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years, however the species may occur on site on occasion.	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits.
Neophema chrysostoma (Blue-winged Parrot)	Vulnerable	Present – the species was recorded within the Subject Land	• BUS surveys • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	The species was recorded during BUS surveys. Risk of collision from a turbine is considered **moderate** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as ecosystem credits.
Nyctophilus corbeni (Corben's Long-eared Bat, South-eastern Long-eared Bat)	Vulnerable	Possible – suitable habitat is present within the Subject Land and the *Nyctophilus* genus was recorded on site during targeted surveys.	Acoustic recordings using Song Meter Mini Bat Detectors were undertaken during the Bat Utilisation Surveys.	BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). *Survey guidelines for Australia's threatened bats* (DEWHA, 2010)	The *Nytctophilus* genus was recorded during Bat Utilisation Surveys, however the species was unable to be determined. A precautionary approach was used and *Nyctophilus corbeni* was assumed present. Risk of collision from a turbine is considered **moderate** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as ecosystem credits.

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
Phascolarctos cinereus (Koala)	Endangered	Unlikely - Minimal habitat present within or directly adjacent to the Subject Land that is suitable or would support this species. Not detected during targeted surveys.	• Targeted spotlighting surveys	*Koala Biodiversity Assessment Method Survey Guide* (DPIE, 2022). Consultation was undertaken with BCS to only do one survey methodology instead of the two required due to the hihgly degraded nature of the site	The species is not considered to occur due to targeted surveys, the highly degraded nature of the habitat present and the lack of records.	No – not considered to occur within the Subject Land due to targeted surveys. No offsetting required as it is not associated with the PCTs present.
Pedionomus torquatus (Plains-wanderer)	Critically Endangered	Present – the species was recorded within the Subject Land	• Targeted surveys of spotlighting from a slow-moving vehicle across a series (10-11) of 1km transects 50m apart. • Incidental sightings	No NSW guidelines for this species are provided within the TBDC as species credits are determined by important habitat mapping. Consultation with DCCEEW – Cwth and BCD led by Plains-wanderer expert David Parker was undertaken and methodology prepared..	A total of 21 individuals were recorded during targeted surveys and incidentally across the Subject Land. As there is no important habitat mapped for the species, offsets are only ecosystem credits in line with the BAM. Risk from operating turbines is considered **moderate** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species will be offset under the BAM as ecosystem credits only.
Polytelis swainsonii (Superb Parrot) *	Vulnerable	Unlikely – minimal suitable habitat and not detected during targeted surveys	• BUS surveys • Targeted surveys for breeding habitat involving stag watches of suitably sized hollows for the species within the Subject Land • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see Appendix J.21).	No – species was not detected during targeted surveys for breeding habitat, however foraging habitat may be present. The species not considered to occur within the Subject Land, however. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits.
Rostratula australis (Australian Painted Snipe)	Endangered	Possible – habitat is present within the Subject Land	• BUS surveys • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance	Species was not detected during BUS surveys over multiple seasons across two years. The species is not considered to occur. Risk of collision from a turbine is	No – not considered to occur within the Subject Land. Species is associated with PCTs present within the Subject Land and will be offset under the BAM

Threatened species/community	EPBC Act status	Likelihood of occurrence	Survey method	Guidelines	Outcome	Further assessment
				with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	considered **moderate** for the species (Nature Advisory, 2025) (see Appendix J.21).	as ecosystem credits.
Stagonopleura guttata (Diamond Firetail)	Vulnerable	Possible – habitat is present within the Subject Land	• BUS surveys • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years, however the species may occur on site on occasion. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken and was determined to be unlikely to be significantly impacted. Species is associated with PCTs present within the Subject Land and will be offset under the BAM as ecosystem credits.
Tringa nebularia (Common Greenshank)	Endangered	Possible – potential suitable habitat is present within the Subject Land	• BUS surveys • Incidental sightings	*Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010) BUS undertaken in accordance with *Onshore Wind Farms – interim guidance on bird and bat management* (DAWE, 2022). BioNet Threatened Biodiversity Database Collection (TBDC) Guidelines (NSW DCCEEW, 2024)	Species was not detected during BUS surveys over multiple seasons across two years, however the species may be at risk of turbine strike if it were to occur. Risk of collision from a turbine is considered **low** for the species (Nature Advisory, 2025) (see Appendix J.21).	Yes – AoS undertaken No significant impact likely, species not required to be offset under the BAM

* species were not included in the supplementary SEARs however have been assessed for impacts due to incidental sightings and/or being associated with the PCTs present

Appendix C BAM calculator credit reports

Credit reports are valid for 14 days following the report generated date. The BDAR/BCAR must be submitted within this timeframe or new reports generated.

C.1 Stage 1 credit reports (Case number - 0003499)

C.2 Stage 2 credit reports (Case number 00045828)

C.3 Euston Intersection credit reports (Case number 000468895)

Appendix D BioNet Search Results

Appendix E Threatened Fauna Sightings

Appendix F Staff qualifications and experience

Name	Title	Qualifications / experience	Role in BDAR
Rebecca Phyland	Principal Ecologist	M. Environmental Management (Conservation), PGradDipEdStud, BEd. (Geog) 20 years experience as Ecologist	BDAR review
Beth Noel	Principal Ecologist	B. Applied Science, M. Wildlife Management. 22 years experience as Ecologist	BAM Assessor Survey Planning
Julie Gooding	Tech Lead Ecologist (BAAS18074)	B. Science (Biology) -7 years experience as Ecologist, -7 years experience in natural resource management.	Lead BAM Assessor, BAM-C analysis, Survey Planning, BDAR reporting
Elise Keane	Senior Ecologist (BAAS 23013)	M. Environmental Management and Sustainability B. Environmental Science (Conservation and Wildlife Biology) -5 years experience as Ecologist	Field Work (Targeted Flora Surveys and BAM plots), BDAR reporting, GIS Mapping
Stella O'Dwyer	Biodiversity Consultant	B. Environmental Biology 1 year ecologist experience, 2 months Biodiversity Consultant	Workstage Management, Survey planning including mapping for surveys, Field Work – Targeted flora surveys, nocturnal surveys, Plains-wanderer

			surveys.
Gillian Young	Senior Ecologist (BAAS17086)	B. Natural Resources (Honours 2) 25 years experience vegetation surveys, 5 years senior Ecologist experience, 15 years experience Vegetation Management Officer CMA-NSW Govt.	Field Work – Targeted Flora surveys for *Austrostipa metatoris, wakoolica, E. leucoxylon, Pilularia novae-hollandiae, Swainsona sericea, Brachyscome papillosa, Calotis moorei, Convolvulus tedmoorei, Lepidium monoplocoides, Maireana cheelii, Solanum karsense, swainsona murrayana, Swainsona plagiotropis* and BAM plots. Targeted fauna surveys for Masked Owl, Basking Owl
Clare Vincent	Senior Ecologist (BAAS23034)	B. Environmental Science 11 years experience in Environmental industry	Field Work – Targeted Flora surveys and BAM plots.
Dimity Bambrick	Senior Ecologist	B. Science (Zoology, Ecology Conservation) 6 years experience in Environmental Fields	Field Work, PCT Mapping
Jessie Whieldon	Senior Ecologist	B. Environmental Science (Honours 2) 7 years environmental consulting experience	Field Work, PCT Mapping
Rachel Ivory	Graduate Ecologist	B. Environmental Science and management majoring in ecosystems and biodiversity 9 months environmental consulting experience	Targeted frog and reptile surveys.
James Hagan	Ecologist	B. Environmental Science	Field Work

		2 years ecology experience	
Django Van Tholen	Senior Consultant - Environmental Management	M. Environment B. Environmental Science: Major in Freshwater Biology and Management 12 years experience as Environmental Scientist	Targeted Frog and Reptile Surveys
Julia Chabros	Graduate Ecologist	B. Environmental Management (Honours) 2 years as Technical Assistant, 6 months Graduate Ecologist	GIS management, BDAR reporting, Targeted Flora Surveys
Evan Creek	Graduate Ecologist	B. Science (Ecology) 4 months experience as Ecologist	Field Work – BAM plots, BDAR Reporting
Jacqui Coughlan	Principal Ecologist	PhD, B. Science (Honours) 30 years experience as Ecologist	Targeted Nocturnal Bird Surveys
Michael Cleland	Ecologist	B. Environmental Science and Management, Vegetation disturbance, Fire Ecology 6 years Environmental industry experience	Field Work
Dylan Robertson	Graduate Ecologist	B. Animal Science (Honours) 14 months experience as Ecologist	Field Work
Josh Smart	Senior Ecologist	B. Environmental Science & Management (Marine	Targeted Flora Surveys

		and Biodiversity & Ecosystems Majors) (Honours 1st Class) 5 years experience as an ecologist	
Tom Fletcher	Ecologist	B. Environmental Science and Management 2 years experience as Ecologist	September Targeted Flora Surveys
Rachael Buzio	Senior Ecologist	B. Marine Science 12 years experience environmental consulting	Targeted Flora Surveys
Timothy Garvey	Senior Ecologist	PhD, M. Research, B. Science (Honours) 3 years experience as Ecologist	Targeted Frog and Reptile Surveys
Greg Calvert	Principal Ecologist	PhD. B. Science (Honours 1) 28 years experience as Ecologist/Environmental Consultant.	Targeted Flora Surveys – September
Justin Solomons	Graduate Ecologist	B. Environmental Science (ecological conservation and restoration) 8 months experience as Ecologist	Flora Surveys – Bam plots
Eamon O'Meara	Senior Ecologist	B. Environmental Management (Natural Systems and Wildlife) Hons. 10 years experience as Ecologist	BDAR reporting
Mark Blair (Ecosystem Thinking)	Subconsultant	Bachelor of Natural Resources 18 years experience as Ecologist	Targeted Flora Surveys
Paul O'Keefe	Subconsultant	Bachelor of Natural	Targeted Flora Surveys

(Ecosystem Thinking)		Resources 34 years experience as Ecologist	
Patrick Costello (Arch Services)	Subconsultant	B. Environmental Management 6 years experience as Ecologist	Targeted Flora Surveys
Paul Mulligan	Ecologist	B. Zoology M. Conservation Biology 1 year experience as Junior Ecologist	Targeted Flora Surveys
John Hunter (Hewlett Hunter Pty Ltd)	Subconsultant Director/Principal	B. Science (Botany/Ecology/Zoology) Honours 1st Class (Plant Systematics) PhD. (Landscape Ecology) 33 years experience as Ecologist	Targeted Flora Surveys
Vanessa Hunter (Hewlett Hunter Pty Ltd)	Ecologist	B. Science 30 years experience	Targeted Flora Surveys
Michael Sommerville (Michael Peter Somerville)	Subconsultant	B. Science Graduate Diploma of Natural Resources 25 years experience as Ecologist	Targeted Flora Surveys
Nicholas Gale (Wildlife Unlimited)	Subconsultant	B. Wildlife and Conservation Biology (Honours) 6 years experience in reptile/amphibian surveys	Targeted Frog and Reptile Surveys
Maddie Robertson	Ecologist	B. Environment B. Science (Biodiversity and Conservation) 5 years experience in the environmental science industry	Targeted Flora Surveys, PCT assessment

Appendix G Agency/consent authority consultation

G.1 DCCEEW and BCD Consultation log

G.2 Grey Snake agency consultation

G.3 Wet weather benchmarks consultation

G.4 Southern Myotis and Koala Survey Methodology

G.5 Swainsona murrayana

Appendix H Hollow-bearing Tree Inventory

#	Species	Common Name	DBH (cm)	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Fissuring	Decorticating Bark	Fauna Present	Retained or Removed
1	Unknown		60										Retain
2	Stag		65	0	0	0	3	0	0	0	0	N	Retain
3	Stag		90	0	0	0	4	0	0	0	0	N	Retain
4	Unknown		35	1	0	0	0	0	0	0	0	Y	Retain
5	*Eucalyptus largiflorens*	Black Box	70	0	1	0	4	1	0	0	0	Y	Retain
6	Stag		85	0	0	0	3	0	0	0	0	N	Retain
7	Unknown		80	0	0	1	2	1	0	0	0	N	Retain
8	Stag		55	0	0	0	3	0	0	0	0	N	Retain
9	*Eucalyptus*	Black Box	75	0	0	0	1	0	0	0	0	N	Retain

	largiflorens												
10	*Eucalyptus largiflorens*	Black Box	40	0	1	0	2	0	0	0	0	N	Retain
11	*Eucalyptus largiflorens*	Black Box	90	0	0	0	2	0	0	0	0	N	Retain
12	Unknown		60	0	0	0	5	0	0	0	0	Y	Retain
13	Unknown		70	0	0	0	3	0	0	1	0	Y	Retain
14	Stag		30	0	0	0	3	1	0	0	0	Y	Retain
15	Stag		40	0	0	0	1	1	0	0	0	Y	Retain
16	Unknown		80	1	0	0	3	0	0	0	0	Y	Retain
17	*Eucalyptus largiflorens*	Black Box	60	0	0	0	5	1	0	0	0	Y	Retain
18	*Eucalyptus largiflorens*	Black Box	50	0	0	0	1	3	0	0	0	Y	Retain
19	*Eucalyptus*	Black Box	38	0	0	0	1	0	0	0	0	N	Retain

	largiflorens												
20	*Eucalyptus largiflorens*	Black Box	40	0	0	0	2	0	0	0	0	N	Retain
21	*Eucalyptus largiflorens*	Black Box	65	0	0	0	3	0	0	0	0	Y	Retain
22	*Eucalyptus largiflorens*	Black Box	42	0	0	0	1	0	0	0	0	N	Retain
23	*Eucalyptus largiflorens*	Black Box	55	0	0	0	1	0	0	0	0	N	Retain
24	*Eucalyptus largiflorens*	Black Box	48	0	0	0	1	0	0	0	0	N	Remove
25	*Eucalyptus largiflorens*	Black Box	36	1	0	0	0	0	0	0	0	Y	Retain
26	*Eucalyptus largiflorens*	Black Box	46	0	0	0	1	0	0	0	0	N	Retain
27	Stag		30	0	0	0	1	0	0	0	0	N	Retain
28	Stag		60	0	0	0	2	1	0	0	0	Y	Retain

29	*Eucalyptus largiflorens*	Black Box	40	0	0	0	1	0	0	0	0	N	Remove
30	Stag		30	0	1	0	1	0	0	0	0	Y	Remove
31	*Eucalyptus largiflorens*	Black Box	35	1	0	0	2	0	0	0	0	Y	Retain
32	Stag		45	0	0	0	5	0	0	0	0	N	Retain
33	Stag		28	0	0	0	2	0	0	0	0	N	Retain
34	Stag		45	0	0	0	4	0	0	0	0	N	Retain
35	Stag		38	1	0	0	0	0	0	0	0	N	Remove
36	Stag		60	0	0	0	3	1	0	0	0	N	Retain
37	Stag		25	1	0	0	1	0	0	0	0	N	Remove
38	Stag		20	0	0	0	1	0	0	0	0	N	Retain
39	Stag		35	0	0	1	0	0	0	0	0	N	Retain
40	Stag		35	0	0	0	2	0	0	0	0	N	Remove

41	Stag		35	1	0	0	1	0	0	0	0	N	Remove
42	Stag		38	1	0	0	2	0	0	0	0	N	Retain
43	Stag		40	1	0	0	1	0	0	0	0	N	Remove
44	Stag		20	0	0	0	2	0	0	0	0	N	Retain
45	Stag		20	0	0	0	1	0	0	0	0	N	Retain
46	Stag		32	0	1	0	2	0	0	0	0	Y	Remove
47	Stag		38	1	0	0	1	0	0	0	0	Y	Remove
48	Stag		20	1	0	0	0	0	0	0	0	N	Retain
49	Stag		35	0	0	0	1	1	0	0	0	N	Remove
50	Stag		40	1	1	0	2	0	0	0	0	N	Retain
51	Stag		42	1	0	0	2	0	0	0	0	N	Retain
52	Stag		32	1	0	0	2	0	0	0	0	N	Retain
53	Stag		48	0	0	0	2	0	0	0	0	N	Retain

54	Stag		40	0	0	0	3	0	0	0	0	N	Retain
55	Stag		45	0	0	0	3	0	0	0	0	N	Retain
56	Stag		28	0	0	0	2	0	0	0	0	N	Retain
57	Unknown		40	1	0	0	0	0	0	0	0	Y	Retain
58	Unknown		40	0	0	0	3	0	0	0	0	N	Retain
59	*Eucalyptus largiflorens*	Black Box	48	0	0	0	1	0	0	0	0	N	Retain
60	*Eucalyptus largiflorens*	Black Box	30	1	0	0	0	0	0	0	0	N	Remove
61	Stag		48	0	0	0	1	0	0	0	0	Y	Retain
62	*Eucalyptus largiflorens*	Black Box	43	0	0	0	1	0	0	0	0	N	Retain
63	*Eucalyptus largiflorens*	Black Box	48	0	0	0	1	0	0	0	0	N	Retain
64	*Eucalyptus*	Black Box	105	2	0	0	0	0	0	0	0	Y	Retain

	largiflorens												
65	*Eucalyptus largiflorens*	Black Box	90	0	0	0	1	0	0	0	0	N	Retain
66	*Eucalyptus largiflorens*	Black Box	86	0	1	0	0	0	0	0	0	N	Retain
67	*Eucalyptus largiflorens*	Black Box	48	1	0	0	1	0	0	0	0	Y	Remove
68	*Eucalyptus largiflorens*	Black Box	95	0	0	0	3	0	0	0	0	Y	Retain
69	*Eucalyptus largiflorens*	Black Box	70	2	0	0	1	0	0	0	0	Y	Retain
70	*Eucalyptus largiflorens*	Black Box	40	1	0	0	0	0	0	0	0	N	Remove
71	*Eucalyptus largiflorens*	Black Box	100	2	1	0	3	0	0	0	0	Y	Retain
72	*Eucalyptus largiflorens*	Black Box	42	3	1	0	2	0	0	0	0	Y	Remove

73	*Eucalyptus largiflorens*	Black Box	28	1	0	0	1	0	0	0	0	Y	Retain
74	*Eucalyptus largiflorens*	Black Box	42	0	0	0	1	0	0	0	0	Y	Retain
75	*Eucalyptus largiflorens*	Black Box	35	2	0	0	2	0	0	0	0	Y	Retain
76	Stag		36	0	0	0	2	0	0	0	0	N	Remove
77	Stag		38	1	0	0	1	0	0	0	0	Y	Retain
78	Stag		38	0	0	0	1	0	0	0	0	N	Retain
79	Stag		55	0	0	1	1	0	0	0	0	N	Retain
80	Stag		1	0	0	0	2	0	0	0	0	N	Retain
81	Stag		30	1	1	1	1	0	0	1	0	N	Retain
82	*Eucalyptus largiflorens*	Black Box	60	1	0	0	1	0	0	0	0	N	Retain
83	Stag		65	0	1	0	3	0	0	0	0	N	Retain

84	Stag		75	0	0	0	3	0	0	0	0	N	Retain
85	*Eucalyptus largiflorens*	Black Box	62	0	1	0	0	0	0	0	0	N	Retain
86	Unknown		95	0	0	0	2	0	0	0	0	Y	Retain
87	Stag		35	0	1	0	1	0	0	0	0	Y	Retain
88	Stag		50	0	0	0	0	1	0	0	0	N	Retain
89	Unknown		45	0	1	0	0	0	0	0	0	N	Retain
90	Unknown		40	0	0	0	0	0	0	1	0	N	Retain
91	Unknown		0	0	0	0	1	0	0	0	0	N	Retain
92	Stag		35	0	0	0	3	0	0	0	0	N	Retain
93	Unknown		40	0	0	0	1	0	0	0	0	N	Retain
94	Unknown		30	0	0	0	1	0	0	0	0	N	Retain
95	Unknown		0										Retain

96	Unknown		0	0	0	0	2	0	0	0	0	N	Retain
97	Unknown		30	0	0	0	4	0	0	0	0	N	Retain
98	Unknown		40	0	0	0	3	0	0	0	0	N	Retain
99	Stag		40	0	0	0	3	0	0	0	0	N	Retain
100	Unknown		0	1	0	0	0	0	0	0	0	N	Retain
101	Unknown		28	0	0	0	2	0	0	0	0	N	Retain
102	Unknown		22	1	0	0	0	0	0	0	0	N	Retain
103	Unknown		25	0	0	0	1	0	0	0	0	N	Retain
104	Stag		35	0	0	0	2	0	0	0	0	N	Retain
105	Stag		50	0	0	0	2	0	0	0	0	N	Retain
106	Stag		50	0	0	0	2	0	0	0	0	Y	Retain
107	Unknown		45	0	0	0	1	0	0	0	0	N	Retain
108	Unknown		45	0	0	0	4	0	0	0	0	N	Retain

109	Stand of HBTs with small hollows		10									N	Retain

Appendix I Herbarium confirmation

I.1 Brachyscome papillosa and Convolvulus tedmoorei

I.2 Maireana cheelii

Appendix J Bird and Bat Utilisation

J.1 Draft BBAMP

J.2 Bat Utilisation Survey report winter 2022

J.3 July 2022 bat call analysis report

J.4 Autumn 2023 bat call analysis report

J.5 Winter 2023 bat call analysis report

J.6 Spring 2023 bat call analysis report

J.7 Summer 2024 bat call analysis report

J.8 Autumn 2024 bat call analysis report

J.9 Winter 2024 bat call analysis report

J.10 Spring 2024 bat call analysis report

J.11 Summer 2025 bat call analysis report

J.12 Summer 2023 bird utilisation survey report

J.13 Autumn 2023 bird utilisation survey report

J.14 Winter 2023 bird utilisation survey report

J.15 Spring 2023 bird utilisation survey report

J.16 Bird Utilisation Survey 1st Year Report

J.17 Summer 2024 bird utilisation survey report

J.18 Autumn 2024 bird utilisation survey report

J.19 Winter 2024 bird utilisation survey report

J.20 Spring 2024 bird utilisation survey report

J.21 Final Bird and Bat Risk Assessment

J.22 Bird and Bat Utilisation Survey- Final Report

Appendix K BDAR Requirements Compliance

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
Introduction	Chapters 2 and 3	Information	
		Introduction to the biodiversity assessment including:	–
		☒ brief description of the proposal	<Section 1.1>
		☒ identification of Subject Land boundary, including: ☒ operational footprint ☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	<Section 1.1.1>
		☒ general description of the Subject Land	<Section 1.2.2>
		☒ sources of information used in the assessment, including reports and spatial data	<Section 1.4>
		☒ identification and justification for entering the BOS	<Section 1.3>
		Maps and tables	
		☒ Map of the Subject Land boundary showing the final proposal footprint, including the construction	<Figure 1-1>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 7-9 Figure 7-10 Figure 7-11 Figure 7-12
Landscape	Sections 3.1 and 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including:	–
		☒ general description of Subject Land topographic and hydrological setting, geology and soils	<Section 2>
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	<Section 2.9>
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	<Section 2.2>
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	<Section 2.4.1>
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	<Section 2.4.2>
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	<Section 2.5>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	<Section 2.6.1>
		☒ areas of outstanding biodiversity value occurring on the Subject Land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	<Section 2.7>
		☐ any additional landscape features identified in any SEARs for the proposal	<Section 2.5>
		☒ NSW (Mitchell) landscape on which the Subject Land occurs	<Section 2.3>
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	<Section 2.9>
		Maps and tables	
		☒ Site Map ☒ Property boundary ☒ Boundary of Subject Land ☒ Cadastre of Subject Land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3	<Figure 1-1> <Figure 1-5> <Figure 2-3 shows IBRA regions and hydrology> <Figure 2-4 shows Mitchell Landscapes> <Figure 2-5 shows Soil types>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
			<Figure 2-8 shows Native vegetation extent>
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of Subject Land ☒ Assessment area (i.e. the Subject Land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM Subsection 3.1.3 ☒ Additional detail (e.g. local government area boundaries) relevant at this scale	<Figure 1-1> <Figure 2-3 shows IBRA regions and hydrology> <Figure 2-4 shows Mitchell Landscapes> <Figure 2-5 shows Soil types> <Figure 2-8 shows Native vegetation extent>
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	–
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries ☒ wetlands and important wetlands	<Figure 2-3 shows IBRA regions and hydrology> <Figure 2-4 shows

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ connectivity of different areas of habitat ☐ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ☐ areas of outstanding biodiversity value occurring on the Subject Land and assessment area ☒ any additional landscape features identified in any SEARs for the proposal ☒ NSW (Mitchell) landscape on which the Subject Land occurs	Mitchell Landscapes> <Figure 2-5 shows Soil types> <Figure 2-8 shows Native vegetation extent>
		Data	
		☒ All report maps as separate jpeg files	Submitted in BAM-C
		Individual digital shape files of:	–
		☒ Subject Land boundary	Submitted in BAM-C
		☒ assessment area (i.e. Subject Land and 1500 m buffer area) boundary	Submitted in BAM-C
		☒ cadastral boundary of Subject Land	Submitted in BAM-C
		☒ areas of native vegetation cover	Submitted in BAM-C
		☒ landscape features	Submitted in BAM-C
Native vegetation	Chapter 4, Appendix A	Information	

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
	and Appendix H		
		☒ Identify native vegetation extent within the Subject Land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	<Section 3.1> <Figure 2-5>
		☒ Provide justification for all parts of the Subject Land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	<Section 3.1.1>
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the Subject Land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	<Section 3.2.2>
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	<Section 3.2.3>
		☐ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	<Not applicable>
		For each PCT within the Subject Land, describe:	–
		☒ PCT name and ID	<Section 3.2.5> <Figure 3-21> <Appendix L.1>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ vegetation class	<Section 3.2.5> <Figure 3-23> <Appendix L.2>
		☒ extent (ha) within Subject Land	<Section 3.2.5>
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	<Section 3.2.1> <Section 3.2.5> <Section 3.3.1>
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	<Section 3.2.5>
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	<Section 3.2.6> <Section 5.2> <Figure 3-21> <Appendix L.1>
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	<Section 3.2.5>
		Describe the vegetation integrity assessment of the Subject Land, including:	–
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	<Section 3.3.1> <Figure 3-23> <Figure 3-24>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
			<Appendix L.2>
		☒ description of vegetation zones within the Subject Land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	<Section 3.3.1>
		☒ area (ha) of each vegetation zone	<Section 3.3.1>
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	<Section 3.3.1>
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	<Section 3.3.1>
		☒ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	<Section 3.3.2>
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	–
		☐ identify the PCT or vegetation class for which local benchmark data will be applied	Not applicable
		☐ identify published sources of local benchmark data (if benchmarks obtained from published sources)	
		☐ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	
		☐ provide justification for use of local data rather than BioNet Vegetation Classification benchmark	Not applicable

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		values	
		☐ provide written confirmation from the decision-maker that they support the use of local benchmark data	Not applicable
		Maps and tables	
		☒ Map of native vegetation extent within the Subject Land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the Subject Land that do not contain native vegetation (BAM Subsection 4.1.2)	<Figure 3-21> <Appendix L.1>
		☒ Map of PCTs within the Subject Land (as described in BAM Section 4.2(1.))	<Figure 3-21> <Appendix L.1>
		☒ Map of vegetation zones within the Subject Land (as described in BAM Subsection 4.3.1)	<Figure 3-23> <Appendix L.2>
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	<Figure 3-23> <Appendix L.2>
		☒ Map of TEC distribution on the Subject Land and table of TEC listing, status and area (ha)	<Figure 3-21> <Section 5.2.1> <Appendix L.1>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	<Figure 3-23> <Table 3-18> <Appendix L.2>
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	–
		☒ composition condition score ☒ structure condition score ☒ function condition score ☒ presence of hollow bearing trees	<Table 3-21> <Table 3-22> <Appendix L.1>
		Data	
		☒ All report maps as separate jpeg files	Submitted in BAM-C
		☒ Plot field data (MS Excel format)	Appendix A-I
		☒ Plot field datasheets	Appendix A-I
		Digital shape files of:	–
		☒ PCT boundaries within Subject Land	Submitted in BAM-C

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ TEC boundaries within Subject Land	Submitted in BAM-C
		☒ vegetation zone boundaries within Subject Land	Submitted in BAM-C
		☒ floristic vegetation survey and vegetation integrity plot locations	Submitted in BAM-C
Threatened species	Chapter 5	Information	
		Identify ecosystem credit species likely to occur on the Subject Land, including:	–
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	<Section 4.2 >
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	<Section 4.4>
		☒ justification for addition of any ecosystem credit species to the list	<Section 4.3>
		Identify species credit species likely to occur on the Subject Land, including:	–
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	<Section 4.5>
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	<Section 4.5>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	<Section 4.5>
		☒ justification for addition of any species credit species to the list	<Section 4.5.1>
		From the list of candidate species credit species, identify:	–
		☒ species assumed present within the Subject Land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) ☒ species present within the Subject Land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) ☒ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.)) ☒ species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	<Section 4.6>
		Present the outcomes of species credit species assessments from:	–
		☒ threatened species survey (as described in BAM Section 5.2.4)	<Section 4.6.1>
		☒ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	Not applicable
		Where survey has been undertaken include detailed information on:	–

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ survey method and effort (as described in BAM Section 5.3)	<Section 4.6.3>
		☒ justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	<Section 4.6.3> <Appendix G>
		☒ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	<Table 4-13>
		☒ survey personnel and relevant experience	<Appendix F>
		☒ describe any limitations to surveys and how these were addressed/overcome	<Section 4.6.3>
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	–
		☐ justification of the use of an expert report ☐ identify the expert, provide evidence of their expert credentials and departmental approval of expert status ☐ all requirements of Box 3 have been addressed in the expert report	Not applicable
		Where use of local data is proposed (BAM Subsection 1.4.2):	–
			Not applicable

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☐ identify relevant species ☐ identify data to be amended ☐ identify source of information for local data, e.g. published literature, additional survey data, etc. ☐ justify use of local data in preference to VIS Classification or TBDC data	
		☒ provide written confirmation from the decision-maker that they support the use of local data	<Appendix G>
		Species polygon completed for species credit species present within the Subject Land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	–
		☒ the unit of measure for each species is documented	<Table 4-13>
		for species assessed by area:	–
		☒ the polygon includes the extent of suitable habitat for the target species within the Subject Land (as described in BAM Subsection 5.2.5)	<Table 4-13>
		☒ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	<Section 4.6.4>
		for species assessed by counts of individuals:	–
		☒ the number of individual plants present on the Subject Land (as described in BAM Subsection 5.2.5(3.))	Not applicable

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	Not applicable
		☒ the polygon includes all individuals located on the Subject Land with a buffer of 30 m around the individuals or groups of individuals on the Subject Land	<Figure 4-12> <Figure 4-13> <Appendix L.4> <Appendix L.5>
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the Subject Land (as described in BAM Section 5.4)	<Section 11.1.2>
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	<Table 4-7> <Table 4-8>
		☒ the ecosystem credit species removed from the list	<Table 4-9>
		☒ the sensitivity to gain class of each species	<Table 4-7> <Table 4-8> <Table 4-10> <Table 4-12>
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	<Table 4-10>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
			<Table 4-12>
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	<Table 4-10>
		☒ the candidate species credit species not recorded on the Subject Land as determined by targeted survey, expert report or important habitat map	<Table 4-13>
		☒ Table detailing species credit species recorded or assumed as present within the Subject Land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	<Table 11-3> <Table 11-4>
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the Subject Land and the species polygon for each species (as described in BAM Subsection 5.2.5)	<Figure 4-12> <Figure 4-13> <Appendix L.4> <Appendix L.5>
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	Submitted in BAM-C
		☒ Survey locations including GPS coordinates of any plots, transects, grids	Submitted in BAM-C
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	Submitted in BAM-C

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ Species polygon map in jpeg format	Submitted in BAM-C
		☐ Expert reports and any supporting data used to support conclusions of the expert report	Not applicable
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	Recorded in Shapefiles. Submitted in BAM-C
Prescribed impacts	Chapter 6	Information	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	–
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) ☒ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) ☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) ☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	<Section 6>
		☒ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	<Section 6.1.5>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	<Section 6.1.6>
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	<Section 6>
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	<Section 6>
		Where the proposed development is for a wind farm:	–
		☒ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	<Section 6.1.5>
		☒ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	<Section 6.1.5>
		☒ predict the habitual flight paths for nomadic and migratory species likely to fly over the Subject Land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	<Section 6.1.5> <Figure 6-3>
		Where the proposal may result in vehicle strike:	–
		☒ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of	<Section 6.1.6>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		vehicle strike due to the proposal	
		Maps and tables	
		☒ Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	<Figure 6-2>
		☒ Map showing location of potential vehicle strike locations	<Figure 6-2>
		☒ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	<Figure 6-3>
		Data	
		☒ Digital shape files of prescribed impact feature locations	Submitted in BAM-C
		☒ Prescribed impact features map in jpeg format	Submitted in BAM-C
Avoid and minimise impacts	Chapter 7	Information	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	–

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	<Section 7.1.2>
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	<Section 7.1>
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	<Section 7.1.1>
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	<Section 7.1.1>
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	<Section 7.1.3>
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	<Section 7>
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	<Section 7>
		Maps and tables	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	<Table 7-2>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	<Figure 7-1> <Figure 7-2> <Figure 7-3> <Figure 7-4> <Figure 7-5> <Figure 7-6> <Figure 7-7> <Figure 7-8> <Figure 7-9> <Figure 7-11> <Figure 7-12>
		☐ Maps demonstrating indirect impact zones where applicable	Not applicable
		Data	
		Digital shape files of:	–
		☒ alternative and final proposal footprint	Submitted in BAM-C
		☒ direct and indirect impact zones	Submitted in BAM-C
		☒ Maps in jpeg format	Submitted in BAM-C

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	Information	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	<Section 8>
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	–
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	<Section 8.2>
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	<Section 8.2>
		☒ reporting any limitations or assumptions, etc. made during the assessment	<Section 8.7>
		☒ identification of the threatened entities and their habitat likely to be affected	<Section 8.2>
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	–
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	–
		☒ karst, caves, crevices, cliffs, rocks and other features of geological significance	Not applicable

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ human-made structures	<Section 8.3.1>
		☒ non-native vegetation	<Section 8.3.1>
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	<Section 8.3.2>
		☒ movement of threatened species that maintains their life cycle	<Section 8.3.2>
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	<Section 8.3.3>
		☒ assessment of the impacts of wind turbine strikes on protected animals	<Section 8.3.4>
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	<Section 8.3.5>
		☒ evaluate the consequences of prescribed impacts	<Section 9.1.3>
		☒ describe impacts that are uncertain	<Section 8.5>
		☒ document limitations to data, assumptions and predictions	<Section 8.7>
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of	<Table 8-2>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		identified impacts	<Table 8-3>
		Data	
		N/A	–
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	Information	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	–
		☒ techniques, timing, frequency and responsibility ☒ identify measures for which there is risk of failure ☒ evaluate the risk and consequence of any residual impacts	<Section 9>
		☒ document any adaptive management strategy proposed	<Section 9.2>
		Identification of measures for mitigating impacts related to:	–
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) ☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	<Section 9.1>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	
		☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	< Section 9.2>
		Maps and tables	
		☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	<Table 9-1>
		Data	
		N/A	–
Impact summary	Chapter 9	Information	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	–
		☒ addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the Subject Land	Not applicable
		☒ for each TEC, report the extent of the TEC in NSW	Not applicable
		☒ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on	<Section 10.1>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		the Subject Land	
		☒ for each threatened species, report the population size in NSW	<Section 10.1.1>
		☒ documenting assumptions made and/or limitations to information ☒ documenting all sources of data, information, references used or consulted ☒ clearly justifying why any criteria could not be addressed	<Section 10.1.2> <Section 10.1.3>
		☒ Identification of impacts requiring offset in accordance with BAM Section 9.2	<Section 11.1>
		☒ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	<Section 0>
		☒ Identification of areas not requiring assessment in accordance with BAM Section 9.3	<Section 11.3>
		Maps and tables	
		☒ Map showing the extent of TECs at risk of an SAII within the Subject Land	Not applicable
		☒ Map showing location of threatened species at risk of an SAII within the Subject Land	<Figure 10-1>
		Map showing location of:	–
		☒ impacts requiring offset	<Figure 11-1> <Figure 11-2>

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
			<Figure 11-3>
		☐ impacts not requiring offset	Not applicable
		☒ areas not requiring assessment	<Section 11.3>
		Data	
		Digital shape files of:	–
		☒ extent of TECs at risk of an SAII within the Subject Land	Submitted in BAM-C
		☒ location of threatened species at risk of an SAII within the Subject Land	Submitted in BAM-C
		☒ boundary of impacts requiring offset	Submitted in BAM-C
		☒ boundary of impacts not requiring offset	Submitted in BAM-C
		☒ boundary of areas not requiring assessment	Submitted in BAM-C
		☒ Maps in jpeg format	Submitted in BAM-C
Impact summary	Chapter 10	Information	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values,	–

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		including:	
		☒ future vegetation integrity score for each vegetation zone within the Subject Land (Equation 25 and Equation 26 in BAM Appendix H) ☒ change in vegetation integrity score (BAM Subsection 8.1.1) ☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the Subject Land (BAM Subsection 10.1.2)	<Table 11-1> <Table 11-2>
		☒ biodiversity risk weighting for each	
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	<Table 11-3> <Table 11-4>
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	<Table 11-1> <Table 11-2>
		☒ Table of threatened species requiring offset and the number of species credits required	<Table 11-3> <Table 11-4>
		Data	
		☒ Submitted proposal in the BAM Calculator	–

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
Biodiversity credit report	Chapter 10	Information	
		☒ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	<Section 11>
		☒ BAM credit report in pdf format	<Appendix C>
		Maps and tables	
		☒ Table of credit class and matching credit profile	<Conclusion>
		Data	
		☒ BAM credit report in pdf format	<Appendix C>

Appendix L Atlas Maps

L.1 Figure 3-19 Plant Community Types and Threatened Ecological Communities within the Subject Land

L.2 Figure 3-20 Plant Community Types, associated zones and BAM plot locations within the Subject Land

L.3 Figure 4-6 Flora survey effort within the Subject Land

L.4 Figure 4-7 Flora species recorded within Subject Land and associated species polygons

L.5 Figure 4-8 Fauna Survey Effort, Fauna Sightings and Species Polygons

L.6 Figure 6-2 Location of prescribed impacts where relevant to threatened entities assessed

L.7 Figure 6-3 Habitual flight paths for nomadic and migratory species (wind farms only)

L.8 Figure 7-3 Stage 1 Construction Footprint

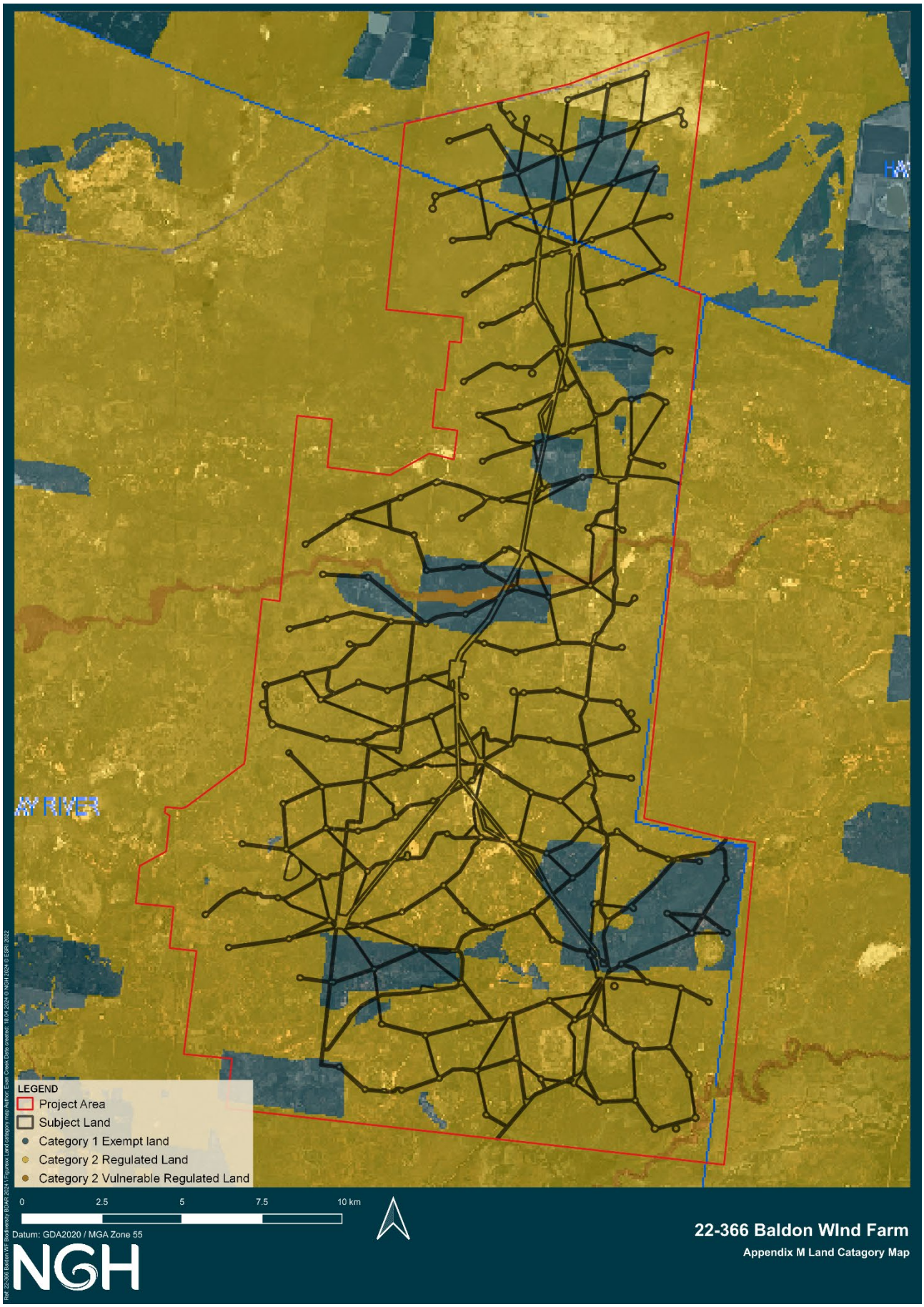
L.9 Figure 7-4 Stage 2 Construction Footprint

L.10 Figure 10-1 Map of threatened entities at risk of SAII

L.11 Figure 11-1 Impacts requiring offsets Stage 1 Development

L.12 Figure 11-2 Impacts requiring offset – Stage 2 Development

Appendix M Draft Land Category Map


LEGEND
Project Area
Subject Land
Category 1 Exempt land
Category 2 Regulated Land
Category 2 Vulnerable Regulated Land
0
2.5
5
7.5
10 km
Datum: GDA2020 / MGA Zone 55
NGH
22-366 Baldon Wind Farm
Appendix M Land Catagory Map

NGH Pty Ltd

NSW • ACT • QLD • VIC

ABN 31 124 444 622 ACN 124 444 622

E: ngh@nghconsulting.com.au

GOLD COAST

2B 34 Tallebudgera Creek Road
Burleigh Heads QLD 4220
(PO Box 424 West Burleigh QLD 4219)

T. (07) 3129 7633

SYDNEY REGION

Unit 17, 21 Mary Street
Surry Hills NSW 2010

T. (02) 8202 8333

BEGA

Suite 11, 89-91 Auckland Street
(PO Box 470)
Bega NSW 2550

T. (02) 6492 8333

MELBOURNE

Level 14, 10-16 Queen Street
Melbourne VIC 3000

T: (03) 7031 9123

TOWNSVILLE

Level 4, 67-75 Denham Street
Townsville QLD 4810

T. (07) 4410 9000

BRISBANE

T3, Level 7, 348 Edward Street
Brisbane QLD 4000

T. (07) 3129 7633

NEWCASTLE - HUNTER & NORTH COAST

Level 1, 31-33 Beaumont Street
Hamilton NSW 2303

T. (02) 4929 2301

WAGGA WAGGA - RIVERINA & WESTERN NSW

35 Kincaid Street (PO Box 5464)
Wagga Wagga NSW 2650

T. (02) 6971 9696

CANBERRA

Unit 8, 27 Yallourn Street
(PO Box 62)
Fyshwick ACT 2609

T. (02) 6280 5053

SUNSHINE COAST

Level 2, 20 Aerodrome Road
Maroochydore QLD 4558

(07) 4410 9000

WODONGA

Unit 2, 83 Hume Street
(PO Box 506)
Wodonga VIC 3690

T. (02) 6067 2533