era
PLANNING
& ENVIRONMENT

St Patricks Plains Wind Farm

Environmental Impact Statement

Final | 29 June 2023

ERA Planning Pty Ltd trading as ERA Planning and Environment

ABN 67 141 991 004

Job Number: 2021-132

Document Status

Document Version	Date	Author	Reviewer
Draft (for EPA review)	3 Feb 2023	Dan Elson	Anahita Jungalwalla
Final (for EPA review)	22 June 2023	Dan Elson	Anahita Jungalwalla
Final V1	29 June 2023	Dan Elson	Anahita Jungalwalla

era
PLANNING
& ENVIRONMENT

Glossary

Abbreviation	Definition
ABN	Australian Business Number
ACN	Australian Company Number
AFAC	Australasian Fire and Emergency Services Authorities Council
ARRB	Australian Road Research Board
AS	Australian Standard
ASS	acid sulfate soil
ATV	all-terrain vehicle
BACI	before/after-control/impact
BESS	battery energy storage system
CEMP	Construction Environmental Management Plan
CFEV	Conservation of Freshwater Ecosystem Values
CGE	computable general equilibrium
CRM	collision risk model
CT	certificate of title
DCCEEW	(Australian Government) Department of Climate Change, Energy, the Environment and Water
dB	decibel
dB LA90	decibel A-weighted 90th percentile
DGV	default guideline value
DNRE	Department of Natural Resources and Environment Tasmania
EIS	Environmental Impact Statement
EMPC Act	*Environmental Management and Pollution Control Act 1994*
EPA	Tasmanian Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPP	Environmental Protection Policy
FPA	Forest Practices Authority

Abbreviation	Definition
FTE	full-time equivalent
GSP	gross state product
IDF	IdentiFlight
LGA	local government area
LIST	Land Information System Tasmania
LOS	level of service
ML	megalitre
MNES	matters of national environmental significance
MW	megawatts
NBES	North Barker Ecosystem Services
NC Act	*Nature Conservation Act 2002*
NGERS	National Greenhouse and Energy Reporting Scheme
NVA	Natural Values Atlas
PASS	potential acid sulfate soil
PEV	protected environmental value
PID	property identification
PSG	project specific guideline
RFA	Regional Forest Agreement
RTA	Roads and Traffic Authority of NSW
TFS	Tasmania Fire Service
TSP Act	*Threatened Species Protection Act 1995*
WBSE	white-bellied sea eagle
WTE	wedge-tailed eagle
WTG	wind turbine generator

Executive summary

St Patricks Plains Wind Farm Pty Ltd, a wholly owned subsidiary of Ark Energy Projects Pty Ltd, is proposing the development of a wind farm in the St Patricks Plains area of the Central Highlands of Tasmania. The wind farm will comprise 47 wind turbine generators (WTGs) with a proposed maximum generating capacity of 300 megawatts, along with ancillary support infrastructure including a new access track network, electrical infrastructure, and an operations facility (the Project). Power generated will be exported via the existing TasNetworks Liapootah-Palmerston 220 kV transmission line onto the Tasmanian grid, significantly increasing Tasmania's renewable energy production.

The construction of the Project will result in a maximum disturbance footprint of up to 481.13 ha (construction footprint). However, once completed, rehabilitated and operational, the actual permanent infrastructure footprint will be approximately 193.88 ha (operational footprint), with 91.09 ha of that footprint subject only to vegetation management (not clearance) for the proposed turbine curtailment system and overhead power line.

The Project is considered a level 2 activity under the *Environmental Management and Pollution Control Act 1994* as it meets the definition of a Wind Energy Facility under that legislation and is also a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* for its potential impacts on matters of national environmental significance. The Project is being assessed as a class 2C project under the bilateral assessment agreement between the Tasmanian and Australian governments. The assessment requires the development of an Environmental Impact Statement (EIS) to address the project specific guidelines (PSGs) developed for the Project by the Tasmanian Environment Protection Authority (EPA) (available online at www.epa.tas.gov.au). A planning permit application will also be lodged with the Central Highlands Council.

This EIS has been developed based on the PSGs supplied by the EPA. For each environmental discipline, the EIS provides a summary of the existing environment, the potential impacts that may arise from the Project, and the management, mitigation and monitoring proposed to prevent the occurrence of unacceptable environmental impacts under state and Commonwealth legislation.

Extensive environmental management has been included for the Tasmanian wedge-tailed eagle, which is resident in the Project area. Significant effort has been made throughout the design phase of the Project to minimise collision risk to eagles from the blades of the WTGs, including the proposed installation of 24 turbine curtailment devices. This technology uses cameras to identify eagles at risk of mid-flight collision and then sends signals to the respective WTGs to curtail (slow or stop) their blade movement. All WTGs will be under the control of at least one curtailment device, with some devices monitoring multiple WTGs. The wind farm layout has also been adapted to avoid areas of known ecological values, particularly known eagle nest sites, which will be protected through the enforcement of a 1 km buffer from all WTGs.

Other environmental considerations for the Project include minimising noise and visual impacts through careful WTG placement; reducing impacts on areas identified as important flora and fauna habitat through the layout of the wind farm; and managing the construction process in an environmentally responsible manner in alignment with all relevant state and Commonwealth legislation.

Traffic generated has been reviewed and impacts addressed. Materials for civil works will be sourced from within Tasmania, and large WTG and electrical infrastructure components will be imported via the Port of Bell Bay near Launceston and delivered by road to the Project Site by specialty vehicles suitable for hauling over-dimensional parts.

Most of the workforce for the Project is expected to be sourced from within Tasmania, with approximately 200 full-time equivalent workers required for the construction period. During operation up to 20 workers will be required to run the wind farm.

The construction of the Project is expected to take approximately 24 months, with an expected commencement date of late 2024.

With the management, mitigation and monitoring measures committed to throughout this document in place, the potential environmental impacts as a result of the Project, in ERA's professional opinion, are manageable and acceptable under state and Commonwealth law.

Overall the Project is considered, in ERA's opinion, to present a net environmental benefit to Tasmania. It does this by significantly increasing the state's production of renewable energy, contributing to Tasmania's renewable energy targets, serving latent load growth and contributing to the state's increased demand for green energy to service existing domestic and commercial demand as well as new industries, such as hydrogen production. This Project would help to lower electricity costs by increasing supply and assist more broadly by contributing to a reduction in carbon emissions from energy production on a nationwide basis.

Contents

Glossary i

Executive summary iii

1 Introduction 1

1.1 Title of proposal 1
1.2 Proposal overview 1
1.3 Proposal location 1
1.4 Project context and background 5
1.5 Legislative framework 5
1.6 Proponent information 6

2 Proposal description 8

2.1 Project overview 8
2.2 Construction overview 8
2.3 Project components 14
2.3.1 Wind turbine generators (WTGs) 14
2.3.2 Electrical system 17
2.3.3 Road network 19
2.3.4 Operations facility 20
2.3.5 WTG curtailment devices 21
2.3.6 Met masts 21
2.3.7 Water supply 22
2.4 Construction 22
2.4.1 Pre-construction phase – micro-siting, detailed design and management plans 22
2.4.2 Construction facilities and equipment 23
2.4.3 Construction materials 24
2.4.4 Construction staffing 25
2.4.5 Construction traffic 26
2.4.6 Construction timeframes 26
2.4.7 Construction methods 27
2.5 Commissioning 29
2.6 Project footprint summary 29
2.7 Operation and maintenance 30
2.8 Offsite infrastructure 31

3 Project alternatives 32

4 Consultation 35

4.1 Engagement undertaken to date 35
4.1.1 Identifying stakeholders 35
4.1.2 Engagement activities 36
4.1.3 Summary of feedback to date 38
4.1.4 Revised layout 38
4.2 Engagement proposed to be undertaken 39
4.3 Engagement with other agencies 39

5 The existing environment 40
5.1 Planning aspects 40
5.1.1 Site location 40
5.1.2 Land tenure and title details 40
5.1.3 Consideration under the Tasmanian Planning Scheme – Central Highlands 42
5.2 Environmental aspects 48
5.3 Socio-economic aspects 53
5.3.1 Background 53
5.3.2 Potential impacts 53

6 Potential impacts and their management 56
6.1 Avifauna 57
6.1.1 Existing environment 57
6.1.2 Legal and other requirements 67
6.1.3 Potential impacts 68
6.1.4 Management, mitigation and monitoring – Eagles 78
6.1.5 Management, mitigation and monitoring – Other avifauna 95
6.1.6 Residual impacts 97
6.2 Terrestrial fauna 99
6.2.1 Existing environment 99
6.2.2 Legal and other requirements 106
6.2.3 Potential impacts – construction 106
6.2.4 Potential impacts - operation 114
6.2.5 Management, mitigation and monitoring 114
6.2.6 Residual impacts 119
6.3 Flora and vegetation communities 121
6.3.1 Existing environment 121
6.3.2 Legal and other requirements 132
6.3.3 Potential impacts 133
6.3.4 Management, mitigation and monitoring 139
6.3.5 Residual impacts 142
6.4 Noise 143
6.4.1 Existing environment 143

6.4.2 Legal and other requirements 144
6.4.3 Potential impacts 145
6.4.4 Management, mitigation and monitoring 152
6.4.5 Residual impacts 153
6.5 Air quality 154
6.5.1 Existing environment 154
6.5.2 Legal and other requirements 154
6.5.3 Potential impacts 154
6.5.4 Management, mitigation and monitoring 155
6.5.5 Residual impacts 156
6.6 Surface water and aquatic fauna 157
6.6.1 Existing environment 157
6.6.2 Legal and other requirements 159
6.6.3 Potential impacts 159
6.6.4 Management, mitigation and monitoring 161
6.6.5 Residual impacts 162
6.7 Groundwater 164
6.7.1 Existing environment 164
6.7.2 Legal and other requirements 164
6.7.3 Potential impacts 164
6.7.4 Management, mitigation and monitoring 165
6.7.5 Residual impacts 165
6.8 Waste management 166
6.8.1 Legal and other requirements 166
6.8.2 Potential impacts 166
6.8.3 Management, mitigation and monitoring 167
6.8.4 Residual impacts 168
6.9 Dangerous goods and environmentally hazardous materials 169
6.9.1 Legal and other requirements 169
6.9.2 Potential impacts 169
6.9.3 Management, mitigation and monitoring 170
6.9.4 Residual impacts 171
6.10 Natural values 172
6.10.1 Existing environment 172
6.10.2 Potential impacts 173
6.10.3 Management, mitigation and monitoring 174
6.10.4 Residual impacts 175
6.11 Greenhouse gases 177
6.12 Infrastructure and offsite facilities 178
6.12.1 Port 178
6.12.2 Roads and associated infrastructure 178
6.12.3 Quarries 178

6.12.4 Electrical infrastructure 179
6.12.5 Accommodation 179
6.13 Cumulative and interactive impacts 180
6.14 Traffic 181
6.14.1 Construction traffic 181
6.14.2 Operational traffic 183
6.14.3 Potential impacts, management and mitigation 183
6.15 Visual 186
6.15.1 Landscape and visual impact analysis 186
6.15.2 Consideration of black blade 190
6.15.3 Blade glint 190
6.15.4 Shadow flicker 190
6.15.5 Summary of management measures 193
6.16 Fire risk 194

7 EPBC Act assessment 196
7.1 Referral details 196
7.2 Matters of national environmental significance 196
7.3 Assessment of relevant matters against MNES Significant Impact Guidelines 197
7.3.1 Endangered species 197
7.3.2 Vulnerable species 197
7.4 Offsets 213
7.4.1 Tasmanian wedge-tailed eagle offset proposal 213
7.4.2 Tasmanian devil offset proposal 216
7.5 Summary of matters specified in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 220

8 Monitoring and review 221
8.1 Construction phase monitoring 221
8.2 Operational phase monitoring 223

9 Decommissioning and rehabilitation 224
9.1 Construction 224
9.2 Operation 224
9.3 Summary 225

10 Management measures 226

11 Conclusion 243

12 References 246

Appendix A **General design principles**

Appendix B **Avifauna reports**

Appendix C **Terrestrial flora and fauna report**

Appendix D **Noise assessment**

Appendix E **Background noise assessment**

Appendix F **Socio-economic report**

Appendix G **Traffic impact assessment**

Appendix H **Visual impact assessment**

Appendix I **Shadow flicker assessment**

Appendix J **Hydrogeology report**

Appendix K **Reconnaissance acid sulfate soils report**

Appendix L **EPA Tasmania avian mortality monitoring plan guidelines**

Figures

Figure 1-1 Project location 3
Figure 1-2 Project site details 4
Figure 2-1 Operational site plan 10
Figure 2-2 Construction site plan 12
Figure 2-3 WTG schematic 16
Figure 2-4 WTG ground disturbance during construction and operation 17
Figure 2-5 Electrical system schematic 19
Figure 2-6 Typical road cross section (Project roads will have a trafficable width of 5.5 – 6.0 m) 20
Figure 3-1 Land considerations 34
Figure 5-1 Land zoning 46
Figure 5-2 Land tenure 47
Figure 5-3 Wind rose for the Project Site area (Ark Energy met mast data from 10 July 2019 to 18 April 2022) 50
Figure 5-4 ASS mapping 51
Figure 5-5 Reserves 52
Figure 6-1 Eagle nests 60
Figure 6-2 Eagle flight paths 61
Figure 6-3 Eagle probability contour map of all seasons combined (cross-hatched areas are considered to have low visibility) (Symbolix, 2021) 62
Figure 6-4 Eagle probability contour map by season (Symbolix, 2021) 63

Figure 6-5 Levels of avifauna avoidance of WTGs. Arrowed lines present flights with macro, meso and micro-avoidance of WTGs 69
Figure 6-6 Lathams snipe habitat suitability and records 75
Figure 6-7 Tasmanian masked owl habitat suitability and records 76
Figure 6-8 Australasian bittern habitat suitability and records 77
Figure 6-9 Example of black painted WTG blade used to decrease motion blur (May, et al., 2020) 85
Figure 6-10 Stratification of Devil denning habitat suitability prior to disturbance (NBES, 2023b) 101
Figure 6-11 Left image shows Miena jewel beetle emergence hole from the Project Site (NBES, 2023b); right images shows an example of an adult beetle (DPIPWE, 2021a) 102
Figure 6-12 Male (left) and female (right) ptunarra brown butterfly images from the Project Site (NBES, 2023b) 103
Figure 6-13 Miena jewel beetle habitat from NBES (2023b) survey 104
Figure 6-14 Ptunarra brown butterfly habitat from NBES (2023b) survey 105
Figure 6-15 Public roads predicted to have a 10% or greater increase in traffic during construction 113
Figure 6-16 Vegetation mapping 124
Figure 6-17 Threatened flora records 128
Figure 6-18 Estimated airblast overpressure levels for Ka = 50 and a = -1.45 (Marshall Day, 2023) 148
Figure 6-19 Noise sensitive receivers with modelled noise contours 151
Figure 6-20 Surface water 158
Figure 6-21 CFEV waterbodies 176
Figure 6-22 Photomontage view from Highland Lakes Road near Steppes Hall 188
Figure 6-23 Photomontage view from Poatina Road 189

Tables

Table 2-1 Proposed maximum WTG parameters 14
Table 2-2 Construction raw material estimates 24
Table 2-3 Proposed construction schedule 27
Table 2-4 Operational Project footprint summary 30
Table 5-1 Title details 41
Table 5-2 Applicable codes 45
Table 5-3 Computable general equilibrium (CGE) modelling outputs for the Project 54
Table 6-1 Listed avifauna species with potential to occur in the Project Site 65
Table 6-2 Modelled unmitigated annual collisions for target species by avoidance rate 69
Table 6-3 Predicted annual collisions for WTE by avoidance rate with mitigation 97
Table 6-4 Summary of distribution of denning habitat classes in relation to proposed footprint (Source: NBES) 107
Table 6-5 Predicted increase in traffic movement on public roads during construction 111
Table 6-6 TASVEG mapping units identified in the Project Site 123
Table 6-7 Listed flora species identified in the Project Site 125
Table 6-8 Native vegetation community impacts 135
Table 6-9 Example construction machinery and task sound power levels 146
Table 6-10 Indicative range of construction noise predictions 146
Table 6-11 Summary of construction phase traffic generation 183
Table 6-12 Theoretical and predicted actual annual shadow flicker duration 192
Table 7-1 Assessment of endangered species against EPBC Act Significant Impact Criteria 199
Table 7-2 Assessment of vulnerable species against EPBC Act Significant Impact Criteria 208
Table 7-3 Assessment of proposed wedge-tailed eagle offset against the EPBC Act offset principles 214
Table 7-4 Assessment of proposed Tasmanian devil offset against the EPBC Act offset principles 217
Table 7-5 Summary of response to Schedule 4 of the EPBC Regulations 2000 220

Table 8-1 Construction phase monitoring 221
Table 8-2 Operational phase monitoring 223
Table 10-1 Summary of management and mitigation measures 226

1 Introduction

1.1 Title of proposal

This Environmental Impact Statement (EIS) has been prepared to seek approval for the proposed **St Patricks Plains Wind Farm.**

1.2 Proposal overview

St Patricks Plains Wind Farm Pty Ltd, a wholly owned subsidiary of Ark Energy Projects Pty Ltd (the Proponent), is proposing the development of a wind farm in the St Patricks Plains area of the Central Highlands of Tasmania. The wind farm will comprise 47 wind turbine generators (WTGs) with a proposed maximum generating capacity of 300 megawatts (MW), with the power generated to be exported via TasNetworks transmission lines (the Project).

Ancillary features of the Project include electrical equipment and facilities, distribution infrastructure, a network of all-weather roads and tracks, a battery energy storage system (BESS), permanent met masts, turbine curtailment technology, and an operations facility.

The construction of the Project will result in a maximum disturbance footprint of 481.13 ha (construction footprint) (shown in Figure 2-2); however, once completed, rehabilitated and operational, the actual permanent infrastructure footprint will be 193.88 ha (operational footprint) (shown in Figure 2-1); a summary table of the operational footprint is provided in Table 2-4.

The proposed Project will involve a capital expenditure of approximately $540 million and will look to employ approximately 200 workers during peak construction and up to 20 full-time equivalent (FTE) workers during the operational phase. The workforce will preferentially be sourced regionally or more broadly from within Tasmania where possible.

WTG components will be imported to TasPorts' Bell Bay facility in northern Tasmania and trucked to site. All remaining construction materials will be sourced regionally or from within Tasmania.

Construction of the Project is planned to commence in late 2024 and is expected to take approximately 24 months to complete. The completed Project will have an operational life of 30 years but is expected to continue past this timeframe with ongoing refurbishment of the infrastructure as required.

1.3 Proposal location

The proposed Project will occur within the St Patricks Plains area of the Central Highlands of Tasmania. The nearest town to the Project is Miena, which is approximately 10 km to the north-west, adjacent to the Great Lake; the town includes tourist accommodation, restaurants and a hotel. The highland lakes area is a popular holiday and fishing destination, which results in a fluctuating population density, with many holiday shacks spread throughout the region, including in areas adjacent to the proposed Project Site.

The closest population centres are Bothwell ~35 km to the south and Miena ~10 km to the north. The Project Site is isolated from the larger Tasmanian cities of Burnie, Devonport, Launceston and Hobart.

The Project occurs on approximately 10,000 ha of land over 15 titles:

- 'Wihareja' – 4244a Waddamana Road, Steppes, Tas 7030 (Titles 100672/1 and 156999/1)
- 'St Patricks Plains' – 6011 Highland Lakes Road, Steppes, TAS 7030 (Titles 182190/1 and 182189/1)
- 'The Ripple (North)' – 6300 Highland Lakes Road, Steppes, TAS 7030 (Title 126982/1)
- 'The Ripple (South)' – Highland Lakes Road, Steppes, TAS 7030 (Title 126983/1)

- ‘Ripple Lodge’ – 6212 Highland Lakes Road, Steppes, TAS 7030 (Title 124603/1)
- ‘Allwrights Lagoons’ – Penstock Road, Shannon, TAS 7030 (Titles 205991/1, 100081/65, 100080/2 and 100080/3)
- ‘Christian Marsh’ – 5057 Highland Lakes Road, Steppes, TAS 7030 (Titles 241119/1, 241119/2, 148905/1 and 148905/2).

Collectively, these land parcels are referred to as ‘the Land’ for permitting purposes and define the area in which the level 2 activity will occur. Throughout this document, the Land is referred to as the Project Site. The Project Site general location is illustrated in Figure 1-1, with the Project Site features such as waterways, roads, topography, and closest sensitive receiver shown Figure 1-2.

There are a small number of residential properties within and adjacent to the Project Site. All owners of residential properties within the Project Site and select properties neighbouring the Project Site are involved with the Project, with commercial agreements in place with the Proponent. They are therefore considered differently to those residential properties not commercially involved when assessing certain environmental aspects of the Project, including noise. These two types of residential premises, marked as involved or uninvolved accordingly, are shown in Figure 6-19.

Project site (the Land)

EXISTING INFRASTRUCTURE

Towns/communities

Roads

NATURAL FEATURES

Rivers and streams

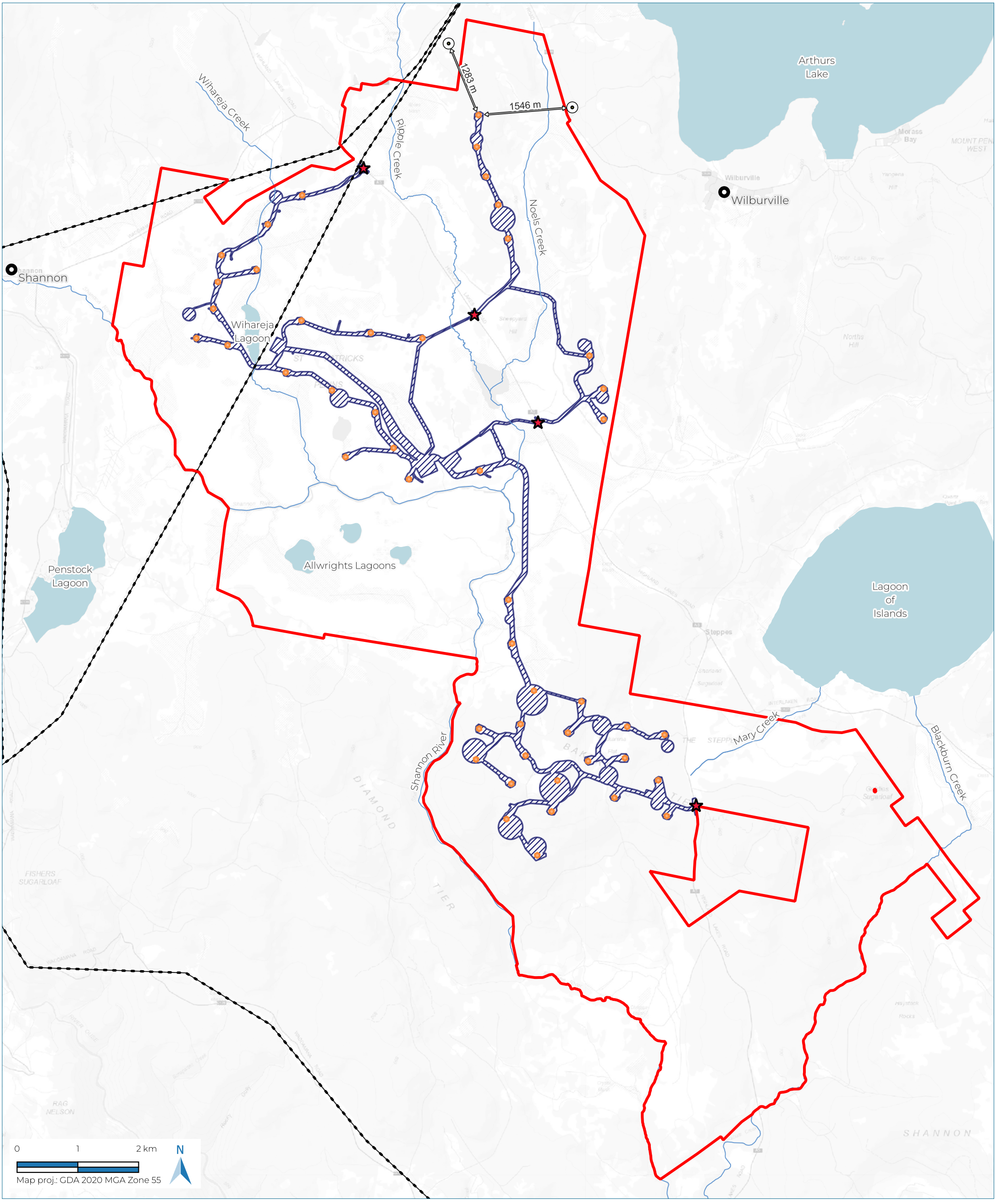
ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 1-1
Project Location



Project site (the Land)

EXISTING INFRASTRUCTURE

- Closest non-involved sensitive receivers *
- Towns/communities
- Power line

NATURAL FEATURES

- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE

- Access location
- Construction footprint
- Wind Turbine

* Involved and non-involved receivers are defined in Section 6.4 and are subject to change as discussions between Landowners and the Proponent are ongoing.

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 1-2
Project site details

1.4 Project context and background

The St Patricks Plains site was identified by the Proponent as a potential wind farm site owing to its strong and consistent winds, large freehold land parcels, isolation from population centres, and access to existing electrical transmission infrastructure (the Liapootah-Palmerston 220 kV transmission line).

The Proponent's other projects in Tasmania include the Western Plains Wind Farm in Stanley (12 WTGs), the Guildford Wind Farm near Waratah in north-west Tasmania (~80 WTGs), and the Hellyer Wind Farm south of Burnie (~40 WTGs), which are all currently in the project approval phase. The Proponent also gained approval for two solar farms in the north of the state.

The Project is located north east of the 144 MW Cattle Hill Wind Farm (the nearest proposed WTG lies approximately 10 km from the nearest existing Cattle Hill WTG), which is on the eastern shore of Lake Echo and includes 48 Goldwind 3 MW WTGs. The Cattle Hill Wind Farm became operational in 2020 and employs nine full-time workers and an equal number of FTE contractors.

The remaining wind farm projects in the North East and North West Renewable Energy Zones in Tasmania are generally coastal projects, which are in various phases, including operational, approval and developmental.

The Proponent will look to build on the success of existing wind farms in Tasmania, contributing towards Australia's green energy target and working with Tasmanians to make the State Government's 2040 renewable energy target of 200% generation a working reality.

While the Proponent is involved in several other wind energy projects in the state, this Project is proposed in isolation and does not rely upon or directly connect to any other project.

1.5 Legislative framework

Wind farms are considered level 2 activities under the *Environmental Management and Pollution Control Act 1994* (EMPC Act) if they meet the definition of a Wind Energy Facility as outlined under Schedule 2 (7)(f) of the Act, namely *'facilities for generating energy through wind with a maximum generating capacity of 30 megawatts or more'*.

As the Project exceeds the 30 MW threshold, the Proponent submitted a Notice of Intent (NOI) for the Project to the Environment Protection Authority Tasmania (EPA) on 7 June 2019. Following receipt of the NOI, the EPA responded in a letter dated 22 July 2019 with the advice that the Project would require a class 2C assessment under the EMPC Act. On 28 October 2019, the EPA issued project specific guidelines (PSGs) for the Project, requiring the submission of an Environmental Impact Statement (EIS) (this document). The EPA also issued two letters amending the PSGs, one dated 15 November 2019, instructing the Proponent to incorporate fire risk into the EIS, and the other dated 23 February 2022 amending the noise assessment requirements for the Project.

This EIS has been prepared in accordance with those PSGs and amendment letters, and the EPA *Guidelines for Preparing an Environmental Impact Statement* (March 2019). Both guideline documents are available on the EPA website at the time of publishing.

The Project will be subject to assessment under Section 25 of the EMPC Act through the lodgement of a planning permit application to the Central Highlands Council (along with a copy of this EIS), which will then be referred by the Council to the EPA for assessment.

The Project was also referred under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) (which was the Department of Environment and Energy at the time of referral), as it was assessed that the Project had the potential to significantly impact several matters of national environmental significance (MNES).

In September 2019 the DCCEEW notified the Proponent that the Project would be a controlled action and would therefore require Australian Government approval under the EPBC Act. The referral number for the Project is 2019 / 8497. The Proponent has elected that the Project be assessed under the bilateral assessment agreement between the State and Australian governments.

In addition to the above statutory approval process, the proposed Project must also comply with a broad range of environmental and planning legislation, guidelines, standards and policies as described in the relevant sections of this EIS. Some of the key acts, regulations and policies most relevant to the Project include the following (noting that further detail on the application of these and other documents is provided in the relevant sections of this EIS):

- *Environmental Management and Pollution Control Act 1994*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Threatened Species Protection Act 1995*
- *Nature Conservation Act 2002*
- *Forest Practices Act 1985* and associated regulations and policies
- *Weed Management Act 1999*
- *Water Management Act 1999*
- *Inland Fisheries Act 1995*
- *Dangerous Substances (Safe Handling) Act 2005* and associated regulations
- *Dangerous Goods (Road and Rail Transport) Act 2010* and associated regulations
- *Environmental Management and Pollution Control (Noise) Regulations 2016*
- *Environmental Management and Pollution Control (Waste Management) Regulations 2020*
- *Tasmanian Environmental Protection Policy (Noise) 2009*
- *Tasmanian Environment Protection Policy (Air Quality) 2004*
- *State Policy on Water Quality Management 1997*
- *Work Health and Safety Regulations 2012.*

1.6 Proponent information

The Proponent is St Patricks Plains Wind Farm Pty Ltd, a wholly owned subsidiary of Ark Energy Projects Pty Ltd (Ark Energy) and was formerly Epuron Projects Pty Ltd. Epuron Projects was purchased by Ark Energy Corporation Pty Ltd on 5 May 2022, part-way through the development of approvals for the Project.

Ark Energy Corporation is an Australian subsidiary of Korea Zinc Co. Ltd, which is the largest zinc, lead and silver producer in the world. Established in January 2021, Ark Energy's mandate is to decarbonise the energy supply of the Korea Zinc group, starting with Sun Metals Corporation Pty Ltd in Townsville, North Queensland. In November 2020, Sun Metals joined RE100 and aims to become the first refinery in the world to produce green zinc. The company has a hydrogen project and a mission to become the safest and most competitive producer of green hydrogen in the world.

Ark Energy has a focus on greenfield development of utility-scale wind and solar energy projects in Australia. Incorporating Epuron, which was established in 2003, Ark Energy is the pre-eminent wind farm developer in NSW and one of the most experienced renewable energy developers in the Australian market.

Ark Energy has secured approvals for 10 large-scale wind farms including four in New South Wales that are now in operation, and three in New South Wales and three in Queensland that are in pre-construction or under construction. The team has also developed eight solar farms currently in operation.

Ark Energy has offices in Sydney, Brisbane and Townsville. It is a key driver of progress in the renewable energy sector in Australia and has a large portfolio of renewable energy assets and projects in development across New South Wales, Queensland, the Northern Territory and Tasmania.

There are no proceedings and have not been any proceedings against Ark Energy under a Commonwealth, state or territory law for the protection of the environment or the conservation of sustainable use of natural resources.

Ark Energy is committed in its business activities to abiding by the principles of ecologically sustainable development. Ark Energy's mission is to produce electricity through the commercialisation of renewable energy resources and Ark Energy is proud of its environmental, health and safety records and continues to maintain and develop policies and procedures that endorse and support them.

All documents referencing Epuron, Epuron Projects, Ark Energy or Ark Energy Projects should be taken to refer to St Patricks Plains Wind Farm Pty Ltd.

St Patricks Plains Wind Farm Pty Ltd is a special purpose vehicle that enables the Project to be a separate, transferable business entity.

Proponent and activity operator details are as follows.

Name of Proponent (legal entity): St Patricks Plains Wind Farm Pty Ltd
Name of Proponent (trading name): St Patricks Plains Wind Farm
Registered and Postal Address of Proponent: Level 2, 275 George Street, Sydney, NSW 2000
ABN: 99 665 062 493
ACN: 665 062 493
Contact Person: Donna Bolton
Phone: 1800 731 296
Email: info@stpatricksplainswindfarm.com.au

2 Proposal description

2.1 Project overview

The proposed Project is the development of a 47 WTG wind farm at St Patricks Plains with a generating capacity of up to 300 MW. The final generating capacity of the Project will depend on the WTG model selected, which will be chosen post-approval to ensure the most efficient and suitable WTG for the Project Site is used.

The Project includes an electrical reticulation system to collect and distribute the power generated, which will consist of a substation with transformer, underground 33 kV cabling from the WTGs to the substation, and an overhead (or potentially underground) 220 kV transmission line from the substation to a switchyard where the Project will connect to the existing TasNetworks Liapootah-Palmerston 220 kV transmission line. A BESS will be located alongside the substation to assist with the control of the output from the Project; it is anticipated this would be sized at between 70 and 140 MWh.

Approximately 52.5 km of all-weather access tracks will be required within the Project Site during the construction and operational phases. This includes development of new tracks and upgrades to existing tracks where suitable.

An operations facility with a storage area and a large workshop also forms part of the Project.

Two meteorological masts (met masts) will be installed within the Project Site to collect data on variables such as wind speed and wind direction. Note there are currently two temporary met masts on site which will be removed following the installation of the new met masts.

There will be 24 automated WTG curtailment units on simple towers of varying heights installed across the Project Site to minimise eagle impacts by reducing or halting WTG blades when the system identifies an approaching eagle. The 24 units will collectively control all 47 WTGs. Power and communications for these units will be installed in the underground reticulation trenches back to the operations facility.

More detailed descriptions of the various Project components are provided in the following sections and illustrated in the operational site plan in Figure 2-1 (this layout is indicative and subject to micro siting, as discussed in Section 2.4.1). All Project works will be contained within the Project Site, including the connection to the existing transmission line.

Prior to the commencement of construction, a final design and layout of the Project will be detailed in a Wind Farm Design Report, which will be provided to the EPA.

2.2 Construction overview

The construction of the Project is expected to take approximately two years and will involve a construction team of approximately 200 workers during peak periods. Given the remote location of the site, the majority of the construction team will be working on a drive-in drive-out basis and stationed at either a temporary camp outside the Project Site (excluded from this application) or spread over local and regionally available accommodation in towns such as Bothwell and Miena. This will be determined post-approval of the Project.

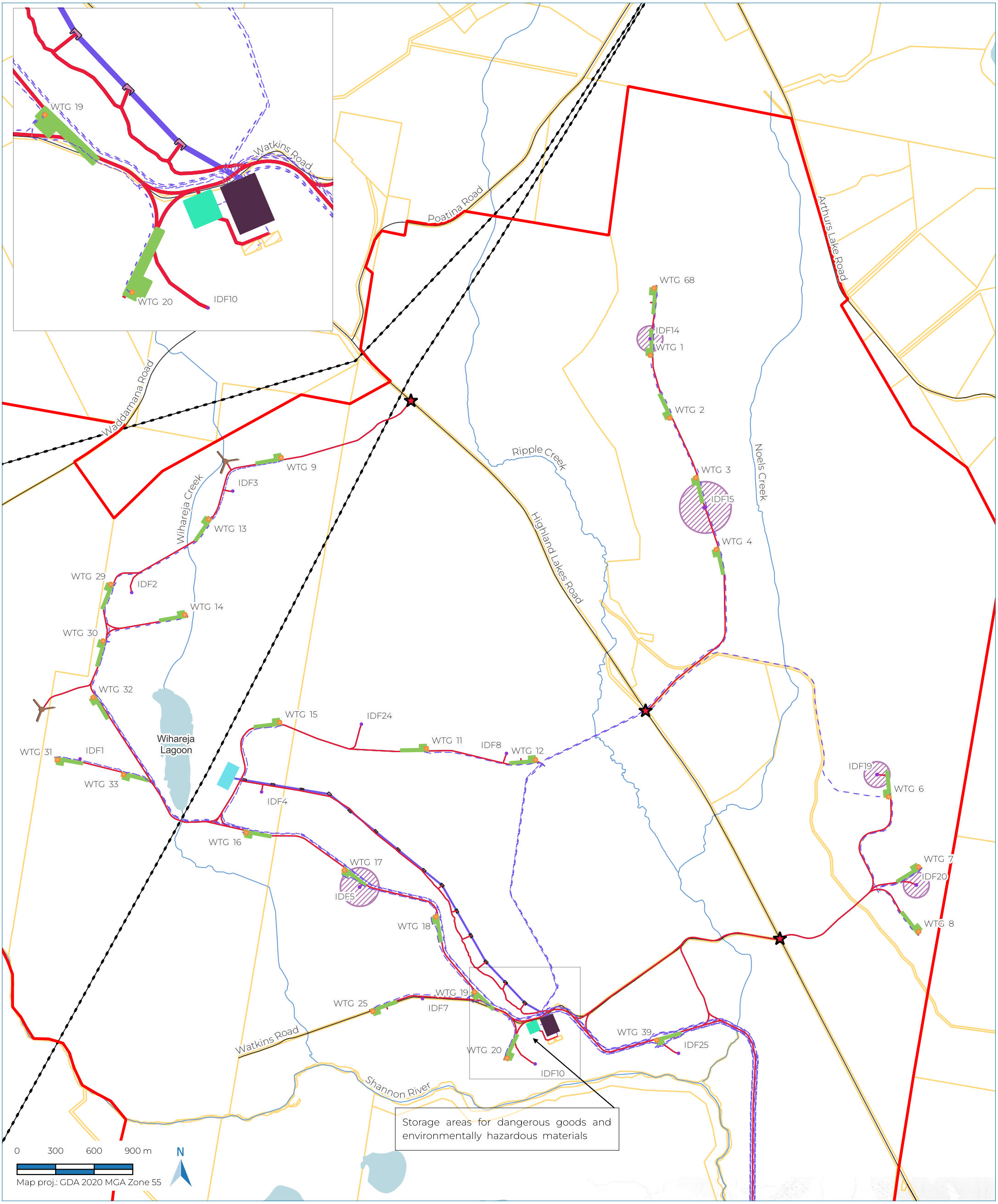
All components and materials will be brought to Project Site via existing road networks, with the majority of WTG components being transported from the Bell Bay Port to the Project Site via the predetermined routes outlined in Section 6.14. Materials will be sourced from a variety of locations, including local and regional quarries and material supply depots further afield around Tasmania. Water will be sourced from the Project Site (refer Section 2.4.3.1).

Temporary construction compounds consisting of crib rooms, amenities and storage containers will be built in the north and south of the Project Site for the workforce.

Concrete will be batched on site at temporary plants to be located in the north and south of the Project Site adjacent to the construction compound in the north and laydown area in the south, as shown in Figure 2-2.

Additional construction infrastructure will include bunded refuelling facilities, a washdown bay, and water supply pumps and tanks.

More detailed descriptions of the construction process and components are presented in Section 2.4, and a construction site plan is provided in Figure 2-2 (this layout is indicative and subject to micro siting, as discussed in Section 2.4.1).



Project site (the Land)

EXISTING INFRASTRUCTURE
- Roads
- Power line
- Parcels

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

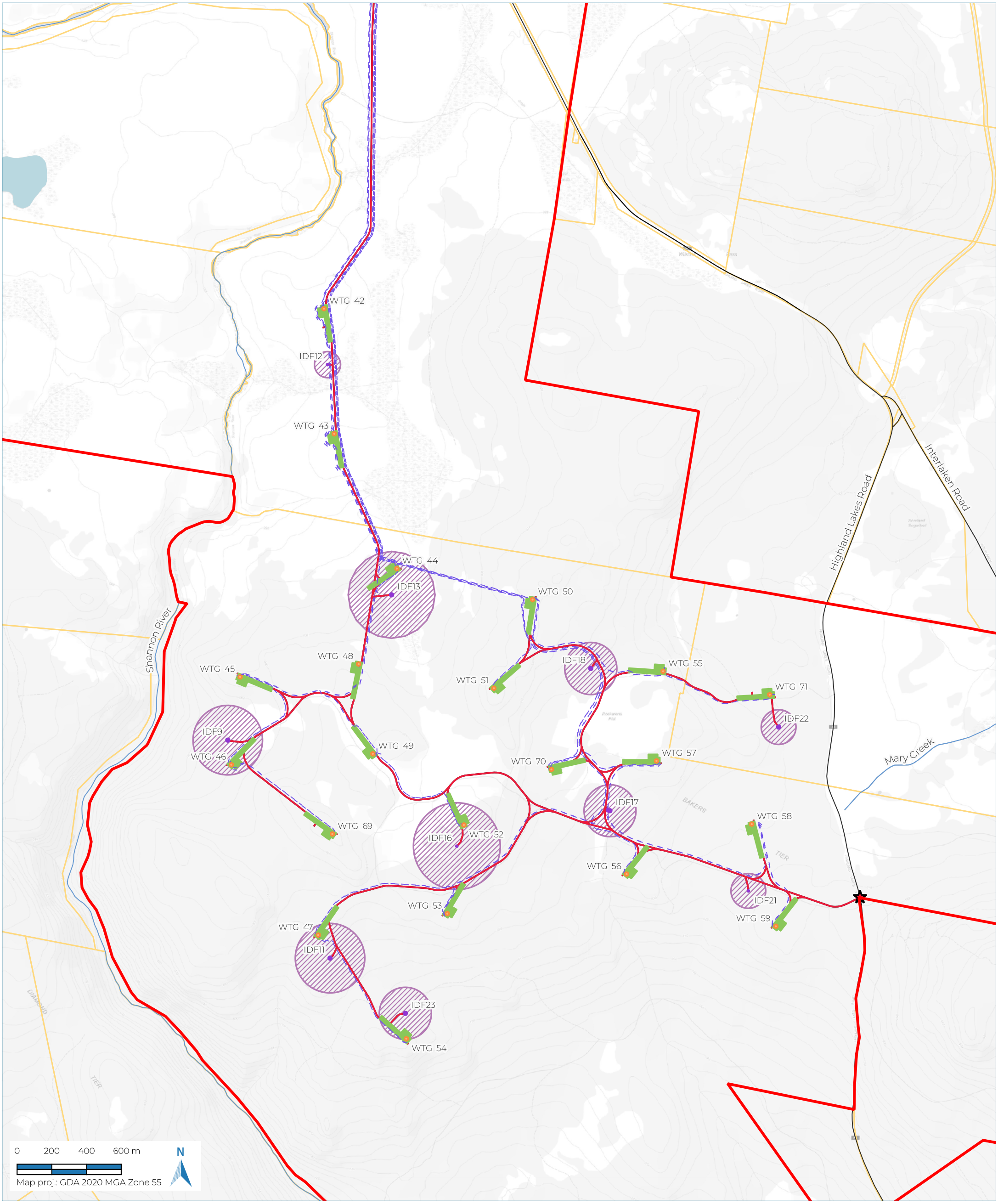
PROPOSED INFRASTRUCTURE
- Access location
- Wind Turbine
- Turbine curtailment device
- Met mast
- Battery energy storage system
- Hardstands
- Overhead poweline pole
- Operations facility
- Substation
- Switchyard
- Turbine curtailment device radial clearing
- Overhead powerline
- Proposed road
- Underground reticulation

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 2-1a
Operational layout (north)



Project site (the Land)

EXISTING INFRASTRUCTURE
- Roads

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Access location
- Wind Turbine
- Turbine curtailment device
- Hardstands
- Proposed road
- Underground reticulation
- Turbine curtailment device radial clearing

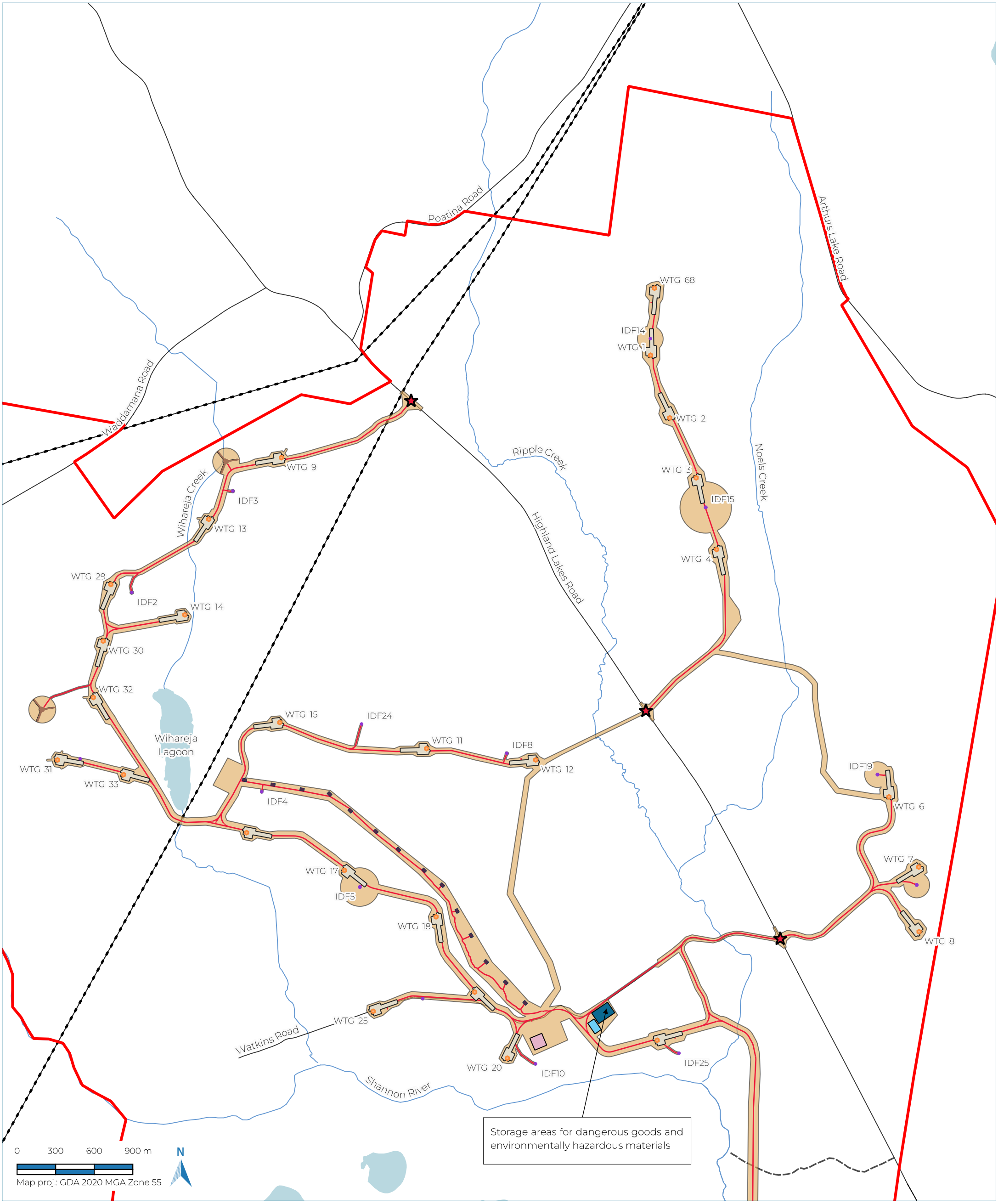
ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 2-1b
Operational layout (south)



Project site (the Land)

EXISTING INFRASTRUCTURE
- Roads
- Power line

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Access location
- Wind Turbine
- Turbine curtailment device
- Met mast
- Proposed road
- WTG construction hardstand
- Construction footprint
- Laydown area
- Batch plant
- Construction compound
- Overhead pole clearing

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 2-2a
Construction site plan (north)

WTG 20
IDF10
IDF25
Shannon river abstraction point
WTG 42
IDF12
WTG 43
WTG 44
IDF13
WTG 50
WTG 48
WTG 45
WTG 51
WTG 55
WTG 71
IDF22
IDF9
WTG 49
WTG 70
WTG 57
WTG 46
IDF17
WTG 58
WTG 52
IDF16
WTG 69
WTG 56
IDF21
WTG 47
WTG 53
WTG 59
IDF11
IDF23
WTG 54
Storage areas for dangerous goods and environmentally hazardous materials
Lagoon of Islands
Interlaken Road
Highland Lakes Road
Mary Creek
Shannon River
0 300 600 900 m
N
Map proj.: GDA 2020 MGA Zone 55

Project site (the Land)

EXISTING INFRASTRUCTURE
- Roads
- Access track

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Access location
- Wind Turbine
- Turbine curtailment device
- Proposed road
- WTG construction hardstand
- Construction footprint
- Laydown area
- Batch plant
- Construction compound

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 2-2b
Construction site plan (south)

2.3 Project components

2.3.1 Wind turbine generators (WTGs)

The WTGs to be used for the Project will be of a standard three blade design, with a nacelle[1] containing all the motor and electrical components sitting atop a tubular steel or concrete tower. A central hub attached to the nacelle will support the three blades, which will likely be constructed of a composite material (e.g. fibreglass reinforced with epoxy, carbon fibre, and solid metal tip).

The current candidate WTG is the Vestas V162, which comes in a variety of power generating versions, currently from 5.6 MW to 6.2 MW models. There are also other, higher rated models using the same dimensions on the design horizon, including a 7.2 MW version. The 6.2 MW version has been used for the various studies completed for this assessment, as it is expected to be comparatively close to the final model used for the Project.

The final model will be selected post approval, as new models are becoming available regularly; the Project will seek to have the most efficient WTG model available at the time of construction to reach the 300 MW Project limit. It is important to note that the final model chosen will be constrained to the physical envelope and characteristics of the candidate model used for this assessment, including the footprint, dimensions and noise-generation potential. The final output of the Project will not exceed 300 MW; therefore only a reduction, not an increase, in WTG numbers from a total of 47 is possible.

Each WTG will sit atop a concrete foundation with a diameter of 20–30 m, which will extend typically 3–5 m below ground level and may include piling or rock anchors, depending on geotechnical conditions encountered at each WTG location on site, for anchoring support. The concrete foundation volume will be around 700 m^3 and surrounded by a permanent gravel hardstand to allow access and ongoing maintenance for the WTG. This will collectively make up the ground disturbance footprint of each WTG during operation; with 47 WTGs, this equates to approximately 43 ha.

The final footprint of each WTG will be approximately half of the total disturbance required at each WTG location during the construction phase, when temporary sections of hardstand will be required for multiple cranes and WTG components. An example of the construction WTG footprint arrangement and general layout with permanent and construction disturbance areas is shown diagrammatically in Figure 2-4 and Appendix A. A maintenance laydown area, shown in Figure 2-4, will be retained for the use of cranes during maintenance works; this area will be allowed to partially regenerate with grasses, but will retain structural integrity to still allow crane operations to occur as required.

The proposed maximum measurement values, including the permanent hardstand area following construction for the various WTG parameters are summarised in Table 2-1, with the parameters illustrated in Figure 2-3.

Table 2-1 Proposed maximum WTG parameters

WTG parameter	Maximum value
Rotor diameter	162 m
Blade length	80 m
Rotor swept area	20,612 m^2
Maximum blade tip height	231 m
Hub height	150 m

[1] A nacelle is a cover that houses generating components in a wind turbine, which sits atop the turbine tower behind the blades.

WTG parameter	Maximum value
Total WTG construction hardstand	1.1 ha
Total WTG permanent hardstand	0.92 ha

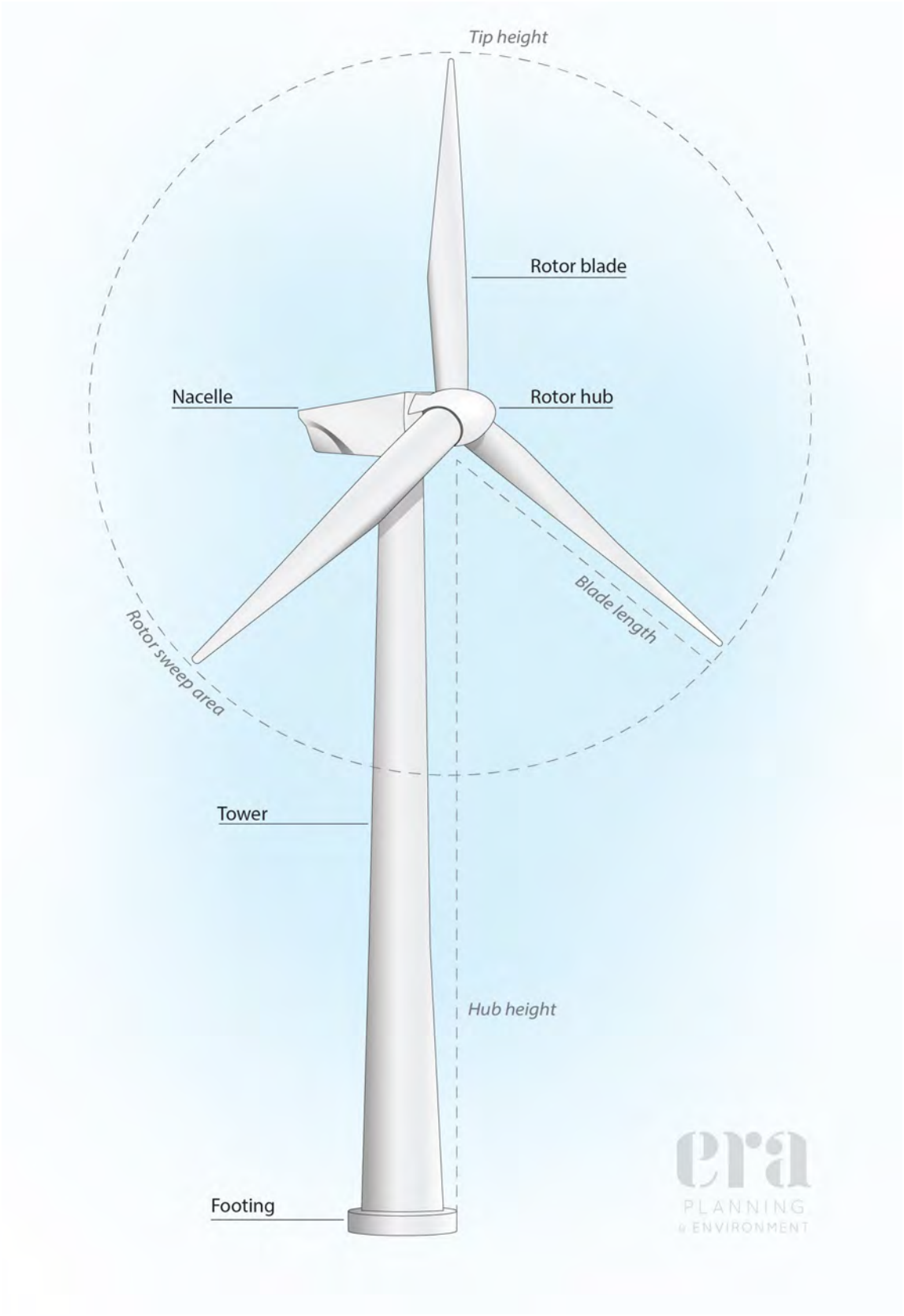


Figure 2-3 WTG schematic

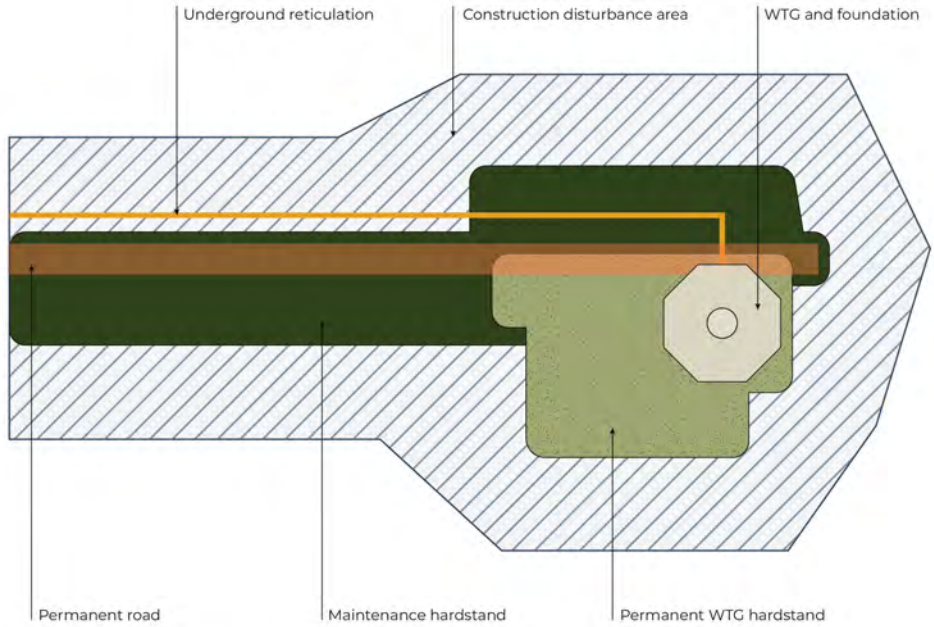


Figure 2-4 WTG ground disturbance during construction and operation

The WTGs can operate in a wind speed range of approximately 3–25 m/s (10.8 – 90 km/hr). The energy from the WTG blades will be captured via a central shaft within the nacelle attached to the WTG hub, which is then transferred to a generator either via a series of gears or a direct drive system. The power generated is then fed via cabling inside the tower structure into the electrical reticulation of the Project.

To ensure energy collection is optimised, WTGs will include a control system that will change the yaw or rotation of the nacelle via a mechanical swivel system to ensure the optimal wind direction is faced. Also, the control system will be able to change the pitch of the blades to suit the wind conditions.

During winds exceeding the design capacity of the WTG (in this case >25 m/s or 90 km/hr), the control system will pitch the blades to an angle to slow or stop rotation, ensuring the integrity of the internal mechanics of the system is maintained. A braking system is also integrated into the design of the WTG that can halt or slow rotation as required, including during maintenance, extreme weather events or when curtailment is required (e.g. to avoid eagle collision).

Each WTG will require an approximately annual routine service, which will take in the order of one week to be completed by an onsite operational maintenance crew of 4 to 5 workers. Maintenance crews will work year-round with the 47 WTG layout proposed.

2.3.2 Electrical system

The Project's electrical system will consist of five main components:

- The underground 33 kV electrical cabling from the WTGs to the substation
- A substation that will collect the power from the WTGs
- A transmission powerline (to be either overhead or underground subject to final design) that will transfer the power from the substation to a switchyard
- A switchyard that will connect to the existing TasNetworks Liapootah-Palmerston 220 kV transmission line via a new overhead transmission line

- Two battery stations to assist in smoothing of power delivery to the transmission system as required

This arrangement is summarised in the electrical system schematic in Figure 2-5. The final arrangement of the electrical infrastructure will not be known until final designs are completed. The disturbance footprint for the various electrical infrastructure is summarised in Section 2.6. The disturbance footprint used for the purposes of vegetation clearance calculations has been sized to ensure a conservative approach. Where possible, priority will be given to disturbance of non-native vegetation over native.

The base of each WTG will connect to a buried 33 kV electrical cable that will be trenched to the substation, typically alongside the access road, and groups of four to five WTGs will be connected in strings. As cables are joined by those from other groups of WTGs, these cables will then continue underground trenched in parallel, typically along the main arterial roads, to the substation.

Individual cable trenches will be approximately 1.2 m deep and 0.6 m wide. Towards the substation, where multiple cables will align, the total width of trenching alongside arterial roads will increase proportionally. Cables trenched in parallel must be spaced apart to minimise any electrical interference issues between the cables.

In total there is expected to be approximately 84 km of trenched cable (noting some cables will be trenched parallel), the ground disturbance of which has been included in the overall site disturbance.

The buried cable network will resurface and connect at the substation, which will subsequently convert the incoming 33 kV electricity to 220 kV via transformers and other related electrical infrastructure. The substation will consist of various electrical infrastructure which will be housed on an approximate 150 m x 170 m fenced concrete and gravel slab.

Once transformed to 220 kV, the power will then be transferred from the substation via double circuit overhead or underground powerlines to the next stage in the power transition process, the switchyard. If overhead powerlines are adopted this would be 220 kV double circuit monopole structures with a height of approximately 40 m. The final number of overhead powerlines would depend on the final Project layout and geotechnical results, but with the current proposed layout, 14 towers are proposed. Each tower will require an approximate 20 m x 30 m clearance area to allow construction, totalling 0.84 ha. Once the towers are constructed, the ground will be either revegetated or left to re-establish. The spans of wires between the towers are unlikely to need vegetation clearance other than potential trimming of occasional tree limbs; an allowance of 3.94 ha has been provided in the operational footprint for vegetation maintenance.

The BESS will be positioned next to the substation, which the batteries will be connected to. Each battery station may consist of multiple batteries and transformers with a total indicative capacity per station of 30 MW. Example sizing of a battery pack unit is approximately 14.4 m x 3.4 m and transformer approximately 3.5 m x 3.5 m; the BESS will be set on an approximate 28 m x 52 m concrete slab and gravel area with adequate spacing for servicing.

The construction of the major components of the electrical systems, including the substation, BESS, switchyard and associated overhead and underground transmission lines, will commence after the development of the construction access roads early in the construction phase. The WTGs will then be constructed and connected into the system on an as-completed basis. Each WTG could start producing power following commissioning during the construction phase (subject to connection arrangements). Where possible, it is preferred that some WTGs generate output while others are still being commissioned.

The operation of the electrical infrastructure will be managed and maintained by the permanent site workers and contractors as required.

The distance from the substation to the switchyard will be approximately 3.2 km. If overhead powerlines are chosen in the final design, spans between towers would vary from 80 m to 257 m, resulting in a maximum easement footprint of 3.94 ha. A 60 m construction buffer around the whole alignment has been included, although this is a conservative impact area and is expected to be significantly less.

The switchyard will consist of an approximate 100 m x 200 m concrete slab housing various electrical infrastructure that will allow connection to the Liapootah-Palmerston 220 kV transmission line via a short length (i.e. less than 50 m) of 220 kV overhead transmission line (within the existing transmission line easement).

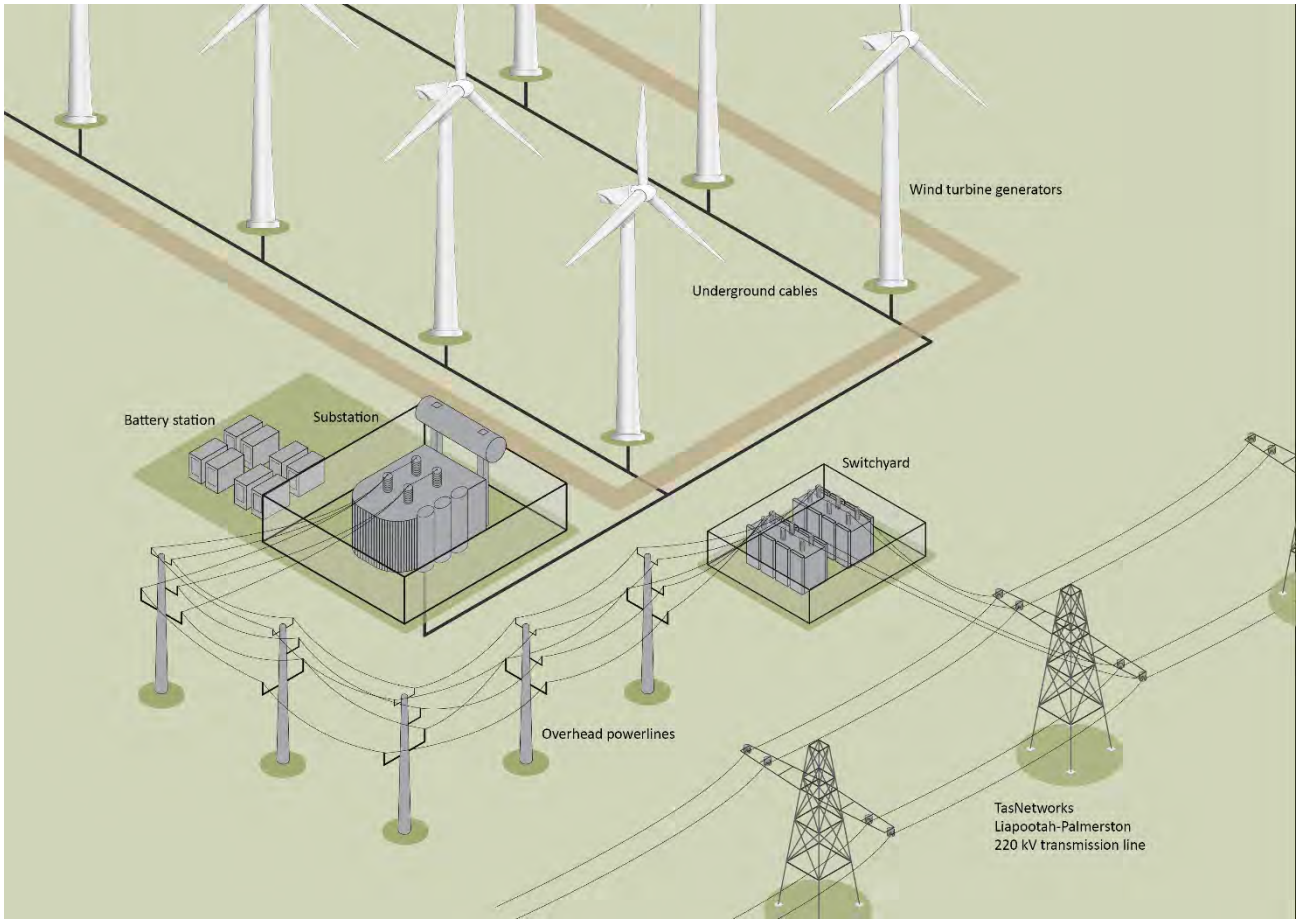


Figure 2-5 Electrical system schematic

2.3.3 Road network

Approximately 52.5 km of all-weather access roads will be required for the Project, with a combination of new roads and upgrades to existing tracks throughout the Project Site. Roads will be designed in accordance with the general design principles outlined in Appendix A. Roads will typically have a pavement layer depth of approximately 300 mm.

The internal access roads will typically be 5.5 m – 6 m trafficable width on straights, with localised widening on curves and where required to support transportation of the over-dimensional WTG component vehicles. There will be an additional 2 m either side to allow for installation of drains, resulting in a total permanent disturbance width of approximately 10 m (6 m road surface, plus 2 m either side for drains). The internal access roads will be constructed using unsealed pavements and will be generally in accordance with the Australian Road Research Board (ARRB) Unsealed Roads Manual.

During construction there will be additional disturbance alongside the roads associated with trenching for electrical cabling and for general construction; this portion of the impact area will be rehabilitated. The total road disturbance width is variable across the site and has been calculated to allow sufficient construction room for each road length across the site, as shown in the construction footprint in Figure 2-2. The width of

the road (and trenched electrical cable) construction footprint generally ranges from 50 m to 80 m. Approximately 10 m of this is the final road footprint (inclusive of drains) and the remainder is to facilitate construction vehicles, stockpiling of construction materials, and cable trenching and installation, noting that the width of the corridor increases in areas where more than one cable is required to be installed: sections of electrical cabling laid in parallel must be sufficiently spaced apart to prevent electrical interference between cables.

All roads will include suitable drainage systems (e.g. table drains) and culverts will be installed where necessary. Drainage from roads will be designed to discharge appropriately to the surrounding vegetation or drainage lines. Roads will mostly be gravel, but some portions near to the entrance of the Project Site and around the operations facility may be bitumen to minimise dirt transport onto main highways and facilities.

A typical road cross section is illustrated in Figure 2-6, and the road layout for the Project is shown in Figure 2-1.

The Traffic Impact Assessment completed for the Project (provided in Appendix G) assessed the suitability of the early design stage proposed Project Site entrances. Of the existing three site entrances and one junction (i.e. consisting of two additional entries), two were required to be relocated due to restricted sight distances that did not meet the minimum required Safe Intersection Sight Distance at the 100 km/h speed limit. This includes moving 'Access Location 1' approximately 30 m to the north, while 'Access Location 3' required the entrance to the road to be relocated 130 m to the south-east to meet requirements, as shown in detail in Appendix G.

Site entries will also be enlarged to accommodate the swept path of the 80 m WTG blades and will have a maximum 10% grade to accommodate the movement of heavy vehicles. They will also be upgraded to a hard-wearing gravel surface. The enlarged entrances for construction are visible in Figure 2-2.

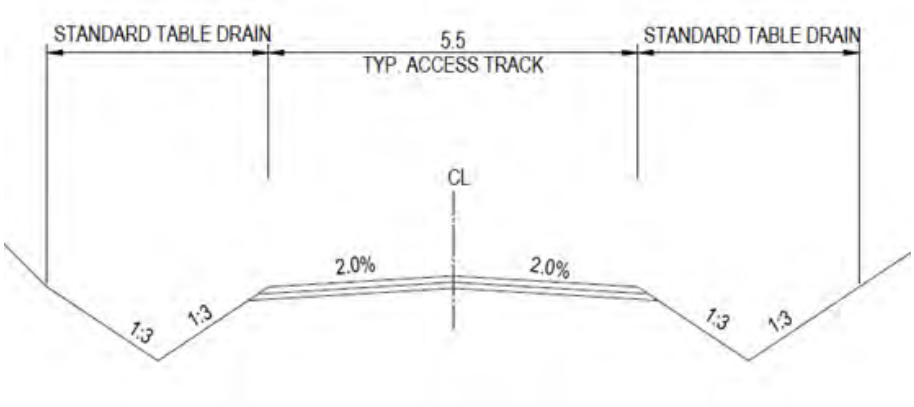


Figure 2-6 Typical road cross section (Project roads will have a trafficable width of 5.5 – 6.0 m)

2.3.4 Operations facility

The operations facility will be located in the northern half of the Project Site and will be the main hub for the Project during operation. The facility will house an administration building, a servicing shed, a washdown facility, and hardstands for vehicle and equipment storage. All environmentally hazardous materials, including fuel, will be kept within the bounds of the facility. Key components of the facility include the following:

- The facility will be located within an approximate 80 m x 80 m footprint and is likely to be fenced for security.
- The administrative building will contain permanent mess and toilet facilities for workers, which will use an 'enviro-cycle' style septic system.

- The servicing shed will be of a size suitable to house required spare parts, equipment, and environmentally hazardous materials.
- A roof rainwater collection system and storage tank will be included to provide water for the facility.
- A fuel bowser using an aboveground tank with bunded drainage will also be included in the facility grounds.
- A permanent washdown facility will be located at the operations compound to minimise the potential for weed and pathogen introduction to the site. This facility will consist of a bunded concrete platform to collect washdown water (which will be sanitised in accordance with the *Tasmanian Washdown Guidelines for Weed and Disease Control 2004*) and a high-pressure hose system and generator in a small shed. Wastewater from the system will be collected by a contractor and regularly disposed of at a suitably licensed facility. The footprint of this facility will be large enough for a service truck or single carriage semi-trailer.

The operations facility will be constructed towards the latter stages of the Project construction timeframe.

2.3.5 WTG curtailment devices

As part of the mitigation strategy for minimising eagle strikes, WTG curtailment devices, namely the IdentiFlight system, will be installed throughout the Project Site. The IdentiFlight system (IDF) works using high precision camera optics to identify eagles approaching the rotor swept area of the WTG and then to send a message to a particular WTG to stop or slow blade motion, thus avoiding a potential strike at that particular WTG.

Each IDF system comprises a single steel tower ranging in height from 6–30 m, depending on surrounding vegetation and topography, with the IDF optical components mounted on top of the tower. Some IDF units may have the potential to control more than one WTG, creating a network effect where a single WTG can receive curtailment signals from multiple IDFs.

The IDF units require vegetation trimming where vegetation is higher than the tower height. This will be required out to a defined radius to ensure there are no 'blind spots' on the optics of the IDF cameras. The calculated vegetation management areas are identified in the Project footprints in Figure 2-1 and Figure 2-2. IDFs in low vegetation areas (e.g. grass plains) require no vegetation management and hence do not have the same vegetation reduction clearance radii applied to them. While the vegetation management areas are counted in the construction disturbance footprint, it should be noted that this does not entail complete loss of vegetation or habitat, as only taller vegetation above 6 m in height will be removed to the base of the trunk and managed, with ground vegetation left undisturbed and suitable for fauna use as habitat after construction.

Providers of the IDF system have advised that at least 24 individual IDF units will be required across the Project Site for complete coverage of all WTGs. The footprint of each IDF unit is expected to be approximately 4 m x 4 m with fencing around the system to prevent access by wildlife and people. Each IDF will have a narrow access road (approximately 4 m wide) suitable for a single light vehicle to access. The area of construction impact for the IDF units will be relatively contained, impacting approximately 10 m beyond the edge of the operational footprint (this construction area has been included in the total construction disturbance footprint provided in Section 2.6).

Additional information on the functionality of the IDF devices is included in Section 6.1.4.

2.3.6 Met masts

To provide ongoing meteorological data for the Project, two permanent met masts will be installed within the Project Site, as shown in Figure 2-1. The met masts will collect data on temperature, humidity, pressure, wind speed and direction, which will be used in the management of the Project.

The met masts will have a triangular metal lattice construction approximately 750 mm wide and will extend to a height of approximately 150 m (WTG hub height). The masts will be secured by groups of multiple guy wires, which will extend out from the tower to nine excavated trench anchor points with three locations each in three concentric rings.

Met mast foundations for guy anchor points will be 1 m x 3.2 m and up to 2.5 m deep and will be located up to 100 m from the structures. The clearance for each permanent met mast is 0.38 ha.

Guy wires will have bird flappers installed at regular intervals to minimise avian collision risk. Minimal ground disturbance will be required for the erection and securing of the masts.

Meteorological sensors will be located at various heights up the mast, with the top mounting consisting of two sensor poles approximately 2 m high. A solar panel and a data logger will also be affixed to the structure at a serviceable height.

During construction, short-term validation masts (nominally four in total) will be installed in or near the footings of the WTGs that the permanent met masts will serve. These short-term validation masts will be removed once the data has been correlated, and the WTGs will be installed in the foundations laid. The validation masts have been included in the construction footprint.

2.3.7 Water supply

Once operational, water demand will be very low (amenities only) and will be sourced from captured rainwater stored in tank(s) at the operations facility. Water deliveries would be received during the summer months if required. Construction water supply is discussed in Section 2.4.3.1.

2.4 Construction

2.4.1 Pre-construction phase – micro-siting, detailed design and management plans

Prior to the commencement of construction, the Project will be subject to detailed design, including finalisation of component selection and the final positioning of all infrastructure within the Project Site.

The following steps will guide the detailed design and development of the Project during this stage to ensure environmental harm is minimised, while ensuring the constructability of the Project and retaining its required functionality:

- Completion of all post-approval environmental surveys committed to in this EIS
- Completion of all engineering assessments required
- Micro-siting of infrastructure to inform the final design
- Completion of final design and compilation of a Wind Farm Design Report to be submitted to the EPA
- Preparation of a Construction Environmental Management Plan (CEMP) to be submitted to the EPA
- Pre-clearance fauna habitat surveys prior to construction.

Some aspects of this process will be undertaken in parallel for some areas of the Project Site but will generally follow the above step-wise fashion. The following provides detail of each of these steps.

Several environmental and engineering surveys will be required to be undertaken post-approval (but prior to construction), including the surveys committed to in this EIS (e.g. final eagle nest search) and any resulting permit conditions. Engineering surveys will also be undertaken, including those required to ensure the constructability of the Project, such as a detailed geotechnical assessment and cut and fill surveys. The

results of these surveys will progress Project design and allow the completion of a first-pass optimisation of the concept Project layout provided in this EIS.

To ensure final optimal positioning of all Project components and ancillary infrastructure throughout the Project Site with respect to environmental and physical constraints, micro-siting of all infrastructure will then be undertaken on the optimised layout (using information from environmental and engineering surveys). Micro-siting will involve an on-ground assessment of proposed locations of infrastructure by environmental specialists and engineers, who will work together to optimise positioning of infrastructure to minimise environmental impacts while maintaining the functional and structural requirements of the Project.

Micro-siting from an environmental standpoint will include positioning of infrastructure (and construction zones) to avoid (where practicable) threatened flora and vegetation, and distinct fauna habitat such as dens and nests discovered on ground. The avoidance of environmental values will be balanced with assessment of constructability of infrastructure from an engineering standpoint, taking into account aspects such as geotechnical stability and physical constraints.

The outcomes of the micro-siting task will inform the final locations of all infrastructure, which will allow detailed design to be finalised. These outcomes will be compiled into a Wind Farm Design Report, which will contain the final footprint of the Project. The final Project footprint will be cross-checked against the environmental constraints in this assessment to ensure no greater net environmental impact than that approved in this EIS would result. The Wind Farm Design Report will include the results of all post-approval surveys and descriptions of micro-siting decisions as appendices; the report will be submitted to the EPA prior to the commencement of construction. Commitments relating to the Wind Farm Design Report are provided in Section 6.

At this time a detailed Construction Environmental Management Plan (CEMP) will also be prepared to address all construction phase environmental controls documented in this EIS (and any resulting approval conditions), as well as any additional measures necessary to manage and monitor environmental impacts during construction. The CEMP will be submitted to the EPA prior to the commencement of construction. Commitments relating to the CEMP are provided in Section 6.

Immediately prior to the commencement of clearing for each component (nominally within two weeks), final flora and fauna clearance surveys[2] will be completed, and any removal or relocation of any product of wildlife will be undertaken in accordance with any Permits to Take obtained under the *Nature Conservation Act 2002* or the Tasmanian *Threatened Species Protection Act 1995*.

The pre-clearance surveys will be the final step in the pre-construction phase. The Project will then transition to the construction phase, which will be managed in accordance with the abovementioned CEMP.

2.4.2 Construction facilities and equipment

The Project will likely be constructed via two individual construction hubs, one for the northern group of WTGs and one for the southern.

The main hub in the north will have a temporary construction compound with a footprint of approximately 100 m x 150 m. It will contain a site office and crib rooms, diesel powered generator, toilet facilities ('port-a-loo' or containerised treatment system), laydown areas, storage containers/sheds (including for storage of environmentally hazardous materials), bunded refuelling facility, bunded washdown area, and vehicle parking. There will be a similar, smaller compound in the south of the Project Site with an approximate 100 m x 100 m footprint.

[2] Pre-clearance surveys are designed as a final check for any transient species (i.e. fauna) that could move into an area in the intervening period between environmental survey and construction.

Adjacent to each construction compound will be a concrete batching facility, which will occupy an area of approximately 100 m x 100 m. The batching facilities will include a trailer mounted concrete mixer, cement storage silo, sand and aggregate and associated material stockpiles, concrete batching water supply, truck washout containment tanks, and storage containers for various equipment and tools. The mixer will be powered by a diesel generator within the facility.

Machinery that will be required to be used throughout the construction period includes:

- Several heavy tonnage cranes for WTG construction
- Medium and small cranes
- Several articulated dump trucks, rollers, dozers and excavators for roadworks and WTG construction
- Several concrete delivery trucks for each batch plant
- Semi-trailers for delivery of materials including construction materials, pipes, steel rebar, electrical cabling/componentry
- Light vehicles and maintenance trucks.

The proposed locations of the construction facilities are illustrated in Figure 2-2.

2.4.3 Construction materials

A summary of project construction raw material estimates is provided in Table 2-2. This material will be sourced both regionally and further afield, if necessary, from the larger population hubs (e.g. Launceston or Devonport).

As outlined in Section 2.4.2 the Project proposes the use of onsite concrete batching plants, to facilitate onsite concrete production and avoid the need to transport concrete to the site (hence raw materials will be transported and batched on site) therefore lowering the overall transport task. It may be possible to repurpose some of the material excavated for foundations in the concrete manufacturing process or for internal road construction. However, further detailed geotechnical investigations will be required to inform this opportunity; hence the estimate of material (Table 2-2) and associated transport task (Section 2.4.5) has assumed all required materials are transported to site from suitable offsite facilities. Any subsequent repurposing of excavated material on site will reduce the final transportation task.

Table 2-2 Construction raw material estimates

Component	Material	Estimate	Source[3]
Concrete foundations	Cement	33,000 m^3	Major city
	Aggregate	113,000 m^3	Regional quarry
	Sand	90,000 m^3	Major city
	Fly ash	33,000 m^3	Major city
	Water	300 L/m^3	Surface water offtake from Shannon River

[3] The final source for all construction materials will not be confirmed until further geotechnical studies are complete, a contractor has been engaged and detailed design is complete. The indicative source locations in the table have been used to inform the traffic impact assessment (Appendix G), which applies a 'worst case scenario' approach and assumes all bulk materials (such as aggregate and gravel) will be sourced from outside the Project Site and therefore includes these traffic volumes in the assessment. At this stage it is likely that pavement gravel and aggregate will be sourced from existing local quarries near Bothwell and off Arthurs Lake Road (pending further investigation) and this assumption has been used in the traffic assessment. The traffic assessment (Appendix G) also uses slightly higher estimates of raw materials to be transported to the site, providing additional conservatism to the traffic assessment.

Component	Material	Estimate	Source[3]
	Steel reinforcement (rebar)	6,000 tonnes	Major city
Roads and hardstands	Road pavement gravel	121,000 m^3	Regional quarry
Construction water total	Water	84.6 ML	Surface water offtake from Shannon River

2.4.3.1 Construction water supply

Water will be required for general construction and amenity purposes during the construction phase, with the highest water demand being the concrete batching process, estimated at 84.6 ML over the 24-month construction period. Advice from the candidate WTG manufacturer Vestas suggests that approximately 1.8 ML of water per WTG is required to construct all aspects of a standard wind farm project, including all concrete, road and other development requirements; therefore 47 WTGs is multiplied by 1.8 ML to arrive at the 84.6 ML referred to in Table 2-2.

Water is abundant in the area and there are several options to supply the project through both construction and operation. The preferred and proposed option for the Project is supply from the Shannon River via an agreement with Hydro Tasmania. The anticipated offtake location is an existing measurement station on the river within the Project Site, as shown in Figure 2-2; however, this will be subject to final arrangements with Hydro Tasmania. Hydro Tasmania has confirmed the availability of 100 ML to be sold over a 24-month period to the Proponent.

Water would be pumped from the river via a temporary pump with foot valve, up to a temporary holding tank within the existing turning circle of the measurement station. Construction water trucks would then collect water as required from the holding tank and deliver it to the required locations.

All approvals for the water abstraction would be obtained from Hydro Tasmania by the construction contractor. Hydro Tasmania has noted the volume requirements to be relatively small for the Project and would be unlikely to require the release of any additional water to the current environmental flow releases occurring from the upstream Miena Dam; Hydro Tasmania would be responsible for managing any additional releases should they be required.

While groundwater was looked at as a potential option for water supply, for concrete batching there is a preference for using less mineralised surface water and, following confirmation that Hydro Tasmania could provide the volume of water required from the Shannon River, the potential use of groundwater for construction was abandoned. Regardless, the results of a groundwater quality and availability assessment around the Project Site are included in the hydrogeology report provided in Appendix J.

2.4.4 Construction staffing

It is expected that up to 200 construction workers will be required on site during peak construction. Although this number is expected to fluctuate with project stages, the assessment has used this peak figure to be conservative.

Construction workers will be sourced locally and regionally as a preference; however, it is not expected that a large enough skilled workforce will be available outside the main population centres of Tasmania. In light of this, it is expected that the majority of workers will be attending site on a drive-in/drive-out basis and will require accommodation.

Several options are being investigated, including the use of a combination of rental and holiday accommodation in local towns such as Miena and Bothwell and nearby townships, or potentially the development of a temporary or semi-permanent accommodation facility near the Project Site, or a combination of both options.

Given the remote location of the site, this will be an ongoing matter and hence the final outcome will be determined during the pre-construction phase. Note that the development of construction accommodation facilities does not form part of this application.

2.4.5 Construction traffic

Construction workers are likely to be sourced from Tasmania's major population centres and will work on a drive-in/drive-out, multi-day shift basis. Workers will be located at the chosen accommodation facility(s) for the duration of their multi-day shift. This will result in two major traffic movements per week, one to the region at shift commencement and one returning home at shift end. It is likely that the majority of the workers at full construction stage capacity will use their own vehicles, resulting in up to approximately 200 light vehicle movements to, and 200 light vehicle movements from, the region over a one-week period.

Once at the accommodation facilities, daily movements to and from the Project Site will occur, possibly via individual vehicles, shared vehicles, or a bus system. Onsite temporary parking facilities will be developed at the Project Site as required within the construction footprint. The traffic impact assessment (Appendix G) has been prepared on the assumption that all workers drive their own vehicle to site (no carpooling or buses) and therefore represents a 'worst case' traffic scenario to ensure all impacts are fully addressed. The traffic impact assessment also makes an assumption that workers will be accommodated in several locations near the site (including Miena, Bothwell, Bronte Park, Waddamana, Flintstone and Wilburville) and predicts traffic flow accordingly.

Delivery of raw materials such as cement, sand, aggregate and steel rebar will occur several times a day via semi-trailer during the construction period. An average of 29 heavy vehicles are predicted to arrive (laden) and leave (unladen) site each day over the construction period using 8-axle trucks (this average will vary with construction activity requirements on site) from a variety of locations; further details of this estimate are provided in the Traffic Impact Assessment in Appendix G. Other consumables and services will also require truck and light vehicle movements to and from the Project Site on a regular basis. These deliveries will likely come from the major population centres of Tasmania.

The large WTG components, including blades, tower sections, and nacelles, will be coming as oversized loads on semi-trailers from the Bell Bay Port and will follow the predetermined routes discussed in Section 6.14. These deliveries will be ongoing throughout the construction phase and will likely occur mostly at night as far as Bothwell to avoid traffic issues on state highways.

Further information on construction traffic movements and predicted total and average daily movements is provided in Section 6.14 (Traffic) and Appendix G.

2.4.6 Construction timeframes

General construction hours are likely to be based on 10 to 12-hour day shifts between 6 am and 6 pm 7 days per week on rotating drive-in/drive-out rosters; this will depend on the construction contractors' arrangements. Construction activities with potential to generate noise will be restricted to the timeframes outlined in Section 6.4.

As crane operations involving large equipment are heavily wind-dependent, teams erecting WTG components will occasionally need to work during the night to use all available low wind periods and maintain the construction schedule. This will be undertaken by agreement with Council and stakeholders.

Delivery of most equipment and materials will be in line with the abovementioned general construction hours. However, as mentioned, large WTG components may use low traffic levels during night-time hours to minimise disruptions. Hence, delivery of these components will need to occur on a 24-hour basis, which will be undertaken by agreement with Council and advance notification to relevant stakeholders around the Project Site boundary.

The proposed construction schedule for the Project will occur over a 24-month period, with a breakdown of timeframes detailed in Table 2-3.

Table 2-3 Proposed construction schedule

Stage	Timeframes
Pre-construction surveys/engineering design	For ~6 months prior to construction commencement.
Site establishment and mobilisation of earthwork plant and equipment	For 3–5 months from construction commencement.
Construction of access tracks, construction compound and hardstand areas	For 10 months following site establishment and mobilisation of earthwork plant and equipment.
Construction of met mast footings and WTG footings	Commencing as soon as the access tracks are suitable for constructing the first WTG footing, for 9–11 months.
Delivery of WTG and other Project components	Commencing as soon as access tracks are suitable and the first WTG footing is ready for installation, to continue for 8–10 months.
Construction of substation and switchyard compounds	Commencing as soon as the access track to the substation/switchyard location is ready, lasting for 6–9 months.
Construction of operations facility	Commencing as soon as access track to the operation facility is ready and materials/equipment are in place, for 4–6 months.
Erection of met masts and WTG components	Met masts will be installed once the access tracks are ready, before WTG installation. The erection of WTG components will commence when the first WTG footing is ready. Two main cranes will be used to install 1–1.5 WTGs per week, for 8–11 months.
Installation of substation and switchyard infrastructure	Commencing as soon as the substation and switchyard compounds are ready, for 3–6 months.
Construction of transmission line	Commencing as soon as the access track to transmission line corridor is ready and earthwork equipment is in place, for 12 months.
Electrical cabling trenching	Commencing as soon as the access tracks are suitable; running in parallel with the construction of WTG footings and installation of WTG components, for 12 months.
Installation of internal electricity network (underground cables/overhead powerlines)	Commencing with the first WTG installation and ending until the last WTG is installed, lasting for 9–12 months.
Wind farm commissioning and testing	Progressively commissioned, subject to TasNetworks arrangements.

2.4.7 Construction methods

2.4.7.1 Roads and hardstands

Typical road and hardstand construction will involve:

- Removal of vegetation and topsoils as required, with topsoil to be stockpiled in dedicated areas within the Project Site construction footprint for future use during site rehabilitation; stockpile locations will be selected based on factors such as drainage and convenience for re-use.
- Areas will then be cut and filled as per design requirements, including construction of batter slopes and drains (and potentially trenching for cables).

- Once area preparation is complete, road base will be added to a depth of approximately 300 mm, or as required.
- The base will then be compacted, shaped and graded according to design.
- Any specified sections of road or laydown will then be bituminised as required.

2.4.7.2 Electrical works

It is likely a dedicated specialised contractor will be installing the electrical components for the Project, especially the substation, switchyard, and overhead/underground powerlines, towers and cables. These works will be undertaken in parallel with the WTG works.

The concrete slabs for the substation and switchyard will be poured following site preparation. Components will then be delivered and installed as they arrive or stored within the construction compounds and installed as needed.

Trenching for the underground electrical reticulation system may either be undertaken at the time of roadworks or post road development, depending on contractor arrangements and material availability.

2.4.7.3 WTGs

The construction process of each WTG will be approximately as follows, with some steps occurring concurrently:

- Access road, laydown area and foundation site cleared and excavated/developed as required (an example is shown diagrammatically in Appendix A)
- Foundation rebar tied-in ready for pour
- Foundation poured in situ with concrete from nearest batch plant
- Components delivered and stored in laydown area surrounding foundation (ongoing)
- Crane(s) moved into position on crane pads as required
- Tower sections assembled onto foundation, with the number of sections depending on the final WTG selection
- Following completion of tower, nacelle craned into place and secured to tower
- Hub attached to nacelle and then each of the three blades craned into position.

For several of the WTG locations, once the foundations are complete, temporary validation masts will be installed, which will be similar in appearance to the met masts with a similar guy wire arrangement. The validation masts, as the name suggests, confirm the modelled wind speeds at the location, with measurements taken for several weeks before the mast is subsequently removed and the WTG erected in its place. This is a very temporary measure in the construction process.

Most ground excavation is expected to be undertaken by excavator. However, there is a possibility some parts of the construction footprint may require blasting where hard rock is encountered (for WTG footings or other ground excavation such as cable trenching).

Once the WTG structure is complete, all underground cables (described in Section 2.3.2) are buried, and the access road and permanent laydown areas are gravelled and complete, the construction disturbance area will be rehabilitated via ripping and reseeding (if required). It is envisaged that not all vegetation in the temporary laydown areas would be destroyed, as several components, including the blades, can be elevated above shrub-sized vegetation via supports rather than being laid directly on the ground.

2.4.7.4 Ancillary infrastructure

Geotechnical investigations will require drill rigs to be brought on to the Project Site. Remaining construction activities will use general civil construction techniques and are unlikely to require any specialised equipment or contractors.

2.5 Commissioning

Project components that will need a commissioning phase are the electrical transfer system and the WTGs themselves. Commissioning requirements of all remaining components are considered minor in nature.

The electrical system will be the first Project component to be fully commissioned upon completion of the substation, switchyard and overhead/underground powerlines. Once this system is fully commissioned, WTGs can then be linked into the system via the underground cabling on an as-completed basis, allowing generation and capture of energy to theoretically commence once the first group of WTGs are connected, subject to safety and connection arrangements.

Each WTG will take around one week to commission once fully installed; this will involve testing of all mechanical components and electrical connections. As each WTG is completed, it will be added to the substation either individually or as part of a cabled group.

2.6 Project footprint summary

The maximum construction disturbance footprint for the Project ('construction footprint') is shown in Figure 2-2 and totals 481.13 ha; this assumes all construction disturbance is counted as disturbance and does not include any rehabilitation.

The construction footprint has been developed by project engineers based on previous experience on large civil infrastructure and wind farm projects. This footprint ensures there is adequate working space to construct each item of infrastructure, including roads, the WTGs, areas of hardstand and power cables. Construction buffers around the permanent infrastructure (e.g. roads, turbine hardstands etc) vary across the site and range from 15–70 m to allow multiple pieces of machinery and equipment to operate in the same area, vehicles to pass one another, stockpiles to be created, and, in the case of roads, enough space for electrical cabling to be installed in parallel in areas to prevent electrical transmission interference. The construction buffer areas also allow for some refinement in the final footprint to micro-site infrastructure as required. Where possible the permanent infrastructure locations will be used for temporary construction disturbance to minimise the overall disturbance footprint. It is unlikely the entire construction footprint will be disturbed; however, to ensure all impacts are thoroughly considered, a conservative impact area has been applied.

The actual footprint for the operational phase of the Project ('operational footprint') is shown in Figure 2-1 and totals 193.88 ha, with a breakdown of individual operational components provided in Table 2-4. This operational footprint represents a figure closer to the anticipated actual site disturbance post construction, after rehabilitation and regrowth. It is noted that the areas allocated for curtailment system vegetation management and overhead powerline maintenance clearance will be subject to woody vegetation management (e.g. tree removal) rather than full vegetation clearance, hence they will remain viable habitat for many species.

Note the operational breakdown shown in Table 2-4 does not include construction-specific compounds that will be removed following completion of the Project, including the batch plants (2.4 ha), the blade laydown areas (1.4 ha) or the site compounds (3.0 ha) in the north and south of the Project Site.

Table 2-4 Operational Project footprint summary

Component	Operational footprint (ha)
WTG footprints (including laydown areas)	43.26
Roads	40.85
Underground cable easements/trenches	11.77
Substation	1.62
Switchyard	2.00
Overhead powerline (power poles only)	0.52
Overhead powerline (maintenance clearance)	3.94
Operations facility	0.81
BESS	0.30
Curtailment system vegetation management zone (with vegetation trimming/removal)	87.15
Curtailment system footprint (IDF hardstands)	0.89
Joint box	0.01
Met masts (two masts, 0.38 ha each)	0.76
Total	**193.88**

2.7 Operation and maintenance

The Project is proposed to have a design life of approximately 30 years but is likely to be extended beyond this with equipment upgrades as required. The design life of individual components, with appropriate maintenance, includes:

- WTGs – 30 years
- Electrical infrastructure – 50 years
- Operations facility – 30 years
- Roads – 30 years.

Once the Project is operational, it is a comparatively low maintenance activity and can be successfully managed throughout the year by a team of fewer than 10 people permanently on site and 10 FTE contractors. The greater part of the operational work will revolve around maintenance of the facility, especially the WTGs, which will require annual servicing.

Each WTG will take a single maintenance crew of four to five people approximately one week to service.

It is expected that most electrical infrastructure will be maintained by specialist contractors on an 'as needs' basis.

While the Project will operate on a 24-hour basis, the site will typically only be fully staffed from Monday – Friday, 8 am – 6 pm, with weekend work as required. Security and/or caretakers will be present on site at all times.

2.8 Offsite infrastructure

The Project will require the use of the Bell Bay Port to import large-scale WTG parts, which will be stored in existing laydown areas in the port facility prior to delivery to site.

The delivery of the WTG parts will be via a range of vehicles suitable for over-dimensional parts, which will require the use of the existing road network from the Bell Bay Port to the Project Site; suitable routes have been assessed for the various components as part of the Traffic Impact Assessment for the Project (refer Section 6.14). It is expected that some vegetation may need to be removed or corners temporarily built up to enable the successful transportation of the components. Any required approvals for these minor road modifications will be sought separately from the current approval for the Project, as the action will occur outside the Project Site and potentially the municipality.

Raw materials required for construction will be sourced from existing local or regional quarries or recovered from onsite works; there is no requirement to establish new quarries on site or elsewhere.

All required power during construction will be available via the existing transmission lines through the Project Site, and therefore no additional offsite power infrastructure is required for the Project.

If a construction camp is chosen as the method to house workers, this will form a significant piece of offsite infrastructure. Approvals for this facility would be sought separately from the current Project.

3 Project alternatives

The number of wind farm projects in Tasmania has grown significantly in the last decade. Contributory factors are the development of the Battery of the Nation initiative by Hydro Tasmania and rising interest from investors in Tasmanian hydrogen plants (which require significant power inputs); general load growth in Tasmania; and the urgent, increasing requirement to transition to renewable energy across Australia. As a renewable energy development company, the Proponent began searching out viable projects throughout Tasmania several years ago, and the St Patricks Plains development is one of several projects now in the planning assessment phase. The other three sites under development are not alternatives but are other sites deemed suitable.

Many more projects are now in development across the state in response to the Government's 200% Renewable Energy Target and the Australian Energy Market Operator's Integrated System Plan, which identified candidate Renewable Energy Zones and put the Marinus Link onto the map. At the time the Project Site was identified such reports, zones and projects were conceptual.

Other sites on the west coast of Tasmania were considered but a combination of land tenure and distance to the grid, plus over-dimensional transport issues, ruled these out. Other sites in the Central Highlands were considered, but distance to the grid in combination with the lower wind regime meant these locations were not selected at the time.

Tasmania has some of the best wind regimes in Australia, so the focus was on good wind sites rather than solar, as the state has lower solar irradiation than other states due to its latitude, weather, and cloud cover.

The St Patricks Plains site was initially under investigation by another wind farm developer. The Proponent acquired an existing met mast at the site and associated data from the previous developer in late 2017 and began its own investigations into the viability of a wind farm project. In general, the site was seen as a viable location as it met the three principal criteria for a wind farm project, that is, having a good wind resource, connection options to the Tasmanian electricity grid, and freehold landowners willing to consider a wind project.

Various options for land to be included in the Project were initially considered, including land adjoining Cattle Hill Wind Farm, land west of Penstock Lagoon, and land north of the current Project Site boundary. Alternative versions of the Project Site are shown in Figure 3-1. The alternative versions were not progressed due to the following issues:

- Land north of Cattle Hill had tenure issues and introduced a disconnected section of the wind farm in terms of land continuity.
- Land west of Waddamana Road at Penstock was available but considered too close to existing shacks.
- Land north of Waddamana Road was available but introduced new neighbours and increased proximity to the Barren Tier communications tower (which might have generated interference).

Essentially the elevated land around St Patricks Plains has the highest wind resource but also opens up the Project to greater visibility across the highlands and greater proximity to residences. Avoiding the elevated land to the west and north of the site and containing the site to the east addressed a number of potential constraints prior to more detailed studies.

The final Project Site boundary was decided following discussions between the Proponent and local private landowners, TasNetworks, and local consultants. Some of the reasons for the decision on the initial Project Site and Project layout included willing freehold landowners; compatible land use; opportunity and capacity to connect a suitably sized wind farm to the electricity network on site; a visually contained setting being surrounded by higher land in each direction; low population and distance to neighbours; access along good

roads (Cattle Hill having demonstrated transport routes to site); and, other than some onsite private forestry in the south and north east, limited tree clearance requirements.

With the site selected, a generic layout concept for WTGs based on separation distances indicated that the site could accommodate up to 80 medium-scale WTGs (e.g. 3.75 MW WTGs).

The WTG layout was the next element involving consideration of alternatives. Wind resource information was used to develop an initial WTG layout containing 67 WTGs, maximising the energy yield from the site. The 67 WTG layout was used for the Notice of Intent, which then triggered the planning process.

This initial layout was then subject to high-level, multicriteria analysis including consideration of topography, view fields, proximity to residences, electromagnetic interference, waterways, vegetation communities, eagle nest sites, threatened flora and fauna locations, geology and Aboriginal and European heritage values. Two years of eagle utilisation surveys provided information about the usage of the site by eagles. The layout design was an iterative process involving the relocation and removal of WTGs as required to reach an optimal layout that seeks to maximise the site yield without compromising the environmental, heritage, and social values of the area.

Through the planning process, consideration was also given to the location and layout of ancillary infrastructure such as transmission lines, substations, and construction and operational compounds.

The studies undertaken to address the PSGs and general guidelines enabled continual review of the layout and, as a result of this process, the Project layout was reduced to 47 WTGs and associated infrastructure, as documented herein. Further refinement of the layout will occur in the detailed design phase through the micro-siting of infrastructure to minimise impacts wherever possible.

Technology and material selection for the Project was mostly guided by the original equipment manufacturer of the WTG, rather than the Proponent. More WTG locations enables selection of WTGs from a wider range of models on the market; fewer locations focuses the selection to the larger WTGs to ensure that the capacity of the site is maintained, and the site provides the most energy possible. WTG height and size are important considerations based on the available area for the Project and the environmental conditions and also on the practicalities of delivering to the Project Site.

Eagles have the potential to be substantially impacted by wind farm projects. The risk of strike has been reduced to as low as reasonably practicable by the incorporation of a leading mitigation system specifically for large raptors into the environmental management of the project, including the latest WTG curtailment system (IDFs) described in Section 6.1, and the adaptive management measure of painting one blade black of some WTGs if required. Any new technologies that appear post or during the approval phase will also be considered.

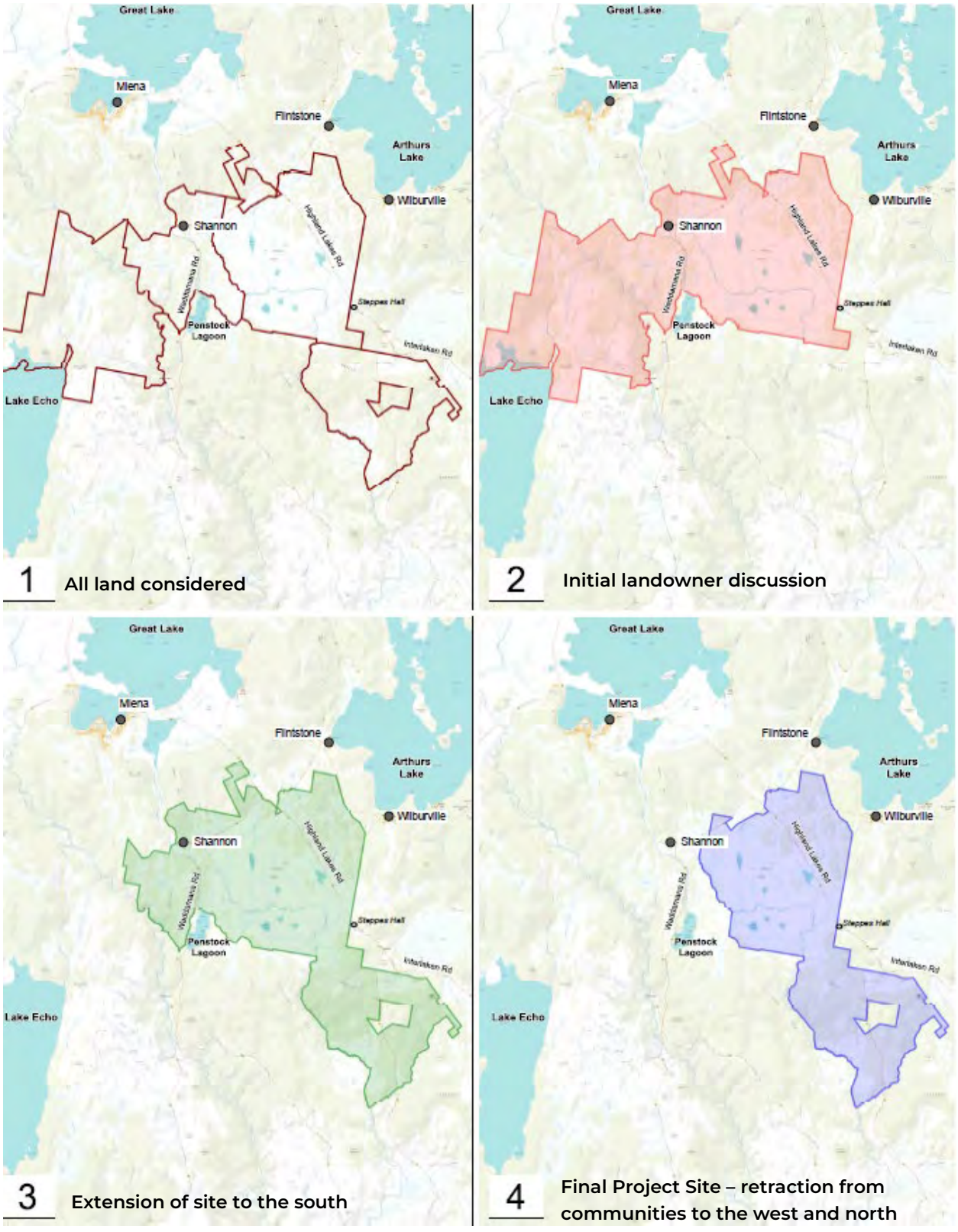


Figure 3-1 Land considerations

4 Consultation

The Proponent's approach to consultation is informed by the International Association for Public Participation's (IAP2) Core Values and Public Participation Spectrum. This is widely accepted as the benchmark for community consultation and provides a framework for considering the appropriate style of engagement and associated activities to implement at each stage.

The IAP2 Core Values for Public Participation define the expectations and aspirations of the public participation process. It states that public participation:

- Is based on the belief that those who are affected by a decision have a right to be involved in the decision-making process
- Includes the promise that the public's contribution will influence the decision
- Promotes sustainable decisions by recognising and communicating the needs and interests of all participants, including decision-makers
- Seeks out and facilitates the involvement of those potentially affected by or interested in a decision
- Seeks input from participants in designing how they participate
- Provides participants with the information they need to participate in a meaningful way
- Communicates to participants how their input impacted or changed the decision.

The approach centres on achieving good community-based outcomes and can be described as genuine, timely, relevant, transparent and inclusive.

In undertaking consultation for the Project, the Proponent has taken guidance from:

- The EPA (March 2019) *Guidance on Community Engagement*
- The Clean Energy Council's *Community Engagement Guidelines for the Australian Wind Industry* (2018)
- The Australian Energy Infrastructure *Commissioner's Observations and Recommendations for Community Engagement* (updated 2020).

With a planning process requiring a minimum of two years of studies, the Proponent has sought to engage the community early, keep all stakeholders updated, and address concerns in a timely and professional manner where it is possible to do so.

4.1 Engagement undertaken to date

Engagement activities commenced in 2017 with initial engagement with key landowners and relevant agencies and has continued throughout the planning and investigation phases.

4.1.1 Identifying stakeholders

Early in the project planning phase, desktop title searches were undertaken by the Proponent to identify local landowners who may have an interest in the Project. Using information from 100 title searches around the site in April 2019, introductory letters were sent to everyone for whom there was an address available. Contact was attempted with all nearby landowners by the Proponent to understand if there was a residence on their land, if they would like to know about the Project, and how best to keep them up to date and hear about any concerns they may have. Most people contacted elected to be on the stakeholder database to receive further information from the Proponent.

A range of face-to-face engagements were then undertaken directly by the Proponent to follow up and try to contact everyone in the local area who might wish to know about the Project. Addressed correspondence was returned to the Proponent from a small number of neighbours, so in 2020 and again in 2022 letters were sent via Central Highlands Council to try and contact the remaining parties.

Although it is possible some local landowners have not received direct contact from the Proponent during the stakeholder identification phase, it is likely that most local landowners have been identified through this process. Where contacted landowners were willing, their contact details have been retained on a stakeholder database by the Proponent to facilitate engagement throughout the Project.

In the Project planning phase, the Proponent also identified other relevant stakeholders such as local council, government bodies, elected members, community leaders and industry.

The Proponent maintains a stakeholder database for the Project, which currently has 501 stakeholders registered to receive updates. There are a further 429 individuals receiving updates who registered via the website and included St Patricks Plains as one of their projects of interest. Many of these are suppliers or those who have another interest (such as interest in other wind farms being developed by the Proponent).

The Proponent has commercial agreements in place with all landowners on whose land WTGs will be installed. Additionally, the Proponent is in the process of offering neighbour agreements to nearby landowners (within a nominal 2 km and 3 km buffer) to provide financial benefits to acknowledge the potential amenity implications of WTGs on neighbouring land. These agreements are optional, and it is acknowledged by the Proponent that they do not negate their responsibility to manage amenity impacts in accordance with all guidelines and legislation.

4.1.2 Engagement activities

Engagement activities undertaken by the Proponent to date have included phone calls, face-to-face meetings, information sessions and the sharing of information via website material newsletters. There have been 17 newsletters to date and 14 inserts into the Highland Digest (see the news and downloads tab at www.arkenergy.com.au/wind/st-patricks-plains/).

Covid-19 restrictions affected some opportunities for direct engagement to be undertaken; however, the Proponent has employed modified techniques where relevant (such as online meetings and phone calls) and taken the opportunity for face-to-face meetings and information sessions when possible. As part of the Proponent's approach to the challenges presented by Covid-19, a resident of the Central Highlands was recruited to assist with community consultation, including contacting neighbours and updating them on the Project, distributing newsletters to venues around the highlands, and keeping the rest of the Sydney-based project team in touch with concerns raised by the community during periods of travel restriction.

Over the course of project planning, the Proponent's project team has met directly with many of the surrounding landowners or had phone discussions with them. Those who wish to have attended information days.

To date there have been nine community information events with 480 total attendances, as follows:

- Steppes Hall (August 2019) – 100 attendees

  The first community information day, held closest to the Project Site itself at the Steppes Hall. Maps and information were displayed, and members of the Proponent's project team were on hand to discuss the Project with attendees. Feedback from individuals at that session was that the community had expected and wanted the Proponent to give a presentation.

- Bushfest, Bothwell (November 2019) – 120 visitors

  The second public event was a Proponent stand at Bushfest in Bothwell, where 120 people visited the stand and 70 people registered to receive updates about the Project.

- Miena (February 2020) – 80 attendees

  The third information event at the Great Lakes Community Centre in Miena responded to the feedback from the Steppes information day, and the Proponent's Project Manager and Executive Director gave a presentation followed by a question and answer session. This event was moderated by an independent planning consultant who gave everyone the opportunity to ask questions during and after the presentation.

- Bothwell and Miena (February 2021) – two separate events with a total of 100 attendees

  Two separate sessions were held, at the Clubs Rooms in the Bothwell Recreation Ground and at the Great Lakes Community Centre in Miena. These events followed the previous format of a presentation with question-and-answer session run by a facilitator. At the Miena event, members of an opposition group displayed information and took to the stage to present their views.

  The feedback from this event was that many people said they would not attend further information sessions in that format, as they did not want to hear from objectors but wanted information about the Project directly and to have their own questions answered by the Proponent.

- Steppes Hall (February 2022) – 80 attendees over four separate meetings

  In response to the feedback from residents and community members who attended the Bothwell and Miena information days, four separate smaller community information sessions were held to brief neighbours and the community specifically about noise, a topic of interest to several attendees and Project Site neighbours. Two meetings were for dwelling owners to the east of the Project Site, one for dwelling owners to the west of the Project Site, and one for any interested members of the public not invited to the local resident events. A representative of Marshall Day Acoustics gave a presentation and answered questions.

All information provided to the community at information days is available on the Proponent's website on the St Patricks Plains Wind Farm news page at www.stpatricksplainswindfarm.com.au.

The Proponent has also met directly with government representatives, businesses and community groups, including but not limited to:

- Federal and state ministers and elected representatives
- The Central Highlands Council Mayor, General Manager, councillors and planning team
- Businesses in the surrounding settlements of Arthurs Lake, Miena, Bronte Park and Bothwell
- Anglers Alliance
- Trout Guides and Lodges Tasmania
- The Johns Group
- Great Lakes Community Centre Committee members
- Hunting groups on each of the Project properties
- Wilburville volunteer Fire Brigade
- Penstock, Hollis Banks and Shannon shack owners
- No Turbine Action Group – including a number of face-to-face meetings to provide updates plus online workshops, phone calls and correspondence.

The Proponent acknowledges the additional advice provided in the PSGs regarding other agencies and organisations with whom engagement is required, and has undertaken separate engagement with Airservices Australia, TasNetworks, Heritage Tasmania and Aboriginal Heritage Tasmania (the latter two guided by the Proponent's heritage consultants, Cultural Heritage Management Australia).

4.1.3 Summary of feedback to date

Across the engagement undertaken to date, the Proponent has identified both significant support for the Project as well as concerns and opposition. The areas of support and the reasons for opposition are the issues of interest to the Project development team.

Key support issues raised to date include:

- A sentiment that more renewable energy is needed, and wind is a good form of renewable energy.
- The Project will create jobs in the area.
- The Project provides a potential tourist attraction.
- Wind farms can supplement hydro power and reduce the use of water and coal to generate electricity.

It is noted that in 2022 a community sparked petition of support was launched gathering support in Bothwell, Miena, Arthurs Lake and Flintstone which collected 329 signatures in support of the wind farm.

Key objections raised to date include:

- Potential visual impact, including the effect on fishers at Penstock Lagoon, drivers along the Highland Lakes Road, and changing the sense of place.
- Potential impacts to eagles – concerns about eagles and other species.
- Concerns about noise.
- Concerns about the possibility of bushfire and the ability to fight fires.
- Impacts during construction – based in part on the Cattle Hill Wind Farm experience.
- Wider policy concerns – a sentiment that Tasmania does not need (or want to pay for) more energy.
- Some objectors with a general sentiment that they support renewable energy but do not want a wind farm here.

The key issues of support and objection have been taken into consideration in the design of the Project and have informed the presentation of information in this EIS.

4.1.4 Revised layout

A revised layout of 50 WTGs was completed at the beginning of 2021. Key principles for the revised layout were consideration of the Key Issues from the PSGs and addressing specific community concerns, where possible.

The revised layout was presented in a newsletter update and sent by mail and email to all stakeholders and advertised in the Highland Digest in advance of the 2021 community consultation events. This early release was to provide the opportunity for stakeholders to review and consider the changes in advance of the community consultation sessions.

The revised layout reduced the size of the Project from 67 WTGs to 50 and reduced the number of shacks or houses within 3 km from 50 to 20. The rationale for the changes to each turbine location were detailed in a presentation to the community (available at the following location – https://arkenergy.com.au/documents/803/StPatricksPlainsWindFarm_CommunityInfoDays_Feb2021.pdf).

Additional inputs following the completion of other studies and assessments caused a further three WTGs to be removed for visual impact avoidance, resulting in the 47 WTG layout proposed herein.

4.2 Engagement proposed to be undertaken

The Proponent will continue to actively engage with the landowners, the local community, elected government and local representatives, organisations and other relevant stakeholders throughout the assessment, construction and post-construction stages. The Proponent will actively promote the formal EIS advertising period through its existing channels and encourage feedback.

A shopfront has been set up in Bothwell for the exhibition phase of the development application, and it opened in January 2023. It is staffed by a local resident and is open one day a week can also be open more frequently during the exhibition period of the Development Application.

A formal Community Engagement Strategy will be established for the construction phase, involving regular stakeholder updates, complaints register, and contact details of a community liaison officer.

4.3 Engagement with other agencies

The Proponent has commenced early engagement with several government agencies and will continue to work closely with all relevant agencies throughout project planning and implementation.

The PSGs identify several government agencies who have provided comment on the Project in relation to matters that must be addressed but fall outside the requirements or scope of this EIS, including TasNetworks, Airservices Australia, Heritage Tasmania, and Aboriginal Heritage Tasmania. The Proponent has engaged with, and provided reports to, each of these agencies as required.

5 The existing environment

5.1 Planning aspects

5.1.1 Site location

As detailed in Section 1.3, the Project Site is located at St Patricks Plains, in the Central Highlands approximately 10 km to the south-east of Miena and 35 km to the north of Bothwell. The Project Site is located in the Central Highlands Local Government Area (LGA), which is bounded by Meander Valley LGA to the north, Northern Midlands LGA to the north-east, Southern Midlands LGA to south-east, Derwent Valley LGA to the south and West Coast LGA to the west. The Central Highlands Council area encompasses a total land area of approximately 7,988 km^2.

The Project Site has been used for agricultural operations for many years. In terms of structures on site, there is agricultural fencing, some outbuildings on 5057 Highland Lakes Road, and a small structure at 6011 Highland Lakes Road. There are a number of access tracks on the Project Site. There are no known activities likely to cause site contamination on the Project Site.

There are no industrial facilities in the vicinity of the Project Site. The nearest residential enclaves are 1.2 km from the Project Site boundary to the east (Wilburville), 1.5 km from the Project Site boundary to the north (Flintstone), or 1.7 km to the west (Shannon). All residences in these enclaves are 3 km or more from the nearest WTG. Immediately to the east of the broader site, there are some large rural residential holdings, some of which have dwellings located on them. Some of the titles on Arthurs Lake Road are directly adjacent to the Project Site, although some distance from the nearest WTGs. The nearest school is at Bothwell District High School, some 35 km away. The nearest hospital would be in Launceston or Hobart; however, there is a community health centre at Ouse, which is over 80 km away. There is a campground on the publicly accessible western side of Penstock Lagoon (Ladys Walk Campground) around 4.5 km from a WTG. There are a number of campgrounds around Arthurs Lake (Pumphouse Bay and Jonah Bay campgrounds) and at Little Pine Lagoon, but all are significantly separated from the Project. The lakes in the area serve as tourist destinations, particularly for shack owners who enjoy fishing in the area. In addition, the Steppes Historical site, including the hall and the heritage property, is directly adjacent to the Project Site.

5.1.2 Land tenure and title details

The Project Site comprises 15 land titles. The land tenure of the Project Site is identified in Table 5-1 and illustrated in Figure 5-2. A copy of each certificate of title (CT) and any associated schedule of easements are contained in a separate Planning Assessment Report. It is noted that any road use except for the direct turn-offs into the Project Site will be addressed separately to this Project.

The general area surrounding the Project Site is a combination of native bushland areas in private freehold titles, and agricultural land used predominantly for grazing. The closest residential zone is located in Wilburville, approximately 1.2 km to the north-east of the boundary of the Project Site.

Table 5-1 Title details

Property address	Title reference (CT and PID)	Easements and covenants	Area (ha)	Land tenure	Land use
'Wihareja' 4244a Waddamana Road, Steppes, Tas 7030	CT 100672/1; CT 156999/1; PID 2813013	Reservations relating to sewer and waterways in favour of the Crown (15 m depth), transmission line burdening easement (45 m wide) and conservation covenant across CT 156999/1. Caveat by Epuron Projects Pty Ltd on both titles.	1,337.2 ha	Private freehold (James Glover & Sons Pty Ltd) and partially contained in a conservation covenant.	Grazing pasture
'St Patricks Plains', 6011 Highland Lakes Road, Steppes, Tas 7030	CT 182190/1 CT 182189/1; PID 5000165	Transmission line burdening easement (45 m wide) and wayleave easement to the benefit of TasNetworks. Three conservation covenants. Caveats by Epuron Projects Pty Ltd.	2,069 ha	Private freehold (P.E.J.E. Pastoral Company Pty Ltd) and partially contained in a conservation covenant.	Grazing pasture and native bushland
'The Ripple (North)', 6300 Highland Lakes Road, Steppes, Tas 7030	CT 126982/1; PID 7936127	Transmission line burdening easement (45 m wide), right of carriageway burdening easement. Caveat by Hydro-Electric Corporation.	387.3 ha	Private freehold (Robert McDowall Campbell)	Grazing pasture
'The Ripple (South)', Highland Lakes Road, Steppes, Tas 7030	CT 126983/1; PID 1780918	Burdening flood easement including rights of carriageway. Benefitting right of carriageway easement. Burdening 12 m wide wayleave easement to the benefit of Aurora Energy. Notice to Treat pursuant to Section 11 of the *Land Acquisition Act 1993*. Private timber reserve pursuant to Section 15(1) of the *Forest Practices Act 1985*. Caveat by Epuron Projects Pty Ltd.	1,425 ha	Private freehold (Duncan Colin Campbell)	Native bushland
'Ripple Lodge', 6212 Highland Lakes Road, Steppes, Tas 7030	CT 124603/1; PID 7936135	Benefitting and burdening right of carriageway easements. Burdening wayleave easement to the benefit of Aurora Energy. Caveat by Epuron Projects Pty Ltd.	75.9 ha	Private freehold (Duncan Colin Campbell)	Grassland and native bushland
'Allwrights Lagoons', Penstock Road, Shannon, Tas 7030	CT 100080/2 & 3; CT 205991/1; CT 100081/65; PID 5010136	Benefitting right of carriageway easement on CT 100080/3.	988.9 ha	Private freehold (John Albert Rose)	Undulating land with native scrub

Property address	Title reference (CT and PID)	Easements and covenants	Area (ha)	Land tenure	Land use
'Christian Marsh', 5057 Highland Lakes Road, Steppes, Tas 7030	CT 148905/1 &2; CT 241119/1 & 2; PID 5000093	Private timber reserve (partially revoked) and caveats by Epuron Projects Pty Ltd on CT 241119/1 & 2, CT 148905/1 & 2.	3,613.7 ha	Private freehold (Cluny Pty Ltd)	Native bushland
Highland Lakes Road	Road reserve, Acquired Road (46/6704)	N/A	N/A	Department of State Growth	Road corridor
Watkins Road	Crown road	N/A	7 ha	Being acquired by P.E.J.E. Pastoral Company Pty Ltd	Private access track and pasture
Hydro Electric Corporation within The Ripple (South)	CT 26886/1,2,3 & 4; CT 28987/1	Flood easement and right of way.	6.1 ha	Hydro Tasmania	No longer used
Shannon River and Shannon River Conservation Area	N/A	N/A	33.2 ha	Crown	River and reserve

5.1.3 Consideration under the Tasmanian Planning Scheme – Central Highlands

The Project falls within the area covered by the *Tasmanian Planning Scheme – Central Highlands* (the planning scheme). The planning scheme primarily controls use and development on land through the application of zones. Each zone provides for a table of use and a suite of use and development standards. Development standards are divided into standards for 'building and works' and standards for 'subdivision'.

Additional to the zones there are a suite of codes within the scheme. The codes set out provisions that may apply to more than one zone or cannot be described by zone boundaries. Some codes are applied by way of a spatial overlay and others by textual application (i.e. certain types of use and development). Where there is a conflict between a code and zone provision, the code provision prevails. Some codes require specified technical information to accompany the application to demonstrate compliance.

The planning scheme also provides for exemptions, general provisions (that apply across the entire municipal area) and site-specific provisions in the form of particular purpose zones or specific area plans.

Under the planning scheme, use and development may be classified as:

- No permit required – a permit is not required to commence or carry out a use or development
- Permitted – a use or development must be granted a permit
- Discretionary – the planning authority has a discretion to refuse or permit a use or development
- Prohibited – a use or development permit must not be granted.

Any use and development standard includes an Acceptable Solution and Performance Criterion. The Acceptable Solution is the Permitted standard, and the Performance Criterion is the Discretionary standard.

The Project site is proposed on land zoned Rural with elements located on land zoned Utilities where the Project traverses Highland Lakes Road and Environmental Management where the internal access road is in proximity to Ripple Creek.

The proposal and all its components fall within the Utilities use class, which is defined as:

> *Use of land for utilities and infrastructure including:*
>
> *(a) Telecommunications;*
>
> *(b) Electricity generation;*
>
> *(c) Transmitting or distributing gas, oil, or power;*
>
> *(d) Transport networks;*
>
> *(e) Collecting, treating, transmitting, storing or distributing water; or*
>
> *(f) Collecting, treating, or disposing of storm or floodwater, sewage, or sullage.*
>
> *Examples include an electrical substation or powerline, gas, water or sewerage main, optic fibre main or distribution hub, pumping station, railway line, retention basin, road, sewage treatment plant, stormwater or flood water drain, water storage dam and weir.*

The scheme divides Utilities into minor utilities and other utilities. Minor utilities are defined as:

> *Means use of land for utilities for local distribution or reticulation of services and associated infrastructure such as a footpath, cycle path, stormwater channel, water pipes, retarding basin, telecommunication lines or electricity substation and power lines up to but not exceeding 110 kV.*

The proposed works would not fall within the definition of minor utilities and therefore would be defined simply as Utilities.

5.1.3.1 Rural zone

In the Rural zone, Utilities is a permitted use. The applicable standards under the Rural zone are development standards for the proposed works. The Project will exceed the permitted building height under the acceptable solution.

The Project is likely to comply with the corresponding performance criteria for this standard, provided the proposal is supported by a visual impact assessment that demonstrates the Project will not have a significant impact on the rural landscape, and that unreasonable impacts to environmental values are minimised.

5.1.3.2 Utilities zone

Elements of the Project, including the upgraded turn-in areas and road widening to sections of Highland Lakes Road, are in the Utilities zone. Utilities are a permitted use in the Utilities zone. As the extent of works proposed in the Utilities zone is limited to roadworks only, there are no applicable use or development standards.

5.1.3.3 Environmental management zone

An element of the Project, being a section of internal access road, will be in proximity to Ripple Creek and therefore in the Environmental Management zone. Utilities are a discretionary use in the Environmental Management zone. The relevant use and development standards in the Environmental Management zone address issues that are being assessed by the EPA and therefore no assessment by Council is required under the zone.

5.1.3.4 Applicable codes and overlays

A number of overlays apply to the Project site including the Bushfire Prone Area, Waterway and Coastal Protection Area, Landslip Hazard Area and Electricity Transmission Infrastructure Protection Area, as shown in Figure 5-1. Additional codes apply by way of textual application clause. The codes applicable to the Project, or requiring further consideration, are identified in Table 5-2 below. It is likely that the Project will trigger assessment under performance criteria in some of these codes.

Table 5-2 Applicable codes

Code	Affected titles	Comments
Bushfire Prone Areas	All titles	The code applies to vulnerable use, hazardous use, or subdivision. The Project does not include subdivision, and Utilities use in not considered a vulnerable use. A hazardous use is defined under clause C13.3.1 as follows: *"Hazardous use…means a use where:* *(a) hazardous chemicals of a manifest quantity are stored on a site; or* *(b) Explosives are stored on a site and where classified as an explosives location or large explosives location as specified in the Explosives Act 2012."* Although the Project includes storage of hazardous chemicals, these are not of a manifest quantity. No explosives will be stored on site for the operation of the use. Therefore, the code is not applicable.
Landslip Hazard Code	CT 126983/1; CT 148905/1; CT 100081/65; CT 124603/1; CT 148905/2; CT 241119/1; CT 182190/1; and CT 182189/1	This code requires consideration of the potential risk from the works on landslide and geotechnical stability and ensuring that the risk is acceptable or capable of feasible and effective treatment through hazard management measures.
Road and Railway Assets Code	Highland Lakes Road	New and upgraded crossovers onto Highland Lakes Road must be designed and constructed in accordance with the Australian Standard.
Parking and Sustainable Transport Code	All titles	There are no minimum parking requirements for the Utilities use class. However, where provided, vehicle parking and loading areas must be able to service the likely workforce and attendance on the Project site and be designed to the relevant Australian Standard. Internal access roads must be designed and constructed to a standard suitable for their intended use. This may include passing bays, and it is likely to require onsite turning for large vehicles. If hazardous materials are stored on site, therefore requiring bushfire management, there may be additional requirements around accessibility for emergency services vehicles.
Flood Prone Areas Hazard Code	All titles	No flood mapping is available on the planning scheme maps, and the Project site is not known to be subject to risk from flood.
Electricity Transmission Infrastructure Protection Code	CT 156999/1; CT 126982/1; CT 100672/1; and 182190/1	Elements of the Project traverse an electricity transmission corridor. The Project must be located an appropriate distance from electricity transmission infrastructure to minimise safety hazards and ensure no impact on operational efficiency of the infrastructure. Written advice from TasNetworks will be required to satisfy the requirements of the code.
Natural Assets Code	All titles	The Project is exempt from the provisions of this code pursuant to clause E11.4.1(a) as it is a Level 2 Activity regulated by the EPA.
Attenuation Code	N/A	The Project is exempt from the provisions of this code pursuant to clause E18.2.1(b) as it is a Level 2 Activity regulated by the EPA.

Flintstone

Wilburville

Shannon

0 1 2 km

Map proj.: GDA 2020 MGA Zone 55

N

Project site (the Land)

EXISTING INFRASTRUCTURE

Towns/communities

PROPOSED INFRASTRUCTURE

Construction footprint

TASMANIA PLANNING SCHEME - ZONES

- Low Density Residential
- Rural Living
- Village
- Local Business
- Rural
- Agriculture
- Environmental Management
- Utilities

Note: Green lines in the map are Environmental Management zones.

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 5-1
Land zoning

Flintstone
Arthurs Lake
Poatina Road
Arthurs Lake Road
Wilburville
Shannon
Wihareja Lagoon
Watkins Road
Highland Lakes Road
Waddamana Road
Penstock Lagoon
Lagoon of Islands
Interlaken Road
Waddamana Road
0 1 2 km
N
Map proj.: GDA 2020 MGA Zone 55

Project site (the Land)

EXISTING INFRASTRUCTURE
- Towns/communities
- Roads

PROPOSED INFRASTRUCTURE
- Construction footprint

LAND TENURE
- Hydro-Electric Corporation
- Inland Water
- Crown Land
- Authority Crown
- Local Government
- Authority Freehold
- Permanent Timber Production Zone Land
- Casement
- Public Reserve
- Local Government Act Reserve
- State Reserve
- Conservation Covenant
- Conservation Area
- Private Freehold

Note: Lines in the map are mainly roads classified as Casement.

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

Saint Patricks Plains Wind Farm

Figure 5-2
Land tenure

5.2 Environmental aspects

The following provides a summary of the environmental aspects of the Project Site, with all detailed information provided under the relevant headings in Section 6.

The Project is located on St Patricks Plains, on the Central Highlands plateau of Tasmania, approximately 10 km south-east of the township of Miena on Great Lake, 1.5 km south-west of Arthurs Lake and approximately 35 km north of Bothwell. The Project Site covers an area of approximately 10,000 ha of generally flat plains in the northern half of the Project, becoming more undulating in the southern half towards Bakers Tier. The Project Site sits at an average elevation of approximately 875 m, with a range of approximately 700 m – 950 m.

The site can be accessed from multiple directions, including from the south from Highlands Lakes Road (A5), which runs through the Project Site, via Bothwell, and from the north via the same road via Deloraine. Other approaches include Poatina Road (B51) via Longford to the north-north-east, Interlaken Road (C527) via Oatlands to the south-east, or from Midland Highway to the east via Tunbridge Tier Road (C526) and Interlaken Road (C527).

The Project Site is traversed by the Shannon River in the central region, which also forms much of the western boundary of the site. Other waterways in the Project Site include Allwrights Lagoons, Wihareja Lagoon and Wihareja Creek, Noels Creek and Ripple Creek in the central region of the Project Site, and Blackburn Creek bordering the southern side of the Project Site. A number of wetlands and marshlands also occur throughout the area, with Allwrights Lagoons listed as a Wetland of National Importance.

Groundwater levels vary with the topography around the site and are relatively shallow in the flatter areas around the wetlands and waterbodies present. Dolerite bedrock (with minor basalt and sedimentary rocks) forms a single unconfined aquifer, containing low-salinity, slightly acidic groundwater that moves very slowly in varying directions at different depths (Cromer, 2022a).

The climate of the site is temperate to alpine, with an annual mean minimum of 1.6 °C and mean maximum of 12.2 °C. Rainfall is significant in the area with a mean annual rainfall of 916 mm from 2000–21; July and August are historically the wettest months with average monthly rainfalls of 120.3 and 125.8 mm respectively (Bureau of Meteorology, 2021). High rainfall in the area is the most important natural process for the maintenance of the ecosystem as a whole, and numerous wetlands, lakes and rivers rely on a combination of groundwater and rainfall.

Wind in the area is predominantly westerly, with the main wind directions being from the north-west, south-west and west, respectively. There are very few easterly winds experienced at the site or periods of no wind, as can be seen in the wind rose in Figure 5-3, which was generated using data collected by an onsite Proponent met mast over an almost three-year period.

The geology of the area is predominantly igneous, with basalt and dolerite (tholeiitic) dominant; there are also some smaller areas of sand, gravel and mud of alluvial, lacustrine and littoral origin. The northern half of the Project Site occurs within the Central Plateau Terrain Geoconservation Site, which covers over 1,000 km^2 and has the following Statement of Significance: '*As a large scale landform the Central Plateau is an outstanding example of both a continental erosion surface and a passive margin horst block*.' The next closest Geoconservation Site is the Shannon Tier ('The Beehive') Melilite Plugs, which is more than 3 km to the south of the site, well outside the influence of the Project.

The Project Site contains many areas mapped as having potential acid sulfate soils (PASS), as shown in Figure 5-4, with 1,411 ha (~14%) within the Project Site mapped as 'low probability inland ASS' (6–70% chance of occurrence in mapping unit), and the remainder of locations, totalling 156 ha (1.6%), mapped as 'extremely low probability inland ASS' (1–5%) (LISTmap, 2021). The extreme range of percentage chance of occurrence for 'low' probability ASS should be noted here and mapped results interpreted with caution; onsite testing is required to confirm the presence of PASS or ASS at each mapped location. The areas mapped as PASS are a

result of the marshlands/wetlands in the area, which typically harbour acidic soils. More information on the ASS investigations undertaken for the Project is provided in Section 6.10.

There are 10 individual conservation covenants within the Project Site totalling approximately 1,084 ha, protected in perpetuity under the *Nature Conservation Act 2002* (NC Act), and these are identified in Figure 5-5. A portion of the Shannon River Conservation Area occurs within the Project Site, which is restricted to the footprint of the Shannon River itself, covering an area of approximately 33.2 ha and protected under the NC Act. The Steppes State Reserve and the Steppes Conservation Area occur outside the boundary of the Project Site to the east. There are also a number of informal reserves bordering the Project Site.

Flora and vegetation surveys undertaken for the Project identified a large number of native and non-native vegetation communities within the Project Site. This included several *Eucalyptus* forest and woodland communities, large tracts of grassland / sedgeland (some of which are state-listed communities), areas of freshwater aquatic herbland (some of which are state-listed communities), and large areas of anthropogenically modified lands for silviculture and farming. No communities listed under the EPBC Act were identified. The surveys also identified 23 threatened flora species listed under either the *Threatened Species Protection Act 1995* (TSP Act), the EPBC Act, or both. An additional three state-listed species are expected to occur within the Project Site but were not identified during on-ground surveys. The Project Site was also found to harbour eight species of weeds declared under the Tasmanian *Weed Management Act 1999*, including gorse (*Ulex europaeus*) and ragwort (*Senecio jacobaea*). There are no areas of high-quality wilderness mapping in or adjacent to the Project Site.

Fauna surveys undertaken at the Project Site confirmed the presence of five terrestrial species listed either under the EPBC Act or TSP Act, including the Tasmanian devil, spotted-tailed and eastern quoll, ptunarra brown butterfly, and the Miena jewel beetle. Although not surveyed for, there are a variety of aquatic species that may occur within the Project Site. The Project Site is also known to support the threatened Tasmanian wedge-tailed eagle and white-bellied sea-eagle, as well as a host of other avifauna species including the listed species Tasmanian masked owl and Latham's snipe.

The Project Site is considered to be vulnerable to several natural processes, as is the case with most areas of Tasmania, with fire considered to be the key potential risk. The Project Site falls within the Bushfire Prone Area overlay in the planning scheme and has been subject to several recorded bushfires. These include an area of just under 400 ha burned in 1983 in the south-western part of the Project Site, an area of land to the south and west of the Project Site in 2019, and several smaller areas in the north-west affected by bushfire at various times between 2014 and 2021 (Source, TheLIST). Overall, the Project Site is considered to be at risk of bushfire, similarly to much of the state.

There are both perennial and ephemeral wetlands across the Project Site. However, advice sought from Central Highlands Council indicates no known history of flooding within the Project Site, and no inundation risk is identified on council available mapping and overlays (Senior Planning Officer, Central Highlands Council pers comm, 1 February 2023). Overall, the Project Site is not expected to be particularly prone to flooding.

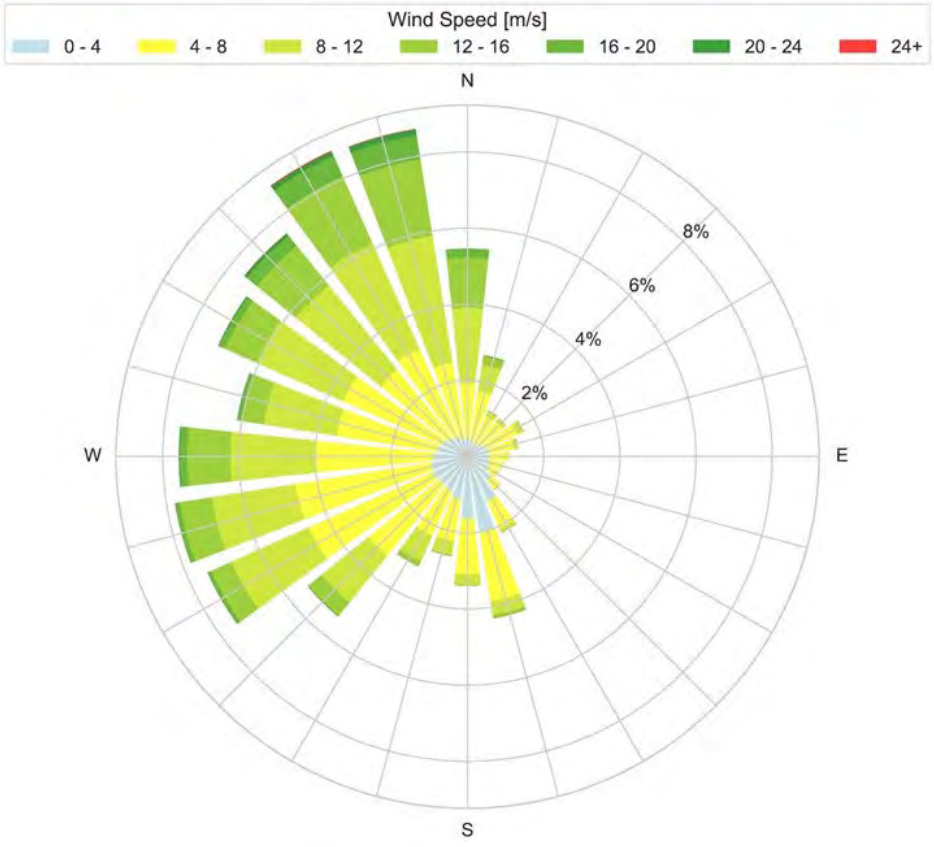
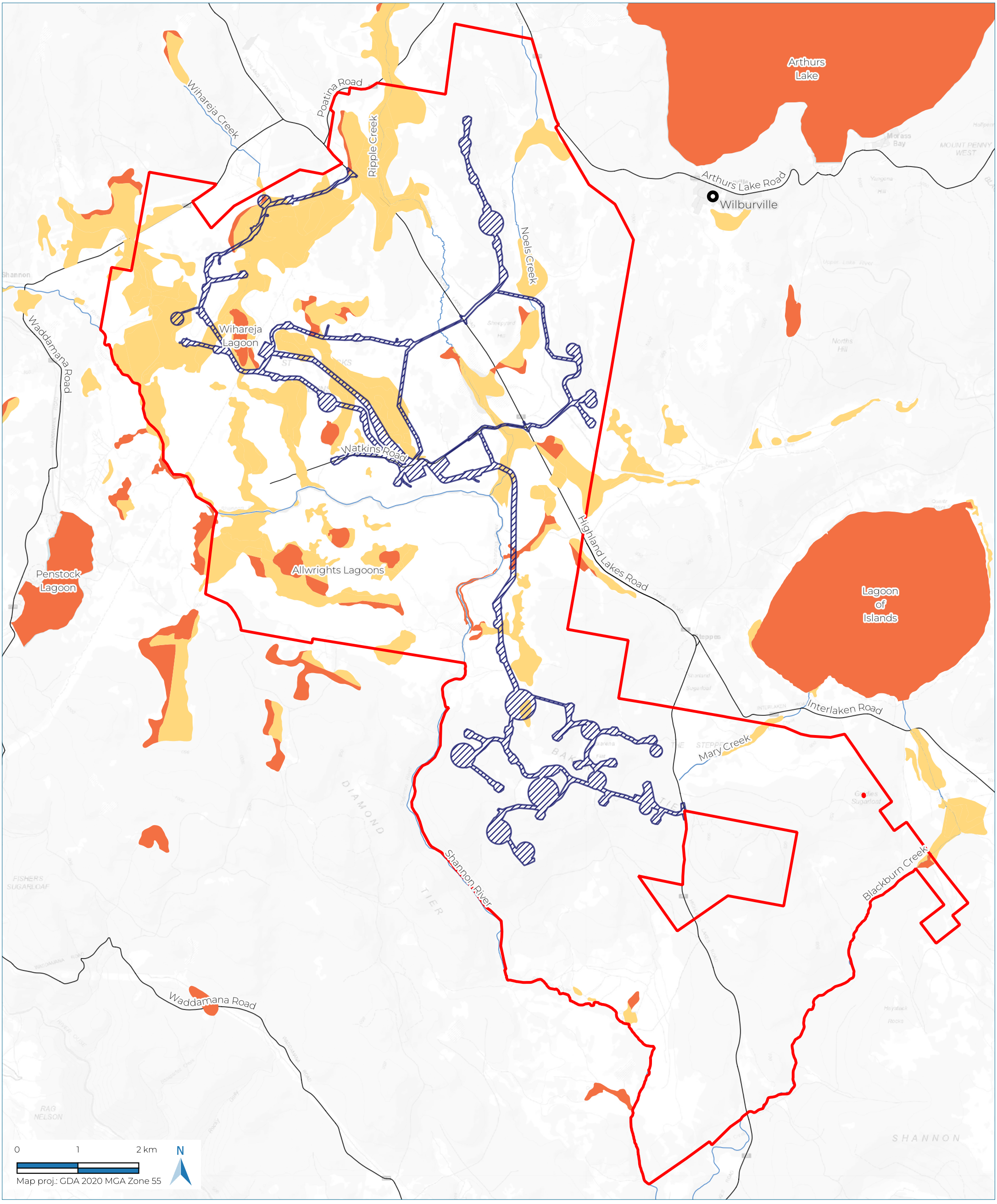


Figure 5-3 Wind rose for the Project Site area (Ark Energy met mast data from 10 July 2019 to 18 April 2022)



Project site (the Land)

EXISTING INFRASTRUCTURE

- Towns/communities
- Roads

NATURAL FEATURES

- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE

- Construction footprint

ACID SULFATE SOIL PROBABILITY

- Extremely Low
- Low

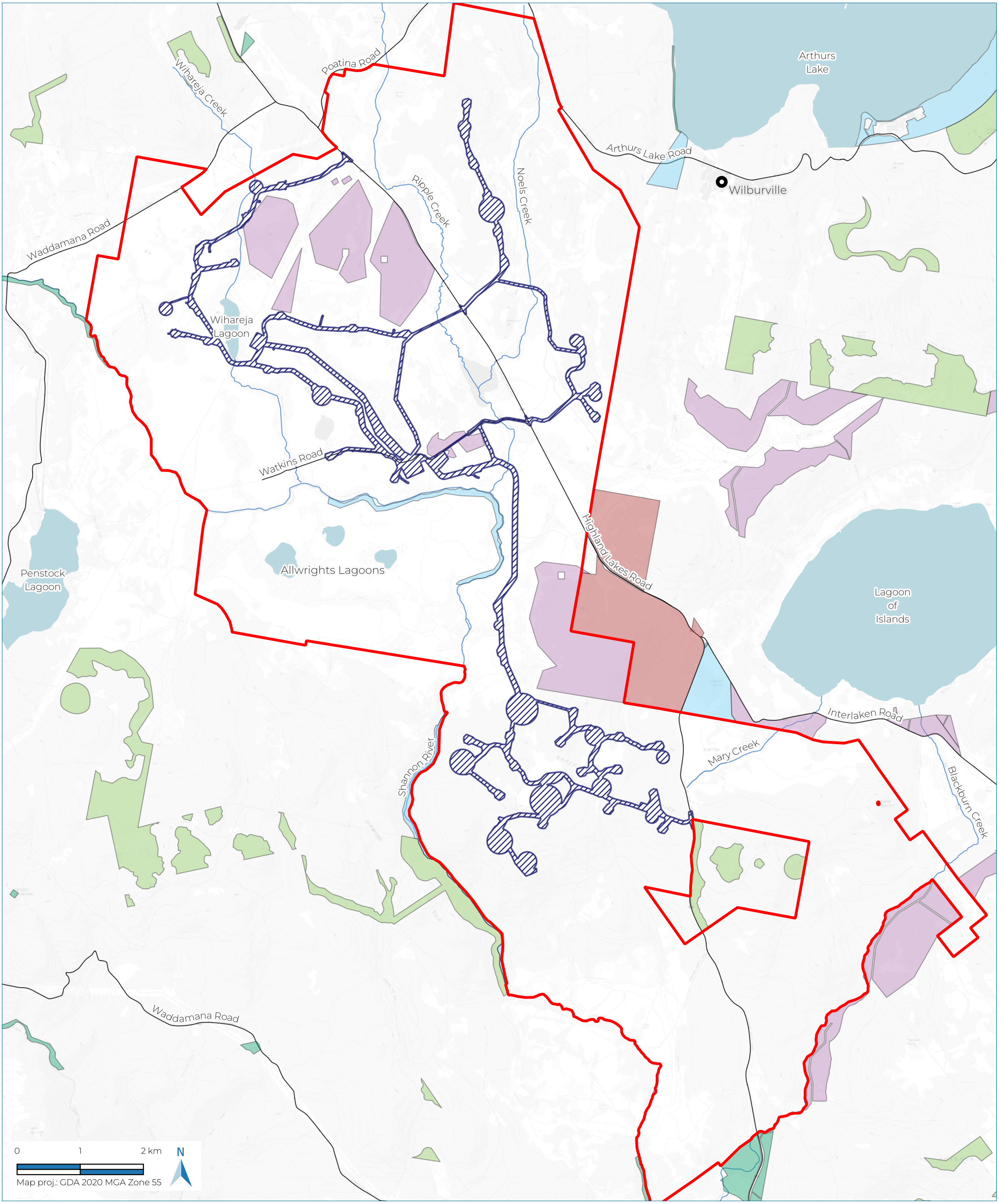
ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 5-4
Acid sulfate soils



Project site (the Land)

EXISTING INFRASTRUCTURE
- Roads
- Towns/communities

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Construction footprint

RESERVES
- Conservation Area
- Conservation Covenant (NCA)
- Informal Reserve on Permanent Timber Production Zone Land or STT managed land
- Informal Reserve on other public land
- State Reserve

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 5-5
Reserves

5.3 Socio-economic aspects

A social and economic impact assessment was completed for the Project by SGS Economics & Planning in March 2021 and is presented in full in Appendix F (SGS, 2022). The assessment characterised the local socio-economic environment and used both quantitative and qualitative analysis techniques to predict the potential direct and indirect impacts (both positive and negative) on the local and regional socio-economic environment. While the timeframes have pushed out, the assessment remains valid.

5.3.1 Background

SGS undertook a review of the socio-economic profile of the Central Highlands and Southern Midlands local government areas (LGAs) to provide context to the socio-economic assessment.

The population of the Central Highlands LGA at the time of the 2016 ABS Census was approximately 2,160 people, representing a decrease over the preceding 10-year period. The population is aging, with the 65+ cohort the only age group that increased in population between 2006 and 2016. The number of youth and children decreased substantially during this time. The population of the Southern Midlands LGA was approximately 6,040 at the time of the 2016 ABS Census and showed population growth in the preceding 10-year period. While the Southern Midlands LGA shows an aging population similar to Central Highlands, the working age population did grow slightly in the decade to 2016.

Socio-Economic Indexes for Areas (SEIFA) measures relative socio-economic advantage and disadvantage in regions. Using the mapped SEIFA information, SGS notes that the area of the proposed Project is mapped as being among the 20–30% most socio-economically disadvantaged areas in Australia, showing a need for economic stimulus and opportunity for the local community.

Housing affordability and rental affordability consider the housing or rental costs relative to household income. Mapping shows rental affordability in the area changed from 'affordable' in 2017 to 'unaffordable' in 2021, suggesting considerable housing stress in the region.

Considering ABS data for industry of employment by worker or resident, the dominant industries across the two LGAs in 2016 were agriculture, forestry and fishing. Workforce participation and unemployment data show that residents in the Central Highlands are facing growing unemployment, while the opposite is true for residents in the Southern Midlands.

5.3.2 Potential impacts

The total expenditure for the development of the Project is expected to be approximately $540 million, of which 14% or $80.5 million will be spent directly within Tasmania, 19% within Australia and 66% internationally. The high international proportion of costs are associated with the purchasing of the WTG components, which are generally only available overseas in the current market.

The assessment's quantitative analysis used a computer modelling process known as computable general equilibrium (CGE) modelling, which is considered one of the leading methodologies for assessing economic impacts from an investment such as the Project, both during construction and operation (SGS, 2022). The model outputs estimated direct and indirect economic impacts on a regional (i.e. Tasmanian) basis during construction and operation, through metrics such as gross state product (GSP) – a state equivalent of gross domestic product representing the value of all goods and services produced within the state – and full-time equivalent (FTE) jobs generated (during construction and operation). A summary of the modelling outputs is provided in Table 5-3.

Table 5-3 Computable general equilibrium (CGE) modelling outputs for the Project

	Construction period[4]			Operational period (15 years modelled)
Aspect	**2023**	**2024**	**2025**	**2026 – 2040**
Real GSP ($m)	10.1	35.3	19.0	379.1
Jobs (FTE)	50	180	74	43 (per year)
State Government revenue ($m) (e.g. from company/personal taxes)	20.8	73.4	31.6	71.8
Australian Government revenue ($m) (e.g. from company/personal taxes)	6.5	22.1	9.7	9.6

In summary, the results of the CGE modelling suggest that, as a result of the Project:

- GSP in Tasmania will increase by $64.4 million over the construction period, driven by construction expenditure in materials, professional services, a construction workforce, and all associated upstream and downstream industries (e.g. accommodation, services, transport).
- Job impacts are significant with up to 200 FTE jobs created at the peak of construction and 43 FTE jobs (both direct and indirect) required annually to run the Project during the operational period, with 20 FTE required for the Project directly.
- Significant State revenue will be generated by the Project, with large inputs early in the construction phase and then a steady flow of income during the operational phase. The Australian Government will also receive benefits from the Project through company and personal taxes.

In terms of qualitative impacts considered by the assessment, there are both positive and negative socio-economic impacts that could arise from the Project.

Negative impacts considered during the construction phase include a potential skills and worker shortage in the construction industry, with other similar projects throughout Tasmania proposed during the same period. Housing affordability and availability could potentially be negatively affected both locally and regionally, and finally traffic and transport impacts could occur during construction.

These potential negative impacts are, however, somewhat offset by significant, positive economic impacts in terms of employment and money spent in the state, improved local employment opportunity, and the ability to attract new families to the highland lakes area, which has an aging population and suffers from high levels of socio-economic disadvantage (SGS, 2022).

Impacts on land values and housing demand are uncertain and will depend somewhat on the chosen construction housing, with a camp-like facility unlikely to have any impact on demand whereas rental of local housing would significantly affect the local affordability of housing. The expectation is that the actual impact will be somewhere in between these extremes, with some dedicated temporary accommodation and some leased rental accommodation. In terms of land values, the literature suggests there is unlikely to be a detrimental impact from the Project itself, as measured in other similar situations across the world (SGS, 2022).

[4] The results of the CGE modelling were calculated based on the expected construction period at the time of the SGS (2022) report generation. It is acknowledged that these dates are now not correct due to project delays; however, the general outcomes of the model are still seen as relevant to the new construction period, and it was not considered warranted to re-model for outcomes that would yield similar results.

To establish a defined benefit to the local community, the Proponent will establish a community fund to support community initiatives at a local scale. The proposal will provide $3,000 (indexed) per year per WTG installed, which equates to $141,000 annually and over $3.5 million over a 25 year period. The management and set-up of the fund will be managed by the Project with the assistance of the LGA and a community representative committee.

6 Potential impacts and their management

The following sections (Sections 6.1 to 6.16) document the potential impacts and proposed management, mitigation, monitoring and reporting for the Project. Management and monitoring measures are documented separately in each section and collated into summary tables in Section 8 (monitoring and review) and Section 10 (management measures). Some management measures are applicable to more than one discipline and therefore will be repeated, or cross referenced, in the following sections (for example, measures to manage impacts to native vegetation will also benefit many fauna species).

As well as the discipline-specific measures documented in the following sections, there are various measures that apply more broadly across all environmental disciplines. These measures are summarised in the following table and will be applied to the Project in its entirety.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Various MM 1	A Wind Farm Design Report will be submitted to the EPA for approval prior to the commencement of construction. The Wind Farm Design Report will be informed by geotechnical assessment and further environmental surveys of the Project Site to inform the finalised road design, final design and micro-siting of all WTGs and ancillary infrastructure, and stormwater management design. Micro-siting of infrastructure will take into consideration a variety of environmental and physical constraints, including topography, environmental values and geotechnical results. Micro-siting will be cross-checked against the environmental constraints in this assessment to ensure no greater environmental impact than that approved in this EIS would result.
Various MM 2	A Construction Environmental Management Plan (CEMP) capturing all relevant construction phase management measures set out in this EIS (and any resulting approval conditions) will be prepared and made available to the EPA prior to the commencement of construction. The approved CEMP will be implemented throughout construction. Any residual management or monitoring measures remaining at the conclusion of construction will be transferred to the Operational Environmental Management Plan (OEMP).
Various MM 3	The OEMP, capturing all relevant operational phase management measures as set out in the EIS (and any resulting approval conditions) will be prepared and made available to the EPA prior to the commencement of operation. The approved OEMP will be implemented throughout operation.
Various MM 4	During the operational phase of the Project, the results of relevant environmental management and monitoring stipulated in this EIS (and any resulting approval conditions) will be documented in annual environmental reports to be submitted to the EPA within 3 months of the conclusion of the reporting period.
Monitoring	
Various MON 1	Monitoring procedures for construction environmental controls will be documented in the CEMP and implemented during the construction phase, including as a minimum: • Daily visual monitoring of active construction areas for dust and other visible emissions (e.g. wind-blown waste and visible water quality issues including high sediment loads or surface sheen). • Fortnightly audits of the physical site construction controls (including sediment and erosion control measures, exclusion fencing, signage, fauna management controls and waste management). Additional audits will be undertaken after extreme weather events. • Monthly audits of all management measures set out in the CEMP.

Reference number	Management, mitigation or monitoring measure
	• Any non-conformance identified during inspections and audits will be documented, investigated and resolved. • Audits will be made available to the EPA on request. • Any non-conformance or incident with the potential for serious or material environmental harm will be reported to the Director, EPA within 24 hours.

6.1 Avifauna

North Barker Ecosystem Services (NBES) was engaged to undertake a targeted avifauna site utilisation and impact assessment (NBES, 2023a), supported by collision risk modelling undertaken by Symbolix (Symbolix, 2021). These investigations considered all avifauna likely to use the Project Site, with a particular focus on threatened avifauna, including targeted consideration of eagles. The results of this work are provided in full at Appendix B and the salient points summarised below.

Consideration of other ecological values is addressed in separate sections of this EIS including non-avian, threatened terrestrial fauna (Section 6.2), flora and vegetation communities (Section 6.3) and other natural values (Section 6.10).

6.1.1 Existing environment

Assessment effort of avifauna at the Project Site was essentially split between eagles and all other avifauna species, as eagles are considered the most at risk of being measurably impacted by wind farms in Tasmania. The two species of eagle at risk are the Tasmanian subspecies of the wedge-tailed eagle (WTE) (*Aquila audax subsp. fleayi*) and the white-bellied sea eagle (WBSE) (*Haliaeetus leucogaster*). Other avifauna of interest include migratory, wetland, and other species protected under the TSP Act and EPBC Act.

6.1.1.1 Eagles

The Tasmanian WTE is listed as endangered under the TSP Act and Endangered under the EPBC Act. The WBSE is listed as vulnerable under the TSP Act but is not listed under the EPBC Act.

To assess the potential impacts of a wind farm on eagles it is necessary to understand both the habitat present, including the number of existing nests and associated nest activity, and the use of the site by eagles; this is achieved through habitat mapping, nest searches from ground and/or air, and eagle utilisation surveys and subsequent modelling.

Eagle nests

Desktop assessment of available data on the Natural Values Atlas (NVA) database identified six registered WTE nests within the Project Site and six within a 1 km buffer of the site.

Eagle nest searches were undertaken using a combination of desktop and ground surveys over an approximate two-year period (with aerial nest activity checks supplementing the ground-based surveys).

Wildspot Consulting was engaged by the Proponent to undertake on-ground surveys in February 2019, which were completed on foot over a five-day period; the full report is presented as Appendix 1 of Appendix B. Noting the locations of the nests already listed on the NVA, this survey identified a further three new WTE nests within the Project Site. Subsequently, nest searches were also undertaken on foot by NBES over a one-week period in April 2020 to search additional areas of the Project Site. These searches identified an additional two nests. Ground searches were chosen for nest searches for the Project Site owing to the habitat type being easy to traverse and several of the known nests in the area being lower in the canopy and

hence more difficult to see from the air (noting that annual aerial nest activity checks as detailed below also help to ensure additional nests have not been missed from the ground).

The results from all survey efforts (including desktop) are 7 eagle nests within the Project Site and a further 10 within 1 km of the Project Site (i.e. 17 in total in or within 1km of the Project Site), as shown in Figure 6-1 (NBES, 2023a). Of the 17 identified nests, one is known to support the WBSE and the remainder are understood to support the WTE; the WBSE is not a common species in the region but does occur occasionally. The 17 known nest sites offer potential nesting opportunities in any given breeding season but would not all be active in any one season due to each eagle pair potentially having two, or a number of, nests and only using one of them in any given season. Groupings of nests within a territorial buffer associated with the same eagle pair would prevent other pairs from nesting too close.

Eagle nest activity and productivity

Annual nest activity assessments have been undertaken during the Project development for the known nest sites to monitor their use to help guide the impact assessment. These are undertaken via helicopter with trained spotters who are looking out for signs of chicks, eggs or adults in the known nests.

The first assessment was undertaken in January 2020 by the Forest Practices Authority (FPA, 2020a), which assessed a total of 12 nests, four of which had fledgling activity noted (Nest IDs 762, 1414, 1599 and 1747).

The second assessment (FPA, 2020b) was completed in October 2020 and a total of 16 nests were attempted to be assessed from the known 17. The assessment identified six nests with adult WTE on the nests (Nest IDs 759, 762, 1412, 1747, 2752 and 2755), two nests showed no signs of activity, seven nests were unable to be located from the air due to canopy cover and one nest (Nest ID 2753) had an adult eagle flying over the nest displaying aggressive behaviour, thus preventing that nest from being observed during the survey.

An additional assessment was completed in January 2021 (FPA, 2021) to determine whether any chicks were visible from the known nest sites. Only a single 11-week-old WTE chick was sighted (Nest ID 2753). The assessment concluded that at least one WTE will have successfully fledged in the 2020/21 breeding season.

The results of 2020 and 2021 nest activity and productivity assessments are provided in detail in tables 1 and 2 of Appendix B.

Eagle utilisation

Eagle utilisation studies are large undertakings that use several seasons of bird utilisation data in various outputs, including computational site utilisation models, territory assessments, and collision risk models to assess the potential impact of specific wind farm projects on eagles.

The first step in the utilisation study is flight path mapping. This involves seasonal surveys of the Project Site from a variety of observation points where trained eagle observers spend multi-hour shifts observing and recording eagle flight paths. There were 22 observation sites established within the Project Site: 11 in the north and 11 in the south; 20 of the 22 sites were used for each seasonal round of surveys, and these sites are shown in Figure 3 of Appendix B.

Each survey involved a team of 5–6 observers who rotated around the observation points in 2–4 hour shifts over a two-week period, with survey effort changing with seasonal daylight. In total there were eight seasons of data collected from winter 2019 through to autumn 2021, which totalled 3,259 observer hours. More in-depth information about the survey effort is provided in Appendix B.

The observation technique involved hand drawing eagle flight paths onto site maps, noting estimated flight height, time, date and species (WTE or WBSE). Four example seasons of data are presented graphically in Figure 6-2. It is important to note that the figure shows tracked eagle flight paths within the Project Site but does not represent activity beyond the Project boundary, resulting in a graphically biased representation,

whereas in reality it is likely eagle movements extend more broadly across the region beyond the Project Site. Over the eight seasonal surveys, 3,596 WTE flights and 43 WBSE flights were observed.

The next step was processing the collected data and transforming it into probability contour maps to gain an understanding of how eagles utilise the area around and within the Project Site. This work was undertaken by Symbolix, working in conjunction with NBES, and involved a series of industry agreed statistical calculations and spatial mapping techniques, the methodologies of which are provided in full in Appendix 3 of Appendix B.

The outputs from this work are contour maps of eagle utilisation, which predict the probability that an eagle flight will utilise a certain area, as shown in Figure 6-3, which combines all seasons of data collected. The figure shows the probability of an eagle flight occurring at any given location on site, with probability measured as 1 being equivalent to 100% probability, so the $1.5e^{-08}$ contour is equivalent to a 0.00000015 in 1 chance of an eagle occurring per square metre at any given moment. The map contour-plot clearly shows the highest flight probability occurs over the Allwrights Lagoons area, in the west of the Project Site.

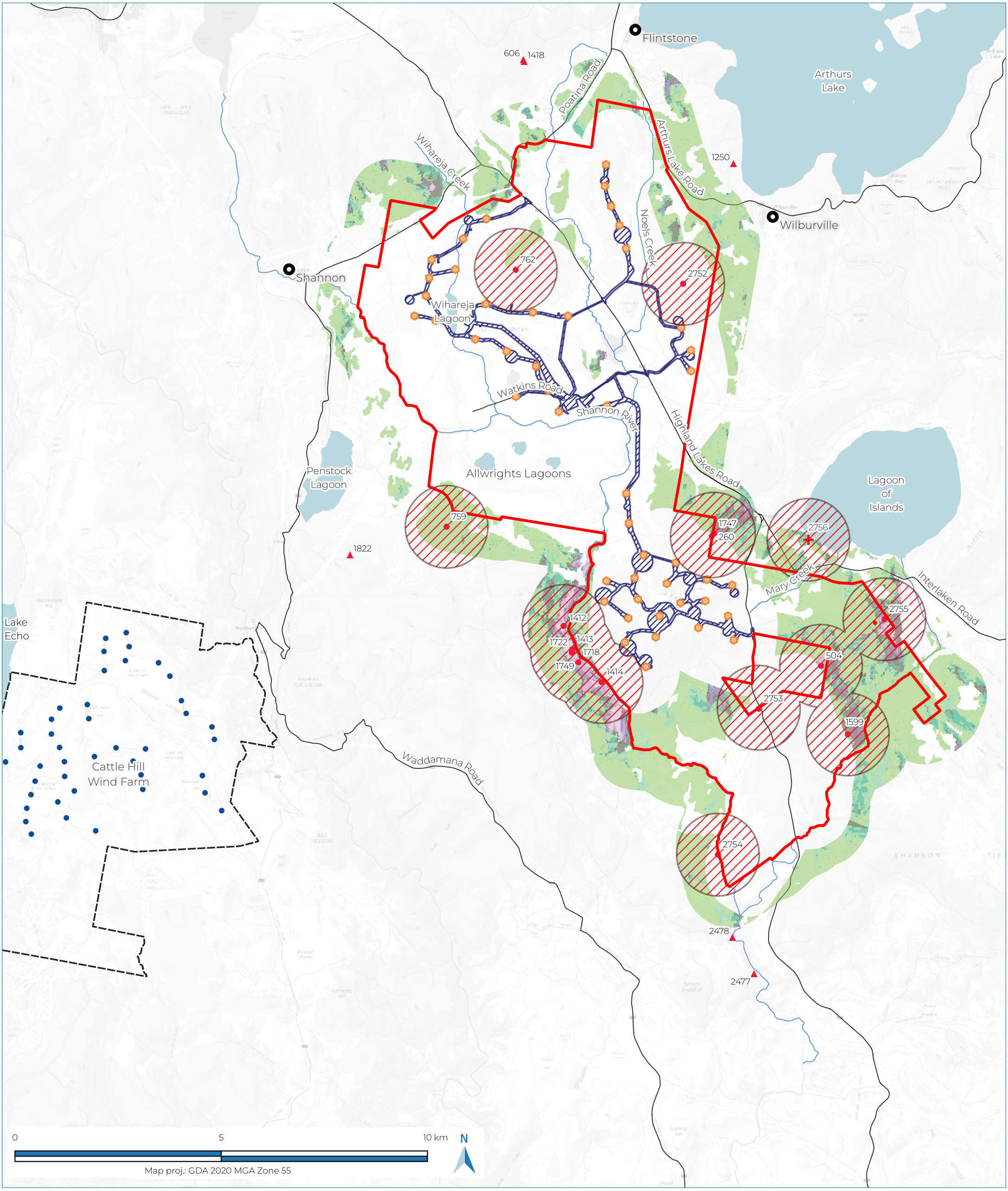
Consideration was also given to the density of flights across the different landscapes at the Project Site. As outlined in Section 7.1.2 of Appendix B, the data indicates a preference for non-forested, over forested, landscapes at the site. This is supported by the eagle probability contour map (Figure 6-3) which shows the highest flight density in the site's mid-west (near Allwrights Lagoons) and south. These areas are non-forested. There are also areas in the north-west, north-east and centre of the site that show a slightly higher flight density, and again non-forested areas are predominant. According to NBES (Appendix B) this preference is likely to be due to the higher availability of prey in non-forested areas or at least the higher likelihood of successfully feeding in non-forested areas.

A breakdown by seasonal data is shown in Figure 6-4, which shows distinct differences between seasons, reflecting the seasonal behaviour of eagles. It should be noted that WTE and WBSE data was combined for the dataset, as the WBSE dataset was not large enough to make an individual dataset.

Potential eagle territories

From the probability results and the locations of the nests, a series of potential eagle territories were identified around the Project Site. NBES (2023a) notes that separate eagle territories have not been found to occur closer than 1.8 km from one another due to territorial competition, so a cluster of nests in a single or adjacent location is likely to belong to a single breeding pair. Hence, territories can contain multiple nests, and nests within a territory are usually within 1 km of each other and closest when habitat is continuous. The size of territories and home ranges varies with the quality of habitat and the abundance of food resources. The density of flights observed on site and the numbers of nests that are known indicate a productive landscape, which allows pairs to establish relatively small territories.

The spring 2019 season of probability results were used to identify potential territories, as it was found to be one of the most active seasons from the eight on record. A territory distribution map was created, which suggested potentially nine separate territories may occur within and adjacent to the Project Site; these can be seen in Figure 10 of Appendix B (noting the majority will be WTE rather than WBSE). The density of potential territories suggests the site is rich in food resources and nesting sites (NBES, 2023a).



Project site (the Land)

EXISTING INFRASTRUCTURE
- Towns/communities
- Roads
- Cattle Hill Wind Farm Project Boundary
- Cattle Hill wind turbines (existing)

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

NESTING HABITAT SUITABILITY INDEX *
- 8 to 9 (high likelihood)
- 7 to 8
- 6 to 7
- 5 to 6
- 4 to 5
- 3 to 4
- 2 to 3
- 0 to 2 (low likelihood)

NESTS *
- WTE nest locations (with nest ID number)
- WBSE nest location (with nest ID number)
- Raptor nest in vicinity (>1km from Project site)
- 1 km nest buffer

PROPOSED INFRASTRUCTURE
- Construction footprint
- Wind turbines

* Nest information includes data provided by North Barker Ecosystem Services and the Natural Values Atlas.

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 6-1
Eagle nests

Winter 2020

Spring 2020

Summer 2020

Autumn 2020

Arthurs Lake
Wilburville
Waddamana Road
Arthurs Lake Road
Noels Creek
Wihareja Lagoon
Watkins Road
Shannon River
Highland Lakes Road
Allwrights Lagoons
Lagoon of Islands
Mary Creek

0 2 4 km

Map proj.: GDA 2020 MGA Zone 55

N

Project site (the Land)

EXISTING INFRASTRUCTURE
- Towns/communities
- Roads

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Construction footprint
- Wind Turbines

NESTS *
- WTE nest locations
- WBSE nest location
- Raptor nest in vicinity (>1km from Project site)
- Eagle flight tracks (2020)

* Nest information includes data provided by North Barker Ecosystem Services and the Natural Values Atlas

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.11
Date	19 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 6-2
Eagle flight paths

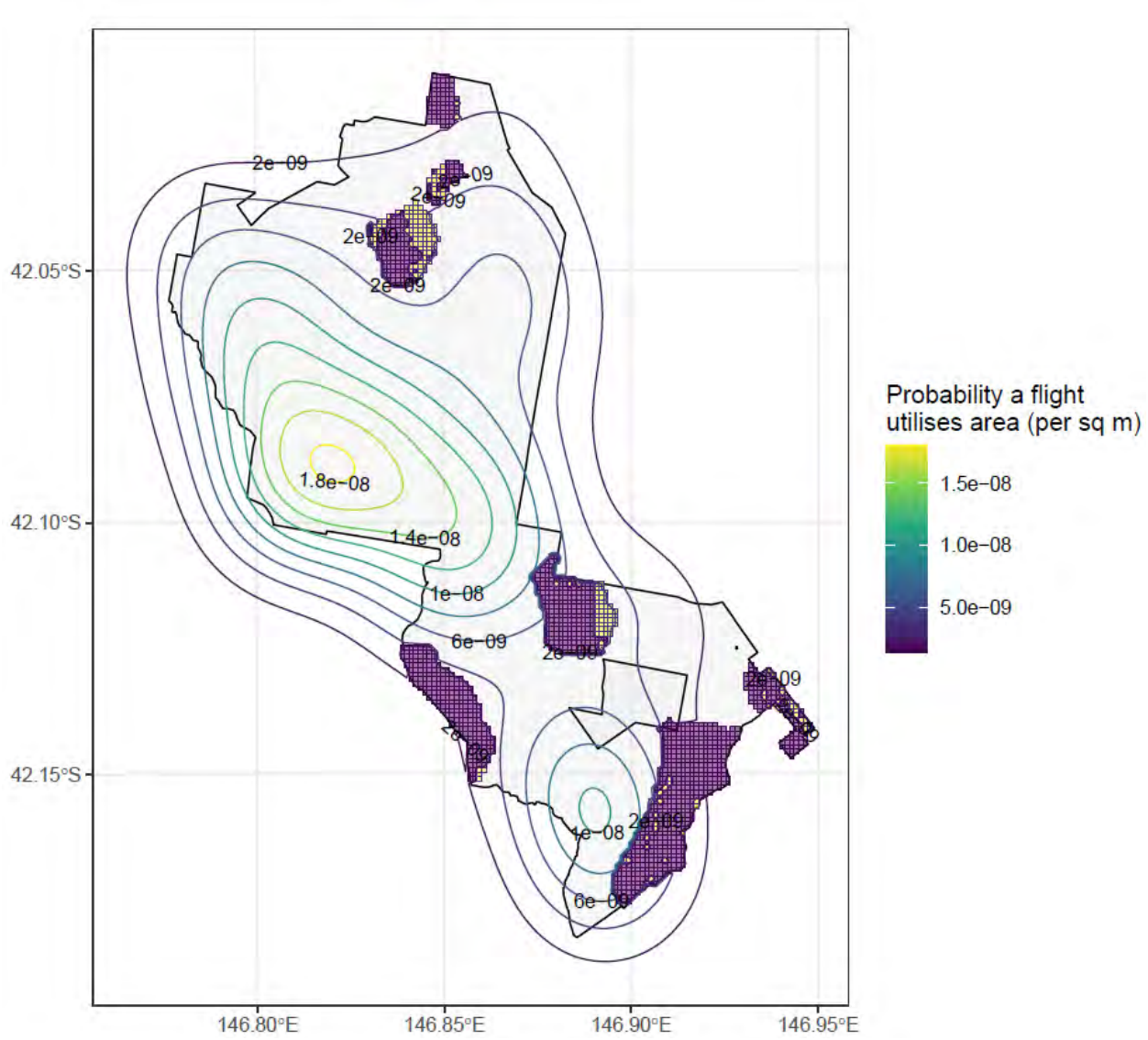


Figure 6-3 Eagle probability contour map of all seasons combined (cross-hatched areas are considered to have low visibility) (Symbolix, 2021)

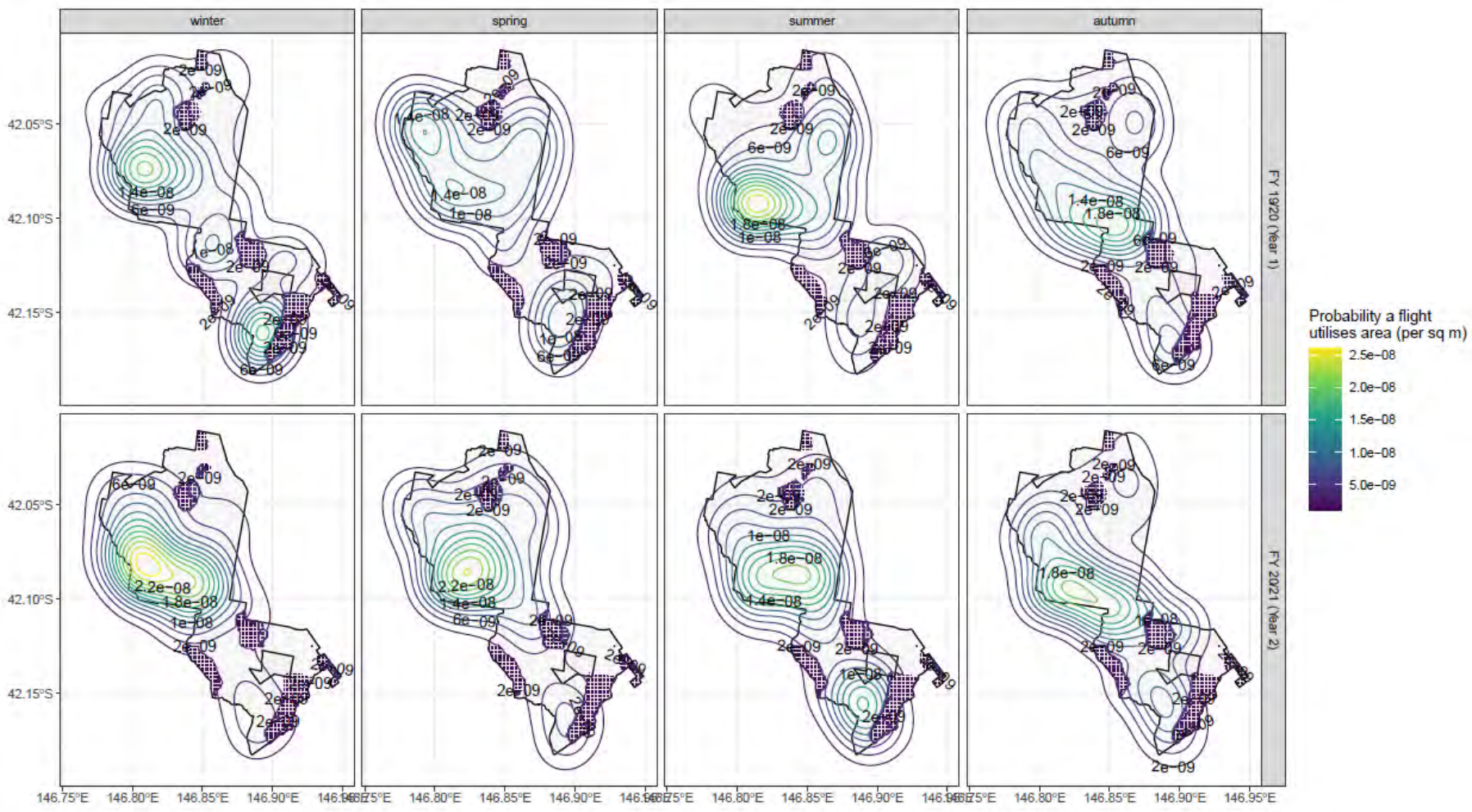


Figure 6-4 Eagle probability contour map by season (Symbolix, 2021)

6.1.1.2 Other avifauna

The varied habitat characteristics of the Project Site lend it to supporting a variety of bird species. The mosaic of forest and non-forested areas, including grasses and heathlands, intertwined with rivers and wetlands, provide numerous feeding and nesting opportunities for a variety of species. The following section provides a summary of the salient points from the avifauna assessment undertaken by NBES (2023a), provided in full in Appendix B.

Listed migratory and threatened avifauna (excluding eagles)

Of specific interest to this assessment are the migratory and threatened species that inhabit or visit the Project Site, owing to their vulnerability as reflected in their listed status. To assess the potential for species to occur at the Project Site, a series of desktop searches were first undertaken to identify target species for survey, including using the Tasmanian Natural Values Atlas and the EPBC Act Protected Matters databases, as well as interrogation of data from Birdlife Tasmania.

Habitat suitability for each species was assessed within the Project Site and surrounds by NBES. This was achieved through initial assessment of satellite imagery and available habitat data, and subsequent in-field ground-truthing as well as on-ground habitat assessments (NBES, 2023a). Habitat suitability was described on a scale of high, moderate or low quality, or as optimal vs suboptimal habitat, depending on the species. The habitat assessment identified various potentially suitable areas within the Project Site, including habitat for wetland species along the Shannon River and several small lagoons and creeks, as well as several larger lagoons and lakes (including Penstock Lagoon, Lagoon of Islands and Arthurs Lake) within a 5 km buffer of the site (refer Figure 1-1 for overview of wetlands and Figures 17 to 22 of Appendix B for detailed habitat maps). The results of habitat assessments are further described in Sections 5.2 and 6.6, and in NBES (2023a) (at Appendix B) and summarised for each relevant species in

Table 6-1.

Additional to the habitat surveys, visual and auditory surveys for avifauna species were also undertaken, spanning three seasons, spring 2019, summer 2020 and autumn 2020. Each survey effort included five 10-hour days, using a variety of stationary and meandering search techniques at a variety of locations. These visual and auditory avifauna surveys considered all avifauna, with a particular focus on migratory and threatened species.

Additionally, targeted investigations were undertaken for the Tasmanian masked owl (refer Footnote 5 for summary of methods, and Section 13.2 of Appendix B for further detail) and opportunistic observations were also noted along with any observations during the eagle utilisation surveys (NBES, 2023a).

The table below (Table 6-1) summarises the results for listed avifauna species (excluding eagles) that NBES identified by desktop research, determined as potentially occurring on site and therefore considered in detail in their assessment (refer Section 12 and 13 of Appendix B).

[5] To assess the potential areas and quality of habitat for this species within the Project Site, remote assessment was first undertaken using the FPA 'mature habitat availability map' (FPA, 2016) of the Project Site and a ~5 km buffer area, which uses mature canopy cover as a proxy for determining potential hollow-bearing tree density. Significant habitat was considered to be all areas of dry forest with at least 20% mature eucalypt crown cover, which was further refined into high and medium habitat suitability based on percentage of mature crown cover. Patches with >40% crown cover of mature eucalypts were classified as having high potential to support suitable hollows, and patches with between 20% and 40% crown cover of mature eucalypts were classified as having medium potential to support suitable hollows.
The habitat identified within the study area was then ground-truthed (NBES, 2023b). This involved inspection of representative areas of the mapped habitat types (within the impact footprint and in the areas where owl surveys were undertaken) to verify the maturity class and classification of habitat suitability. Due to the size of the Project Site and number of potential habitat areas, this ground-truthing focused on confirmation of mapping classification, rather than full ground coverage, as further outlined in NBES (2023a). No counts of individual hollow-bearing trees were undertaken during these surveys. Additional surveys included call play-back surveys using a speaker with pre-recorded calls to mimic the species in order to induce a response. Recording devices were also set up at various locations for a total of 126 nights to try and capture any calls. The total survey times for all surveys exceeded the recommended effort from DCCEEW.

Table 6-1 Listed avifauna species with potential to occur in the Project Site

Species	TSP Act/EPBC Act listing status	Potential to occur in the Project Site
Curlew sandpiper (*Calidris ferruginea*)	– /Critically Endangered, Migratory	Low to moderate habitat suitability with no historic records in the Project Site or surrounding 5 km buffer. No individuals recorded during site assessment and has not been recorded in the Central Highlands in recent history. Unlikely to occur in the Project Site and therefore the site is considered to have no importance to these species and they have a very low risk of being impacted by the Project (NBES, 2023a).
Eastern curlew (*Numenius madagascariensis*)	endangered /Critically Endangered, Migratory	
Latham's snipe (*Gallinago hardwickii*)	– /Migratory	Moderate to high-quality habitat exists in the Project Site and surrounds. Field investigations found 15 individuals in spring 2019, 24 in summer 2020, and 2 in autumn 2020 from the Shannon River, Wihareja Lagoon, Allwrights Lagoons and various other wetland areas in the Project Site. The Project Site and surrounds contain various habitats that likely constitute nationally important habitat for the species as it meets the required thresholds (NBES, 2023a).
Australasian bittern (*Botaurus poiciloptilus*)	– /Endangered	The Project Site itself contains some very small patches of low-quality wetland habitat, which are potentially suitable for foraging but not nesting due to the highly disturbed nature of the dams and water bodies and their lack of dense vegetation. Some moderate and high-quality habitat exists in the 5 km buffer area. Previous records are located at Lagoon of Islands, Woods Lake, and Little Pine Lagoon. Two individuals were recorded during the spring 2019 survey at Lagoon of Islands (just outside the Project Site), but none were recorded on the Project Site. Despite the species being unlikely to inhabit the Project Site, the area may be flown through between areas of greater quality habitat (NBES, 2023a).
Red-capped plover (*Charadrius ruficapillus*)	– /– Marine	Only suboptimal habitat was found for these species in the Project Site and the 5 km buffer area. Birdlife Tasmania data showed several records from both Shannon Lagoon and Lagoon of Islands; all of these records were from a single survey in 1984. No records occur within the Project Site. No individuals were identified during the NBES surveys. The site is not considered to contain important habitat for these species (NBES, 2023a).
Double-banded plover (*Charadrius bicinctus*)	– /– Migratory	
Azure kingfisher (*Ceyx azureus subsp. Diemenensis*)	endangered/Endangered	Only suboptimal habitat was found for this species in the Project Site and the 5 km buffer area. There are three Birdlife Tasmania records from within the 5 km buffer area, but outside the Project Site: one at Arthurs Lake and two at the Lagoon of Islands (refer Figure 21 in Appendix B). No individuals were identified during the NBES surveys. Given the infrequency of records, NBES considers the species to be either an occasional visitor to the area or that a very small population is present. Surveys show there is very little suitable habitat for the species in the Project Site, including very little vegetation cover offering perches around the waterways in the site. Overall, the species is considered very unlikely to occur in the Project Site.

Species	TSP Act/EPBC Act listing status	Potential to occur in the Project Site
Tasmanian masked owl (*Tyto novaehollandiae castanops*)	endangered/Vulnerable	As the Project Site occurs at an altitude above 600 m, it is not in the core habitat range of the species, which includes dry forests below 600 m altitude. Regardless, the species has been recorded from the broader area and the Project Site does contain areas of suitable dry forest habitat (NBES, 2023a). Within the Project Site there is estimated to be approximately 281 ha of high potential hollow-bearing tree habitat and 821 ha of medium potential hollow-bearing tree habitat that would potentially be suitable for the species. This makes up 11% (2.8% high and 8.2% medium potential habitat) of the Project Site, with the majority of the site (~89%) containing negligible to low suitability vegetation (NBES, 2023a). Ground surveys confirmed the presence of suitable habitat within the Project Site, including the presence of scattered hollow-bearing trees found in mature sections of dry forest. The species was not recorded within the Project Site itself during recent surveys (the most recent records within the Project Site are prior to 1981); however, it was recorded outside the Project Site within the 5 km buffer zone, with several recordings on sound meters and positive field identifications in areas outside the Project Site, specifically around the Lagoon of Islands. NBES considers it likely that only a few pairs of birds occur within the entire 5 km buffer area, considering the large home range of the species (>1,000 ha) and the amount of suboptimal or non-core habitat in the area, especially within the Project Site itself (NBES, 2023a).
Swift parrot (*Lathamus discolor*)	endangered/Critically Endangered	Swift parrots generally occur in habitat containing their preferred food source, the nectar from flowering *Eucalyptus globulus* and *Eucalyptus ovata* trees, neither of which occur in the 5 km buffer area. No individuals were recorded during the site surveys and there are only four records from within the 5 km buffer area, all pre-1988. The available hollow-bearing mature eucalypts were considered unlikely to support the species as nesting sites due to the lack of a food source. NBES notes that the species may occasionally pass through the area but are highly unlikely to use the site regularly (NBES, 2023a).
Orange-bellied parrot (*Neophema chrysogaster*)	endangered/Critically Endangered	The orange-bellied parrot is considered very unlikely to occur in the region, as the area is extremely disjunct from the species' core habitat (NBES, 2023a). NBES notes that records for this species identified via desktop research are very old and quite likely to be erroneous, with sightings often mistaken for the similar blue-winged parrot[6] (which has been recorded regularly on the Project Site). The Project Site is not within the orange-bellied parrot breeding range, non-breeding range or migration route as documented in the National Recovery Plan for the Orange-bellied Parrot (Department of Environment, 2016).

[6] The blue-winged parrot (*Neophema chrysostoma*) was listed as vulnerable on the EPBC Act in March 2023 (after all ecological studies for the Project had already been completed). In accordance with the *EPBC Act Policy Statement – Listing Events under the EPBC Act*, new listings or changes in listing status that occur after a controlled action decision has been made on a Project are not required to be taken into consideration in the assessment of that Project. The EPBC Act section 158A(4) states that any listing event made after a section 75

Species	TSP Act/EPBC Act listing status	Potential to occur in the Project Site
Grey goshawk (*Accipiter novaehollandiae*)	endangered/ –	One grey goshawk was observed on site, and NBES notes that this single observation is likely to have been a foraging adult or dispersing juvenile traversing non-breeding habitat. No nests were recorded and the Project Site is well above the known breeding range; noting no nests of this species have previously been recorded above 450 m above sea level (NBES, 2023a). NBES concludes that habitat within the Project Site is suboptimal and because of this the Project Site is unlikely to support more than an occasional bird dispersing from a territory lower in the landscape.

General bird utilisation results

In addition to eagles, general bird utilisation surveys of the site were also undertaken as part of the same survey effort for winter/spring 2019 and summer/autumn 2020, with species and numbers recorded. The large number of sites (22), spatial distribution over the various types of habitat present, and number of seasons surveyed are thought to provide a strong coverage of the Project Site for estimating resident and migratory avifauna in the area (NBES, 2023a).

A total of 67 bird species were identified, in addition to those species listed above, during the surveys with a grand total of 3,590 observations over the four seasonal monitoring events. The native species identified were found to be consistent with the habitats observed. There were six exotic species identified during the surveys. The most frequent eight species observed made up 51% of the observations, and the least frequent 23 species made up 2% of observations (NBES, 2023a). There were 11 species that were observed only once in the four seasons surveyed. The greatest number of species were observed during spring and summer.

Species richness was between 20 and 42 species at sites surveyed during all seasons. The southern survey sites with forest adjacent returned the highest species richness, while sites in the open heath and grassland recorded the lowest taxonomic richness. The eight most common species identified were the forest raven, black currawong, Australian magpie, yellow wattlebird, yellow-throated honeyeater, grey butcherbird, green rosella, and the laughing kookaburra, none of which are listed. A complete list of the species identified and counts are provided in the NBES report in Appendix B.

6.1.2 Legal and other requirements

The key legislation and policy relevant to protecting avifauna values of relevance to this Project include:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Tasmanian Threatened Species Protection Act 1995*
- *Nature Conservation Act 2002.*

The key performance requirement is to minimise impacts to identified avifauna values and seek necessary approvals for any unavoidable impacts.

decision (decision on whether a project is a controlled action) must be disregarded in making any further approval process decisions under Parts 7 to 9 of the Act. The species is not listed on the Tasmanian TSPA. Nonetheless, advice provided by NBES indicates the Project has limited risk of impact to the species, and the mitigation measures established for other avifauna (including searches for hollow-bearing trees prior to construction) will also afford protection to this species.

6.1.3 Potential impacts

6.1.3.1 Eagles

Collision risk

The principal risk to eagles from all wind farms is the potential for collision with WTG rotors, the tips of which can be travelling deceptively fast at speeds in excess of 300 km/h (Biosis Research, 2006) and which can be difficult to see for eagle species in motion (DPIPWE Threatened Species Section, 2021). To assess the potential impacts of the Project on the eagle species known from the area (WTE and WBSE), a collision risk model was generated by Symbolix (2021) from the eagle utilisation data collected. The model uses a significant number of variables, including WTG dimensions and operational aspects, number and location of WTGs, and eagle behaviour. The model is explained in detail in Symbolix (2021), which is attached as Appendix 3 of Appendix B.

The outcome of the collision risk modelling is a predicted number of eagle flights at risk of collision at a certain avoidance rate. Avoidance rate refers to the starting assumption that a certain percentage of birds will avoid collision with a WTG without any mitigation in place.

The overall avoidance rate incorporates the sum of measured avoidance behaviours at various scales, as illustrated in the diagram in Figure 6-5, and explained as follows:

- Macro-avoidance – behaviour changes such that birds avoid the Project area altogether – conservatively, flights at this scale provide negligible contribution to the probability of avoidance as it is too difficult to statistically measure whether the presence of the wind farm caused the behaviour or not and therefore is assumed to be zero.
- Meso-avoidance – behaviour changes such that birds avoid the cylindrical space containing the WTG.
- Micro-avoidance – behaviour changes such that birds fly over or under the rotor, or between blades, all 'inside the cylinder'.

Studies at other wind farms in Tasmania suggest that between 81% and 97% of approaching eagles entering the meso-scale avoidance zone avoid collisions with the WTGs nearby (e.g. tens to hundreds of metres from the blade) without any mitigation measures in place (NBES, 2023a). This eagle flight avoidance rate increases when micro-scale avoidance is taken into account (several metres from the blades, below the blades and up to tens or hundreds of metres above the rotor).

Smales et al. (2013) tested the most appropriate avoidance rate for use in collision risk modelling using eagle mortality data from two Tasmanian wind farms that had also had models generated for the respective sites. Models with 95% avoidance rates best predicted the mean number of collisions actually documented at these sites. Avoidance rates of 90% and 95% both predicted actual collisions within a 95% confidence interval (Smales, Muir, Meredith, & Baird, 2013). Based on these figures, a realistic minimum overall avoidance rate of 90% was identified as most suitable to be used for modelling (refer Appendix B Symbolix memo on Avoidance Rate Determination).

Therefore, the avoidance rates applied to the model for the Project are at 90%, 95%, and 99% avoidance to provide a range of predictions of collision within the bound of industry standard modelling rates; the results at the various rates are provided in Table 6-2.

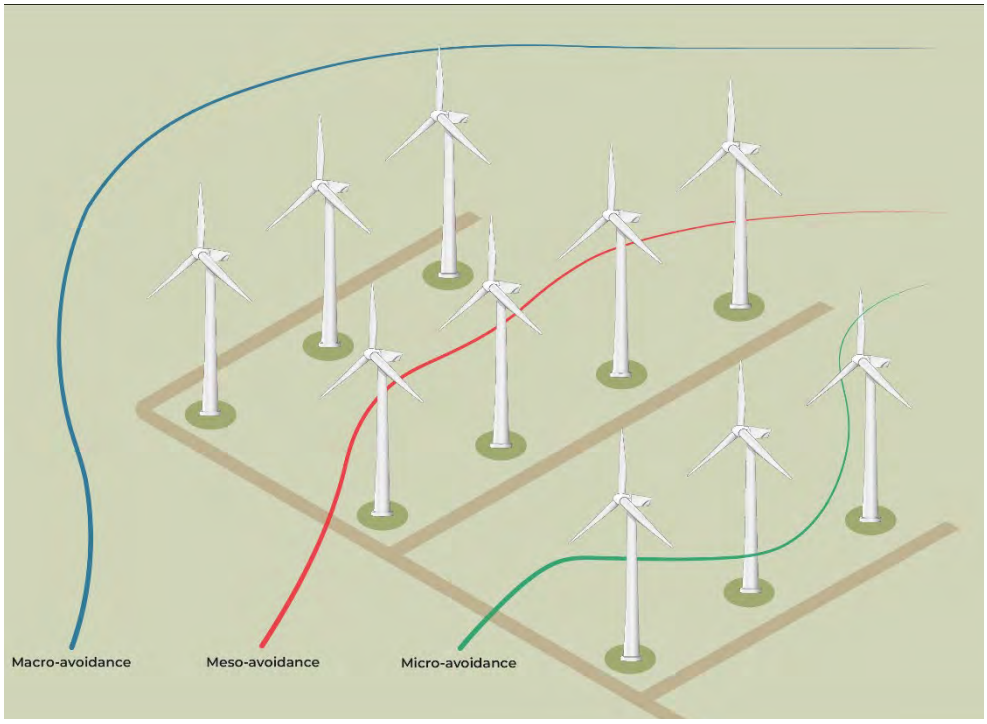


Figure 6-5 Levels of avifauna avoidance of WTGs. Arrowed lines present flights with macro, meso and micro-avoidance of WTGs.

Table 6-2 Modelled unmitigated annual collisions for target species by avoidance rate

Species	Avoidance rates		
	90%	**95%**	**99%**
Wedge-tailed eagle	4.89	2.44	0.49
White-bellied sea-eagle	0.05	0.03	0.005

The results suggest that with no mitigation in place other than the positioning of WTGs at least 1 km from known nest sites (as part of the design of the Project, explained further below), 4.89 WTE flights are at risk of collision annually at a 90% avoidance rate, reducing to 2.44 collisions at 95% avoidance and 0.49 collisions at 99% avoidance. An important point to note when interpreting these numbers is that the model assumes a constant number of birds (i.e. each eagle lost from collision is immediately replaced and behaves in the same way, thus the population remains static). As the model assumes immediate replacement, the estimated number of collisions may be higher than the actual collision rate if a struck bird is not rapidly replaced. The rate of replacement is not known, particularly in the context of the variation in the number of juveniles and floaters at the site from time to time (NBES, 2023a).

Predicted WBSE collision numbers are extremely low, even at 90% avoidance, owing to the scarcity of the species in the area.

Given the high occurrence of WTE at the site, collision risks are relatively high for this species, and generally considered to be unacceptable without further mitigation to seek to reduce those predicted collision rates to a more acceptable level (refer Section 6.1.4).

Flight collision risk also changes with seasons and the productivity of the area in terms of food supply. The Project Site is expected to remain relatively stable during the operational phase in terms of productivity, but mitigation and management will be required to reduce any additional abundance of prey as a result of the

Project, such as roadkill and the carrion of other avifauna species colliding with the WTGs (albeit unlikely as discussed below).

Additional components of the Project that present a minor collision risk (in comparison to the WTGs) are the met mast towers and associated guy wires, and any new sections of overhead powerline. There is no information available about current collision occurrence at the existing large transmission line that traverses the Project Site, so there is no basis for impact extrapolation (NBES, 2023a). According to NBES (2023a), high collision risk areas for powerlines and guy wires are near take-off and landing areas adjacent to wetlands and across valley floors. NBES concludes that the proposed layout does not present this risk, based on detailed knowledge of site conditions. Several sections of the proposed overhead powerline for the Project and met-mast guy wires do, however, occur in the vicinity of ephemeral wetland areas. Although not considered a significant risk, to minimise the residual risk of collision, overhead powerlines and guy wires will include regular interval flags or 'flappers' on the wires to increase their visibility to eagles. Given the comparative size of these components to other larger collision risks in the Project Site, including the WTGs and existing large 220 kV powerlines, potential impacts from these aspects of the Project are expected to be negligible.

Noise and construction disturbance impacts

Other risks to eagles include disruption to breeding from excessive noise generated from projects during either construction or operational phases. This can include eagles fleeing nests and leaving chicks or eggs unattended for long periods, potentially leading to a reduction in survival. WTEs vary in their tolerance to noise levels and are more likely to be tolerant if they build a nest in an already noisy area, as opposed to reacting to new noises around an established nesting site (DPIPWE Threatened Species Section, 2021). Generally, the further away eagle nests are from construction activities, the less likely they are to be disturbed during the breeding season.

As outlined in Section 2.4.7, most ground excavation is expected to be undertaken by excavator, but there is a possibility some parts of the construction footprint may require blasting. The extent of blasting will not be quantified until geotechnical studies and detailed design are complete, but it is anticipated to be very limited (if required at all). Blasting has the potential to impact on eagles, particularly if undertaken in proximity to active nests, and could result in breeding disruption and nest abandonment.

The author notes many previous projects in Tasmania have adopted a 500 m or 1 km line of sight buffer as a minimum distance required between eagle nests and construction activities, and operationally 1 km for WTGs; these buffer zones are shown in Figure 6-1. This requirement likely originated from adoption of the Forest Practices Authority's (FPA) recommendations relating to forestry activities (Forest Practices Authority, 2007); it remains a generally accepted activity buffer distance for environmental approvals in Tasmania to prevent significant impacts from noise and visual disturbance. With this in mind, all WTGs for the Project were positioned a minimum of 1 km from known eagle nest sites during the Project design phase. For the most part, all roads and ancillary infrastructure are also outside the 1 km buffer zones, with the exception of a small section of road and underground electrical cabling (totalling 4.3 ha in disturbance) that falls within 1 km, but outside 500 m of one nest site (which is 629 m from the closest section of proposed road) plus two other small areas of IDF construction and clearance that fall within 1km, but outside 500 m from nest sites. Construction measures will need to be in place to protect the nest sites if they are active during construction, including specific controls for blasting (refer Section 6.1.4).

Habitat loss

With respect to loss of eagle nesting habitat as a result of the Project, the vast majority of the Project layout has been designed to avoid higher quality nesting habitat in the Project Site with reference to the nesting habitat suitability index developed by the FPA (FPA, 2014); the various habitat areas and their suitability ratings are shown in detail for the Project Site in Figure 6-1 and Figure 2 of Appendix B. The existing nesting sites appear to correlate well with the index, which provides confidence that the vast majority of suitable

nesting habitat will be protected from clearance for the Project. Loss of a relatively small area of foraging habitat will also occur, but in the context of the broader landscape and available foraging habitat, the loss is considered minimal. Given the general avoidance of areas mapped as potential nesting habitat and the relatively small loss of potential foraging habitat, impacts to eagles associated with land clearance are expected to be negligible.

Cumulative impacts

With respect to cumulative impacts to individual eagle territories, the nearest existing wind farm to the Project Site is Cattle Hill Wind Farm, noting that there is a distance of approximately 10 km between the nearest WTGs from the two projects (refer Figure 6-1). Of the nests between the two sites, NBES (2023a) notes that the nests nearest the Project Site are approximately 9.5 km east of the Cattle Hill Wind Farm and the nearest nests to Cattle Hill Wind Farm are about 7 km west of the Project Site. Based on typical and estimated territory sizes at the Project Site and generally for WTEs, these birds are highly unlikely to forage within the alternative respective wind farm sites; none of the known nests between the two sites are likely to occupy territories that span both sites, and therefore cumulative impacts between the two sites are not expected to increase the risk to eagles at the individual territorial level (NBES, 2023a).

Additional to consideration of cumulative impacts at the individual territory level, it is also important to acknowledge that any impact to eagles at the Project Site is in the context of cumulative impacts from all other impacts to eagles both locally and across Tasmania (i.e. cumulative impact on the regional and statewide population level). This includes other wind farms (both regionally and across the state) as well as other impacts such as shooting, poisoning, collision with other structures (powerlines, vehicles), electrocution from powerlines, habitat loss and nest disturbance. It is not possible to quantify the extent to which the Project has a cumulative impact (combined with these other impacts) as there is limited holistic information on impacts from these other sources. Although this potential cumulative impact on regional and statewide populations cannot be readily quantified, it does emphasise the importance of minimising impacts at the Project level, given the overall threat to the species from other wind farms and other activities regionally and across the state. The management, mitigation and monitoring measures documented in Section 6.1.4 aim to achieve this goal, including the commitment to mortality reporting and adaptive management in response to any listed avifauna mortality.

6.1.3.2 Other avifauna

For the vast majority of other avifauna identified (i.e. aside from eagles) NBES concludes that the risk of impacts is very low, with the possible exception of the Latham's snipe and masked owl where the risk of impact is still considered low. The following provides a high-level summary of NBES conclusions, with full details of the analysis provided in its report at Appendix B.

Latham's snipe

Latham's snipe was observed on several occasions in the Project Site during NBES surveys, and there are patches of both moderate and high-quality habitat for the species mapped within the Project Site and in the surrounding 5 km buffer. Key areas of high-quality mapped habitat include along the Shannon River and the margins of the lagoons and wetlands both within the Project Site and beyond, as shown in Figure 6-6.

The potential impacts to the Latham's snipe are related to loss of habitat and potential collisions with WTGs.

The wind farm layout avoids the majority of waterway and wetland areas, thus largely avoiding mapped habitat for the species. The exception is the proposed access roads, some of which cross small patches of mapped moderate-quality habitat. In total approximately 9 ha of mapped moderate-quality habitat is expected to be impacted. There will be no impact to mapped high-quality habitat.

The predicted impact to approximately 9 ha of moderate-quality habitat is in the context of a total of 2,626 ha of moderate-quality habitat and 206 ha of high-quality habitat mapped within the Project Site and

5 km buffer area (noting the habitat extends over the Project Site boundary, hence the broader habitat included in the 5 km buffer is a more relevant consideration when understanding available local habitat for the species, which in fact extends far beyond the 5km buffer into the broader region). Refer to Figure 6-6 and Table 17 in Appendix B for details of habitat distribution and impact areas.

Overall, this habitat loss represents a very small proportion of the available habitat on the Project Site and in the broader region (noting also that the 9 ha of predicted habitat loss is the total predicted impact during construction, some of which will be rehabilitated, resulting in a smaller residual loss as a result of permanent infrastructure). NBES concludes that it is likely Latham's snipe will continue to use the Project Site and surrounding landscape, particularly the wetlands, rivers and wet grasslands.

While they may potentially be at risk of collision, the impact level is likely to be low for this species due to the relatively short time that they are flying when they arrive, their natural ground level foraging behaviour, their short low flights between habitats, and low evidence of turbine collision in the past (NBES, 2023a). The lack of WTGs in the areas where Latham's snipe frequent, such as the Shannon River and mapped wetlands (refer Figure 6-6), minimises the risk and aids in protecting the birds and their habitat (NBES, 2023a).

Overall, the species is considered at low risk of impact. To minimise the impact of potential habitat loss, any areas of temporary disturbance within mapped terrestrial habitat will be rehabilitated post construction (refer Section 6.1.5). To measure the predicted low risk of collision, Latham's snipe will be included in the avifauna mortality monitoring program outlined in Section 6.1.4.3.

Tasmanian masked owl

There is potential habitat for the Tasmanian masked owl in the Project Site. Although the species was not recorded within the Project Site during NBES surveys, the species was recorded outside the Project Site, within the 5 km buffer, as shown in Figure 6-7. The species was observed (heard and seen) adjacent to the Lagoon of Islands by NBES ecologists, and the species was recorded on song meters deployed outside the Project Site (near Lagoon of Islands). No nests or signs of nesting were observed, and the area is outside the core range of the species, which is considered dry forest areas below 600 m altitude.

The potential impacts to the Tasmanian masked owl are related to loss of habitat and potential collisions with WTGs.

The Project Site is considered mostly suboptimal habitat, with approximately 11% of the Project Site mapped as medium and high potential hollow-bearing tree maturity class and the remaining 89% mapped as low to negligible. The Project layout has been designed to avoid impacts to mapped habitat where possible, with the footprint largely concentrated in areas mapped as negligible to low potential hollow-bearing tree habitat. In total the Project is expected to impact on approximately 12.2 ha out of 280.9 ha (~4%) of mapped high potential hollow-bearing tree habitat, and approximately 15.9 ha out of 820.9 ha (~2%) of mapped medium potential hollow-bearing tree habitat in the Project Site (these areas are shown in Figure 6-7 and summarised in Table 19 of Appendix B). In considering these proportional impacts it is important to note that the potential habitat for the species extends well beyond the boundary of the Project Site (as demonstrated by the mapping in Figure 6-7), which shows a far greater density of high quality habitat mapped outside the Project Site), hence the proportional loss in the broader region is significantly lower than the numbers stated here.

Regardless, to ensure any potential impacts to the species are minimised, management and mitigation to avoid destruction of potential habitat will be implemented including pre-construction nest surveys and micro-siting (refer Section 6.1.5). It is noted that in the event a nest were to be identified on site during pre-construction nest surveys, additional controls would also be implemented for any proposed blasting within 1 km of the nest (refer Section 6.1.5 for proposed controls).

Despite some owl species suffering very high levels of collision mortality elsewhere in the world (on wind farms where the number of birds is high, and the turbine sweep is low enough to engage the owls' low flying habit), the Tasmanian masked owl occurs at significantly lower density than other species due to large

territory sizes, even in core habitat (NBES, 2023a). NBES concludes that risk of collision for the Project is relatively low due to the low density of birds, occurring in suboptimal habitat and large home ranges. Risk of collision is further reduced for the species by the short amount of time on the wing as a result of their predominantly perch-based foraging strategy or prey being taken from and among trees, which places them below and beyond the impacts of the rotor swept area of the WTGs around forests and forest edges (NBES, 2023a).

Curlew sandpiper and eastern curlew

The curlew sandpiper and eastern curlew are considered a low probability of occurring within the Project Site, with no records from the vicinity on database searches and none recorded during field surveys. The potential risk to this species from habitat clearance or collision with WTGs is considered negligible.

Double-banded plover and red-capped plover

Wetland habitat suitable for the double-banded plover and red-capped plover is present within the Project Site in the north and adjacent lagoons. However, both species tend to aggregate around the coastline, with only a small number ever being recorded inland (records of the birds are very rare in the vicinity and none were found during the NBES surveys). Hence, although there is a small chance that these species could fly over the site, there is a very low potential for collision with WTGs given the low frequency of the species' occurrence on the Project Site and the ground-feeding behaviour of the species (NBES, 2023a). Mapped wetland habitat for these species is avoided by the proposed layout, negating the risk to these species from habitat clearance (refer Figure 20 Appendix B).

Azure kingfisher

Suitable habitat for the azure kingfisher within the Project Site is very limited (only along the Shannon River), with little vegetation cover offering perches, and it is very unlikely this species occurs on site, and if it were to occur, its behaviour would likely restrict it to the minimal vegetation that does exist around waterways (NBES, 2023a). Refer to Figure 21 in Appendix B for mapped potential habitat both within the Project Site (Shannon River) and outside the Project Site (nearby lakes and lagoons). Records of the species in the vicinity are very rare and the species was not recorded during NBES surveys; hence there is an extremely low potential for collision with WTGs, which is further reduced by this species' low-level foraging behaviour. Mapped habitat for this species (refer Figure 21 in Appendix B) is avoided by the proposed layout, negating the risk to the species from habitat clearance.

Australasian bittern

The Australasian bittern may occasionally cross the Project Site when searching for suitable habitats. Given the low numbers of the species in the area and limited habitat within the Project Site, as illustrated in Figure 6-8, the risk of collision is considered very low (NBES, 2023a). NBES (2023a) notes that as the restoration of the Lagoon of Islands continues, this species may increase in number and may require adaptive management in the future if carcass surveying detects the species (refer Section 6.1.4.3 for avian mortality monitoring and adaptive management).

Only low-quality habitat (potentially suitable for foraging but not nesting) is mapped within the Project Site for this species; moderate- and high-quality habitat is mapped outside the Project Site (refer Figure 6-8). Almost all mapped habitat within the Project Site will be avoided, with the exception of some minor waterway crossings (mapped as low-quality habitat). Given the low quality and very limited impact, overall habitat loss is considered negligible.

Grey goshawk

The Project Site is well outside the breeding range for the grey goshawk, which is limited to below 450 m above sea level, as reflected by the rarity of records in the vicinity and extreme infrequency of flights observed on the Project Site, which demonstrates a negligible probability of turbine collision (NBES, 2023a).

Given the site is outside the breeding range and the very low number of records and recorded flights, NBES concludes that the risk of impacts to grey goshawk as a result of collision or habitat loss from the Project is considered negligible.

Swift parrot

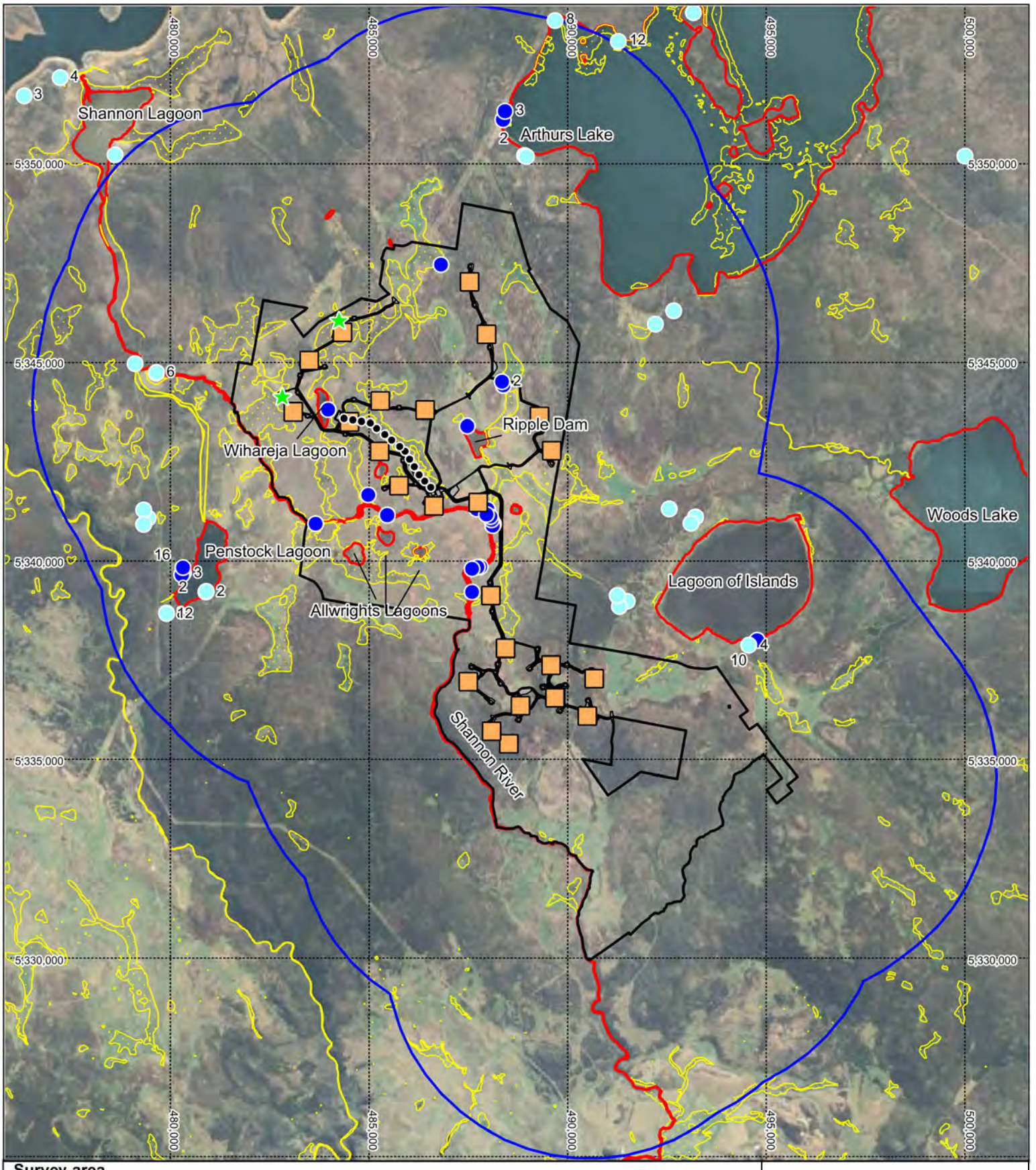
The Project Site is well outside the core foraging and breeding range of the swift parrot, which is reflected in the rarity of records in the vicinity. Additionally, the foraging habitat on the Project Site is suboptimal and because of this is unlikely to support breeding. Given the low probability of the species occurring in the region (which is outside its core foraging and breeding range), and even lower probability within the Project Site itself (due to suboptimal habitat), NBES concludes the risk to swift parrot as a result of collision or habitat loss from the Project is considered negligible.

Orange-bellied parrot

The orange-bellied parrot is not expected to occur on site, as outlined in Section 6.1.1.2, noting the Project Site is well outside the range of this species and its migratory route. Impacts to the species are therefore not expected.

Non-listed avifauna

Potential impacts to the general avifauna population of the Project Site and surrounds are not anticipated to be significant, with the majority of species identified during survey unlikely to fly at the rotor swept area, and of those species that do fly at that height, it is generally only an infrequent event. Therefore, interactions with WTG blades are likely to be a rare event (NBES, 2023a). There will be some loss of habitat for avifauna; however, in the context of the overall landscape and diversity of habitats available, the extent of impact to the general avifauna population is expected to be minimal.



Survey area

- project area
- 5 km buffer

Latham's snipe habitat suitability

- High (within 20 m of large water bodies)
- Moderate

Latham's snipe (-/MI) records
(labelled with number of individuals if >1)

- Latham's snipe
- NBES records

The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.

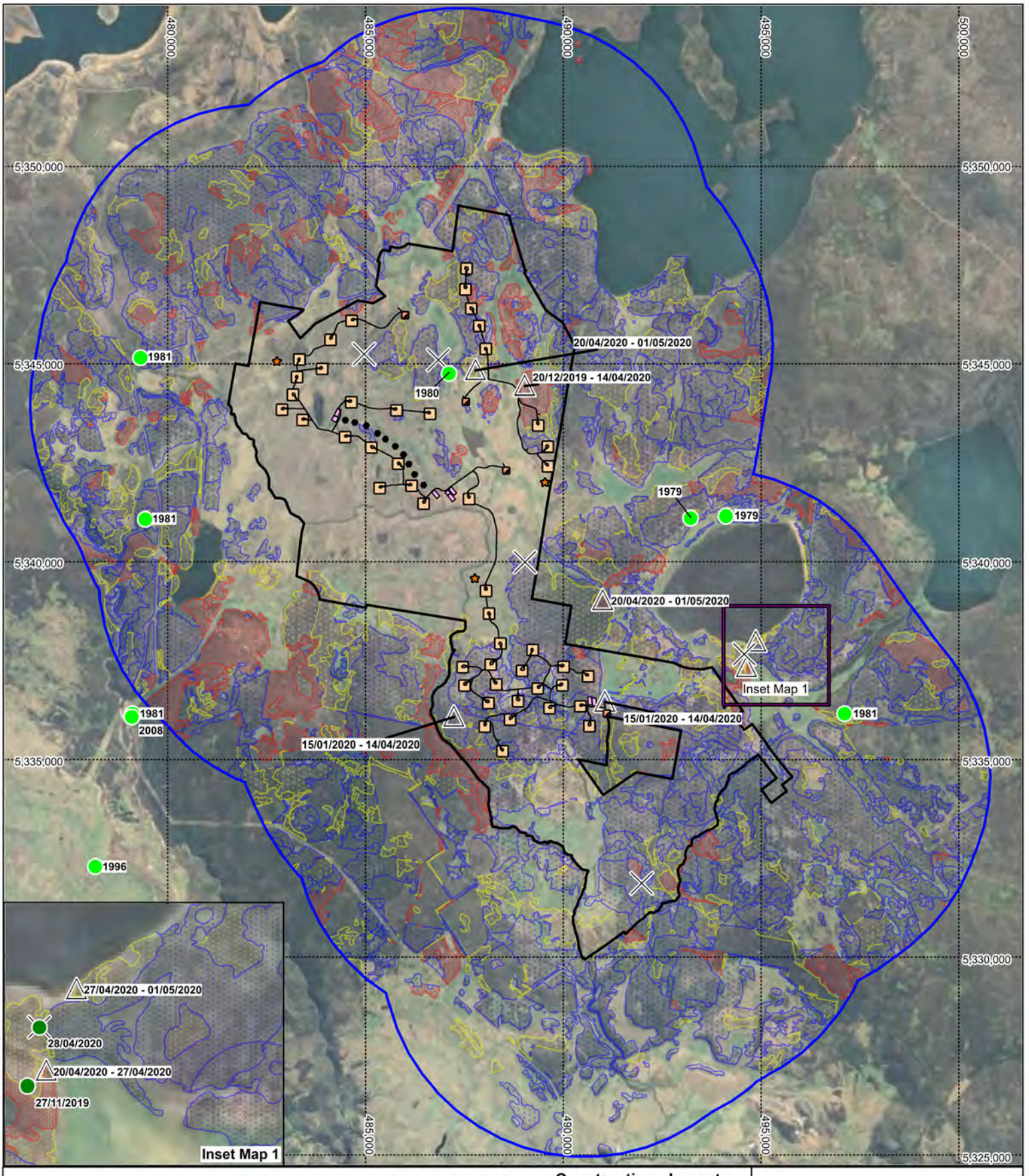
Proposed infrastructure
Source: Epuron as of 27/05/2022

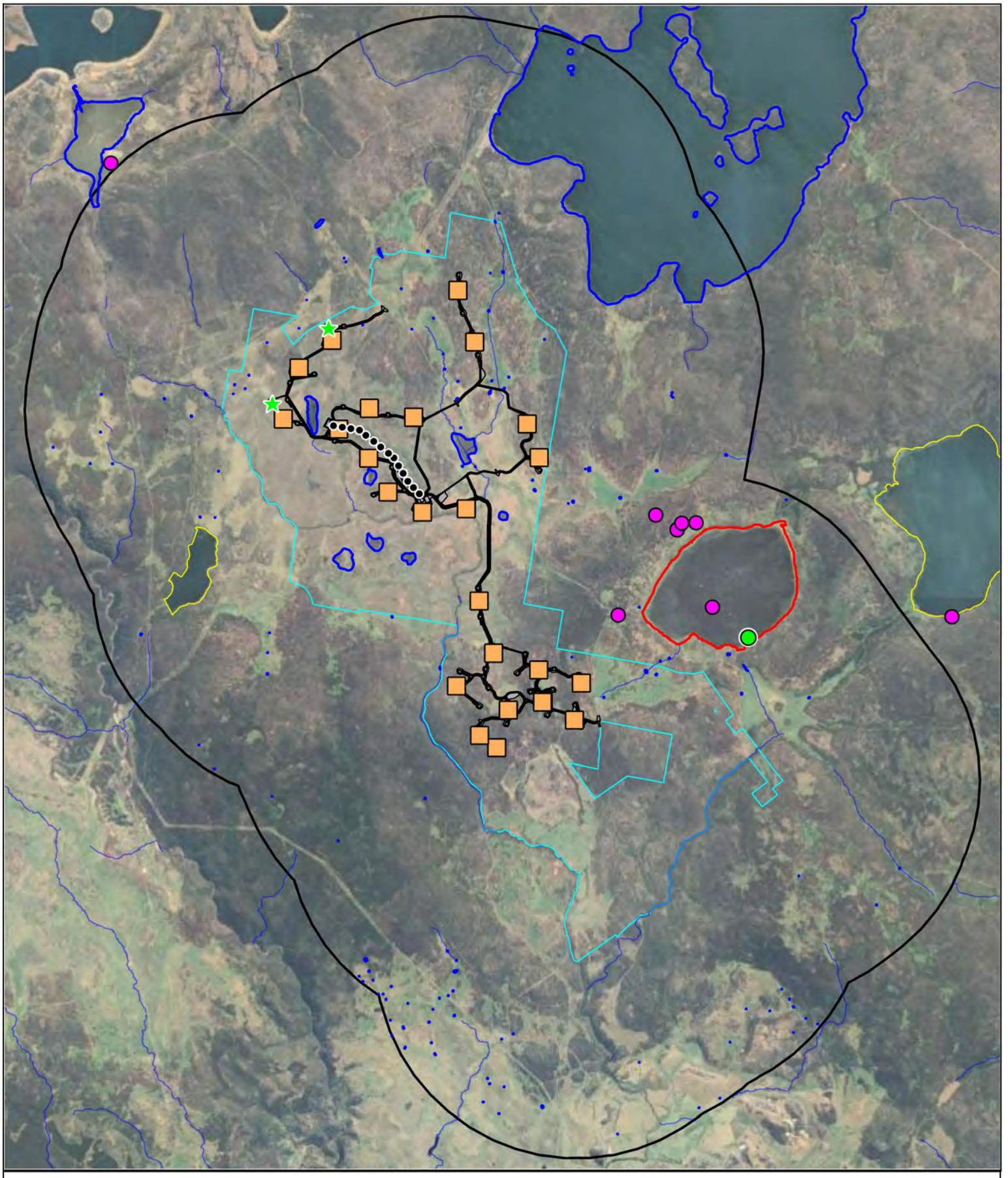
- Disturbance footprint
- IDF Hardstand and Turbine
- Met mast
- OH Reticulation Pole

0 5
kilometres

northbarker
ECOSYSTEM SERVICES

Figure 6-6


480,000
485,000
490,000
495,000
500,000
5,350,000
5,345,000
5,340,000
5,335,000
5,330,000
5,325,000
1981
1980
1979
1996
2008
20/04/2020 - 01/05/2020
20/12/2019 - 14/04/2020
15/01/2020 - 14/04/2020
Inset Map 1
27/04/2020 - 01/05/2020
28/04/2020
20/04/2020 - 27/04/2020
27/11/2019
Project area
5 km buffer
Survey method
call back survey
songmeter (date deployed - date retrieved)
The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
NBES Tasmanian masked owl (e/VU) observations
NVA record (as of 11/12/2019) labelled by observation year
NBES record labelled by observation date
Tasmanian masked owl (e/VU)
Habitat suitability (forest maturity: potential for hollow bearing trees)
High
Medium
Low
Construction elements
Turbines
Hardstands
Access roads
Poles for transmission line
Facilities
Met masts
Access points
0
5
kilometres
northbarker
ECOSYSTEM SERVICES
Figure 6-7
Base data from theLIST, © State of Tasmania
Google Image date 29/12/2018
Datum: GDA94, AHD Grid: MGA Zone 55
PAS114 03/05/2023 LD



Project area

5 km buffer from project area

Australasian bittern records

Previous records (NVA ALA, Birdlife)

NBES observations November 2019

Habitat suitability

Australasian bittern [Botaurus poiciloptilus (-/E)

High

Moderate

Low

Proposed infrastructure
Source: Epuron as of 27/05/2022

Disturbance footprint

IDF Hardstand and Turbine

Met mast

OH Reticulation Pole

0 5
kilometres

northbarker ECOSYSTEM SERVICES

Figure 6-8

Base data from theLIST, © State of Tasmania
Datum: GDA94, AHD Grid: MGA Zone 55

PAS114 16/05/2023 LD

The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.

6.1.4 Management, mitigation and monitoring – Eagles

Minimising the potential impact to eagles, particularly the risk of collision with WTGs, is a critical component of the environmental management for the Project.

The starting point for eagle mitigation was to position all WTGs at a minimum distance of 1 km from known eagle nests (as noted in Section 6.1.3.1), which informed the original WTG layout. Subsequently, the collision risk model was developed and further adjustments to WTG number and layout were made to remove WTGs from the areas of highest eagle activity; this was the key driver in reducing the number of WTGs from 67 to 50, along with additional community separation distances, with the removal of the final three WTGs (i.e. resulting in 47 in total) related to visual impact. New nests have been found throughout the investigation of the Project Site, but all remain at least 1 km from the closest WTG.

With the WTG layout adjusted to minimise collision risk, the methodology for further reducing the risk to eagles turns to management and mitigation through other mechanisms.

The key tool for documenting and implementing necessary eagle management and mitigation measures will be an Eagle Monitoring and Management Plan. The information contained in the following sections constitutes a Preliminary Eagle Monitoring and Management Plan, with the intention that this provides sufficient information to outline the proposed approach and facilitate Project approvals. This information will then be further refined and documented in the Final Eagle Monitoring and Management Plan, which will be submitted prior to construction commencing to the Director, EPA, and DCCEEW for approval. The approach to eagle management takes into account the recently published DCCEEW document *Onshore Wind Farms – interim guidance on bird and bat management*.

The Preliminary Eagle Monitoring and Management Plan framework is outlined in the following sections and includes the following key components.

- Avian collision avoidance measures and other mitigation
    - WTG positioning
    - Management of other works within 1 km of known eagle nests
    - Minimising collision risk with met masts and overhead powerlines
    - WTG curtailment systems
    - Carcass management
    - Adaptive management measures (black blade, land management changes)
    - Reporting
- Eagle nest monitoring
    - Eagle nest searches
    - Nest activity and productivity surveys
    - Reporting
- Avian mortality monitoring
    - Monitoring trials
    - Avian mortality monitoring plan
    - Reporting
- Offset strategy

Details on each aspect mentioned above are outlined in the following sections.

6.1.4.1 Avian collision avoidance measures and other mitigation

There is a suite of measures that can be applied to mitigate the risk to eagles from collision and other construction disturbance (e.g. noise near nesting sites). This includes both measures that are being proposed as part of this Project (e.g. WTG curtailment system) and other adaptive management measures that can be further investigated and applied, if necessary, in the event that the monitoring program identifies eagle collisions.

The following management measures will be applied to the Project from the outset (with further refinement of some of these measures as needed and where possible during operation in response to avian mortality monitoring results):

- WTG positioning
- Management of other works within 1 km of known eagle nests
- Minimising collision risk with met masts and overhead powerlines
- WTG curtailment system
- Carcass management.

The following additional management measures are not currently proposed but will be further investigated and deployment assessed and applied as appropriate in the event that a Mortality Report recommends their implementation (any eagle death identified through avian mortality monitoring will result in the preparation of a Mortality Report by a suitably qualified person inclusive of recommendations on how to prevent a similar mortality in the future – refer Section 6.1.4.3 for details):

- Black blade
- Other adaptive management measures (e.g. changes in land management practices).

These measures are documented below and will be further refined in the Final Eagle Monitoring and Management Plan (considering contemporary information at the time of writing).

It is noted that some of these measures will be in place in advance of the finalisation of the Eagle Monitoring and Management Plan (e.g. final micro-sited positioning of WTGs and curtailment systems) but will be included in the final plan for completeness on the overall strategy and to address adaptive management where relevant (e.g. adjustments to the curtailment devices to improve efficacy).

WTG positioning

WTGs have been positioned a minimum of 1 km away from all known eagle nests and outside areas of highest predicted eagle activity based on collision risk modelling. As outlined in Section 6.1.4.2, an additional pre-construction nest search will be undertaken (outside the eagle management constraint period[7]) and, in the event a new active nest is identified, a 1 km exclusion zone will be applied for WTG placement.

This setback of 1 km from any known eagle nest is a well-established management measure in Tasmania and contributes to a reduction in risk to eagles by reducing nesting disturbance (e.g. noise and activity near the nest that can affect breeding success) and reducing collision risk in the area immediately around known nests, where eagle activity tends to be highest.

[7] The eagle management constraint period is defined by the Forest Practices Authority in Fauna Technical Note 1 (2023) as the most sensitive stages of the breeding season for the majority of birds and will be declared by the Forest Practices Authority on an annual basis in response to seasonal changes as required.

Management of other works within 1 km of known nests

As outlined in Section 6.1.3.1, although there are no WTGs proposed within 1 km of known eagle nest sites, there are small areas of other infrastructure (e.g. roads) that fall within this buffer (all of which are a minimum of 500 m from the nest location).

For any sections of road or other infrastructure that fall between 500 m and 1 km of an active nest site, the construction activity will occur outside the eagle management constraint period[7] (July to January inclusive or as varied by the Forest Practices Authority) to minimise risk of nest abandonment. In the event blasting is required, its use will be minimised in areas near known eagle nests (with other construction techniques used in preference where possible) and blasting will not be undertaken within 1 km of any known active eagle nest during the eagle management constraint period.

Minimising collision risk with met masts and overhead powerlines

The proposed layout has been designed to minimise the potential risk of collision with met mast guy wires and overhead powerlines where practicable (by avoiding known take-off and landing areas), but a residual risk remains.

To address this risk of collision, overhead powerlines and guy wires will include regular interval flags or 'flappers' on the wires to alert birds to the presence of the structure and thereby reduce collision risk. This management measure is aimed at both eagles and other avifauna.

WTG curtailment systems

There are now several impact minimisation options that are being used on wind farms across the world to reduce avifauna collision rates. One of the most promising technologies is the WTG curtailment systems now available (e.g. IdentiFlight), which uses cameras to identify approaching target avifauna species and then triggers curtailment of blade rotation of WTGs if the approaching eagle is considered at risk of collision. Curtailment is achieved by sending a message to the WTG to adjust blade presentation by 'feathering' the blade's motion, resulting in either slowing of WTG blades or halting their movement altogether; blades can take from 20 seconds to 1 minute to stop entirely (McClure, et al., 2021). IdentiFlight is in its eighth year of operation and commercial development, with IdentiFlight units now installed or in the final stages of installation, at over 30 wind farms worldwide.

A BACI (before/after-control/impact) study of a wind farm site in Wyoming, USA, showed a 63% reduction in eagle (bald eagle and golden eagle) mortalities at an impact site using the IdentiFlight system, relative to before the installation of the system, and an 82% reduction in fatalities in terms of impact vs control sites (McClure, et al., 2021). The site contained 66 x 1.5 MW and 44 x 2.3 MW WTGs (a total of 110 WTGs) and 47 IdentiFlight systems. The authors note that, while effective, the system does not eliminate the risk of collision completely and as such it is secondary in the risk hierarchy to options such as avoidance of high risk areas in WTG placement (as has been undertaken for this Project) (McClure, et al., 2021).

NBES (2023a) also notes a further two IdentiFlight research papers that used the same collision risk model (CRM) type used for the Project Site, but with IdentiFlight curtailment built into the model code to determine likely collision risk reduction using the system. The results of the modelled assessments found curtailment from IdentiFlight would likely result in a collision reduction of between 50% and 67%, which is in line with (and more conservative than) the real-world BACI study range mentioned above of 63% to 83%.

Most relevant to the Project is the assessment of the IdentiFlight system that is being used at the neighbouring Cattle Hill Wind Farm run by Goldwind; the Cattle Hill site uses 16 individual IdentiFlight (IDF) systems to monitor 48 WTGs. The recent release (February 2022) of a report on the performance of the system at the site to date allows for an indicative insight into how the system may operate at the Project Site, given a similar landscape and the same bird species. The publicly available Goldwind report (Goldwind, 2022) covers the period from commencement of operation of the wind farm in August 2020 to February 2022. During the first 18 months of operation there were three WTE deaths recorded. Goldwind (2022)

reports that of the three strikes, all were avoidable with alterations to the operation of the IdentiFlight system.

The first strike occurred as a result of human error. Goldwind (2022) reports that in the weeks leading up to the strike, the WTGs had been failing to restart after the IDF systems had curtailed them and so a manual override restart process was temporarily put in place. The manual override was triggered by an employee after a curtailment had commenced and unfortunately led to the strike occurring. A review was undertaken and processes and controls to prevent further recurrence were implemented such that an IDF curtailment signal cannot be overridden for any reason (Goldwind, 2022).

The second and third strikes that occurred at the site were in close proximity and determined to be most likely a result of dense vegetation surrounding two of the WTGs causing a blind spot in the IDF system (from a certain direction and altitude) and a failure to curtail the WTGs in question. This vegetation was subsequently removed. According to the Goldwind report (Goldwind, 2022), the remaining WTGs at the Cattle Hill site are not subject to potential blind spots from vegetation and have proven the IDF to be effective, with no strikes at any of these WTGs, which includes the four WTGs with the highest eagle activity in the wind farm (as recorded by the IDF system). Goldwind (2022) concludes that the IDF performance thus far has been in line with published research and could arguably be significantly greater with a closer focus on IDF placement and consideration of vegetation management with regard to potential blind spots.

Given the above data and information from Cattle Hill Wind Farm, it is proposed to install 24 IDF units across the Project Site, with preliminary locations shown in Figure 2-1, which will be micro-sited in line with the WTGs. This is in line with site-specific advice provided by the IdentiFlight team, with each WTG curtailment system unit able to control multiple WTGs (i.e. all 47 WTGs will be under the control of at least one unit). This configuration of IDF units is based on the proposed Project layout and may be refined in response to WTG micro-siting and contemporary research at the time of installation to ensure maximum coverage across all WTGs.

Vegetation management will also be in line with advice from the IdentiFlight team, with all vegetation above 6 m to be trimmed or removed out to the radial arcs identified by the IdentiFlight team. These are represented as clearance circles around the IDF towers on Figure 2-1, noting this clearance will mainly consist of vegetation management rather than complete clearing to retain as much flora and fauna habitat as possible. Many of the IDF towers in flatter plains within the Project Site do not require any vegetation clearance as they are located in low-level shrub or grassland. This removes the need for a considerable amount of potential vegetation disturbance.

The expected reduction in collisions from the installation of the system is conservatively estimated at between 50% and 67%, in line with the more conservative modelling results mentioned above. At 90% avoidance rates, this would reduce the predicted 4.89 collisions per year to between 1.61 and 2.45. Although the more conservative modelling results have been adopted for this Project, it is useful to note for comparative purposes, if the percentage avoidance rates from the abovementioned real-world BACI study were applied to this Project the results (at 90% avoidance rate) would be even lower at 0.83 – 1.81 collisions per year (i.e. 63 to 83% reduction in collisions).

Given the strong results from the Cattle Hill Wind Farm (Goldwind, 2022), there is now data to back confidence in the IDF system and subsequent adjustments have been made to that project's IDF layout, including adding more systems and performing additional vegetation management to optimise the performance of the system. Experience at the Cattle Hill site, as well as other wind farms worldwide, will be used to inform the optimal IDF configuration and operation for this Project. For example, the image database from IdentiFlight's installation at the Cattle Hill wind farm has played an important role in improving IdentiFlight's neural network and artificial intelligence performance. This image database and neural network is then used at each additional IdentiFlight site (including for this Project) and is therefore improved over time as additional images are captured and processed. With the continued knowledge gained from the operation of the IDF system at the Cattle Hill Wind Farm and continuous advancements in

the IDF system technology by the IdentiFlight team, by the time the IDF system is installed at the Project Site, additional improvements in the efficacy of the IDF system are likely.

The design of the curtailment system for the Project will incorporate all relevant learnings from other sites (e.g. Cattle Hill) including positioning, vegetation management and system functionality (e.g. processes and controls to ensure an IDF curtailment signal cannot be manually overridden).

The avian mortality monitoring program and mortality reports (refer Section 6.1.4.3) will facilitate adaptive management such that all collisions will be investigated and if issues with the IDF functionality are identified (e.g. as was found at Cattle Hill) these matters can be rectified to achieve optimal performance. Opportunities to adjust the curtailment system in response to collisions (i.e. adaptive management) include optimisation of the system software (e.g. improved interaction with the WTGs through the SCADA system), changes to vegetation management (e.g. additional tree trimming or the removal of perch branches), operator training and, if necessary, additional units to capture unpredicted landscape use by eagles . Any necessary changes will be informed and guided by reviewing mortality reports (refer Section 6.1.4.3).

Carcass management

The Project Site is highly productive with regard to the biomass of mammals including wild, pest and livestock, and this high productivity is a major contributing factor to the number of eagles the Project Site supports (NBES, 2023a). Carcass management[8] is therefore an important tool to reduce the availability of prey for WTEs and WBSEs and in turn reduce the potential for collision. Carcasses (which could result from natural causes, roadkill, hunting, sick or injured livestock, or wind farm collisions) are likely to encourage eagle activity around the Project Site, hence increasing the risk of collision. Managing the availability of carcasses near WTGs will also reduce the presence of scavenger species in these areas, which may themselves become the target of eagles.

In considering carcass management across the landscape, it is also relevant to understand that while reducing carcass availability can have a positive effect on eagles by reducing collision risk near turbines, it can also present an unintended negative effect by reducing the overall availability of prey for eagles in the landscape and therefore affecting the carrying capacity of the land for the species. It is also important to recognise the potential food resource carcasses can provide to other fauna species (e.g. Tasmanian devils) and therefore achieve a suitable balance between minimising carcasses near WTGs (hence reducing collision risk) while leaving naturally occurring carcasses elsewhere in the landscape for native scavenger species.

For these reasons carcass management needs to be carefully balanced to achieve the outcome of reducing collision risk without unduly affecting other parts of the ecosystem via reduced prey availability. This will be addressed via the preparation of a specialist Carcass Management Plan, prepared by a suitably qualified person using contemporary research and site-specific information.

Carcass management will be undertaken in accordance with the Carcass Management Plan, which will form part of the Final Eagle Monitoring and Management Plan to be developed for the Project and submitted prior to construction to the Director, EPA, and DCCEEW for approval. The Carcass Management Plan will include, but not be limited to, the following measures:

- All carcasses (all species) located during the avian mortality monitoring program (refer Section 6.1.4.3 below) will be removed and disposed of.
- Any carcasses incidentally observed within 500 m of a WTG (e.g. during daily operational tasks, or by surveyors on their way to and from avian mortality monitoring events) will be removed and disposed of.

[8] Carcass management refers to the practice of reducing available carcasses near WTGs by limiting carcass generation (e.g. managing hunting practices or controlling the population of potential prey species), managing where carcasses are disposed of (i.e. not allowing carcass disposal near WTGs) and collecting and removing carcasses found near WTGs.

- Roads within the Project Site will be observed for roadkill as part of the role of the operational workers on site, with any carcasses located to be removed from the roadside immediately and disposed of.
- Carcass disposal will either be via a covered carcass bin that would be located within the Project Site and collected by a contractor on a regular basis, or through the use of an onsite carcass pit (or pits) to be located within the Project Site. The number of carcass bins or pits will be appropriate to the size of the land and ensure availability to all involved land titles. Both methods will require the application of agricultural lime for odour control and to minimise scavenger attraction, and in the case of the carcass pit, a layer of topsoil would also be applied each time a carcass was disposed of; carcass pits are used generally in the Central Highlands area for hunting. Carcass disposal (under either method) will be located a minimum of 500 m from a WTG. In the event the carcass is a threatened species, it will be frozen and offered to Department of Natural Resources and Environment (DNRE) Tasmania and the Tasmanian Museum and Art Gallery; if unwanted, the carcass will be disposed of with other carcasses.
- At this time the Project does not propose any specific changes to the permitted land management practices across the site (e.g. hunting/agriculture), with the exception of greater control over carcass disposal. Hunting currently permitted on the properties that make up the Project Site is already carefully managed by property owners with a tag-in/tag-out system allowing monitoring of hunting practice and ensuring hunters bury or remove all waste (carcasses) from the Project Site. As part of the Project, hunters will be required to either use the carcass disposal methods developed for the Project (e.g. sealed carcass bins/pits), remove waste entirely from the site or ensure any buried waste is located a minimum of 500 m from WTGs. Sheep grazing will continue on some parts of the Project Site on a seasonal basis. Any sheep carcasses found during the avian mortality monitoring program, by personnel undertaking roadkill monitoring or by landowners as part of farming operations will be disposed of in line with requirements for other carcasses (i.e. sealed bins or carcass pits).
- Any adaptive land management changes recommended as a result of operational monitoring (refer below to optional adaptive management measures) will be discussed with landowners and documented in the final Carcass Management Plan if required.
- The final suite of measures to be included in the Carcass Management Plan will be determined by a suitably qualified person taking into consideration all potential options outlined in the NBES report (Appendix B) and other contemporary research available at the time. It is noted that the NBES report includes a suite of potential carcass management options. Some of these are focused on the management of carcasses (e.g. carcass monitoring and disposal) and will be adopted as outlined above. Other measures in the NBES report are focused on the reduction in prey species (e.g. wallaby and deer culling, rabbit control via calicivirus or warren destruction, and removal of cover vegetation to reduce the ability of wallaby and deer to graze as widely). These prey control measures have the potential for other implications (such as reducing prey for other species as outlined previously) and therefore will be considered in the final Carcass Management Plan as potential adaptive management measures in the event mortality reporting (refer Section 6.1.4.3) identifies high prey volumes as a key factor in collisions.
- Reporting and data collection requirements will be established, including the collection of data on the number of carcasses being generated at the site (including estimates of the carcasses generated through hunting, carcass removal and avian mortality monitoring (refer Section 6.1.4.3)) to allow consideration of temporal and spatial patterns and inform adaptive management.

Effective carcass management is expected to reduce the availability of prey, and therefore the intensity of eagle activity around WTGs, thereby reducing collision risk (noting a quantitative estimate of the extent to which collisions will reduce is not possible due to the varied nature of each individual site and situation).

Adaptive management – black blade

Another collision risk mitigation tool available as an adaptive management measure for the Project is the 'black blade' technique, a method of creating visual contrast by painting one blade black, as shown in Figure 6-9, to reduce the motion smear that can occur from having three all-white blades (Hodos, 2002). This mitigation measure has been trialled and studied at a wind farm in Norway using a BACI experimental design, with approximately 7.5 years of before data and 3.5 years of after treatment data (May, et al., 2020). The experiment used eight target WTGs, four with one blade painted and four adjacent control turbines with no change to the colour of the blades.

The results of the study showed an average reduction in annual fatality rates of all birds at treated WTGs by 71.9% when compared to control WTGs in the period after treatment, with the most profound effect seen for raptor species, with eagle deaths reduced to zero at the treated WTGs. Although promising, the results of this experiment, including the reduction in collision factor, should be interpreted with caution, as raptor fatality rates increased significantly at the control sites between the before and after periods. The increase in fatalities at the control sites could not be explained by the authors; however, it is mentioned that no evidence was identified of birds being forced into the control WTGs as a result of evasion of the painted WTGs. The authors acknowledge that further research to identify any contributing factors in the experiment would be required (May, et al., 2020).

Using the additional potential collision reduction of 71.9% at selected WTGs where one blade was painted black within the Project Site potentially reduces the post-WTG curtailment system collision figures to 0.45-0.69 eagle collisions per year (for the individual WTGs), assuming a cumulative collision mitigation effect.

Given the confidence in the IDF system, the black blade technique would only be employed if there was an identified issue at one or more WTGs that justify the action (identified via avian mortality monitoring and mortality reporting as outlined in Section 6.1.4.3). If used, the black blade mitigation measure would be employed in a fashion so as to allow for a scientific study to be completed (i.e. to allow statistical comparison of results) and only used on WTGs confirmed as problematic for collisions. If no problems persisted post-painting of select WTGs, the site would continue to operate with no additional changes (i.e. the remaining WTGs would not be painted black).

As this would be an adaptive management tool and implemented only if and when required, it is not proposed to be installed prior to construction and would be considered only after 1 to 2 years of operation (as a minimum) to facilitate the collection of baseline data from which to compare the results. As such it is anticipated that the visual impact of the WTGs would be established such that the painting of one blade black on a selected number of WTGs would be an incremental increase to the visibility of the WTGs, rather than the quantum change from no WTGs to installed WTGs. The potential visual impact of the application of some black blades would be further assessed and consultation would be undertaken with the community prior to undertaking this adaptive management measure.

Additionally, contemporary research at other wind farm sites would inform the scale and scope of the implementation of the black-blade measure, noting this is an emerging mitigation approach and additional data on its implementation and efficacy is expected to become available in the coming years.

Other adaptive management measures

Other potential adaptive management measures that could be incorporated into collision management include changes to land management in negotiation with landowners in terms of hunting and livestock management (to reduce prey and therefore eagle activity around WTGs). For example, culling of prey species could be considered, where excess prey species was considered to be contributing to collision risk and it was deemed (by a suitably qualified person) as an effective management measure. Such measures would need to be carefully designed to ensure no unintended consequence for other fauna species (e.g. by reducing available prey). The avian mortality monitoring (and reporting) will be the key tool for determining

if additional adaptive management measures are needed and how these should operate, considering contemporary research at the time.

Additionally, the Proponent is willing to consider/discuss trials of any new collision avoidance technologies as they become available, if applicable to the Project.

Figure 6-9 Example of black painted WTG blade used to decrease motion blur (May, et al., 2020)

Reporting

The above-mentioned management measures (both those proposed and adaptive measures that could be applied) will be further documented in the Final Eagle Monitoring and Management Plan to be submitted to the Director, EPA, and DCCEEW for approval prior to construction.

The performance of adopted measures will be documented in annual environmental reports to be submitted to the EPA during operation.

In the event that eagle fatalities are recorded, a mortality report will be prepared, and the matter investigated to facilitate adaptive management as set out in Section 6.1.4.3.

6.1.4.2 Eagle nest monitoring

Eagle nest searches

While all known eagle nest locations have been taken into consideration during the design phase of the Project, it is acknowledged that new nests could occur at any time within the Project Site during construction or operation of the Project.

To ensure any new nests are considered in the final design of the Project, a nest search will be undertaken prior to the finalisation of the Wind Farm Design Report (i.e. prior to construction). A 1 km WTG exclusion zone will be applied to any new active nest identified.

The nest search will be conducted via helicopter, by suitably qualified professionals, in accordance with the *Forest Practices Authority Fauna Technical Note 1 (Eagle nest searching, activity checking and nest management)* (2023) and will be undertaken outside the eagle management constraint period (as defined by the Forest Practices Authority)[7].

The Project does not propose ongoing eagle nest searches during the operational period; however, in the event a new nest is incidentally observed within the Project Site, it will be reported to DNRE and the EPA and included in subsequent nest activity and productivity surveys (refer below) and associated reporting.

Nest activity and productivity surveys

Nest activity and productivity[9] surveys for all known nest locations will be undertaken on an annual basis from the commencement of construction, throughout operation. This information will be used to track breeding success and inform any changes needed to the overall eagle management approach.

Nest activity and productivity surveys will be conducted by suitably qualified professionals, in accordance with the *Forest Practices Authority Fauna Technical Note 1 (Eagle nest searching, activity checking and nest management*) (2023) to inform the Proponent of eagles' ongoing use of nests within the Project Site.

Reporting

The results of the pre-construction nest search will be reported to the EPA (prior to the commencement of construction) and will be used to inform the final wind farm layout. A 1 km exclusion zone will be applied to any new active nest identified.

The results of annual nest activity and productivity surveys will be reported to the EPA (as part of the Project's annual environmental reporting) and will be included in the five-yearly reviews of the Final Eagle Monitoring and Management Plan to inform any necessary adjustments.

Any new nest locations identified will also be submitted to the Natural Values Atlas in accordance with standard practice.

6.1.4.3 Avian mortality monitoring

Once the Project is operational, avian mortality monitoring will be conducted for the life of the Project to record any collisions attributable to the Project and understand the efficacy of the mitigation measures being applied (and inform any changes). The avian mortality monitoring program will be focused on eagles (as the key species of concern) but will also record information on other avifauna species (including listed species).

The following provides the preliminary avian fauna mortality monitoring approach, which will be further refined into a final Avian Mortality Monitoring Plan to be documented as part of the Final Eagle Monitoring and Management Plan (to be submitted to the EPA and DCCEEW prior to construction). Monitoring trials (scavenger and carcass detection) will be undertaken pre-construction and will be used to inform the final detail of avian fauna mortality monitoring to ensure the final methodology (as documented in the Final Avian Mortality Monitoring Plan) is effective and site specific.

The approach to avian mortality monitoring is informed by the recommendations from NBES (2023a) (see Chapter 11 of Appendix B) and Symbolix (Symbolix, 2021) and the *Avian Mortality Monitoring Plan Guidelines* provided by the EPA in the PSGs, and included here as Appendix L. These guidelines set out the information to be included in the avian mortality monitoring plan, the principles of the survey methods, and reporting and review requirements. In finalising the monitoring approach, a thorough review of the most recent literature available on carcass detectability and persistence will also be undertaken to ensure the most recent and effective measures are used for the Project.

[9] Productivity assessments will record the number of chicks reared to fledging (as recommended by the regulator).

An effective avian mortality monitoring plan requires a robust methodology to ensure the collision estimate numbers are as close as possible to actual collision numbers, given not all WTGs will be searched during every monitoring event (hence some data extrapolation applies). Collision detection requires a number of aspects to align and to therefore be taken into account when designing the plan:

- The bird must have been injured to a point where it is immobile or deceased. A bird that is clipped and not completely immobilised will be unlikely to be found based on the proposed search techniques below. Therefore, it cannot be assumed that all carcasses or injured birds found are 100% representative of all strikes that have occurred.
- The carcass or injured bird must land within the defined search zone around each WTG; therefore, zones must be large enough to enable an adequate detectability.
- The carcass or injured bird must not be scavenged or decayed to a point where it is unlikely to be identified prior to the search occurring; scavenger trials should be undertaken to take this into account to ensure searches are undertaken frequently enough to detect mortalities.
- The observer must observe the carcass or injured bird during the monitoring event; the search methodology and intensity must therefore be suitably designed to maximise observation potential. To assess this, carcass detectability trials should be undertaken to inform the monitoring plan.

With the above in mind, two trials will be undertaken pre-construction at the Project Site to inform the final monitoring plan, one to determine scavenger effects on detectability and one to assess carcass detectability by the search techniques proposed.

Scavenger trials (pre-construction)

Scavenger trials will be undertaken prior to construction (at the Project Site) to determine an indicative timeframe that a carcass is expected to remain in situ following a collision, prior to scavenging or decay occurring. This information will be used to determine suitable timing between mortality monitoring events and to inform calculations for mortality estimates. The scavenger trials will include the following aspects:

- The trials will involve leaving a bait carcass at each trial location and then returning to the location at regular intervals to assess the effects of scavenge or decay. Bait carcasses to be used will be determined in consultation with DNRE Tasmania.
- Two separate scavenger trials will be undertaken at the Project Site prior to construction. One trial will be undertaken during winter and the other during spring or summer (to take into account different weather conditions and scavenger movements).
- The detailed trial methodology (e.g. number of trial locations, trial timeframes, observation effort) will be designed by a suitably qualified person and take into account Project Site conditions (e.g. topography and vegetation), WTG layout, carcass type to use, search technique, data collection and analysis. The detailed trial methodology will be determined in consultation with DNRE Tasmania and have a statistically sound design. An example trial would be 10 replicates per carcass size per terrain type over a three-week observation period in spring, with observation intervals at 1, 2, 4, 8, 14 and 21 days.
- The results of the scavenger trials will be subject to statistical analysis, used to inform the final avian mortality monitoring approach, and incorporated into the Final Eagle Monitoring and Management Plan to be submitted to the EPA and DCCEEW prior to construction.

Carcass detectability trials (pre-construction)

The carcass detectability trials will be undertaken at the Project Site prior to construction to determine the efficacy of searchers and techniques in the various terrains that will be required to be searched as part of avifauna mortality monitoring once the Project is operational. The results of the trial will be used to both inform the development of the avian mortality monitoring approach and to provide a statistical factor that

can be applied to avifauna mortality estimates to ensure they are as accurate as possible. The carcass detectability trials will include the following aspects:

- Trial of multiple search techniques, which could include, where suitable, the use of all-terrain vehicles (ATVs), dogs, drones, and more traditional on-foot transect surveys. Suitable techniques to be tested will be determined in consultation with DNRE Tasmania.
- Two separate carcass detectability trials will be undertaken at the Project Site prior to construction. One trial will be undertaken during winter and the other during spring or summer (to take into account the effects of snow and high water levels on detectability).
- Trials will be undertaken in multiple vegetation types found within the Project Site.
- Suitable carcasses (or replica carcasses) will be placed within the search zones, using both small and large bird carcasses to determine detectability for different sized avifauna. Carcasses to be used will be determined in consultation with the DNRE Tasmania.
- A variety of search patterns will be trialled for each search technique, including variation of spacing between transects etc.
- For each observer technique, where practicable, multiple observers will be assessed to determine a robust statistical factor that can be applied to mortality estimates.
- The detailed trial methodology (e.g. number of trial locations, trial timeframes, observation effort) will be designed by a suitably qualified person and take into account Project Site conditions (e.g. topography and vegetation), WTG layout, searching technique, data collection and analysis. The detailed trial methodology will be determined in consultation with DNRE Tasmania and have a statistically sound design. Symbolix (2021) recommends 10 replicate WTG sites, per carcass size class, per habitat type, per monitoring event. The final survey design will be commensurate with this approach.
- The results of the carcass detectability trials will be subject to statistical analysis, used to inform the final avian mortality monitoring approach, and incorporated into the Final Eagle Monitoring and Management Plan to be submitted to the EPA and DCCEEW prior to construction.

Avian mortality monitoring (operational phase)

Following the completion of the trials, detailed methodologies will be developed for the chosen monitoring techniques, informed by the outcomes of the scavenger and carcass detectability trials. It is noted that any surveys completed for the purpose of detecting collisions of eagles must occur frequently enough to reliably determine if an impact has occurred with regard to the carcass persistence and searcher efficiency trials.

The following provides a framework for the proposed avian mortality monitoring, which is informed by the EPA guidelines (refer Appendix L) and the document *Carcass Monitoring – Statistical Considerations* (Symbolix, 2020) included as Attachment 4 to the NBES avifauna report in Appendix B. This is a preliminary framework only and will be refined by a suitably qualified person to generate the final Avian Mortality Monitoring Plan (informed by pre-construction trials and site conditions) to be documented as part of the Final Eagle Monitoring and Management Plan which will be submitted to the EPA and DCCEEW for approval prior to construction commencing.

- Avian mortality surveys will be undertaken under proposed overhead powerlines and around selected WTGs and met masts using a circular transect method to provide a representative coverage across the Project Site.
- The number of WTGs to be included in the monitoring program (given a total of 47 WTGs at the Project Site) is anticipated to be approximately 20 WTGs, which provides for an approximate 3–4 day turnaround for a team of two, requiring around two hours to survey each WTG. The final number of

WTGs surveyed will be determined by a suitably qualified professional and will be sufficient to provide statistically sound collision estimates for the Project Site.

- The WTGs to be surveyed (approximately 20 in each survey event) would be randomly selected to provide an unbiased estimate of mortality, and the same subset of WTGs would be revisited over several survey periods to allow for any seasonal patterns to emerge. Over time, the subset of WTGs sampled would be adjusted, such that all WTGs are subject to survey at some point in order to provide maximum site coverage. This would likely be achieved by surveying a different subset each survey event (nominally monthly) such that all WTGs are surveyed over time, but a seasonal pattern can also be developed as each 'subset' is revisited every couple of months. If habitat types are significantly different, WTGs would be randomly selected within each strata and equally distributed (with 3–4 WTGs selected per habitat type).
- Survey interval timing will be less than or similar to scavenge rates for target species, which will be determined during scavenger trials. While the final survey interval timing will be guided by the scavenger trials, research from other sites indicates monthly surveys are likely to be suitable[10].
- Surveys will be commenced within three months of Project commissioning and continue for the life of the Project (pending results of five-yearly reviews of the Final Eagle Monitoring and Management Plan).
- Surveys will be undertaken by suitably trained personnel, with fatigue management measures in place to ensure effective data collection.
- The WTG area to be searched is a factor of the WTG height and blade length (Hull & Muir, 2010), and for the Project's WTG 150 m maximum hub height and 80 m maximum blade length, a search radius of 122 m is proposed for a 95% coverage of WTEs and 100% coverage of small and medium birds and bats. Moving further out will result in diminishing returns. The search area can also be moved out or around impenetrable vegetation to achieve the same coverage by extrapolating the data gathered.
- Transect spacing for on-foot or ATV searches would be approximately 5 m out to a distance of 60 m from the WTG base and then 12 m spacing from a distance of 60 m to 120 m from the WTG base.
- The need, or otherwise, for vegetation management around WTGs to facilitate visibility for surveys will be determined by site conditions at the selected WTGs and the results of detectability trials. Where vegetation management is required, this would be undertaken in an ecologically sensitive manner, avoiding impact to any listed species or community.
- The final Avian Mortality Monitoring Plan will also stipulate details on the calculations to be used to estimate undetected mortalities (based on the statistical coverage of the survey design) and this will be used to inform final mortality estimates.
- Detailed protocols for avian carcass removal and injured bird management will be developed as part of the Final Avian Monitoring Plan; however, as a minimum the following will apply:
    - All personnel involved in mortality monitoring will be suitably trained in animal handling and care, and in the event of an injured bird will contact an appropriately qualified wildlife carer for instructions on care.
    - Any avian carcass found during mortality monitoring will be removed from the search area to avoid attracting scavengers or resulting in double counting in the next survey event. In the event the carcass is a threatened species, it will be frozen and offered to DNRE Tasmania and the Tasmanian Museum and Art Gallery; if unwanted, the carcass will be disposed of with other

[10] The NBES avifauna report (Appendix B) considers evidence from four wind farm locations in the USA (Hallingstad et al., 2018) where mean carcass persistence time varied between 28 and 76 days for raptors. This research also estimated that 95% of large avian carcasses fall within 100 m of turbine bases and 99% fall within 150 m of turbines with heights of approximately 125 m.

carcasses. Any non-threatened-species carcass will be removed well away from the search area (and any roads or buildings) and disposed of to a sealed storage vessel or carcass pit in accordance with the final Carcass Management Plan for the site (refer Section 6.1.4.1).

Reporting and adaptive management

As outlined above, the results of scavenger trials and carcass detectability trials undertaken pre-construction will be subject to statistical analysis and the results documented in (and used to inform) the Final Eagle Monitoring and Management Plan.

The avian mortality monitoring approach will be further developed (using the preliminary approach set out in this EIS) by a suitably qualified professional and documented in a Final Avian Mortality Monitoring Plan (as part of the Final Eagle Monitoring and Management Plan) to be submitted to the EPA and DCCEEW for approval prior to construction commencing.

Once operational, the results of the mortality monitoring program will be used to measure the success of implemented mitigation measures (e.g. WTG curtailment measures) and facilitated adaptive management where needed. To this end, the results of the avian mortality monitoring will be reviewed at the completion of every survey event and the results reported to the EPA via annual environmental reporting.

In the event that the death of a threatened avian species is detected during avian mortality monitoring:

- The Director EPA (and the Threatened Species Section in DRNE Tasmania) will be notified within 24 hours of completion of that day's survey.
- A mortality report will be prepared by a suitably qualified professional to document the particulars of the mortality (date, time, species, sex, location etc) and, where possible, investigate the likely cause of death[11] and related factors that may provide insight into how the mortality has occurred and make recommendations as to what (if anything) can be adjusted in the management measures to mitigate a future event. Recommendations from the mortality report will be implemented, where possible, including adjustments to curtailment devices such as vegetation management, operator training and, if necessary, changes to unit heights or locations.
- The mortality report will be provided to the EPA and DCCEEW (for EPBC Act listed species) within one week of its completion.

Additional to the above procedure for threatened species, the Director EPA will be notified within one week of the completion of each avian mortality monitoring event of any native (but non-threatened) bird or bat injury or fatality.

By reviewing any threatened avian mortality attributable to the Project, management measures can and will be adjusted accordingly. For example, experience at Cattle Hill (refer Section 6.1.4.1), has demonstrated that in some instances mortalities could be attributed to specific events causing the WTG curtailment system not to function effectively (e.g. vegetation obscuring the view field), and these matters could then be resolved to avoid a repeat incident. This approach, of reviewing any threatened avian mortality, will be an important tool in keeping the risk to eagles as low as possible.

The Final Eagle Monitoring and Management Plan will be subject to five-yearly reviews, to accommodate changes in the site or eagle collision risk over time. Reviews will be submitted to the EPA and DCCEEW.

6.1.4.4 Offset strategy

The mitigation and management measures set out above, particularly the WTG positioning and the use of WTG curtailment devices with full coverage across all WTGs, is expected to significantly reduce the risk of eagle collision at the site. The use of avian mortality monitoring and mortality reports investigating all eagle

[11] The imagery captured by the IDF units may be a useful resource in investigating the incident.

mortality events will facilitate adaptive management including changes to the curtailment program (e.g. vegetation management, or adjustment to height or positioning). Nonetheless, there remains a residual risk to eagles from the Project. Therefore, the Proponent proposes an offset strategy in accordance with the DCCEEW Environmental Offsets Policy (DSEWPaC, 2012) and DNRE *Offset Guidelines for Impacts to Threatened Eagles from Wind Farm Developments*, in the form of a monetary contribution to the Wedge-tailed Eagle Research Fund.

The Proponent commits to providing $100,000 per Tasmanian WTE mortality resulting from WTG collision to the Wedge-tailed Eagle Research Fund. The fund is administered by NRM South, one of three non-government organisations (NGOs) in Tasmania established under the *Natural Resource Management Act 2002* to act as a conduit between government, industry, and the community; additionally, the fund is supported by DNRE Tasmania, who provide input as required.

Although the key eagle risk at the site is to the Tasmanian WTE, the offset strategy (outlined in Section 7.4) will also apply to the WBSE.

Further information on the eagle offset strategy is provided in Section 7.4.

6.1.4.5 Summary of eagle management, mitigation and monitoring

The following tables summarise the key monitoring, management and mitigation measures and reporting committed to by the Proponent to manage the risk of the Project to eagles.

Pre-construction and construction

The following management, mitigation and monitoring measures are proposed for the pre-construction and construction phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Eagle MM 1	Building upon the Preliminary Eagle Monitoring and Management Plan set out in this EIS, a Final Eagle Monitoring and Management Plan will be developed for the Project and submitted to the EPA and DCCEEW for approval prior to commencement of construction. The plan will be prepared by a suitably qualified professional, in accordance with the EPA *Avian Mortality Monitoring Plan Guidelines* and the DCCEEW document *Onshore Wind Farms – interim guidance on bird and bat management* and will include, as a minimum: • Avian collision avoidance measures and other mitigation o WTG positioning o Management of other works within 1 km of known eagle nests o WTG curtailment systems o Carcass management o Adaptive management measures o Reporting • Eagle nest monitoring o Eagle nest searches o Nest activity and productivity surveys o Reporting • Avian mortality monitoring o Monitoring trials o Avian mortality monitoring plan o Reporting • Offset strategy

Reference number	Management, mitigation or monitoring measure
Eagle MM 2	Final WTG positioning as documented in the final Wind Farm Design Report will ensure no WTG is installed within 1 km of any known eagle nest site.
Eagle MM 3	For any sections of road or other infrastructure that fall between 500 m and 1 km of an active nest site, the construction activity will occur outside the eagle management constraint period (July to January inclusive, or as varied by the Forest Practices Authority) to minimise risk of nest abandonment. Blasting will not be undertaken within 1 km of any known active eagle nest during the eagle management constraint period.
Eagle MM 4	Overhead powerlines and the guy wires of met masts will include regular interval flags or 'flappers' on the wires to reduce collision risk.
Eagle MM 5	A total of 24 WTG curtailment system units will be installed across the Project Site, providing curtailment system coverage for all proposed WTGs (as individual curtailment units cover more than one WTG). Vegetation management measures will be applied within the radial arc identified by the system operator for each individual unit to ensure tree heights are maintained at a suitable level to provide visibility and effective operation of the units.
Eagle MM 6	A Carcass Management Plan will be prepared by a suitably qualified professional and submitted to the EPA and DCCEEW as part of the Final Eagle Monitoring and Management Plan. The Carcass Management Plan will include, as a minimum: • Procedures for removal of all carcasses identified through the avian mortality monitoring program. • Removal of any carcass found within 500 m of a WTG. • Removal of carcasses observed along roads within the Project Site, both during construction and operation. • Procedures for appropriate carcass disposal (to be at least 500 m from any WTG) including separate procedures for handling and notification in the event of a threatened species carcass identification. • Documentation of any recommended changes to land management practices (e.g. hunting or livestock restrictions) within the Project Site, to be developed in conjunction with landholders.
Eagle MM 7	Two separate scavenger trials will be undertaken at the Project Site prior to construction (one during winter and the other during spring or summer). The detailed trial methodology will be designed by a suitably qualified person and take into account Project Site conditions, WTG layout, carcass type to use, search technique, data collection and analysis. The detailed trial methodology will be determined in consultation with DNRE Tasmania and have a statistically sound design. The results of the scavenger trials will be subject to statistical analysis, used to inform the final avian mortality monitoring approach, and incorporated into the Final Eagle Monitoring and Management Plan to be submitted to the EPA and DCCEEW prior to construction.
Eagle MM 8	Two separate carcass detectability trials will be undertaken at the Project Site prior to construction (one during winter and the other during spring or summer). The detailed trial methodology will be designed by a suitably qualified person and take into account Project Site conditions (e.g. topography and vegetation), WTG layout, search technique, data collection and analysis. The detailed trial methodology will be determined in consultation with DNRE Tasmania and have a statistically sound design. The results of the carcass detectability trials will be subject to statistical analysis, used to inform the final avian mortality monitoring approach, and incorporated into the Final Eagle Monitoring and Management Plan to be submitted to the EPA and DCCEEW prior to construction.
Eagle MM 9	A final Avian Mortality Monitoring Plan (informed by pre-construction trials and site conditions) will be prepared by a suitably qualified person and documented as part of the Final Eagle Monitoring and Management Plan which will be submitted to the EPA and DCCEEW for approval prior to

Reference number	Management, mitigation or monitoring measure
	construction. The avian mortality monitoring approach will include, as a minimum: • Avian mortality surveys to be undertaken around selected WTGs, met masts and overhead powerlines constructed for the Project. • A sufficient number of WTGs surveyed (across suitably varied terrain and vegetation communities) to provide statistically robust collision estimates for the Project Site. • Survey interval timing, transect spacing, survey area and survey methods informed (as appropriate) by scavenger and carcass detectability trials to generate statistically sound collision estimates for the Project Site. • Detailed protocols for avian carcass removal and injured bird management including staff training, notification and handling protocols in the event of native and threatened species mortality, and carcass storage and disposal.
Monitoring	
Eagle MON 1	An eagle nest search will be undertaken by a suitably qualified person (outside of the eagle management constraint period as defined by the Forest Practices Authority) prior to construction. The results of the nest search will be reported to the EPA (prior to the commencement of construction) and will be used to inform the final wind farm layout to be included in the final Wind Farm Design Report. A 1 km WTG exclusion zone will be applied to any new active nest identified. Any new nest locations identified will also be submitted to the Natural Values Atlas in accordance with normal process.
Eagle MON 2	Nest activity and productivity surveys for all known nest locations will be undertaken by a suitably qualified person on an annual basis from the commencement of construction, throughout operation. Surveys will be undertaken in accordance with all relevant guidelines. The results of annual nest activity and productivity surveys will be reported to the EPA (as part of the Project's annual environmental reporting).

Operation

The following management, mitigation and monitoring measures are proposed for the operational phase of the Project, noting that some of the measures stipulated during the construction phase above will carry through into the operational phase (as specified).

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Eagle MM 10	The Final Eagle Monitoring and Management Plan (inclusive of the Carcass Management Plan and Avian Mortality Monitoring Plan) will be implemented throughout the operational life of the wind farm and will be subject to five-yearly reviews (to be submitted to the EPA and DCCEEW).
Eagle MM 11	In the event of an eagle death attributable to the Project, the Proponent commits to providing $100,000 per eagle mortality resulting from WTG collision to the Wedge-tailed Eagle Research Fund.
Eagle MM 12	In the event that a new eagle nest is incidentally observed within the Project Site during operations, it will be reported to DNRE and the EPA and included in subsequent nest activity and productivity surveys and associated reporting.
Monitoring	
Eagle MON 2 (monitoring measure carried over from construction)	Nest activity and productivity surveys for all known nest locations will be undertaken, by a suitably qualified person, on an annual basis from the commencement of construction, throughout operation. Surveys will be undertaken in accordance with all relevant guidelines. The results of annual nest activity and productivity surveys will be reported to the EPA (as part of the Project's annual environmental reporting).
Eagle MON 3	Avian mortality monitoring will be undertaken in accordance with the Final Eagle Monitoring and Management Plan (inclusive of the Final Avian Mortality Monitoring Plan). The results of avian mortality monitoring will be reviewed and reported to the EPA as part of the Project's annual environmental reporting.
Eagle MON 4	In the event that the death of a threatened avian species is detected during avian mortality monitoring: • The Director, EPA, will be notified within 24 hours of completion of that day's survey. • A mortality report will be prepared by a suitably qualified professional to document the particulars of the mortality and, where possible, investigate the likely cause of death and related factors that may provide insight into how the mortality has occurred and what (if anything) can be adjusted in the management measures to mitigate a future event. Recommendations from the mortality report will be implemented, where possible (including adjustments to curtailment devices such as vegetation management, operator training and, if necessary, changes to unit heights or locations). • The mortality report will be provided to the EPA and DCCEEW (for EPBC Act listed species) within one week of its completion.

6.1.5 Management, mitigation and monitoring – Other avifauna

6.1.5.1 Pre-construction and construction

The following management, mitigation and monitoring measures are proposed for the pre-construction and construction phase of the Project. Where management measures are directly applicable to several topics, they are referenced as 'Various' and replicated in all relevant sections of this EIS for completeness.

Note that some management measures related to terrestrial fauna (Section 6.2) and flora and vegetation communities (Section 6.3) (e.g. post-construction revegetation) are also applicable to avifauna species and are documented under those sections where they are deemed most applicable.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Various MM 5	All WTG and other infrastructure will be micro-sited, with the assistance of a trained ecologist, to ensure disturbance of listed species, listed communities and habitat for listed species is avoided as far as practicable and infrastructure is located in areas with relatively lower ecological value where possible[12]. Micro-siting will include consideration of the construction buffer areas, with these to be reduced as far as reasonably practical in areas of important ecological value to minimise construction phase impacts.
Various MM 6	Approved site disturbance boundaries within the Project Site will be clearly articulated to the construction contractors through electronic means, onsite documentation and (where appropriate) physical demarcation, and it will be specified that all works, vehicles and materials will be confined to the designated impact areas. For areas of specific ecological value (threatened fauna habitat, threatened flora locations, threatened vegetation communities) that are not within the final Project footprint and can be retained, exclusion zones will apply. These will be marked on construction plans, communicated to all construction personnel and, where they lie adjacent to the works area, will also be physically cordoned off with temporary fencing (or similar) to avoid inadvertent impacts. No ground disturbance, stockpiling or alteration of drainage patterns will be permitted within exclusion zones.
Other Avifauna MM 1	Any areas of temporary disturbance within mapped terrestrial habitat for Latham's snipe will be rehabilitated post construction.
Other Avifauna MM 2	Potential nesting trees for Tasmanian masked owls will be surveyed prior to commencement of construction (during the nesting period from October to March) to inform micro-siting of infrastructure. Any confirmed nests will have a 100 m buffer allocated from WTGs and a 50 m buffer from other infrastructure and any construction or maintenance activities involving heavy machinery, where practicable. If a nest is required to be decommissioned, a permit to take will be sought and decommissioning delayed until after the conclusion of the breeding season.
Other Avifauna MM 3	In the event an active masked owl nest is identified on site there will be no blasting undertaken within 1 km of the nest site during the breeding season.

[12] Micro-siting considerations will include but not be limited to habitat for eagles, Latham's snipe, Tasmanian masked owl, Miena jewel beetle (including the species' host plant *Ozothemnus hookeri*), ptunarra brown butterfly, Tasmanian devil and spotted-tailed quoll (including potential den sites), wetland and waterway habitat for listed species, threatened vegetation communities (including highland Poa grassland and highland grassy sedgeland) and threatened flora (including Liawenee greenhood, matted lignum, ferny buttercup, longhair fireweed and *Eucalyptus gunnii*).

Reference number	Management, mitigation or monitoring measure
Monitoring	
There are no specific monitoring measures for 'other avifauna' proposed during construction, noting that general fauna management is addressed separately in Section 6.2 and eagle monitoring is addressed in Section 6.1.4.	

6.1.5.2 Operation

The following management, mitigation and monitoring measures are proposed for the operational phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
	No specific mitigation or management is proposed during the operational phase of the Project for avifauna species other than eagles, noting that the management and monitoring for eagles and terrestrial fauna also provide coverage for other avifauna. In particular, the Avian Mortality Monitoring Plan (ref Eagle MM 10 and Eagle MON 3) and mortality reports (Eagle MON 4) will be inclusive of all listed avifauna and will facilitate monitoring for avifauna mortalities, reporting on any listed avifauna mortality and adaptive management in accordance with the recommendations of the mortality reports.
Monitoring	
	During operation, the avian mortality monitoring proposed for eagles (reference Eagle MON 3) will also be used to assess the Project's impact on avifauna species other than eagles. If impacts are identified for a particular species, additional management and mitigation will be investigated in accordance with the mortality reports (reference Eagle MON 4).

6.1.6 Residual impacts

6.1.6.1 Eagles

Significant planning and design effort has been incorporated into the Project to ensure that collision risk for eagles has been minimised to as low as reasonably practicable. The implementation of buffers around known eagle nests not only reduces collision risk but also provides a high degree of certainty that nesting activities are unlikely to be disturbed from construction and operational noise and visual activities associated with the Project.

The installation of 24 WTG curtailment system units is expected to reduce the eagle collision rate (from that predicted in the CRM based on the proposed layout) by at least 50–67% (and potentially higher, noting that IdentiFlight have advised the adopted rate is conservative and real world results are likely to be more favourable (IdentiFlight pers comm. 2023)). The predicted number of eagle collisions based on the CRM with the WTG curtailment system in place at various avoidance rates is shown in Table 6-3. The predicted number of collisions at the 90% avoidance rate with the WTG curtailment system in place is between 1.61 and 2.45 eagles per year. At a 95% avoidance rate, the predicted number of collisions reduces significantly with mitigation to 0.80 – 1.22 eagles per year.

Table 6-3 Predicted annual collisions for WTE by avoidance rate with mitigation

Mitigation	WTE avoidance rates		
	90%	**95%**	**99%**
No mitigation	4.89	2.44	0.49
With WTG curtailment system	1.61 – 2.45	0.80 – 1.22	0.016 – 0.25

Further management measures outlined in the preceding sections, including carcass management, are expected to reduce the likelihood of collision further, but it is difficult to quantify the actual reduction of these other measures. Hence the numbers in Table 6-3 show the predicted annual collisions with the WTG curtailment system in place but do not show any further reductions that might be achieved from the other

management measures (which are likely to reduce collision risk further but cannot be predicted in a quantitative fashion).

Mortality reports to be developed for any eagle death (as outlined in the sections above) will facilitate a review of adaptive management and its implementation and ensure all management measures are operating at optimal performance.

As the most recent (albeit 2006) predicted population of Tasmanian adult WTE is between 1,000 and 1,500 (DPIW, 2006) and the species is listed as Endangered under the EPBC Act, even the loss of a single adult individual has the potential to significantly impact the sub-species within the meaning of the Significant Impact Guidelines 1.1 (Department of the Environment, 2013). Therefore, an offset plan has been developed for this species, presented in Section 7.4 (noting this offset plan is focused on the Tasmanian WTE as the key eagle at risk, but will also apply to the WBSE in the event of a mortality).

6.1.6.2 Other avifauna

Based on the low likelihood of impacts to almost all listed and non-listed species, the potential residual impacts to this group of avifauna are considered negligible to low, with only the listed Tasmanian masked owl requiring any specific management and mitigation.

6.2 Terrestrial fauna

The following sections provide an analysis of terrestrial fauna values, potential impacts, and their management and mitigation. An additional summarised consideration of all EPBC Act matters is provided separately in Section 7.

6.2.1 Existing environment

An assessment of terrestrial fauna and habitat values was undertaken by NBES (2023b) in conjunction with its assessment of flora and ecological communities (as documented in Section 6.3). The results of that assessment are reported in full at Appendix C, with matters relevant to terrestrial fauna summarised herein. The flora and fauna habitat assessment at Appendix C did not include avifauna, which was undertaken as a separate body of work and is covered in Section 6.1.

The NBES assessment included desktop review of relevant databases and previous assessments of the area and several field surveys spread across a range of seasons from winter 2019 through to autumn 2020. A range of survey techniques were used including habitat mapping, searches for evidence of threatened fauna (sighting, scats, tracks and dens) and remote motion-operated trail cameras. Targeted surveys were undertaken for key species including the Tasmanian devil, eastern and spotted-tailed quolls, Miena jewel beetle and the ptunarra brown butterfly (refer Appendix C for details of survey methods).

The site is generally dominated by native grasslands, eucalypt forest and woodland, and cultivated land (agriculture and silviculture) with patches of wetland, other native vegetation communities, and other areas of human disturbance (roads, easements etc.). This mosaic provides a wide range of habitat types supporting both threatened and non-threatened native fauna.

Through desktop analysis and field survey NBES analysed the potential for threatened terrestrial fauna to inhabit the Project Site and identified the following five key species within the Project Site:

- Tasmanian devil (*Sarcophilus harrisii*) (TSP Act endangered / EPBC Act endangered)
- Eastern quoll (*Dasyurus viverrinus*) (TSP Act not listed / EPBC Act endangered)
- Spotted-tailed quoll (*Dasyurus maculatus ssp. Maculatus*) (TSP Act rare / EPBC Act vulnerable)
- Miena jewel beetle (*Castiarina insculpta*) (TSP Act endangered / EPBC Act not listed)
- Ptunarra brown butterfly (*Oreixenica ptunarra*) (TSP Act endangered / EPBC Act endangered).

Although other threatened terrestrial fauna have the potential to inhabit the Project Site, NBES concluded the likelihood to be very low with the exception of the tussock skink (*Pseudemoia pagenstecheri*). Note that the Shannon galaxias (*Paragalaxias dissimilis*) is covered in Section 6.6.

Several skinks of the Pseudemoia genus were observed on site, and although these individuals have been attributed to the non-threatened *P. entrecasteauxii* species, this classification was not without uncertainty and there remains some possibility the threatened tussock skink may occur within the Project Site. Given the shared habitat preferences of the tussock skink and ptunarra brown butterfly, the management measures discussed below to minimise impacts to ptunarra brown butterfly will also protect habitat values for the tussock skink if it were to occur on site.

6.2.1.1 Tasmanian devils and quolls

Evidence of Tasmanian devils was found at various locations throughout the Project Site in the form of scats at eight different locations, a devil carcass, and several observations on motion cameras at five different sites. Although no natal dens were confirmed, the site contains widespread denning opportunities, including three denning locations with confirmed devil occupation. No definitive evidence of natal activity was recorded, although genital dragging (a type of mating behaviour) was observed, and a juvenile was effectively resident in one den during monitoring over several weeks. Based on this evidence, along with

anecdotal evidence from nearby property owners, NBES (2023b) concludes that devils are likely widespread across the Project Site but unlikely to be abundant. The Project Site falls within the known range of the Tasmanian Devil Facial Tumour Disease and has been diseased for approximately 20 years (NBES, 2023b).

A roadkill carcass of a spotted-tailed quoll was identified during the survey, which was the only evidence found throughout the Project Site of the species, with none identified on camera traps and no scats identified. Anecdotal evidence from by nearby landowners suggests the species is present at the Project Site. NBES (2023b) concludes that the species is possibly widespread across the site but in low abundance.

Camera traps identified the eastern quoll at a single location, which was suspected to be the same individual over multiple nights. NBES (2023b) notes that the Project Site contains suitable habitat for the species, and it is likely to be widespread across the site and may be more abundant in select areas despite the paucity of records from survey work.

There were 114 wombat burrows[13] observed across the Project Site, three of which were confirmed to be used by Tasmanian devils. All three of the burrows showing evidence of devil use have been avoided by the proposed layout. Additional burrows are likely to occur on site but were not detected during surveys. NBES (2023b) has provided a method for calculating the predicted density of additional burrow sites likely to occur (but not yet detected), predicting that up to 52 additional burrows could occur within the construction disturbance footprint (plus a 50 m buffer). As outlined in Section 6.2.5, pre-clearance surveys will be undertaken to identify any such additional burrow sites and ensure they are appropriately managed.

NBES (2023b) concludes that due to the large variety of habitats available (including extensive rocky habitats) and the large number of burrows identified that almost all the Project Site (except for permanently inundated locations) constitutes potential denning habitat. Suitable denning opportunities are therefore unlikely to be a limiting factor for the three species. NBES (2023b) provides stratification of denning habitat across the study site, categorising it into optimal (approximately 63% of the Project Site), suboptimal (approximately 33% of the Project Site) and unsuitable (approximately 4% of the Project Site); this is shown graphically in Figure 6-10. The NBES stratification of denning habitat notes that even wetland habitats appear to be prone to seasonal desiccation, allowing seasonal use of potential denning locations that may otherwise be deemed unsuitable if inundated on a more permanent basis. Consistent with this, the denning stratification modelling shows that almost the entire project area (other than permanently inundated locations) constitutes potential denning habitat (Figure 6-10).

[13] Wombat burrows can be used by devils and quolls for denning.

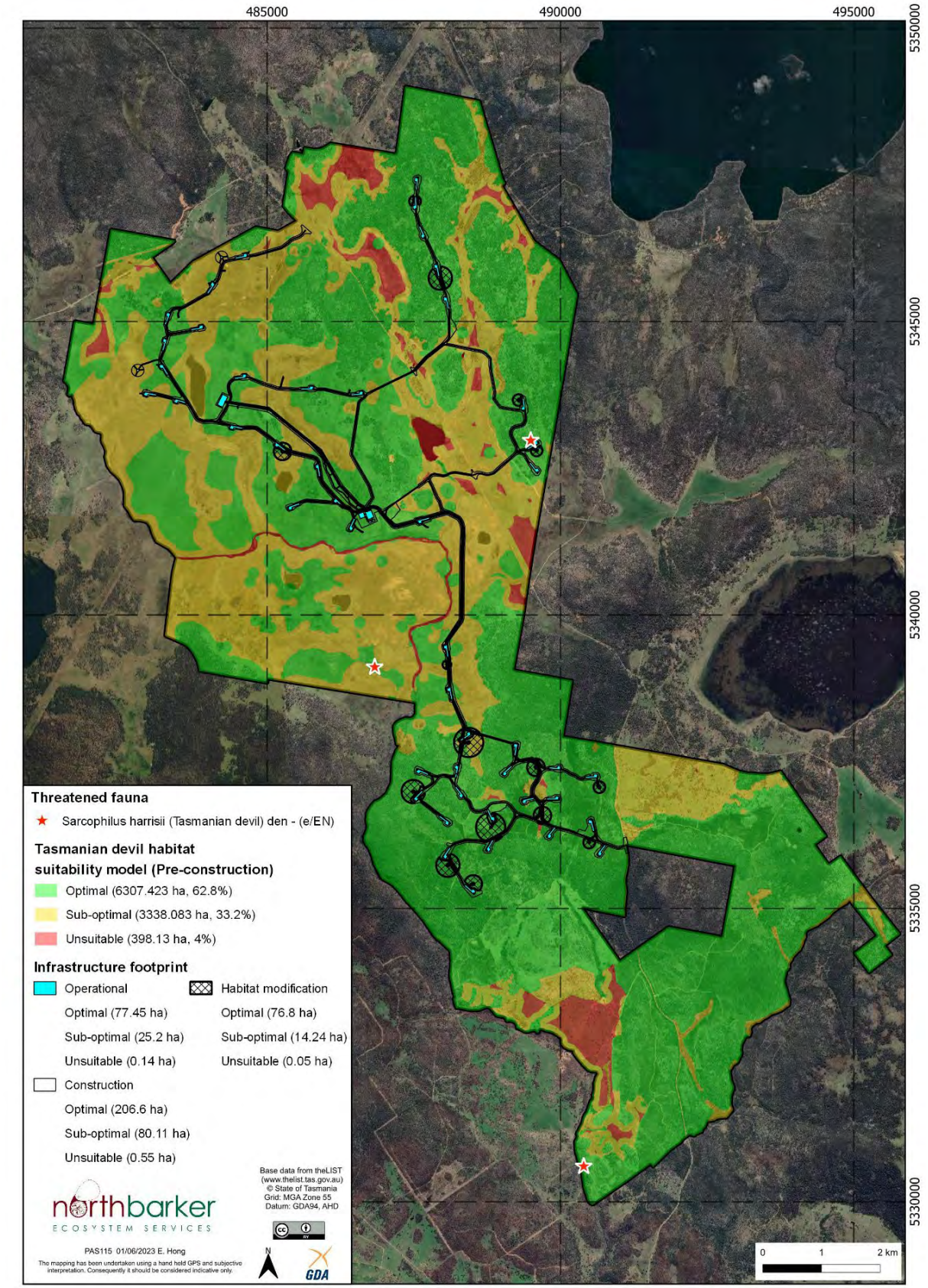


Figure 6-10 Stratification of Devil denning habitat suitability prior to disturbance (NBES, 2023b)

6.2.1.2 Miena jewel beetle

The Project Site was found to contain approximately 56 ha of potential habitat for the Miena jewel beetle, which was identified as areas dominated by the plant species *Ozothamnus hookeri*. A survey of a small amount of the habitat found by the NBES field team was undertaken out of season for the beetle, which identified several larvae emergence holes. The habitat was reassessed during the 2021 flowering season and adult beetles were identified, as shown in Figure 6-11, confirming their presence on site.

NBES (NBES, 2023b) notes that the density of the host plant may vary within mapped habitat patches, as can the occupation rate of the species, and that this variation is not necessarily consistent from year to year, or every second year in this case as the species has a two-year larval period with adults being scare in alternative years (which are those with even year dates).

Potential habitat for the Miena jewel beetle is identified in Figure 6-13.

Figure 6-11 Left image shows Miena jewel beetle emergence hole from the Project Site (NBES, 2023b); right images shows an example of an adult beetle (DPIPWE, 2021a)

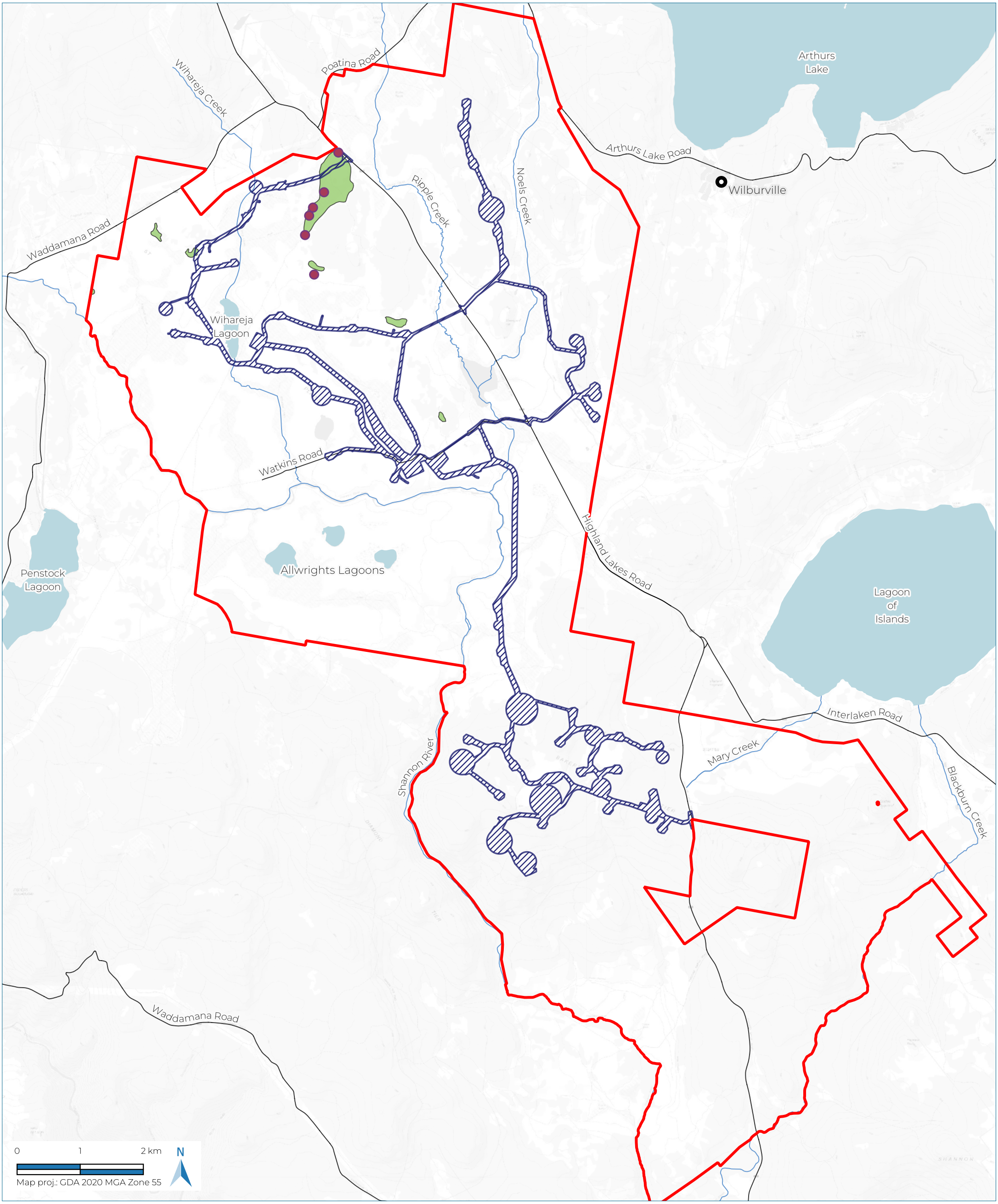
6.2.1.3 Ptunarra brown butterfly

Targeted surveys for the ptunarra brown butterfly (Figure 6-12), were concentrated on suitable habitat within the Project Site, which included the various forms of grassland and sedgeland throughout the northern half of the Project Site. Over 2,000 individuals were recorded from the transects completed, with an additional 80 individuals counted as incidental observations during other surveys. The analysis of survey results confirmed that relative abundance varies between habitat types, with sedgy grassland supporting the highest density of individuals and very short grasslands the lowest, with over 90% of surveys in this habitat type yielding no observations. Within a single two-minute survey, the highest total of butterflies counted was 54 individuals.

Based on the results of the transect surveys, suitable habitat within the Project Site for the ptunarra brown butterfly was ranked in three categories in terms of quality, namely high, medium and low. The habitat classes adopted (high, medium and low) are a direct reflection of the association between habitat types and the recorded density of butterflies in each habitat type.

There were 1,209 ha of high-quality (~12% of Project Site), 2,135 ha of medium-quality (~21% of Project Site), and 443 ha of low-quality (~4% of Project Site) habitat mapped. NBES (2023b) estimates the site may support approximately 200,000 individuals within the identified habitat areas. The habitat distribution of the ptunarra brown butterfly is shown in Figure 6-14.

Figure 6-12 Male (left) and female (right) ptunarra brown butterfly images from the Project Site (NBES, 2023b)



Project site (the Land)

EXISTING INFRASTRUCTURE

- Towns/communities
- Roads

NATURAL FEATURES

- Lakes and lagoons
- Rivers and streams

PROPOSED INFRASTRUCTURE

- Construction footprint

MIENA JEWEL BEETLE (from North Barker Ecosystem Services)

- Miena jewel beetle record
- Miena jewel beetle habitat

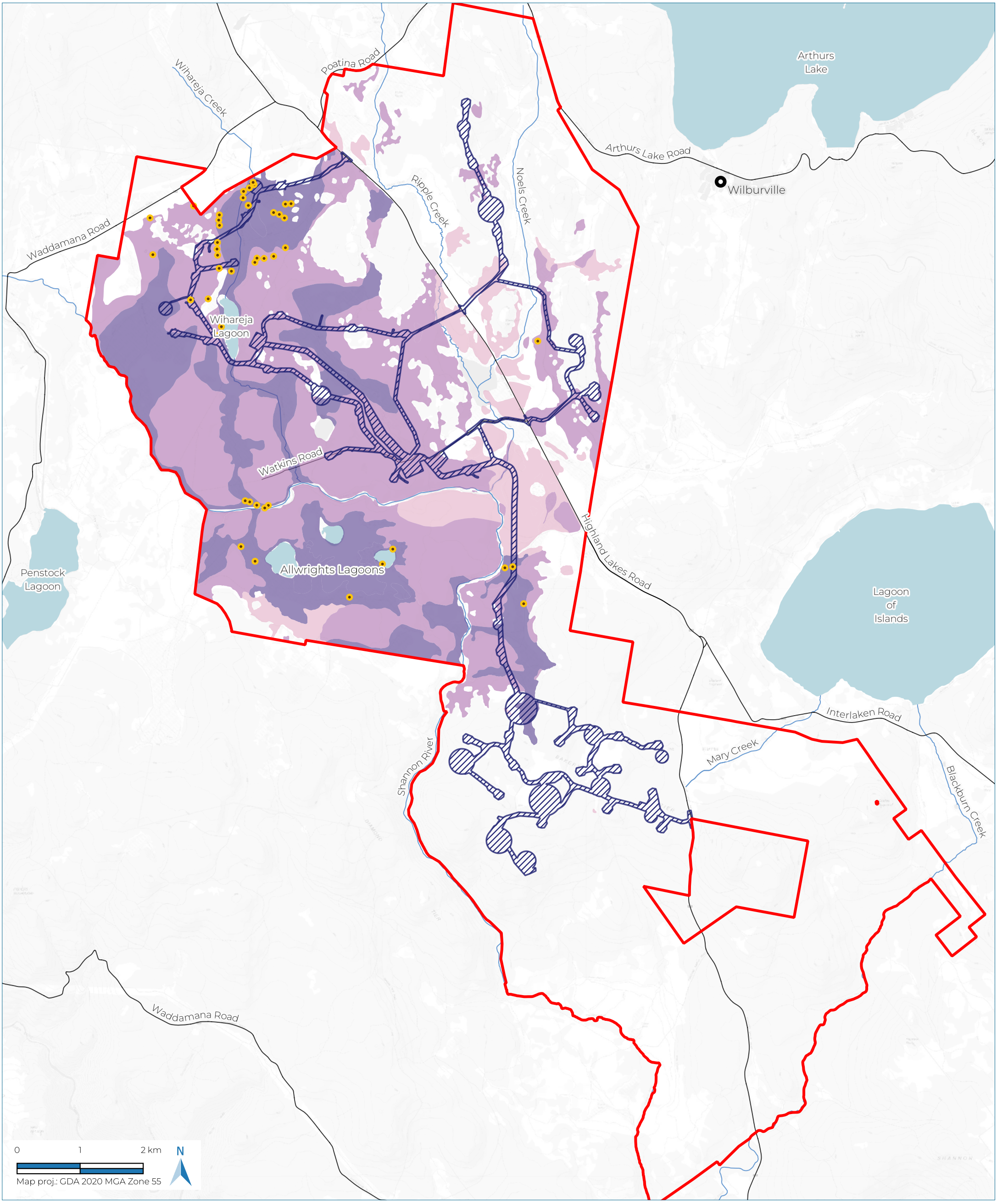
ARK ENERGY

era PLANNING & ENVIRONMENT

St Patricks Plains Wind Farm

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

Figure 6-13
Miena jewel beetle habitat from NBES survey



Project site (the Land)

EXISTING INFRASTRUCTURE

- Towns/communities
- Roads

NATURAL FEATURES

- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE

- Construction footprint

PTUNARRA BROWN BUTTERFLY (from North Barker Ecosystem Services)

- Ptunarra brown butterfly (records)

PTUNARRA BROWN HABITAT (from North Barker Ecosystem Services)

Habitat quality

- High
- Moderate
- Low

ARK ENERGY

era PLANNING & ENVIRONMENT

St Patricks Plains Wind Farm

Figure 6-14 Ptunarra brown butterfly habitat from NBES survey

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

6.2.2 Legal and other requirements

The key legislation and policy relevant to protecting fauna biodiversity values of relevance to this Project include:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Tasmanian Threatened Species Protection Act 1995*
- *Nature Conservation Act 2002*.

The key performance requirement is to minimise impacts to identified fauna values and seek necessary permits for any unavoidable impacts.

6.2.3 Potential impacts – construction

The construction phase of the project has the greatest potential for impact to terrestrial fauna, largely through land clearance resulting in habitat loss. In addition to direct land clearance impact, the construction phase also has the potential for other impacts to terrestrial fauna including animal mortality associated with falling into construction trenches, disturbance from blasting (if required), introduction of weeds, pests and diseases, and increased roadkill. These potential impacts are addressed separately in the following sections.

6.2.3.1 Habitat clearance

A constraints analysis, using information from NBES ecological surveys, was undertaken during the Project planning phase to achieve a layout that minimises impact to mapped terrestrial fauna values where possible. Through this process the proposed layout avoids of the vast majority of mapped threatened terrestrial fauna habitat.

Overall, the Project will involve the disturbance of up to 481.13 ha of land, this is made up of the permanent impact associated with the operational footprint (193.88 ha) and the temporary disturbance associated with the construction buffer (287.25 ha). Of the total 481.13 ha impacted, approximately 384.91 ha is mapped as native vegetation communities, and the remaining 96.22 ha is non-native mapping units. It is noted that several key fauna species (e.g. devils and quolls) are expected to use both native and non-native vegetation types, hence totality of impacts to both native and non-native vegetation is considered herein.

Within the operational footprint (193.88 ha), approximately 91.09 ha of land is related to the overhead powerline and IDF vegetation management zones and therefore will be subject to removal of obstruction woody vegetation only, rather than full vegetation clearance, hence constituting habitat modification rather than permanent loss. For most species, these areas will remain as suitable habitat.

The land impacted within the construction buffer (287.25 ha) will be subject to rehabilitation in a manner that promotes regeneration of native vegetation after works are completed; hence this construction buffer area will be impacted but does not represent permanent loss of native vegetation. Additionally, the construction impact areas have been calculated using a construction buffer applied to all infrastructure as a prediction of the maximum area needed to facilitate construction, however during the final design and micro-siting stage there may be opportunities to slightly adjust the position of infrastructure or reduce the size of the construction buffer in key locations to minimise impacts to ecological values hence the disturbance calculations are based on a worst-case scenario.

This habitat clearance and modification has some potential for impact to native fauna, noting that it represents a very small proportion of the native habitats available in the Project Site and the broader region. The effects of habitat clearance, habitat modification and areas of temporary impact that are subsequently rehabilitated can affect each fauna species differently (for example some species will continue to use habitat post rehabilitation or during regular management for woody vegetation, whereas others may not). These

differences are discussed where relevant in the following sections and in more detail in the ecology report (Appendix C).

Tasmanian devils and quolls

The Tasmanian devil, spotted-tailed quoll and eastern quoll are wide ranging carnivores with foraging locations largely driven by prey occurrence rather than habitat types or conditions, on this basis the entire site is potentially suitable habitat (excluding permanently inundated areas), with all three species known to be present (NBES, 2023b). The entire Project Site is also identified as potential foraging habitat for devils and quolls. Due to the more critical nature of breeding sites (natal dens) these are treated with the highest priority when considering impacts and mitigation measures.

The Project has the potential to impact a total area of approximately 481 ha, including both construction phase impacts and the operational footprint. Whilst this entire area represents potential foraging habitat, and most of it constitutes potential denning habitat also, the degree and permanency of impacts within this area varies considerably. NBES have undertaken habitat stratification modelling to quantify the expected impact on denning habitat, as summarised in the table below.

Table 6-4 Summary of distribution of denning habitat classes in relation to proposed footprint (Source: NBES)

	Impact Areas (% of total in Project Site)				**Avoidance areas**	
	Direct and permanent impact (operational infrastructure)	Habitat modification for operations (vegetation management)	Construction disturbance buffer (potential temporary impacts)	Total extent of potential impacts and modifications	Area retained (% of total)	Total in Project Site
Optimal denning habitat	77.45 (1.23 %)	76.80 (1.22 %)	206.60 (3.28 %)	360.84 (5.72 %)	5,946.59 (94.28 %)	6,307.43
Suboptimal denning habitat	25.20 (0.75 %)	14.24 (0.43 %)	80.10 (2.40 %)	119.56 (3.58 %)	3,218.53 (96.42 %)	3,338.08
Unsuitable habitat	0.14 (0.04 %)	0.05 (0.01 %)	0.55 (0.14 %)	0.74 (0.19 %)	397.39 (99.81 %)	398.13
Total	102.79 (1.02 %)	91.09 (0.91 %)	287.25 (2.86 %)	481.13 (4.79 %)	9,562.51 (95.21 %)	10,043.64

- Table Note – All numbers are in hectares.
- Table Note - Habitat modification in this table relates to areas of obstructive woody vegetation management around the IDF units and under the overhead powerline. In these areas ground level vegetation will be retained, and vegetation management will be undertaken in a selective fashion to facilitate visibility (for the IDF units) and safety (for the powerlines).

As outlined in NBES (2023b) the total 481.13 ha construction footprint will not result in an equivalent loss of potential habitat for these species due to their broad ecological niche and minimal habitat selection within a local area. The nuances in the type of impact in different habitat suitability is an important consideration in understanding the expected impact on the species. As demonstrated in the table above, impacts need to be considered in relation to temporary impacts during construction (approximately 287.25 ha) which will be subject to rehabilitation, habitat modification resulting from woody vegetation management for the IDF units and overhead powerline (91.09 ha) and permanent habitat loss associated with the permanent infrastructure (102.79 ha) (some of which will still be used by devils and quolls).

Following construction, much of the habitat within the operational footprint will still be viable for general use, such as dispersal and foraging, but may simply be different habitat to what was present prior to development; this is not necessarily a detrimental change. This will apply to areas converted to roads (approximately 40.85 ha, which may subsequently improve as dispersal corridors), areas in which vegetation is partially or fully cleared but not physically excluded from the surrounding area, and areas where the development is overhead or underground.

Where forested vegetation is required to be partially cleared or modified (i.e. for IDF vegetation management and overhead reticulation) and managed during operation, it is anticipated that the forest vegetation will revert to something equivalent to a disturbance induced grassland or a regenerating scrub/heathland. Native non-forest vegetation will effectively remain the same. This management of vegetation will not necessarily render the habitat unsuitable for denning (nor foraging) and for much of the impact area (outside of permanent footprint losses), habitat can be expected to remain as viable foraging and denning habitat.

NBES have determined that the permanent loss of habitat is limited to areas of solid obstructions (e.g. WTGs themselves, substations, roads etc.). These elements of permanent footprint infrastructure constitute an area of 102.79 ha of the overall footprint, representing a loss of ~1 % of the current available habitat within the Project Site (Table 6-4). NBES notes that additional habitat may effectively be impacted in terms of denning potential due to changed suitability (but will still be viable for foraging). NBES have explored this matter by running the denning stratification model with post-clearance parameters to factor in the change in vegetation structure and distribution at the completion of construction and rehabilitation. The results are presented in Table 11 of Appendix C. This modelling considered holistic change in denning suitability due to changes outside the permanent infrastructure footprint (102.79 ha) such as the conversion of forested vegetation to treeless vegetation, which increases exposure, and thus reduces the suitability for devils beyond the immediate margins of remaining forest. The results demonstrate a net additional loss of 0.20 ha of suitable denning habitat, and a reduced suitability of a further 97.20 ha (from optimal to suboptimal). Given that suboptimal habitat is still viable for denning, the overall additional loss in denning suitability from vegetation change (0.20 ha) is considered by NBES to be negligible (NBES, 2023b).

The vast majority of the overall Project impacts therefore involve a change in habitat rather than removal, and these changes in habitat may not necessarily be detrimental to devils or quolls. Devils are habitat generalists and can persist in human-modified landscapes, even taking advantage of habitat fragmentation features for travel and foraging (NBES, 2023b). As the Project will only clear patches of vegetation in an already fragmented landscape, and a network of forest patches will persist during Project operations, devils and quolls are expected to continue to use the area much as before.

As outlined in Section 6.2.1.1, a total of 114 burrow sites were mapped within the Project Site (some of which had evidence of use by Tasmanian devils). Of these, 109 are outside the footprint and will be retained and 5 may be impacted (refer Table 9 of Appendix C). As noted in Section 6.2.1.1, three of the burrows identified on site showed evidence of devil use. These three burrows are outside the construction footprint. Two of these burrows are at least 1 km away from the footprint and the third (which had a single visit from a devil during the extended camera surveillance) lies approximately 30 m from the construction disturbance footprint and 60 m away from the operational disturbance footprint.

It is likely that other burrow sites also exist and were not detected during survey. NBES (2023b) applied an extrapolation from the survey data (refer NBES 2023b for details), indicating a further 52 burrows are predicted to have been undetected within the construction footprint (plus a buffer of 50 m). Hence, up to 57 burrows (including those detected and the extrapolated numbers expected to be undetected) could potentially be located within the construction footprint (plus 50 m buffer). Section 6.2.5 sets out proposed management measures to assess burrows for devil and quoll activity prior to construction and to apply den management protocols in the lead-up to clearance to avoid direct impact to individuals and ensure appropriate den decommissioning in the event this is required.

NBES (2023b) has undertaken a significant impact assessment for devils and quolls and concluded the Project is not likely to have a significant impact, as documented in Section 5 of the NBES (2023b) report and summarised in Section 7 of this EIS.

Miena jewel beetle

Consideration was made to minimising impact to mapped habitat for this species in the proposed wind farm layout, with known habitat patches avoided where possible. Although not all areas of mapped habitat were practically avoidable without compromising the wind farm design, the proposed layout will avoid all emergence hole and adult observation locations, and approximately 94% of mapped potential habitat for the species. Approximately 3.2 ha of the mapped 56.2 ha of potential habitat may be lost through land clearance during construction.

NBES notes that beetle density may vary in the mapped area of impacted habitat through variance in the density of both the host plant and the beetle itself. As a result, this area of habitat impacted could be proportionally more or less important to the overall persistence of the population, depending on how many beetles it supports. To address this potential variation, further survey to characterise density of host plants and species has been proposed prior to construction, with the result to inform final management and mitigation measures (refer Section 6.2.5 for details).

Ptunarra brown butterfly

The Project layout has avoided the vast majority (approximately 94%) of mapped habitat for this species, with a residual loss of approximately 50 ha of high-quality habitat (in relation to a total of 1,208 ha mapped on site), approximately 157 ha of medium-quality habitat (in relation to a total of 2,135 ha mapped on site) and approximately 23 ha of low-quality habitat (in relation to a total of 444 ha mapped on site)[14].

The Project also has the potential to lead to an increase in European wasp numbers at the site through habitat disturbance, noting that the wasps can prey upon the ptunarra brown butterfly. Section 6.2.5 sets out proposed monitoring and control measures to manage European wasp numbers during and post construction. With monitoring and control measures in place this risk can be well managed.

NBES (2023b) has undertaken a significant impact assessment for the ptunarra brown butterfly and concluded the Project is not likely to have a significant impact, as documented in Section 5 of the NBES (2023b) report and summarised in Section 7 of this EIS.

Other species

Land clearance during construction also has the potential to impact on native fauna not protected by the TSP Act or EPBC Act, including the possible loss of wombat burrows, which may have implications for approval under the Tasmanian NC Act (e.g. permits are required for impact to wombat burrows). It is noted that management and mitigation measures focused on threatened terrestrial species will also provide a level of protection for other, non-threatened native fauna.

As outlined in Section 6.2.1, there is some possibility the Project Site may support other threatened fauna, including the tussock skink. If the tussock skink were to occur on site, the management measures outlined below to protect the ptunarra brown butterfly will also afford protection to this species.

6.2.3.2 Fauna entrapment and blasting

Given that the Project involves a significant amount of trenching for electrical cables, there is a risk of fauna entrapment if trenches are left open, especially during the night or for extended periods, which can result in harm to fauna through exposure to weather and predation, and restriction of access to food and water. This risk can be effectively addressed through construction management (refer Section 6.2.5).

[14] This represents a loss of approximately 6% of potential habitat mapped within the Project Site, consisting of 5% of low, 7% of medium and 4% of high quality habitat in relation to the extent of each habitat type mapped within the Project Site.

Blasting (if required) has some potential to disturb local terrestrial fauna, particularly if undertaken near den sites. The key species potentially at risk are devils and quolls, which could be affected if blasting were to be undertaken in close proximity to a den site. This can be managed via the implementation of exclusion zones for blasting around known den sites as outlined in Section 6.2.5.

6.2.3.3 Introduction of pests

There is some risk of introduced weeds, pests and diseases during construction if not appropriately managed. The risk of introduction of pest animals or animal diseases is, however, very low, as there will be no introduction of animals to the site as part of the Project, with no obvious vector for introduction. Weeds and plant pathogens and diseases are addressed in Section 6.3.

6.2.3.4 Roadkill

The Project Site has an existing network of tracks, some of which will be upgraded as part of the Project, which will experience increased traffic during the construction phase. The Project will also result in increased use of existing roads beyond the Project Site for the delivery of construction equipment, materials and workers. Unmitigated, the increased vehicle movement in the area has the potential to impact a range of threatened and non-threatened native fauna, including the Tasmanian devil, spotted-tailed quoll and eastern quoll.

The Traffic Impact Assessment (Appendix G) provides an analysis of existing and predicted traffic volumes for the Project, including delivery of materials and components to the site and predicted travel of construction workers. Information from that report has been summarised in Section 6.14 of this EIS, including a tabulated summary of predicted construction traffic volumes (Table 6-11). This information has been used to inform the assessment of potential impact of traffic on wildlife and proposed management, mitigation and monitoring measures. The Traffic Impact Assessment notes that over-dimensional loads and delivery of raw materials are generally less likely to create a roadkill risk (as they will be predominantly restricted to daylight hours except in instances where night movements are required to avoid traffic issues, and in the case of over-dimensional loads, the vehicles will be travelling at relatively low speeds). In contrast the greater roadkill risk comes from construction workers travelling to and from the Project Site (some of whom are likely to travel during the dawn and dusk periods, where risk of roadkill is generally higher).

The Tasmanian devil survey guidelines, released by the Tasmanian Government (PCAB, 2015), advise that roads that will experience an increase in night-time[15] traffic of more than 10% as a result of a project should be assessed for roadkill impacts to threatened fauna and managed/mitigated accordingly. The Traffic Impact Assessment undertaken for the Project (provided in Appendix G) identifies several roads outside the Project Site predicted to meet this criterion, including parts of Marlborough Road, Poatina Road and Highland Lakes Road. The following table (drawn from Appendix G) summarises the predicted change in traffic volumes and demonstrates that the greatest predicted increase in traffic volume is experienced on Highland Lakes Road, which has a relatively low existing traffic volume (e.g. in comparison to the Midland Highway). Roads with a predicted 10% or greater increase in traffic during construction are illustrated in Figure 6-15.

This estimate of predicted traffic increase relies upon several conservative assumptions, including all site workers bringing an individual vehicle to site (i.e. assumes no use of buses or ride sharing) and all raw construction materials being brought to site (some material may be repurposed from onsite excavations, pending results of geotechnical investigations).

Additionally, the data presented in the table below is across the entire day, not specific to the night-time period (inclusive of dawn and dusk) which is known to be a greater roadkill threat due to increased animal activity and reduced visibility. However, it is likely that at least some vehicle movements will occur during

[15] Night-time as defined by the Tasmanian devil survey guidelines includes from one hour before dusk through to one hour after dawn.

the defined night-time period (particularly dawn and dusk) and hence the precautionary principle has been applied, and roads predicted to experience 10% or greater volumes overall are assumed to sometimes experience this increase during the night-time period.

Table 6-5 Predicted increase in traffic movement on public roads during construction

Road	Location	Change in traffic use		Per cent increase	
		Daily	Peak hour	Daily	Peak hour
Marlborough Rd	South of Highland Lakes Rd	215 – 255	23 – 43	18%	87%
Poatina Rd	Highland Lakes Rd to Arthurs Lake Road	407 – 490	43 – 71	20%	61%
	Arthurs Lake Road to Poatina	560 – 565	46 – 47	2%	4%
Highland Lakes Rd	North of Miena	435 – 435	30 – 30	0%	0%
	Miena to Poatina Main Rd	370 – 490	25 – 85	32%	340%
	Poatina Main Rd to Interlaken Rd	363 – 636	30 – 160	75%	533%
	Interlaken Rd to Bothwell	430 – 592	49 – 124	37%	253%
	Bothwell to Midland Highway	776 – 801	60 – 67	4%	5%
Midland Highway	North of Highland Lakes Rd	5,153 – 5,163	470 – 471	1%	1%
	South of Highland Lakes Rd	5,681 – 5,713	430 – 435	1%	0%

- Table Note: Shaded cells represent a 10% or greater increase in predicted traffic volume.

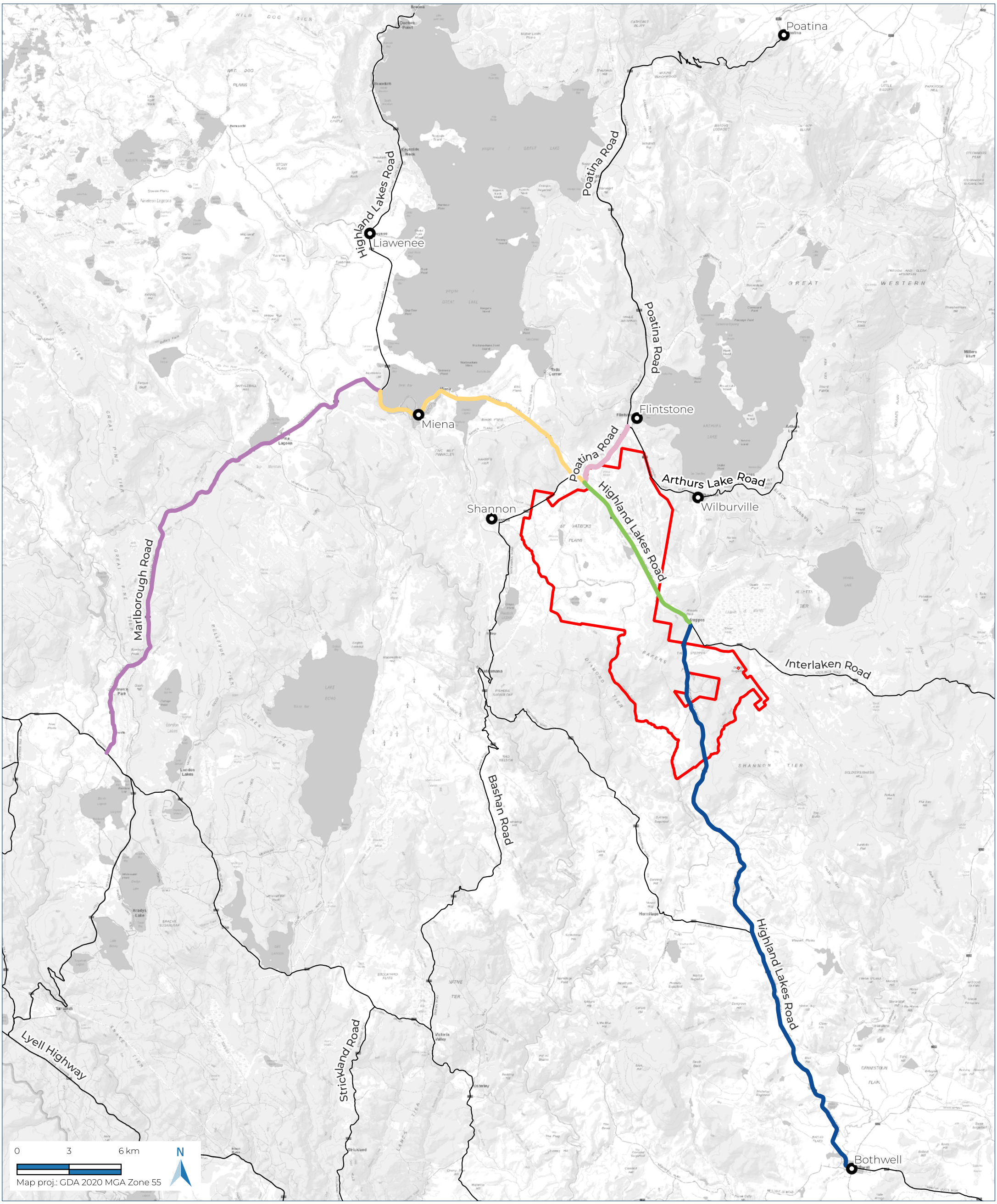
In accordance with the guidelines, the roads predicted to experience a 10% or greater increase in traffic should be further assessed to quantify (and manage) the risk of roadkill of Tasmanian devils and quolls. The establishment of baseline roadkill numbers for devils and quolls along these routes and subsequent monitoring and management during construction will be used to assess and manage the impact of the Project on an ongoing basis, as detailed in Section 6.2.5. Baseline roadkill data collection was commenced by the Department of State Growth on the required roads in January 2023; this data will be made available to the Proponent monthly. The baseline roadkill dataset will provide information on any roadkill hot spots and any seasonal fluctuations, which will then be the focus of targeted mitigation measures to be set out in a Roadkill Monitoring and Adaptive Management Plan (refer Section 6.2.5 for details).

In developing the baseline roadkill monitoring approach, consideration was given to existing data. The Department of State Growth was contacted to access their existing dataset; however, only very limited data was available, and it was insufficient to form a comprehensive baseline.

There is also some existing roadkill data along the abovementioned roads available on the LIST; however, there are some limitations in using this available data as a baseline for the Project because it has largely been collected as part of the public roadkill reporting project and therefore is opportunistic rather than targeted survey results and its accuracy cannot be verified. This data does, however, provide some context of the potential risk to fauna, particularly threatened species. The data shows a total of 25 Tasmanian devil records[16] and one spotted-tailed quoll record along Highland Lakes Road from Miena to Bothwell documented on the LIST, dating from 2004 to 2022. Annual data is highly variable, with several years showing no Tasmanian devil or quoll records at all, and other years showing multiple records, with the highest annual being a total of four Tasmanian devil records in 2021. This data, although insufficient to form

[16] There were several records shown in close proximity to one another on the same date and these have been assumed to be duplicates.

a comprehensive baseline, does demonstrate that there is an existing risk to wildlife (including threatened species) along the roads predicted to experience the greatest increase in traffic volumes. Therefore management measures, monitoring and adaptive management in response to monitoring results will be important to manage the potential risk from the Project during construction (refer Section 6.2.5 for details).



Project site (the Land)

EXISTING INFRASTRUCTURE

Town/community

Other roads

ROADS WITH EXPECTED 10% OR GREATER INCREASE IN TRAFFIC DURING CONSTRUCTION (from Hubble Traffic)

Poatina Rd (Highland Lakes Rd to Arthurs Lake Rd)

Highland Lakes Rd (Interlaken Rd to Bothwell)

Highland Lakes Rd (Miena to Poatina Rd)

Highland Lakes Rd (Poatina Rd to Interlaken Rd)

Marlborough Rd (South of Highland Lakes Rd)

ARK ENERGY

era PLANNING & ENVIRONMENT

St Patricks Plains Wind Farm

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

Figure 6-15
Public roads predicted to have a 10% or greater increase in traffic during construction

6.2.4 Potential impacts - operation

During operation the Project poses very little risk to terrestrial fauna (noting avifauna are addressed separately in Section 6.1) with the exception of fauna roadkill, which will always be a risk on the roads within the Project Site.

Operational phase traffic levels, however, are insignificant in comparison to construction phase traffic. As outlined in the Traffic Impact Assessment (section 10 in Appendix G) the operational phase of the Project is expected to generate up to a maximum of 20 light vehicle trips[17] per day (i.e. 10 vehicles) to undertake a range of monitoring and maintenance activities, resulting in less than 4 vehicle trips per day per access point (i.e. light vehicles will access the Project Site from several different points). These vehicle movements are very small in comparison to existing movements on the road network (which range from 215 daily movements on Marlborough Road to over 5,000 daily movements on the Midland Highway). Additionally, operational phase traffic movements will be largely contained within daylight hours (noting some movements to and from the Project Site during dawn and dusk), minimising the potential risk of fauna roadkill.

6.2.5 Management, mitigation and monitoring

6.2.5.1 Pre-construction and construction

The following management, mitigation and monitoring measures for terrestrial fauna are proposed for the pre-construction and construction phase of the Project and will be included in the Construction Environmental Management Plan (CEMP) in a more detailed form.

Where management measures are directly applicable to several topics, they are referenced as 'Various' and replicated in all relevant sections of this EIS for completeness.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Various MM 5	All WTG and other infrastructure will be micro-sited, with the assistance of a trained ecologist, to ensure disturbance of listed species, listed communities and habitat for listed species is avoided as far as practicable and infrastructure is located in areas with relatively lower ecological value where possible[18]. Micro-siting will include consideration of the construction buffer areas, with these to be reduced as far as reasonably practical in areas of important ecological value to minimise construction phase impacts.
Various MM 6	Approved site disturbance boundaries within the Project Site will be clearly articulated to the construction contractors through electronic means, onsite documentation and (where appropriate) physical demarcation, and it will be specified that all works, vehicles and materials will be confined to the designated impact areas. For areas of specific ecological value (threatened fauna habitat, threatened flora locations, threatened vegetation communities) that are not within the final Project footprint and can be retained, exclusion zones will apply. These will be marked on construction plans, communicated to all construction personnel and, where they lie adjacent to the works area, will also be physically cordoned off with temporary fencing (or similar) to avoid inadvertent impacts.

[17] One 'trip' represents one vehicle movement (i.e. a car travelling to site in the morning and from site later in the day counts as two trips).

[18] Micro-siting considerations will include but not be limited to habitat for eagles, Latham's snipe, Tasmanian masked owl, Miena jewel beetle (including the species' host plant *Ozothemnus hookeri*), ptunarra brown butterfly, Tasmanian devil and spotted-tailed quoll (including potential den sites), wetland and waterway habitat for listed species, threatened vegetation communities (including highland Poa grassland and highland grassy sedgeland) and threatened flora (including Liawenee greenhood, matted lignum, ferny buttercup, longhair fireweed and *Eucalyptus gunnii*).

Reference number	Management, mitigation or monitoring measure
	No ground disturbance, stockpiling or alteration of drainage patterns will be permitted within exclusion zones.
Various MM 7	A rehabilitation plan (either as a standalone document or to be included in the CEMP) will be prepared prior to the commencement of construction to detail the rehabilitation approach. Rehabilitation will be undertaken in accordance with the plan. Rehabilitation of any disturbed areas suitable for rehabilitation will commence as soon as practicable following the completion of each Project component (i.e. in a staged fashion), with reinstatement of any stripped topsoil and seeding with local provenance where appropriate, noting the topsoil seedbank may be sufficient in some cases.
Terrestrial Fauna MM 1	Pre-clearance surveys of identified disturbance footprints will be undertaken by a suitably qualified person to ensure all wildlife is clear of the area as far as reasonably practicable.
Terrestrial Fauna MM 2	A den management protocol will be applied before and during construction. A draft Devil and Quoll Den Management Protocol has been prepared and provided as Appendix L to NBES (2023b) (Appendix C). This protocol sets out pre-clearance surveys, den monitoring, den decommissioning, and reporting requirements. Any dens identified during previous surveys or pre-clearance surveys will be avoided where possible, with priority given to the avoidance of natal dens. In the event that avoidance is not possible, dens will be decommissioned in accordance with an approved version of the decommissioning protocol. The draft protocol will be further developed and submitted to DNRE Tasmania for review and then to the Director, EPA for approval prior to construction commencement. The protocol will also include decommissioning of wombat burrows. In the event a natal den is identified in the footprint and cannot be avoided an offset will be applied in accordance with the *Survey Guidelines and Management Advice for Development Proposals That May Impact On the Tasmanian Devil* (PCAB, 2015) and in conjunction with NRE.
Terrestrial Fauna MM 3	To manage the residual risk to ptunarra brown butterfly from European wasps, monitoring and management will be undertaken during construction, and for the first five years following construction, in accordance with an approved Ptunarra Brown Butterfly Monitoring and European Wasp Monitoring and Control Strategy. A draft strategy has been prepared and included as Appendix M to NBES (2023b) (Appendix C). This strategy sets out a monitoring program, trigger levels for intervention and control measures in the event trigger levels are breached. This strategy will be further refined and submitted to DNRE Tasmania for review and then to the Director, EPA for approval prior to construction commencement.
Terrestrial Fauna MM 4	A permit to take any species listed as threatened under the TSP Act (which includes to kill, injure, pursue, catch, damage, destroy and collect) will be in place prior to relocation of any listed species. A Permit Activity Report will be completed and returned to DNRE Tasmania covering all species taken.
Terrestrial Fauna MM 5	A permit to take any product of wildlife under the NC Act will be in place prior to relocation of all relevant fauna species or decommissioning of burrows.
Terrestrial Fauna MM 6	Trenching for cables and other components will be managed to minimise the length of open trench at any one time to avoid fauna entrapment. Trenches that need to remain open overnight or for extended periods will either be covered, or fauna egress points will be provided at regular intervals (<10 m) along the open trench length.
Terrestrial Fauna MM 7	Traffic management controls will be applied to minimise the risk of fauna roadkill during construction, including: • A maximum speed limit of 40 km/h permitted throughout the Project Site during daylight hours. • Vehicle movements within the Project Site restricted to formed tracks only (once constructed). • Scheduling of material deliveries and worker shifts to restrict vehicle movements to daylight hours, where practicable, to avoid times of elevated fauna activity.

Reference number	Management, mitigation or monitoring measure
	• The use of buses and car pooling for site workers, where possible. • Roadkill removed from roads internal to the Project Site and some select external roads from the chosen accommodation facility(s)[19] on a daily basis to minimise roadside scavenging by Tasmanian devils and quolls.
Terrestrial Fauna MM 8	A Roadkill Monitoring and Adaptive Management Plan will be prepared and submitted to the EPA for approval prior to commencement of construction. The plan will include all roads internal to the Project Site (to be used by construction personnel) and external public roads used to access the Project Site that are predicted to experience a 10% (or greater) increase in traffic as a result of the Project (relevant public roads), in accordance with the requirements of the devil survey guidelines (PCAB, 2015). The Roadkill Monitoring and Adaptive Management Plan will include as a minimum: • Preconstruction monitoring (relevant public roads external to the Project Site) – Weekly roadkill monitoring (using a methodology compliant with the PCAB guidelines) will be undertaken on the relevant public roads for a minimum period of 6 months prior to construction, to form a baseline against which construction phase monitoring can be compared. Note that weekly roadkill monitoring was commenced in January 2023 using a methodology compliant with the PCAB guidelines[20]. • Construction monitoring (relevant public roads external to the Project Site) – Weekly roadkill monitoring will be undertaken on relevant public roads (using a methodology compliant with the PCAB guidelines) for the duration of construction. • Construction monitoring (internal Project Site roads) – Weekly roadkill monitoring (using a methodology compliant with the PCAB guidelines) will be undertaken for all roads within the Project Site with active construction traffic, for the duration of construction. • Carcass removal – Carcasses will be removed from roads (and verges) to reduce the risk of scavenging and secondary roadkill. Removed carcasses from the relevant public road monitoring will be handled and disposed of in accordance with Department of State Growth procedures. Removed carcasses from internal roads will be placed in sealed bins or disposed of at an onsite carcass pit in accordance with the Carcass Management Plan. • Injured animals – All staff involved in monitoring will be trained in safe animal handling, and procedures will be in place for care of injured animals. • Review and adaptive management – The results of pre-construction monitoring will be used to identify any hotspots on the existing public road network for management measures to be put in place prior to commencement of construction. The results of construction phase roadkill monitoring will be reviewed against the baseline data (where relevant) on a quarterly basis and any increase in fauna roadkill attributable to the Project (or hotspots identified) will be subject to adaptive management. The proposed trigger level for adaptive management measures to be implemented will be defined as an increase (above baseline) of more than two Tasmanian devils, spotted-tailed quoll or other listed threatened fauna species killed in a 12-month period. Options for adaptive management and mitigation of roadkill risk will be discussed and agreed upon with the EPA and DNRE Tasmania, to be documented in the final Roadkill and Adaptive Management Plan. These may include reductions in speed limits for Project-related vehicles, installation of mitigation devices, or alterations in travel hours for Project-related vehicles where reasonable and feasible.

[19] The final location for worker accommodation is not yet known, and will be dependent on the contractor and workforce employed, hence the specific roads to which this management measure applies will be confirmed at a later date, and documented in the Roadkill Monitoring and Adaptive Management Plan.

[20] Roadkill monitoring on relevant public roads is being undertaken by the Department of State Growth, with an agreement to provide the results of this monitoring to the Proponent on a monthly basis. The Proponent approached the Department of State Growth in 2022 regarding undertaking monitoring on the roads in question. The Department confirmed that it would already be undertaking ongoing monitoring on the required roads from January 2023 and did not want additional surveying undertaken by a third party to avoid compromised roadkill counts. As such, an agreement was made that the Department would undertake the monitoring and supply the required data to the Proponent on a monthly basis. Although the commitment in this EIS is for a minimum of 6 months baseline data (in accordance with the PCAB guidelines), data collection commenced in January 2023 will be ongoing and hence a minimum of 12 months data is expected to be available pre-construction.

Reference number	Management, mitigation or monitoring measure
	• Residual impacts – To compensate for the residual fauna roadkill risk from increased road traffic, the Proponent proposes a donation of $8,000 to the Save the Tasmanian Devil Program (STDP) for any Tasmanian devil fatality recorded above the baseline level. This proposed compensation will be discussed and agreed upon with the EPA and DNRE Tasmania prior to the commencement of construction and formalised in the final Roadkill Monitoring and Adaptive Management Plan. • Reporting – The results of construction phase roadkill monitoring and any adaptive management measures applied will be reviewed and reported quarterly (most likely as part of quarterly CEMP auditing reports). Each quarter will review the effect of any adaptive management measure put in place the previous quarter. Quarterly reports will be made available to the EPA.
Terrestrial Fauna MM 9	In the event that blasting is required for construction, a 250 m exclusion zone will be applied around any known active devil or quoll den and blasting will not be undertaken within the exclusion zone while the den is in use.
Terrestrial Fauna MM 10	Prior to the commencement of construction, a density survey will be undertaken for the Miena jewel beetle to characterise the relative density of the species in the Project footprint in comparison to adjacent habitat. This will involve an assessment of density of the species host plant (*Ozothamnus hookeri*) and the species itself (via counts of larval bore holes) in patches of habitat both within and outside the Project Footprint to allow a more accurate determination of the relative impact. The results of the density assessment will be reported to the EPA and DNRE to inform the need or otherwise for additional mitigation measures and a permit to take. If the area of habitat to be impacted by the Project is found to represent a disproportionally high density of the species (based on statistical analysis of the survey results) additional mitigation measures will be applied, as informed by recommendations in the NBES report (NBES, 2023b) and in consultation with DNRE.
Terrestrial Fauna MM 11	To compensate for residual impacts to Tasmanian devil, the Proponent proposes to make a one-off contribution of $250,000 to the Save the Tasmanian Devil Program to support ongoing management and protection of the species.
In addition to the above measures, some of the management and mitigation measures established to protect flora and vegetation communities in Section 6.3.4 will also afford protection to terrestrial fauna through minimising impacts to habitat. In particular management measure 'Flora & Vegetation Communities MM 7' stipulates the preparation of a site-wide Native Vegetation Management Plan and Stewardship Agreements to be made with landowners of the balance land (i.e. remaining native vegetation not impacted by the Project) to support long-term management of native vegetation communities in the area and will offer a benefit to several terrestrial fauna species. This measure will include provisions for long-term management of native grasslands in the area, offering direct benefit to ptunarra brown butterfly populations.	
Monitoring	
Terrestrial Fauna MON 1	Pre-clearance den surveys will be undertaken in accordance with the Devil and Quoll Den Management Protocol (draft protocol provided as Appendix L to NBES (2023b) (Appendix C)). Identified dens will be avoided where possible. Where this is not possible, den decommissioning will be undertaken in accordance with the Devil and Quoll Den Management Protocol.
Terrestrial Fauna MON 2	Ptunarra brown butterfly and European wasp monitoring will be undertaken in accordance with an approved Ptunarra Brown Butterfly Monitoring and European Wasp Monitoring and Control Strategy (draft strategy provided as Appendix M to NBES (2023b) (Appendix C)) to be commenced in the year prior to construction and then annually during construction and for the first five years post construction.
Terrestrial Fauna MON 3	Roadkill monitoring will be undertaken during the pre-construction and construction phase in accordance with the Roadkill Monitoring and Adaptive Management Plan and the PCAB devil survey guidelines (PCAB, 2015) including as a minimum: • Weekly pre-construction monitoring along relevant public roads external to the Project Site for a minimum period prior to construction of either a 3-month period during devil weening or for 6 months outside this period, to form a baseline against which construction phase monitoring can

Reference number	Management, mitigation or monitoring measure
	be compared. • Weekly construction monitoring along relevant public roads external to the Project Site and all roads internal to the Project Site used by construction personnel for the duration of construction.
Terrestrial fauna management control measures (e.g. exclusion fences and trench covers/egress points) will be subject to fortnightly audits during construction as part of the CEMP monitoring program as documented in Section 6 (refer Various MON 1).	

6.2.5.2 Operation

The following management, mitigation and monitoring measures for terrestrial fauna are proposed for the operational phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Terrestrial Fauna MM 12	Operational staff will be required to record any fauna roadkill event (collision) they are involved in (including details of the location, date, time and species) both within the Project Site and on their way to and from the Project Site. This information will be included in annual environmental reporting provided to the Director, EPA. The Annual Environmental Report will review the results of reported collisions over time and, if any roadkill hotspots are identified, additional mitigation measures will be applied (e.g. signage within the Project Site, operator training, or management of the timing of vehicle movements). Any carcass resulting from a collision will be collected (to minimise roadside scavenging) and placed in a sealed bin or carcass pit in accordance with the Carcass Management Plan.
Terrestrial Fauna MM 13	Roadkill will be removed from roads internal to the Project Site on an opportunistic basis during operations to minimise roadside scavenging by Tasmanian devils, quolls and other predators such as eagles. All removed carcasses will be placed in a sealed bin or carcass pit in accordance with the Carcass Management Plan. Any threatened species carcass collected will be recorded (date, species and location) and the data provided to the EPA as part of the Annual Environmental Report.
Terrestrial Fauna MM 14	During operations, traffic management controls will apply to all Project vehicles within the Project Site, including: • A maximum speed limit of 40 km/h permitted throughout the Project Site during daylight hours. • Vehicle movements within the Project Site restricted to formed tracks only. • Vehicle movements scheduled to avoid dawn and dusk periods where practicable to avoid times of elevated fauna activity.
Monitoring	
No additional terrestrial fauna monitoring is proposed for the operational phase of the Project, noting ptunarra brown butterfly and European wasp monitoring undertaken annually during construction will be continued into the first five years of operation as noted in Section 6.2.5.1. Avifauna monitoring associated with collision risk is addressed separately in Section 6.1.	

6.2.6 Residual impacts

By avoiding key fauna habitat during design, micro-siting Project components, undertaking pre-clearance surveys, and mandating Project Site speed limits, overall residual impact to all fauna species is expected to be minimal.

As noted at the beginning of this section, Section 7 provides a summarised consideration of all EPBC Act matters, including the ptunarra brown butterfly, Tasmanian devil, spotted-tailed quoll and eastern quoll.

6.2.6.1 Tasmanian devils and quolls

The Project will result in potential impact to approximately 481.13 ha of potentially suitable habitat for Tasmanian devils and quolls. This includes construction disturbance, permanent infrastructure and areas of ongoing vegetation management (but not clearance) for the IDF units and overhead powerline. The resulting effect is nuanced as the type of impact varies (from temporary and minimal changes, through to permanent loss) and the use of the habitat also varies (with impacts to foraging and dispersal behaviour different to the denning implications). NBES have determined the permanent loss of habitat is limited to areas of solid obstructions (e.g. turbines themselves, substations, roads etc) totalling 102.79 ha (~1% of the mapped denning habitat on the Project Site), plus a reduction in net denning habitat of 0.2 ha as a result of changed denning potential.

In the context of available habitat throughout the region, this is not expected to significantly affect the viability of these species. NBES (2023b) also notes that through the prevention of impacts to potential dens in the Project Site, an adequate level of species protection will be achieved to maintain species persistence in the area. The implementation of the roadkill management and mitigation proposed, which will be informed by consistent monitoring over the construction period, will also help to reduce the likelihood of impacts occurring to these species. In terms of significance of impact with regards to MNES under the EPBC Act, NBES (2023b) found that the Project was unlikely to result in a significant impact to any of the three species when assessed against the Commonwealth Significant Impact Guidelines (DOTE, 2013), as detailed in the NBES report in Appendix C (and summarised in Section 7 of this EIS).

Although NBES has concluded that residual impacts to the Tasmanian devil are not thought to be significant, as defined under the Significant Impact Guidelines, early communication with the DCCEEW has indicated that the Commonwealth may form an alternative opinion and may seek an offset proposal for this species. In response to this feedback from DCCEEW, the Proponent has elected to offer an offset proposal for the Tasmanian devil in the form of a monetary contribution to the Save the Tasmanian Devil Program as discussed in Section 7.

Additional to the proposed offset for residual impacts, under the EPBC Act for, further compensatory measures are also proposed for potential impacts to individuals and natal dens. As outlined above, even with the proposed mitigation measures in place, there remains a residual risk of direct impact to Tasmanian devils and quolls through fauna roadkill or natal den loss. In the event of such losses, the Proponent proposes a financial donation of $8,000 to the Save the Tasmanian Devil Program for any Tasmanian devil roadkill recorded above the baseline and offsets for any natal den that cannot be avoided in accordance with the Tasmanian *Survey Guidelines and Management Advice for Development Proposals That May Impact on the Tasmanian Devil* (PCAB, 2015) in consultation with DNRE.

6.2.6.2 Miena jewel beetle

The development of the Project will result in the loss of approximately 6% of habitat suitable for the Miena jewel beetle in the Project Site. If the remaining known habitat is maintained and any additional patches of *O. hookeri* identified in the Project Site are not disturbed, no further residual impacts to the species are expected.

6.2.6.3 Ptunarra brown butterfly

With the avoidance of 96% of high quality ptunarra brown butterfly habitat in the Project Site, and a further 93% of moderate quality habitat, no further residual impacts are expected for the species. It has also been assessed as a non-significant impact in line with the Commonwealth Significant Impact Guidelines (DOTE, 2013), as outlined in the NBES report in Appendix C (and summarised in Section 7 of this EIS).

6.3 Flora and vegetation communities

The following sections provide an analysis of flora and vegetation community values, potential impacts and mitigation. A summarised consideration of all EPBC Act matters is provided separately in Section 7.

6.3.1 Existing environment

An assessment of flora and ecological communities was undertaken by NBES (2023b) in conjunction with its assessment of fauna habitat (as documented in Section 6.2). The results of that assessment are reported in full at Appendix C and matters relevant to threatened flora, weeds and vegetation communities are summarised herein. The NBES assessment included desktop review of relevant databases and previous assessments of the area and several field surveys spread across all seasons from winter 2019 through to autumn 2020.

Vegetation community surveying and mapping was undertaken in accordance with the methods outlined in DNRE Tasmania's *Guidelines for Natural Values Surveys – Terrestrial Development Proposals* (DPIPWE, 2015a). This method includes taking existing TASVEG 4.0 mapping for an area and further refining it through both aerial imagery comparisons and on ground surveys to confirm the mapped units match the TASVEG community description and, if required, altering the original mapping unit to suit.

Following ground sampling and the collation of data, TASVEG units observed on site were cross-referenced against all vegetation communities listed as threatened under the NC Act and the EPBC Act, as well as conservation priorities for the Central Highlands area under the Tasmanian Regional Forest Agreement.

To support the determination of TASVEG units and provide general floristic data, within each native community at least one full vascular plant species list was taken in representative quarter hectare plots using a timed meander search technique. Threatened flora surveys were informed by desktop research with on ground searches focused on vegetation communities most likely to support target species. Threatened flora surveys covered three seasons with a focus on surveying for each species during the relevant flowering period.

Declared and environmental weeds, as well as symptomatic evidence of plant pathogens, were searched for and recorded where evident within or close to the Project Site (e.g. along adjacent roads).

6.3.1.1 Vegetation communities

The Project Site is generally dominated by native grasslands, eucalypt forest and woodland, cultivated land (agriculture and silviculture) with patches of wetland, other native vegetation communities and other areas of human disturbance (roads, easements etc.). The ecological survey identified a total of 19 different TASVEG mapping units, including both native vegetation communities and areas of non-native land use, as summarised in Table 6-6 and shown in Figure 6-16.

The native vegetation communities can be broadly grouped into: aquatic habitats (AHF, AHL and OAQ), dry eucalypt forest and woodland habitats (DPD, DDP, DRO, DAD, DDE, DGW), native non-forest mosaic (GPH, MGH and MRR), and non-eucalypt forest (NLE).

- Aquatic habitats – aside from the deeper water bodies that make up the OAQ mapping unit (which generally lack a macrophyte dominance (NBES, 2023b), the most prominent aquatic vegetation was aquatic herbland (AHF), which encompasses the shallower permanent and ephemeral wetland areas and lagoons of the northern area of the Project Site, as can be seen in Figure 6-16. Allwrights Lagoon, which is listed as a Nationally Important Wetland under the EPBC Act, and Wihareja Lagoon make up a large portion of the area mapped as AHF and AHL. Both AHF and AHL are listed threatened communities under the NC Act, within the 'wetlands' classification. The OAQ waterbodies are not equivalent to the NC Act listed wetlands due to the paucity of aquatic macrophytes. None of the communities in this grouping meet the definition of ecological communities listed as threatened under the EPBC Act.

- Dry eucalypt forest and woodland – these eucalyptus-dominated vegetation units collectively are the most abundant within the Project Site, making up more than a third of the Project Site by area. They are especially dominant in the south and north-east of the Project Site, as shown in Figure 6-16. The most widespread vegetation unit of this class is *Eucalyptus pauciflora* forest and woodland on dolerite – DPD (shown in Figure 6-16), which NBES states is dominated by secondary growth, a sign of anthropogenic influence on the unit, likely from timber harvesting, which is further evidenced by the more mature trees in the unit being located in the more difficult to reach, elevated positions in the landscape. None of the communities identified are listed under the NC Act or the EPBC Act. One of the communities in this group, *Eucalyptus rodwayi* forest and woodland – DRO, corresponds to the Central Highlands RFA priority *E. rodwayi* forest.
- Native non-forest mosaic – making up another approximately one-third of the Project Site are the large swathes of native mosaics of grassland, sedgeland and rushland, which are especially prominent in the northern half of the Project Site. The Poa grasslands (GPH) of the Project Site, shown in Figure 6-16, form the most abundant vegetation unit found in the Project Site, covering an area of approximately 2,706 ha. As the name suggests, this vegetation unit is dominated by Poa grasses, namely *Poa clivicola*, *Poa gunnii* and *Poa labillardierei*, but also supports a variety of shrubs; the unit is essentially treeless (NBES, 2023b). The other dominant unit in this class is the highland grassy sedgeland (MGH), which lacks the larger shrubs of the Poa grasslands and forms some extensive, featureless plains around the Project Site. Both GPH and MGH are listed threatened communities under the NC Act; however, none of the units within this group correspond to listed communities under the EPBC Act including the 'lowland native grasslands of Tasmania' community predicted to occur in the area from the EPBC Act's Protected Matters Search Tool database (NBES, 2023b) due to the elevated altitude of the Project Site.
- Non-eucalypt forest – There is a small (approximately 6.7 ha) area of *Leptospermum* forest (NLE) in the south of the Project Site in the poorest draining areas. This vegetation unit is not listed under the NC Act or the EPBC Act.

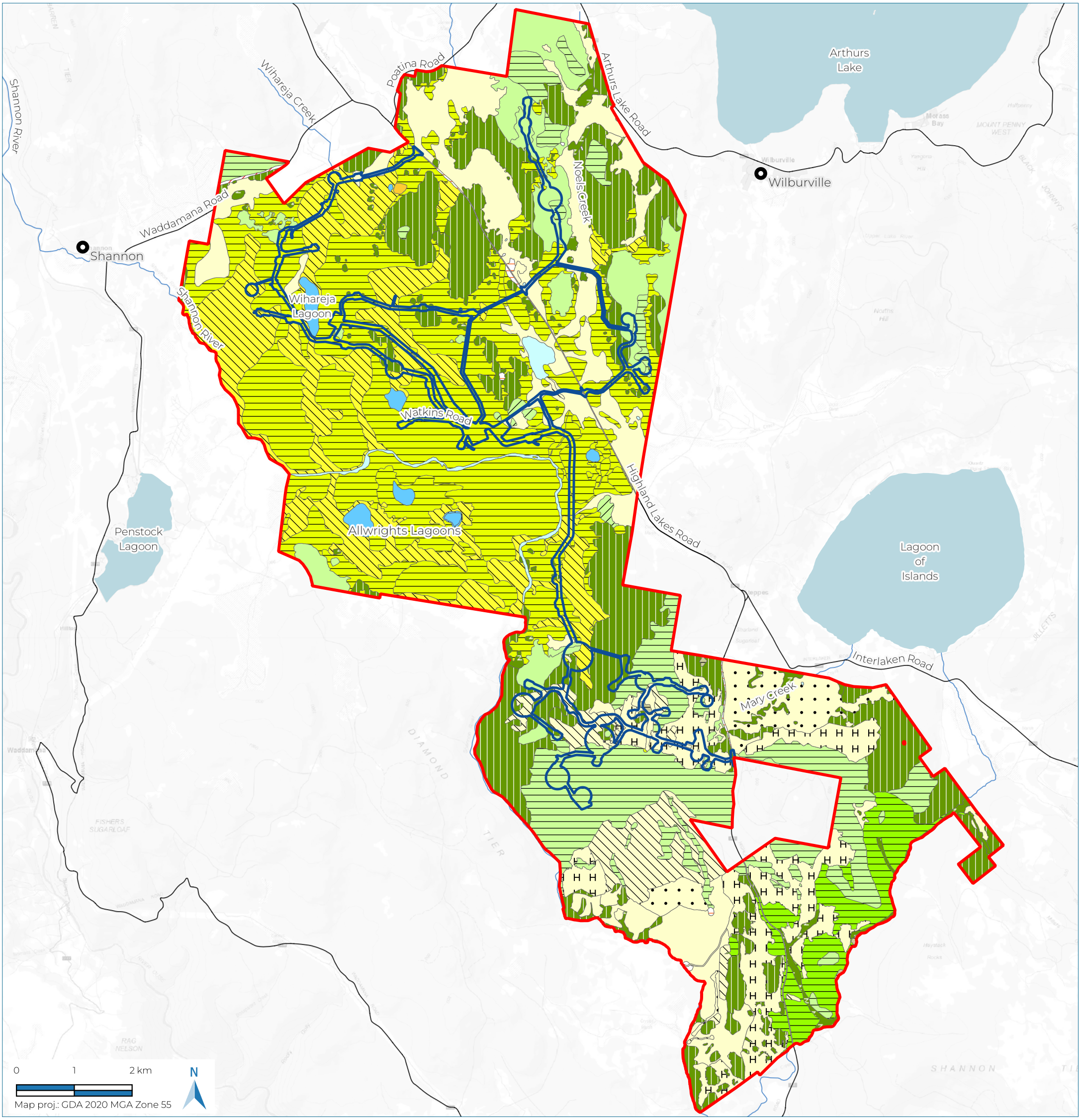
The remaining vegetation units within the Project Site are anthropogenically influenced. Several large tracts of land have been cleared for agricultural grazing, especially in the north-east quadrant of the Project Site, and around the southernmost extents. Large areas of plantation and regenerating cleared land are also present in the southern half of the Project Site, as can be seen in Figure 6-16.

In summary, four of the communities identified on site correspond with listed communities under the Tasmanian NC Act (namely AHF, AHL, GPH and MGH), but no communities correspond to EPBC Act listed ecological communities.

It is noted that NBES investigated three EPBC Act listed ecological communities as potentially occurring in the area during their desktop research (namely alpine sphagnum bogs and associated fens, lowland native grasslands of Tasmania, and Tasmanian forests and woodlands dominated by black gum or Brooker's gum); however, none of these communities was found on site. NBES undertook an analysis of the diagnostic criteria for each of these communities to determine whether the vegetation communities found on the Project Site could be considered to fit the definition of any of these communities and concluded that they could not (details of this analysis are provided in Appendix I of Appendix C).

Table 6-6 TASVEG mapping units identified in the Project Site

TASVEG mapping unit	Listing status	Approximate area mapped in Project Site (hectares)
Native vegetation units		
(AHF) Fresh water aquatic herbland	Threatened under NC Act	70.15
(AHL) Lacustrine herbland	Threatened under NC Act	2.13
(DAD) *Eucalyptus amygdalina* forest and woodland on dolerite	Not listed	345.22
(DDE) *Eucalyptus delegatensis* dry forest and woodland	Not listed	1,072.06
(DDP) *Eucalyptus dalrympleana – Eucalyptus pauciflora* forest and woodland	Not listed	531.34
(DGW) *Eucalyptus gunnii* woodland	Not listed	21.71
(DPD) *Eucalyptus pauciflora* forest and woodland on dolerite	Not listed	1,688.57
(DRO) *Eucalyptus rodwayi* forest and woodland	Not listed	134.40
(GPH) Highland Poa grassland	Threatened under NC Act	2,706.09
(MGH) Highland grassy sedgeland	Threatened under NC Act	1,083.63
(MRR) Restionaceae rushland	Not listed	3.29
(NLE) *Leptospermum* forest	Not listed	6.69
Total native vegetation communities		**7665.28**
Non-native mapping units		
(FAC) cleared land with a canopy	Not listed	264.32
(FAG) agricultural land	Not listed	1,089.47
(FPE) permanent easement	Not listed	4.30
(FPL) plantations for silviculture	Not listed	602.15
(FRG) regenerating cleared land	Not listed	328.37
(FUM) extra-urban miscellaneous	Not listed	27.53
(OAQ) water, sea	Not listed	61.90
Total non-native vegetation communities		**2,378.04**



Project site (the Land)

EXISITING INFRASTRUCTURE
- Towns/communities
- Roads

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Construction footprint

VEGETATION COMMUNITIES (from North Barker Ecosystem Services)

MODIFIED LAND
- (FAG) Agricultural land
- (FUM) Extra-urban miscellaneous
- (FAC) Improved pasture with native tree canopy
- (FPE) Permanent easements
- (FPH) Plantations for silviculture - hardwood
- (FRG) Regenerating cleared land

DRY EUCALYPT FOREST AND WOODLAND
- (DAD) Eucalyptus amygdalina forest and woodland on dolerite
- (DDP) Eucalyptus dalrympleana - Eucalyptus pauciflora forest and woodland
- (DDE) Eucalyptus delegatensis dry forest and woodland
- (DGW) Eucalyptus gunnii woodland
- (DPD) Eucalyptus pauciflora forest and woodland on dolerite
- (DRO) Eucalyptus rodwayi forest and woodland

MOORLAND, SEDGELAND AND RUSHLAND
- (MGH) Highland grassy sedgeland **
- (MRR) Restionaceae rushland

NATIVE GRASSLAND
- (GPH) Highland Poa grassland **

NON-EUCALYPT FOREST AND WOODLAND
- (NLE) Leptospermum forest

OTHER NATURAL ENVIRONMENTS
- (OAQ) Water, sea

SALTMARSH AND WETLAND
- (AHF) Freshwater aquatic herbland **
- (AHL) Lacustrine herbland **

** denotes listed threatened vegetation community under the Nature Conservation Act 2002.

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 6-16
Vegetation communities

6.3.1.2 Threatened flora

The ecological survey confirmed or established the presence of 23 threatened flora species listed on the TSP Act, EPBC Act or both. Table 6-7 provides a summary of these species, and their distribution around the Project Site is shown in Figure 6-17. NBES notes that, for some species, the recorded occurrence within the Project Site (as summarised in Table 6-7) may not represent the full extent of the species on site, and several species are considered likely to be more abundant on site than current mapping and data indicates (refer to NBES flora and fauna report in Appendix C for further details).

There were an additional three TSP Act listed species which have been recorded in the Project Site in the past which were not relocated during the contemporary surveys, namely:

- Carpet willowherb (*Epilobium willisii*) – TSP Act rare
- Plain quillwort (*Isoetes drummondii ssp. Drummondii*) – TSP Act rare
- Australian pillwort (*Pilularia novae-hollandiae*) – TSP Act rare.

These species are thought likely to be present, albeit not expected to be widespread or abundant.

Additionally, two species recorded from the Project Site previously were found highly likely to have been misidentifications between listed species (*Asperula minima* and *Prasophyllum crebriflorum*) and closely related non-threatened species. All listed species are described in detail in the NBES flora and fauna report in Appendix C.

NBES has considered a wide range of threatened flora (beyond those observed on site) and provides a detailed consideration of the likelihood of other threatened flora being located on the Project Site (and not recorded during survey) in its report. NBES concludes that although additional species of threatened flora may occur, the likelihood is generally low (with the exception of the species mentioned above).

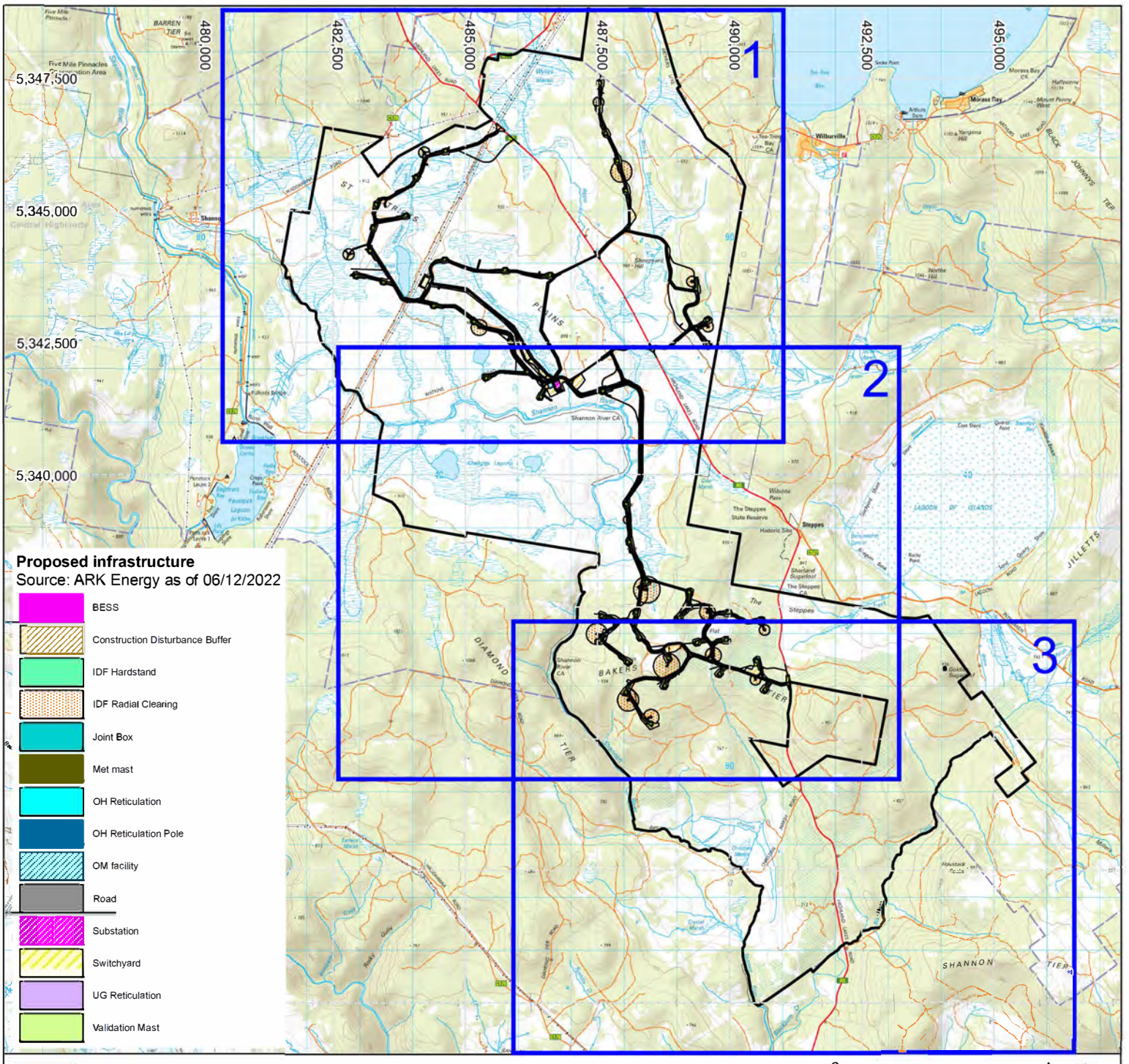
In addition to the threatened species, NBES also recorded localised occurrences of three other vascular flora that are considered conservation significant on the basis of few known records in Tasmania, namely *Carex curta* (no common name), dainty bitter-cress (*Cardamine tryssa*), and brittle bladder fern (*Cystopteris tasmanica*). The locations of these species are illustrated on Figures 5a and 5b in the NBES report at Appendix C.

Table 6-7 Listed flora species identified in the Project Site

Species	Listing status (TSP Act/EPBC Act)	Extent of occurrence recorded in Project Site
Prickly woodruff *Asperula scoparia ssp. Scoparia*	(rare / –)	Occasional, with scattered plants (<10)
Water woodruff *Asperula subsimplex*	(rare / –)	Prolific at a localised scale, with a total of over 30,000 m^2 extent of occurrence observed within the Project Site
Riverbed wintercress *Barbarea australis*	(endangered / Endangered)	Approximately 20 plants observed at several locations on the Shannon River
Milky beautyheads *Calocephalus lacteus*	(rare / –)	Prolific at moderately broad scale, with some extensive patches in the grassland and sedgeland habitats (with estimates of hundreds of plants)
Yellowleaf sedge *Carex capillacea*	(rare / –)	Extensive occurrence (>100,000 plants estimated) observed in marshy margins of Shannon River

Species	Listing status (TSP Act/EPBC Act)	Extent of occurrence recorded in Project Site
Grassland cupflower *Colobanthus curtisiae*	(rare / Vulnerable)	Limited numbers within the Project Site (<100), and NBES notes that there is a strong likelihood that many past records of this species from the site are erroneous.
Pretty pearlflower *Cryptandra amara*	(endangered / –)	Observed at one location supporting 10 plants on the banks of Shannon River
Miena cider gum *Eucalyptus gunnii ssp. Divaricata*	(endangered / Endangered)	No new observations of this species made within the Project Site There are historical records on site, with the larger stands impacted by dieback, many of which are now dead trees. Some individual healthy trees remain (outside the Project footprint).
Clover glycine *Glycine latrobeana*	vulnerable / Vulnerable)	Small number of plants (<50) observed within forest remnants
Rockfield purplepea *Hovea tasmanica*	(rare / –)	Observed to be prolific (hundreds of plants) on the banks of the Shannon River
Veiled quillwort *Isoetes humilior*	(rare / –)	Recorded on the banks of the Shannon River
Hoary sunray *Leucochrysum albicans var. tricolor*	(endangered / Endangered)	Uncommon in the Project Site with localised occurrences
Matted lignum *Muehlenbeckia axillaris*	(rare / –)	Prolific at a moderately broad scale, with tens of thousands of square metres extent occurrence and numerous locations supporting dense mats
Southern mousetail *Myosurus australis*	(endangered / –)	Relatively frequent and widespread with over 2,000 plants observed within the survey period
Tiny watermilfoil *Myriophyllum integrifolium*	(vulnerable / –)	Recorded at only one location supporting an estimated 1,000 plants, but likely to be more widespread
Liawenee greenhood *Pterostylis pratensis*	(vulnerable / Vulnerable)	Relatively common at a broad scale, with approximately 742 plants recorded in the area either by NBES or as NVA records previously recorded. NBES estimate the St Patricks Plains subpopulation is estimated to be considerably larger, potentially in the order of several thousand plants (NBES, 2023b).
Ferny buttercup *Ranunculus pumilio var. pumilio*	(rare / –)	Prolific at a broad scale with a minimum extent of occurrence of around 100 ha
Chamomile sunray *Rhodanthe anthemoides*	(rare / –)	A large, localised occurrence around the Ripple Creek Dam within St Patricks Plains, previously recorded and verified as still extant
Longhair fireweed *Senecio longipilus*	(vulnerable / –)	Found at several locations within the Project Site with estimated numbers >20,000
Spreading knawel *Scleranthus fasciculatus*	(vulnerable / –)	Several occurrences found within the Project Site with a total estimate of around 450 plants

Species	Listing status (TSP Act/EPBC Act)	Extent of occurrence recorded in Project Site
Mountain dandelion *Taraxacum aristum*	(rare / –)	A total of four plants observed, but likely to be more widespread
Submerged watertuft *Trithuria submersa*	(rare/ –)	Prolific at localised scale within the Project Site, with some locations supporting populations of thousands of plants
Alpine violet *Viola cunninghamii*	(rare / –)	Observed around the Shannon River but may be more widespread



Threatened flora NBES survey (status: TSPA/EPBCA)

See map for number of plants (labelled with number of plants and count error [for relatively large occurrences] or area occupied [sqm] and coverage [%] if applicable)

- As - Asperula subsimplex (r/-)
- Ass - Asperula scoparia subsp. scoparia
- Ba - Barbarea australis (e/EN)
- Ca - Cryptandra amara (e/-)
- Cc - Carex capillacea (r/-)
- Cl - Calocephalus lacteus (r/-)
- Gl - Glycine latrobeana (v/VU)
- Ht - Hovea tasmanica (r/-)
- Ih - Isoetes humilior (r/-)
- La - Leucochrysum albicans (e/EN)
- Mau - Myosurus australis (e/-)
- Max - Muehlenbeckia axillaris (r/-)
- Mi - Myriophyllum integrifolium (r/-)
- Pp - Pterostylis pratensis (v/VU)
- Ra - Rhodanthe anthemoides (r/-)
- Rpp - Ranunculus pumilio var. pumilio (r/-)
- Sf - Scleranthus fasciculatus (v/-)
- Sl - Senecio longipilus (v/-)
- Ta - Taraxacum aristum (r/-)
- Ts - Trithuria submersa (r/-)
- Vc - Viola cunninghamii (r/-)

- As - Asperula subsimplex (r/-)
- Cc - Carex capillacea (r/-)
- Cl - Calocephalus lacteus (r/-)
- Ht - Hovea tasmanica (r/-)
- Max - Muehlenbeckia axillaris (r/-)
- Pp - Pterostylis pratensis (v/VU)
- Ra - Rhodanthe anthemoides (r/-)
- Rpp - Ranunculus pumilio var. pumilio (r/-)
- Sl - Senecio longipilus (v/-)

NVA threatened flora as of 20/12/2022 (status TSPA/EPBCA)

Considered reliable by NBES

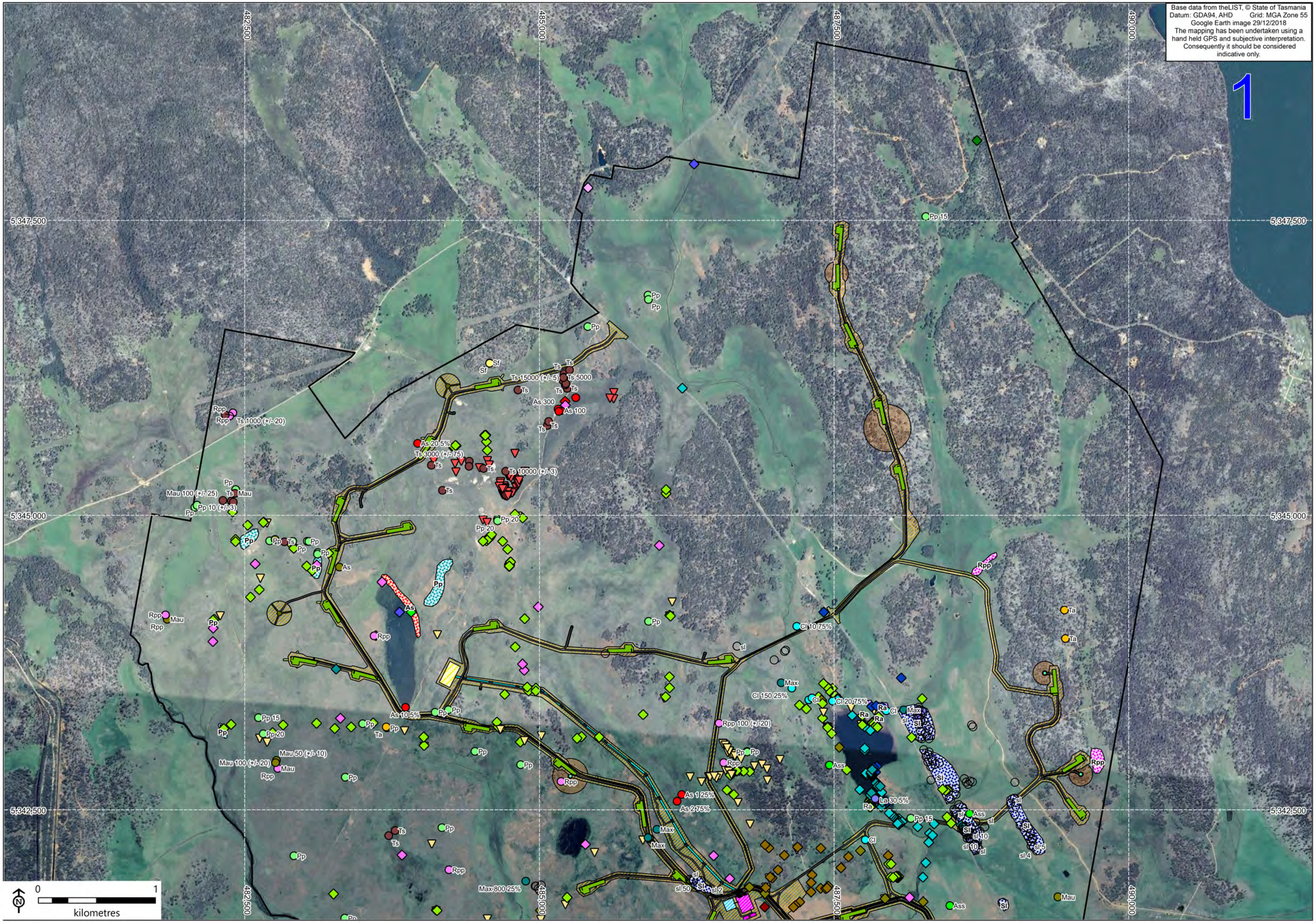
- As - Asperula subsimplex (r/-)
- Cca - Carex capillacea (r/-)
- Cc - Colobanthus curtisiae (r/VU)
- Cl - Calocephalus lacteus (r/-)
- Eg - Eucalyptus gunnii subsp. divaricata (e/EN)
- Gl - Glycine latrobeana (v/VU)
- Hm - Hovea montana (r/-)
- Ht - Hovea tasmanica (r/-)
- La - Leucochrysum albicans subsp. tricolor (e/EN)
- Id - Isoetes drummondii subsp. drummondii (r/-)
- Ih - Isoetes humilior (r/-)
- Max - Muehlenbeckia axillaris (r/-)
- Pn - Pilularia novae-hollandiae (r/-)
- Pp - Pterostylis pratensis (v/VU)
- Ra - Rhodanthe anthemoides (r/-)
- Rpp - Ranunculus pumilio var. pumilio (r/-)
- Ta - Taraxacum aristum (r/-)
- Ts - Trithuria submersa (r/-)

Considered questionable by NBES

- Am - Asperula minima (r/-)
- Cc - Colobanthus curtisiae (r/VU)
- Pc - Prasophyllum crebriflorum (e/EN)

northbarker ECOSYSTEM SERVICES

Figure 6-17


Base data from theLIST, © State of Tasmania
Datum: GDA94, AHD Grid: MGA Zone 55
Google Earth image 29/12/2018
The mapping has been undertaken using a hand held GPS and subjective interpretation.
Consequently it should be considered indicative only.
1
482,500
485,000
487,500
490,000
5,347,500
5,345,000
5,342,500
0
1
kilometres
N

Base data from theLIST, © State of Tasmania
Datum: GDA94, AHD Grid: MGA Zone 55
Google Earth image 29/12/2018
The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.

2

Refer to inset map 1 for detail

Inset map1

482,500 485,000 487,500 490,000

5,342,500 5,340,000 5,337,500

Pp 15 Pp 20 As 10 5% Pp Pp Pp Ta Pp Mau 50 (+/- 10) Mau 100 (+/- 20) Mau Rpp Pp Pp Rpp Rpp Pp Pp Rpp Cl Cl 20 5% Cl Cl Max Ra (5000+/-400) Ra (12000+/-2000) Rpp (200+/-50) Rpp 100 (+/-20) Pp Pp Rpp Ass As 1 25% As 2.75% Max Max Ra La 30 5% Pp 15 Ass Cl Ts Ts Pp Pp Rpp Max 800 25% Pp Rpp Mau 120 Cc Max Max Rpp Rpp Rpp Mau 45 (+/-5) Mau 25 (+/-5) Ass Max Ts 750 (+/- 500) As Ass Rpp (12000+/-2500) Cl Cl 100 2% Cl Cl Cl 40 10% Cl 60 25% Pp Pp Cl 100 25% Cl Cl 200 25% As Max Cc (100000+/-25000) Vc Cl (1500+/-500) Max Max 100 5% Cl Ass As 1 25% Mau Mau Mau 30 (+/- Mau 200 (+/- 50) Mau 50 (+/- 10) Cl Mau 40 (+/- 10) Mau 1000 (+/- 2) Mau Mau Mau 25 Rpp (100000+/-30000) Ba Ba Max Ih Cc Max 30 Ass Rpp 100 Rpp Pp Pp Pp Max Ht Cl 20 50% Ra La 30 5%

0 1 kilometres

Base data from theLIST, © State of Tasmania
Datum: GDA94, AHD Grid: MGA Zone 55
Google Earth image 29/12/2018
The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.

3

5,337,500
5,335,000
5,332,500
5,330,000
487,500
490,000
492,500
495,000

Ht
Cl 20 50%
Rpp 500 (1%)
Ba
Ba
Ba
Ht
Ht
Ca
Ca
Ba
Cl
Ba 15 (+/- 5)
Cl 20
Ht 600 (+/- 100)

0 1
kilometres

6.3.1.3 Weeds and pathogens

There were approximately 70 introduced species identified during the floristic surveys of the Project Site and through opportunistic observation. Of the 70, there were several environmental weeds found and eight species declared under the *Tasmanian Weed Management Act 1999*:

- Californian thistle (*Cirsium arvense*)
- Slender thistle (*Carduus pycnocephalus*)
- Gorse (*Ulex europaeus*)
- Orange hawkweed (*Pilosella aurantiaca ssp. Aurantiaca*)
- Ragwort (*Senecio jacobaea*)
- Canary broom (*Genista monspessulana*)
- English broom (*Cytisus scoparius*)
- Crack willow (*Salix x fragilis nothovar fragilis*).

Declared weed distribution and density throughout the Project Site was considered relatively low (NBES, 2023b), with only four species with greater than 10 individuals found throughout the Project Site. The most common weed found was the Californian thistle, with over 1,500 individuals estimated to be on site. Gorse and slender thistle were also at numbers greater than 500 individuals over the Project Site. Declared and some common environmental weeds found within the Project Site are shown in Figures 6a and 6b in Appendix C.

There were no signs of the pathogen *Phytophthora cinnamomi*, commonly referred to as root-rot, within the Project Site. NBES (2023b) notes this is most likely due to the altitude of the site, which results in soil temperatures generally being lower than the threshold required for the pathogen to survive. Despite this, it is still plausible for the species to be introduced during the warmer summer months. There were no other plant pathogens identified by NBES within the Project Site.

6.3.2 Legal and other requirements

The key legislation and policy relevant to protecting flora and vegetation biodiversity values of relevance to this Project include:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Tasmanian Threatened Species Protection Act 1995*
- *Forest Practices Act 1985* and associated regulations and policies
- *Nature Conservation Act 2002*
- *Weed Management Act 1999.*

The key performance requirement is to minimise impacts to identified biological values and seek necessary permits for any unavoidable impacts.

6.3.3 Potential impacts

6.3.3.1 Construction

Vegetation communities

The main impact to vegetation communities from the Project is through direct clearing for the various Project components during construction.

Overall, the Project will involve the disturbance of up to 481.13 ha of land, this is made up of the permanent impact associated with the operational footprint (193.88 ha) and the temporary disturbance associated with the construction buffer (287.25 ha).

Within the operational footprint (193.88 ha), approximately 91.09 ha of land is related to the IDF vegetation management zones and overhead powerline and therefore will be subject to removal of obstruction woody vegetation only, rather than full vegetation clearance, hence constituting vegetation modification rather than permanent loss. NBES note that low lying vegetation is expected to persist in these areas and for native non-forest vegetation units the vegetation management in these areas will be inconsequential (NBES, 2023b). The result is approximately 102.79 ha of direct and permanent impact from the Project (i.e. excluding the vegetation management zones), of which 83.93 ha is mapped as native vegetation.

Within the construction buffer (287.25 ha) impacts to vegetation communities will be temporary, with the extent of impact varied based on the type of construction work undertaken and the type of vegetation present. This area will be subject to rehabilitation in a manner that promotes reinstatement of native vegetation after works are completed; hence this construction buffer area will be impacted (and may not all be rehabilitated to original vegetation community class) but does not represent permanent loss of native vegetation. Additionally, the construction impact areas have been calculated using a construction buffer applied to all infrastructure as a prediction of the maximum area needed to facilitate construction, however during the final design and micro-siting stage there may be opportunities to slightly adjust the position of infrastructure or reduce the size of the construction buffer in key locations to minimise impacts to ecological values; hence disturbance impacts have been assessed at a worst-case quantum.

NBES have calculated the expected impacts to native vegetation communities and vegetation types, taking into consideration the different types of impact discussed above (i.e. temporary impacts during construction, permanent vegetation loss during operation and areas of vegetation management during operation) as documented in Table 5 of Appendix C. The estimated impact to native vegetation communities is as follows:

- Direct and permanent impact to native vegetation communities – 83.93 ha
- Habitat modification to native vegetation communities (via woody vegetation management) – 69.61 ha
- Temporary impact to native vegetation communities – 231.37 ha

The balance, of 96.22 ha, is confined to non native vegetation units.

This provides a high-level summary of the predicted impacts to native vegetation from construction and operation of the Project. It is also relevant to consider the impact to individual vegetation communities, particularly listed communities.

Table 6-8 documents the maximum predicted impact to each vegetation community and highlights the percentage loss of each native vegetation unit with respect to the remaining vegetation in the Project Site and more broadly the state. The numbers in Table 6-8 include direct and permanent impacts, habitat modification and temporary construction impacts, hence they represent the maximum upper limit of impacts and do not take into account the nuances of the type of impact discussed above or the effects of rehabilitation. Hence, the estimates provided in Table 6-8 are the maximum upper limit of disturbance and

may be reduced through final design, micro-siting, restriction of the construction buffer in key areas and post-construction rehabilitation. For listed communities, further consideration of the type of impact is provided in the following sections. During development of the Project layout, native vegetation (especially listed native vegetation) was included in constraints mapping to guide the layout of the Project to actively avoid these communities as far as practicable. This resulted in the greater part of listed vegetation communities being avoided in the layout.

As can be seen in Table 6-8, the Project footprint impacts two listed vegetation communities (listed under the Tasmanian NCA), namely highland Poa grassland (GPH) and highland grassy sedgeland (MGH).

A total of up to 181.58 ha of highland Poa grassland is expected to be impacted, constituting approximately 50.52 ha within the operational footprint and 131.06 ha impacted within the construction buffer. In total this represents a potential impact to approximately 0.76% of the known state-wide distribution of the mapped vegetation community. This total impact area is, however, a conservative estimate for several reasons. Regarding the stated area of operational impact of 50.52 ha, approximately 5 ha of this is associated with the IDF vegetation management areas and easements for overhead reticulation. In reality highland Poa grassland is expected to persist in these areas (which will be subject to woody vegetation management, not ground level clearance), and hence this does not represent loss of the community. Regarding construction phase impacts, the construction buffer applied represents the maximum extent of all construction phase impacts and will be minimised where possible in areas of important ecological value such as threatened communities (refer Section 6.3.4 for details). The extent of disturbance within this buffer will also vary, in some locations full-scale ground excavations will occur, whereas in other parts of the site physical disturbance will be limited to less intrusive impacts such as vehicle traffic and laydown, hence representing a varied level of impact. The construction buffer will also be subject to rehabilitation post construction. Although it is acknowledged that rehabilitation is unlikely to restore all of the construction buffer to the same ecological community present pre-construction, it is reasonable to assume that at least parts of this buffer will be fully restored (particularly in areas where ground disturbance is less) hence resulting in temporary impact rather than permanent clearance and conversion. As a result, the residual loss of this vegetation community is likely to be lower than the calculated impacts presented in Table 6-8.

A total of 47.82 ha of highland grassy sedgeland is expected to be impacted, constituting approximately 20.75 ha within the operational footprint and 27.07 ha impacted within the construction buffer. When considering total impact this represents approximately 0.21% of the mapped state-wide distribution of the community. However, similarly to the highland Poa grassland, this is a conservative estimate of total impacts. The total construction impacts are likely to be less than predicted (for the same reasons stated for highland Poa grasslands) and of the stated 20.75 ha of operational phase impact, a little over half of this relates to IDF vegetation management areas and overhead powerline, where the community is expected to persist. As a result the residual loss of this vegetation community is also likely to be lower than the calculated impacts presented in Table 6-8.

Proportional losses of listed communities are considered by NBES (2023b) as very low.

No Commonwealth listed communities were identified within the Project Site (Refer Section 6.3.1.1).

The NBES report (Appendix C) addresses the impact of the Project on the comprehensive, adequate, and representative reserve system identified as part of the Tasmanian RFA, maintenance of forest communities under the Tasmanian Government *Policy for Maintaining a Permanent Native Forest Estate 2017* and wildlife strips under the *Tasmanian Forest Practices Code 2015* and on non-forest communities. The NBES report demonstrates that the proportional loss of forested vegetation communities (impact area as a percentage of the extent in permanent native forest estate) is less than 0.3 % for all forest communities and does not threaten the maintenance of the permanent native forest estate. The NBES report also identifies that there are no wildlife strips (under the *Tasmanian Forest Practices Code 2015*) impacted by the Project. Overall, the NBES report concludes the potential losses of native vegetation communities are not

considered to be highly significant with respect to conservation status and the likelihood of persistence of vegetation communities at a local level and higher.

Other potential impacts to native vegetation communities during construction include unapproved clearing and disturbance (to be addressed through construction management as set out in Section 6.3.4), potential impacts from excessive dust generation (albeit unlikely at this site), potential impacts from fires generated as a result of the Project (addressed in Section 6.16), alterations to drainage patterns (considered unlikely given the linear nature of proposed infrastructure and general avoidance of waterways in the Project layout), and introduction of weeds and pathogens (addressed below). Impacts to water quality and available quantity could also affect areas of wetland community; water quality and quantity impacts are assessed in Section 6.6 and 6.7.

Table 6-8 Native vegetation community impacts

Vegetation community	Listing	Project Site total area (ha)	Project disturbance total (ha)	Total % loss (Project Site)	Total % loss (State)
(AHF) Fresh water aquatic herbland	NC Act	70.15	0	0%	0%
(AHL) Lacustrine herbland	NC Act	2.13	0	0%	0%
(DAD) *Eucalyptus amygdalina* forest and woodland on dolerite	None	345.22	0	0%	0%
(DDE) *Eucalyptus delegatensis* dry forest and woodland	None	1,072.06	63.73	5.94%	0.02%
(DDP) *Eucalyptus dalrympleana – Eucalyptus pauciflora* forest and woodland	None	531.34	46.91	8.83%	0.38%
(DGW) *Eucalyptus gunnii* woodland	None	21.71	0	0%	0%
(DPD) *Eucalyptus pauciflora* forest and woodland on dolerite	None	1,688.57	42.92	2.54%	0.12%
(DRO) *Eucalyptus rodwayi* forest and woodland	None	134.40	0.85	0.63%	0.01%
(GPH) Highland Poa grassland	NC Act	2,706.09	181.58	6.71%	0.76%
(MGH) Highland grassy sedgeland	NC Act	1,083.63	47.82	4.41%	0.21%
(MRR) *Restionaceae rushland*	None	3.29	0	0%	0%
(NLE) *Leptospermum* forest	None	6.69	1.10	16.50%	0.002%

Threatened flora

The Project Site has a relatively high number of threatened and conservation-significant flora species spread throughout the area which could be impacted without careful layout and siting.

The largest threat to listed flora is through direct impacts from clearing and disturbance. With this in mind, the design development phase of the Project used the locations of mapped populations of listed species from the NBES (2023b) report as part of the environmental constraints mapping to guide the Project layout.

The final Project layout arrangement avoids the vast majority of known threated flora species locations or populations within the Project Site, with the following exceptions, which could not readily be avoided. The following provides a summary of the potential impacts to listed flora species[21], with a more fulsome analysis and discussion provided in Section 4.4 of Appendix C. Table 7 in Appendix C provides a tabulated summary of the recorded populations (inclusive of historical NVA records, NBES point data and NBES polygon data[22]) and predicted impact for all threatened flora species. This table also provides an estimate of potential habitat for each species, and the predicted impact to the mapped potential habitat (noting this is potential habitat and does not indicate the area of occupancy of the species).

As discussed below, some of the impacted plants are within the construction buffer or parts of the operational footprint subject only to vegetation management rather than full clearance (e.g. the IDF vegetation management areas), hence some of these plants are likely to be retained through micro siting of the construction footprint (refer Section 6.3.4) or persisting at a ground level in areas of vegetation management respectively. This is discussed where relevant below.

- Grassland cupflower (*Colobanthus curtisiae*) listed on the EPBC Act and TSPA

  The construction footprint intersects with a total of 28 historical records[23] of this species, however NBES conclude that there is a strong likelihood that these past records of this species from the Project Site are erroneous. NBES did not record any *Colobanthus curtisiae* at these locations (nor elsewhere on the Project Site) and consider the species to be restricted to rocky outcrops within forested area, none of which surveyed within the footprint have been found to support the species. The construction footprint intersects with a total of 0.22 ha of a mapped 53.49 ha of potential available habitat for the species within the Project Site (noting no individuals were located by NBES).

- Liawenee greenhood (*Pterostylis pratensis*) listed on the EPBC Act and TSPA

  The occurrences of this species on the Project Site are noted as representing an important population referenced within the respective listing statement (referred to as St Patricks Plains), noting the listing statement is relatively out of date and the data collected by NBES for this Project is likely to be the most detailed assessment of the population to date (and has subsequently established a greater population abundance and extent than referenced within the listing statement).

  The Project is expected to impact approximately 60 mapped plants of this species (18 plants recorded by NBES, plus 42 existing records from the NVA). This is in the context of approximately 742 plants recorded at the Project Site. NBES (2023b) notes that the overall size of the St Patricks Plains subpopulation is estimated to be in the order of several thousand, hence the recorded observations (NVA and NBES) are likely to represent only a subset of the total population in the area.

  Only 10 of the plants predicted to be impacted are found within the operational footprint, with the remaining 50 within the construction disturbance buffer. Given the proportion of the potentially impacted plants within the construction buffer (rather than the operational footprint) NBES notes that the greatest scope for avoidance is to selectively protect the species within the construction disturbance buffer with small exclusion zones, noting the species would conceivably only require a buffer of 2 m to prevent impacts (given its tiny size). To this end NBES have nominated proposed exclusion zones within the construction buffer, which would bring the total impacts down to around 28 plants. The Proponent has commitment to applying these exclusion zones (refer Section 6.3.4) thereby bringing the predicted loss down to 28 plants out of 742 total records, representing 3.77% of

[21] The NBES report discusses several additional species not addressed here because the NBES report concludes that current records of those species are not impacted by the Project, with the construction footprint overlapping historical Natural Values Atlas records, not found during NBES surveys. Refer to Section 4.4.1 of Appendix C for further details.

[22] NBES collected species data as both individual points (for single plants or clusters of plants) and polygons of mapped occurrence (with density estimates where possible). Their analysis and that summarised herein is inclusive of both the point and polygon data, as well as historical NVA records for completeness.

[23] Records on the Tasmanian Natural Values Atlas

the recorded number on the Project Site, and a far smaller proportion of the predicted local population (which NBES notes may be in the order of several thousand plants).

NBES has also calculated an estimate of the total available habitat for the species on the Project Site (i.e. the potential extent of occurrence for the species on site, rather than an estimate of actual occurrence), identifying over 3000 ha of potential suitable habitat, of which only approximately 200 ha is at risk of impact from the Project (around 6% of the available habitat on the Project Site). NBES notes that this represents the 'worst case' potential impact as it does not include consideration that approximately 5 ha of the potential habitat impacted is within the vegetation management areas, where there will be ample scope to manage these areas in the required fashion without impacting habitat value (or even individual occurrences of the species).

NBES (2023b) has assessed the Project against the EPBC Act significant impact criteria and concludes that the Project is not considered likely to constitute a significant impact to this species (refer Section 5 in Appendix C for details and Section 7 of this EIS for a summary).

- Matted lignum (*Muehlenbeckia axillaris*) listed on the TSPA
  The Project area contains 241 isolated plants that have been mapped as single points (NVA and NBES records) in addition to 16.81 ha of area of occupation with matted plants too dense to make an accurate abundance estimate. Only 4 of the 241 isolated plants (1.66%) are within the construction footprint. Additionally, the construction footprint impacts 0.48 ha of the mapped 16.81 ha of the species, representing a total proportional impact of 2.86% of the mapped area. Only 0.09 ha of this 0.48 ha is within the operational footprint, with the balance in the construction disturbance footprint.
- Ferny buttercup (*Ranunculus pumilio var. pumilio*) listed on the TSPA

  NBES estimates over 112,000 plants are present within the Project Site, which is a combination of past NVA records, NBES point observations and areas NBES have mapped as extent of occurrence polygons. A total of 1,106 plants (inclusive of both individual counts and polygon population estimates) is within the construction footprint, representing only 0.98% of the total population observed. However, NBES notes that impacts are actually likely to be less given that most of the plants to be impacted are within the construction buffer or IDF clearance area and the species as a whole is likely to persist within the construction disturbance buffer and IDF vegetation management areas due to its small size and disturbance ecology.
- Longhair fireweed (*Senecio longipilus*) listed on the TSPA

  The Project Site supports an estimated population in the order of 30,000 plants (including both individual mapped occurrences and estimated populations for mapped polygons).
  In total approximately 3,625 plants (inclusive of both individual counts and polygon population estimates) are within the construction footprint, representing approximately 12% of the total population observed. Only a very small proportion of these plants are within the operational footprint (364 individuals, representing only ~1% of the total population observed), with the remainder in the construction buffer.

  Given that the overwhelming majority of potential impacts to this species are within the construction buffer (rather than the operational footprint) and the fact that plants have relatively clustered nodes of occurrence, NBES conclude that the potential for total impacts could be reduced significantly by selectively narrowing the construction disturbance buffer in areas where the species is concentrated and treating these areas as exclusion zones. NBES have recommended exclusion zones and the proponent commits to implementing these (refer Section 6.3.4). With the exclusion zones in place the total number of plants predicted to be impacted is reduced to 3,071, representing approximately 10% of the estimated population on site. NBES have also calculated the total available habitat on site, noting that with the proposed exclusion zones in place the Project is expected to impact on up to

approximately 112 ha out of 1,726 ha of available habitat on the Project Site (i.e. ~6.5 % of mapped habitat impacted).

NBES further note that, given the construction footprint in no area will fully remove any single patch of occurrence, combined with the ecology of the species as a highly fecund, bulk seed producing disturbance coloniser (consistent with the typical ecology of Senecio species), means that the balance of plants within the undeveloped areas of occurrence will be a significant source of propagules for the adjacent construction disturbance buffer, in which this species can be expected to be one of the dominant pioneering species post-works.

- Prickly woodruff (*Asperula scoparia*) listed on the TSPA

  Sixteen locations of this species have previously been recorded from the Project Site (inclusive of NVA and NBES records) and the Project avoids all bar one of these locations (supporting a single plant).

- Milky beautyheads (*Calocephalus lacteus*) listed on the TSPA

  A total of 2,794 plants have variously been recorded within the Project Site (including NVA records, NBES points and NBES plants mapped as polygon areas). The construction footprint intersects with locations supporting 24 plants, representing a total potential impact of less than 1 % of the total recorded (0.86 %). In addition, only 2 of the 24 plants are within the operational footprint, with the balance of 22 plants at risk within the construction disturbance buffer.

Aside from direct disturbance, the other potential impacts for listed flora species are the same as those listed for vegetation communities above.

Weeds and pathogens

During construction there is a risk of introducing weeds and pathogens to the Project Site through a number of vectors, which commonly include introduction of dirty vehicles, machinery and equipment to site; pathogens such as *phytophthora* are also commonly spread via shoes that have previously been worn in affected areas. The introduction of weed and pathogen species to the relatively low weed and pathogen environment has the potential to significantly impact native vegetation and flora.

Management and mitigation to minimise and avoid the potential impacts mentioned here are provided in Section 6.3.4.

6.3.3.2 Operation

Once operational the Project poses a very low risk to vegetation communities or threatened flora. Minor vegetation management may be required (such as slashing below transmission lines or to maintain fire breaks) but this will be within areas already identified for construction phase impacts and will not affect additional listed flora or communities.

The operational phase does pose ongoing risk of weed and pathogen introduction or spread through routine movements of workers and maintenance crews through the Project Site. Management and mitigation to minimise the spread of weeds and pathogens is provided in Section 6.3.4.

It is noted that the Project will not inhibit any pre-existing vegetation management practices (e.g. ecological burning) undertaken by other parties in the vicinity of the infrastructure or elsewhere. Where ecological burning is proposed, protocols will need to be in place to protect built assets in the same way as already occurs for other assets in the landscape (e.g. buildings). New access tracks formed for the Project can be used to facilitate any such vegetation management practices where relevant (e.g. providing access and fire break opportunities for ecological burning). The Project itself does not propose any ecological burning.

6.3.4 Management, mitigation and monitoring

6.3.4.1 Construction

The following management, mitigation and monitoring is proposed for the construction phase of the Project, which will be included in the Construction Environmental Management Plan (CEMP) for the Project in a more detailed form.

Where management measures are directly applicable to several topics, they are referenced as 'Various' and replicated in all relevant sections of this EIS for completeness.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Various MM 5	All WTG and other infrastructure will be micro-sited, with the assistance of a trained ecologist, to ensure disturbance of listed species, listed communities and habitat for listed species is avoided as far as practicable and infrastructure is located in areas with relatively lower ecological value where possible[24]. Micro-siting will include consideration of the construction buffer areas, with these to be reduced as far as reasonably practical in areas of important ecological value to minimise construction phase impacts.
Various MM 6	Approved site disturbance boundaries within the Project Site will be clearly articulated to the construction contractors through electronic means, onsite documentation and (where appropriate) physical demarcation, and it will be specified that all works, vehicles and materials will be confined to the designated impact areas. For areas of specific ecological value (threatened fauna habitat, threatened flora locations, threatened vegetation communities) that are not within the final footprint and can be retained, exclusion zones will apply. These will be marked on construction plans, communicated to all construction personnel and, where they lie adjacent to the works area, will also be physically cordoned off with temporary fencing (or similar) to avoid inadvertent impacts. No ground disturbance, stockpiling or alteration of drainage patterns will be permitted within exclusion zones.
Various MM 7	A rehabilitation plan (either as a standalone document or to be included in the CEMP) will be prepared prior to the commencement of construction to detail the rehabilitation approach. Rehabilitation will be undertaken in accordance with the plan. Rehabilitation of any disturbed areas suitable for rehabilitation will commence as soon as practicable following the completion of each Project component (i.e. in a staged fashion), with reinstatement of any stripped topsoil and seeding with local provenance where appropriate, noting the topsoil seedbank may be sufficient in some cases.
Flora & Vegetation Communities MM 1	A Weed, Disease and Hygiene Management Plan will be prepared prior to construction. This plan will be prepared in general accordance with the *Weed, Disease Planning and Hygiene Guidelines* (DPIPWE, 2015b) and include provisions for: • Pre-construction weed control for areas of existing weed infestation where construction equipment will be required to work. • Hygiene protocols, including vehicle washdown prior to site entry/exit to avoid the spread of weeds and pathogens in general accordance with the *Tasmanian Washdown Guidelines for Weed and Disease Control* and *Keep It Clean – A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens*.

[24] Micro-siting considerations will include but not be limited to habitat for eagles, Latham's snipe, Tasmanian masked owl, Miena jewel beetle (including the species' host plant *Ozothemnus hookeri*), ptunarra brown butterfly, Tasmanian devil and spotted-tailed quoll (including potential den sites), wetland and waterway habitat for listed species, threatened vegetation communities (including highland Poa grassland and highland grassy sedgeland) and threatened flora (including Liawenee greenhood, matted lignum, ferny buttercup, longhair fireweed and *Eucalyptus gunnii*).

Reference number	Management, mitigation or monitoring measure
	• Control measures for material brought onto the site for construction to ensure it is free from weed seeds or disease. The Plan will be informed by a pre-construction weed survey of the finalised Project footprint, to provide contemporary information on pre-existing conditions and inform management actions.
Flora & Vegetation Communities MM2	Prior to the commencement of construction, the IDF vegetation management areas and overhead power line easements will be surveyed by a suitably qualified person to provide fine-scale mapping of any conservation significant values (including vegetation communities, threatened flora and threatened fauna habitat) and advice on vegetation clearance approach that best supports long term viability of these values where possible. Where ecological values can be retained by selective vegetation clearance (noting the IDF vegetation management areas do not require full clearance, only management of tall vegetation) they will be marked as exclusion zones (on construction site plans and on ground where appropriate) and protected during vegetation clearance. At the conclusion of construction these exclusion zones will be marked on operational site plans and protected during routine vegetation management for IDF visibility during operations.
Flora & Vegetation Communities MM 3	Prior to the commencement of construction, the margin of the final footprint will be surveyed for *Eucalyptus gunnii* subsp. *divaricata* to a radius of 15m and any individual of the species found within the buffer and alive, that can be avoided by the footprint, will be protected with a radial exclusion zone proportional to 12 times diameter at breast height.
Flora and Vegetation Communities MM 4	The threatened flora exclusion zones recommended in Figure 11 of Appendix C will be applied during the construction phase to minimise impacts to listed flora species, particularly *Pterostylis pratensis* and *Senecio longipilus*. These areas will be marked on construction plans, communicated to all construction personnel and physically cordoned off with temporary fencing (or similar) to avoid inadvertent impacts. No construction access will be permitted to these areas.
Flora and Vegetation Communities MM 5	To supplement the expected natural recolonization of *Senecio longipilus* of the Project Site post construction, seed collection for the species will be undertaken in the season prior to construction. This collected seed will be used as a targeted source of rehabilitation post works in proximity to remaining occurrences and within areas in which plants were impacted. A collection of these seeds will be lodged with the Tasmanian Seed Conservation Centre.
Flora & Vegetation Communities MM 6	For individuals of flora species listed under the *Threatened Species Protection Act 1995* that cannot be avoided a permit to take will be sought in accordance with the *Nature Conservation Act 2002*.
Flora & Vegetation Communities MM 7	Prior to the commencement of operation, a suitably qualified person will be engaged to prepare a Native Vegetation Management Plan for the balance land within the Project Site (i.e. remaining native vegetation not impacted by the Project), to provide guidance on the management regimes best suited to promoting the long term viability of listed ecological values on site inclusive of native grassland and sedgelands, threatened flora and habitat for threatened fauna. This information will be used to prepare voluntary Stewardship Agreements with the landowners of the balance land, whereby the Proponent will provide an annual monetary contribution to each landowner to support the implementation of on ground actions in accordance with the Stewardship Agreement. The Stewardship Agreements will be specific to each landowner and will be subject to auditing, with monetary contributions contingent upon implementation. In the event a landowner does not partake in a Stewardship Agreement (either at the outset or demonstrates non-compliance during routine auditing) the relevant monetary contribution will instead be provided to a suitable research or conservation effort specific to the ecological values being managed. This annual contribution will remain in effect for the predicted operational life of the wind farm, 30 years and may be renegotiated at that time.

Reference number	Management, mitigation or monitoring measure
Monitoring	
Flora & Vegetation Communities MON 1	Rehabilitated sites will be monitored every 3 months to assess progress, and monitoring will continue post-construction on a 3-monthly basis until sites are rehabilitated in accordance with the target attributes to be developed in the rehabilitation plan for the Project.
Flora & Vegetation Communities MON 2	Weed, disease and hygiene monitoring will be undertaken in accordance with the Weed, Disease and Hygiene Management Plan developed for the Project.
Flora and vegetation management control measures (e.g. exclusion fences) will be subject to fortnightly audits during construction as part of the CEMP monitoring program as documented in Section 6 (refer Various MON 1).	

Additional management and mitigation for flora and vegetation during construction is provided in the following sections:

- Section 6.5 – Air quality (for dust generation)
- Section 6.6 – Surface water (for drainage alterations)
- Section 6.16 – Fire risk.

6.3.4.2 Operation

The following management, mitigation and monitoring is proposed for the operational phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Flora & Vegetation Communities MM 8	Ecological values, including all listed native vegetation communities, known areas of listed flora species, and areas of known weed infestation, will be marked on an operational site plan and communicated to all operational personnel to ensure values are maintained and weed areas avoided throughout the operational phase.
Flora and Vegetation Communities MM 9	A Weed, Disease and Hygiene Management Plan will be developed, and implemented, for the operational phase of the Project.
Monitoring	
Flora and Vegetation Communities MON 3	During the operational phase, annual audits of weed, disease and hygiene management protocols and infrastructure will be undertaken for the operational footprint and made available to the Director, EPA upon request.

6.3.5 Residual impacts

The main risk to vegetation communities and flora from the Project are direct impacts from clearing for construction and operational infrastructure. Using environmental constraints mapping to inform the Project layout design phase, the vast majority of both listed vegetation communities and listed flora and associated habitat have been avoided. This has resulted in low potential for significant impacts to occur to the listed communities and species.

Mitigation measures proposed by NBES have been broadly adopted in this EIS, reducing the potential impact to flora and vegetation communities and establishing processes to minimise impacts during construction (e.g. via exclusion zones, micro siting and construction control measures). This EIS also commits to long term management measures post construction including rehabilitation, a site wide Vegetation Management Plan, and voluntary Stewardship Agreements with landholders to facilitate long term viability of ecological values across the Project Site. With these measures in place residual impacts to listed species can be reduced to within acceptable levels.

There remains a residual risk from unapproved clearance during construction and through the introduction of weeds and pathogens through both construction and operational phases; ongoing risks will also remain from fire for the length of the Project's operational period. However, with the implementation of the management, mitigation and monitoring proposed for the Project in Section 6.3.4, residual impacts are expected to be at an acceptable level for listed flora and vegetation.

With the management and mitigation measures set out in this EIS in place, there are no formal offsets to state or Commonwealth listed flora or vegetation proposed for the Project, in line with the advice provided in NBES (2023b).

6.4 Noise

To address the potential noise risk from the Project, Marshall Day Acoustics was engaged to undertake an environmental noise assessment in accordance with relevant legislation, policy and standards. The assessment is reported in two parts: the impact assessment report (refer Appendix D) and the background monitoring (refer Appendix E); the salient points are summarised herein. The assessment considered both construction and operational noise impacts.

6.4.1 Existing environment

The Project Site is a mosaic of natural environments, farming land, silviculture, roads and scattered residential properties. The noise environment of the site is expected to be similarly diverse with a relatively quiet profile (in comparison to more built-up population centres) dominated by natural noise in some areas and agricultural, forestry or traffic noise in others.

During planning for noise monitoring, the Proponent considered the EPA publication *Noise Measurement Procedures Manual* (EPA, 2008), as specified in the PSGs for the Project. At the time, the assessment of wind farm noise in Australia was undertaken in accordance with the New Zealand Standard 6808:2010 *Acoustics – Wind farm noise* (NZS 6808). The standard notes that the initial step in a noise assessment should be to determine whether a full noise modelling assessment is warranted by first running an initial noise prediction model from a proposed WTG layout using 35 dB L_{A90} as the threshold at surrounding sensitive receivers; this is 5 dB lower than the 40 dB L_{A90} noise limit at sensitive receivers proposed by the standards.

Essentially, if the predictive model indicates there are sensitive receivers predicted to experience 35 dB L_{A90} noise levels or greater from the Project, then background monitoring is required to inform a more comprehensive modelling exercise. If no private dwellings (i.e. sensitive receivers) are found to be within the modelled 35 dB L_{A90} threshold, then no noise monitoring is required. The standard treats involved and non-involved sensitive receivers differently. Involved receivers are host landholders (i.e. those with WTGs to be deployed on their land and/or in commercial arrangements with the Proponent) whereas non-involved receivers are those without any direct involvement in the Project[25].

Changes in wind farm noise regulation by the EPA, post the completion of the baseline assessment, have resulted in the implementation of a reduced noise limit for wind farms from a 40 dB L_{A90} base noise limit to 35 dB L_{A90}. This theoretically means the determination of the necessity for baseline monitoring should be determined at 30 dB L_{A90} rather than the 35 dB L_{A90} that was used for this Project. Fortunately, at the time of baseline survey the Proponent was conservative and assessed baseline noise at more sites than were strictly required under the 35 dB L_{A90} criterion (only one location was identified within the 35 dB L_{A90} contour but seven sites were actually assessed) and therefore all sensitive receivers within the 30 dB L_{A90} contour were addressed in the original monitoring and no additional background monitoring was necessary in response to the new limits.

The initial predictive model was run on a Vestas V162 5.6 MW model WTG in a 50 WTG layout. Known parameters were used from the selected WTG model and applied from the proposed WTG height at a variety of wind speeds to generate noise level contours around the layout (specific details of the modelling parameters used are provided in Appendix D). The model identified a single (at the time non-involved) receiver within the 35 dB L_{A90} contour, as shown in Figure 6-19; this prompted the requirement for background noise monitoring. This receiver has since become an involved receiver. Additional (involved) receivers also occur within the modelled threshold, but these are owned by participants in the Project and have agreements with the Proponent regarding noise generation in place and are therefore assessed using different standards and therefore do not require background monitoring. As part of an update to the

[25] It is noted that some receivers who were non-involved at the time the noise assessment was prepared (and are therefore described as non-involved receivers herein) have since become involved receivers.

subsequent noise impact assessment report, and using the final layout of 47 WTG locations, the model was re-run for the larger Vestas V162 6.2 MW WTG, which yielded the same outcome as the 5.6 MW model with respect to the number of dwellings within the 35 dB $_{LA90}$ contour.

In addition to monitoring at the single site required, as mentioned above, the Proponent elected to undertake background monitoring at an additional six locations to develop a more thorough dataset of reference conditions (refer to monitoring sites Figure 6-19).

Noise monitoring equipment was deployed at the seven locations for a period of between six and nine weeks at each location between August and November 2020. The noise monitors were located a minimum of 3.5 m from any structures to minimise sound reflection. The monitors were placed in the open on the Project side of the dwelling locations (where possible), to provide the most relevant results. A weather monitoring station was also installed adjacent to one of the sites to inform wind speed and record rainfall as inputs into the assessment.

Wind data for the proposed WTG heights was derived from data from an existing met mast within the Project Site, which has anemometers measuring wind speed at a range of heights.

The full background noise assessment for the Project is provide in Appendix E, with the results used in the impact assessment below (Marshall Day, 2023). As above, it is noted that the background noise assessment was undertaken prior to a chance in the noise limits by the EPA and hence references a 40 dB $_{LA90}$ base noise limit, rather than the newly adopted 35 dB $_{LA90}$. The Environmental Noise Assessment (Appendix D), which assesses the noise impact of the Project, uses the newly adopted 35 dB $_{LA90.}$

6.4.2 Legal and other requirements

The Tasmanian *Environmental Protection Policy* (EPP) *(Noise) 2009* sets a strategic framework for noise management in Tasmania. The noise policy sets out environmental values to be protected, including the wellbeing of the community and the wellbeing of individuals. It must be demonstrated that noise from the proposal will not prejudice the environmental values the noise policy sets out to protect.

To achieve the objectives of the noise policy, the EPA regulates operational noise from Level 2 activities by setting noise level compliance limits on a case-by-case basis.

Specifically for wind farm assessments, the New Zealand Standard 6808:2010 Acoustics – Wind farm noise (NZS 6808) was historically used in Tasmania in accordance with the *Noise Measurement Procedures Manual* (EPA, 2008), which set a 40 dB $_{LA90}$ base noise limit for wind farms. However in March 2020, the EPA released an EPA Board Communiqué that stated (in line with other Australian state jurisdictions), that the EPA would be adopting a new lower limit of 35 dB $_{LA90}$ for wind farms in Tasmania. This was communicated after the initial baseline monitoring was undertaken, and fortunately sufficient baseline data had been collected on this occasion to accommodate the new limit.

The *Environmental Management and Pollution Control (Noise) Regulations 2016* have provisions for the management of residential and building construction noise. The regulations set out the acceptable hours for the use of mobile machinery, forklifts and portable equipment emitting noise as follows:

- Between 07:00 hours and 18:00 hours Monday to Friday
- Between 08:00 hours and 18:00 hours Saturday
- Between 10:00 hours and 18:00 hours Sundays and public holidays.

As there are no Tasmanian guidelines for construction vibration, references to the NSW State Government's publication *Construction Noise and Vibration Guideline 2016* are used to inform this assessment.

6.4.3 Potential impacts

6.4.3.1 Construction

The noise impact assessment undertaken by Marshall Day (Appendix D) included consideration of construction noise and vibration. This assessment included consideration of construction vibration levels (with reference to the NSW *Construction Noise and Vibration Guideline 2016*) onsite construction noise levels (with reference to the *Environmental Management and Pollution Control (Noise) Regulations 2016*) and offsite construction traffic noise.

As outlined in Section 2.4.6, general construction hours are likely to be based on 10 to 12-hour day shifts between 6 am and 6 pm on 7 days per week on rotating drive-in/drive-out rosters; this will depend on the construction contractors' arrangements. Construction activities with potential to generate significant noise will be further limited as documented in the management measures in Section 6.4.4.1.

As outlined in Section 2.4, it is expected that ground excavations can be undertaken by excavator, but there is a possibility that blasting may be required for some parts of the project in the event that ground conditions encountered are unsuitable for standard excavation (e.g. hard rock), noting that blasting also significantly limits the duration of noise impacts over traditional rock breaking. For the purposes of the noise assessment, blasting is considered separately from other noise generating activities, because it would be undertaken infrequently during construction (if required) and represent a single point source of noise for a very short duration, not an ongoing noise source during construction. The following sections therefore consider general construction noise and blasting separately.

General construction

There are several construction activities that will be occurring simultaneously within the Project Site with potential for noise generation, including civil works for the development of the road network, concrete batching and pouring of the WTG foundations, construction and assembly of the various structures including the WTGs, operations facility, substation(s) and met masts. All these activities require noise generating machinery and tools that could cause noise impacts to sensitive receivers in the vicinity of the Project Site. It is relevant to note that the nature of wind farm construction is that noise generating activities are generally dispersed across a large area and often occur at relatively large separation distances from receivers. In this instance, the closest sensitive receiver to any proposed construction area is receiver M5-1 at a distance of 1283 m, with the next closest receiver (O7-1) more than 1.5 km away, as shown in Figure 6-19.

The noise assessment used standard noise generating data (from a variety of standards and databases) for the various items of equipment and machinery required for the Project construction tasks. An example selection of machinery sound power levels and the combined levels resulting from various example construction tasks are replicated from Appendix D in Table 6-9 below (with full detail on potential noise generating equipment sound power levels available in Appendix D). The table includes all the equipment and construction tasks with the highest noise generating capacity from the Project, with the rock crusher being the loudest single piece of machinery and the task of pouring the foundation and assembling the WTGs the loudest single activity (with the exception of potential blasting, addressed separately below). This data was used to develop an understanding of the potential for noise disturbance to sensitive receivers during construction.

The noise assessment predicted noise levels from the various activities at the closest sensitive receivers using methods from relevant Australian Standards, as outlined in Appendix D and reproduced below in Table 6-10.

The assessment found that receiver M5-1, as shown in Figure 6-19, was the closest to several of the construction activities and would likely experience the highest single construction sound level, which will result from the WTG foundation and assembly works. The predicted range of construction sound levels that

will be heard at the nearest sensitive receiver is in the order of 40–45 dB $_{Laeq}$. Several of the involved receivers will also experience sound levels in the upper end of this range (30–55 dB $_{Laeq}$).

The potential impacts to the closest sensitive receivers will be temporary in nature and will gradually decrease as construction of the closest Project features are finalised. Careful management and mitigation will need to be followed to avoid nuisance noise at the nearest sensitive receivers, especially adherence to the work time restrictions outlined in the EPP for noise (refer Section 6.4.4).

Marshall Day also considered potential vibration impacts from construction and found the potential for vibration impacts to any receivers was extremely unlikely given the closest receiver (M12-1, which is an involved receiver) is approximately 660 m from the nearest activity and the recommended minimum working distances for cosmetic damage and human response are 25 m and 100 m respectively for the worst-case machinery items.

Table 6-9 Example construction machinery and task sound power levels

Equipment and machinery	**Sound power level (dBL_{WA})**
Concrete batch plant	110
Bulldozer	108
Dump truck	117
Excavator (100–200 kW)	107
Crane (1,200 t)	115
Rock crusher	120
Construction task (plant and equipment required)	**Approximate aggregated sound power level (dBL_{WA})**
Access road and track construction (1x bulldozer, 7x delivery trucks, 2x dump trucks, 2x excavators, 1x grader)	120
WTG foundation and assembly (1x bulldozer, 1x concrete pump, 2x concrete trucks, 1x crane (1,200t), 1x dump truck, 1x excavator, 1x rock crusher)	125

Table 6-10 Indicative range of construction noise predictions

Construction task	**Non-involved receivers**		**Involved receivers**	
	Nearest receiver	**Predicted level range (dB Laeq)**	**Nearest receiver**	**Predicted level range (dB Laeq)**
Access road and tracks construction	M5-1	40-45	M12-1	50-55
Cable trench digging	M5-1	40-45	M12-1	50-55
Concrete batching	T19-1	30-35	M12-1	40-45
Permanent met mast	K17-1	30-40	Q13-1	35-40
Powerline pole	K17-1	30-35	M12-1	40-45
Site compound	T19-1	30-35	M12-1	40-45

Construction task	Non-involved receivers		Involved receivers	
Substation	K17-1	30-35	M12-1	40-45
Switchyard	F15-1	25-30	M12-1	30-35

Blasting

It is possible blasting may be required for ground excavation for some project components if unfavourable ground conditions are encountered on site (this will be determined following geotechnical studies post-approval). The Tasmanian *EPA Quarry Code of Practice 3rd Edition*, dated May 2017 (Quarry Code of Practice), provides guidance for assessing blast-induced airblast and vibration effects from quarries. Although it is understood that blasting may be required for the construction foundations and trenching rather than quarrying activities, the requirements detailed in the Quarry Code of Practice still provide a useful reference for consideration of blasting impacts and have been used for this project.

Section 7.4.2 of the Quarry Code of Practice specifies the following criteria:

- Airblast overpressure at sensitive sites must be:
  - below 115 dB Lzpeak[26] for 95% of all blasts; and
  - below 120 dB Lzpeak at all times.
- Ground vibration at sensitive sites must be:
  - below 5 mm/s (PPV) for 95% of all blasts; and
  - below 10 mm/s (PPV) at all times.

The above criteria are based on the Australian and New Zealand Environment Council report '*Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*', dated September 1990 (ANZEC 1990 Report). Based on the ANZEC 1990 Report, a limit of 115 dB Lzpeak is referenced to practically minimise the risk of cosmetic or structural damage to typical residential constructions from airblast.

The Quarry Code of Practice also requires that, where blasting is expected within 1 km of sensitive receivers, modelling and monitoring of ground vibration and airblast overpressure must be undertaken in accordance with AS 2187.2:2006 *Explosives – Storage and use, Part 2: Use of explosives* (AS 2187.2).

Given the Project layout in relation to sensitive receiver locations and the fact that blasting will only be required in the event of hard rock, it is unlikely that blasting will be required within 1 km of any sensitive receiver locations. Given the separating distances, the fact that blasting will only be used for areas of hard rock and that the excavation methods needed to prepare the turbine foundations would not be determined until subsequent stages of the project, detailed modelling of vibration and airblast overpressure was not warranted at this stage and has not been conducted as part of this assessment.

Notwithstanding the above, to provide an indication of the effects of blasting, overpressure levels have been estimated using the method detailed in AS 2187.2. The method accounts for the separating distance, the mass of the charge detonated in any given instant (referred to as the maximum instantaneous charge), the configuration of the charge (unconfined versus confined blastholes), and site characteristics that can be evaluated from measurements of test shots.

For confined blasthole charges, as may be used for this Project, and accounting for example site characteristics described in AS 2187.2, estimated airblast overpressure levels are presented in Figure 6-18 for

[26] LZpeak means the maximum absolute value of the instantaneous sound pressure level using a Z-weighting frequency curve.

a range of separating distances and maximum instantaneous charge weights. The criteria specified in the Quarry Code of Practice are also shown in Figure 6-18. The figure illustrates the predicted airblast overpressure for different charge mass (maximum instantaneous charge), demonstrating that adjustment to blast mass can be made to reduce airblast over pressure at receiver locations as needed. The results in Figure 6-18 demonstrate that, for the assumed site characteristics, achieving compliance with the applicable airblast criteria is dependent on selection of suitable maximum instantaneous charge weights, accounting for the site characteristics of the locations where blasting may be needed.

Accordingly, if blasting is ultimately required, the activities will be controlled using blast management procedures documented in construction management plans. The procedures would identify the locations where blasting could be conducted and describe the testing, management and monitoring measures that would be implemented to achieve the Quarry Code of Practice criteria. This is expected to involve conducting test shots to evaluate site-specific characteristics, in turn enabling the selection of suitable maximum instantaneous charge weights that are appropriate for the site. In this way the potential impact of blasting (if required) can be effectively managed through construction controls.

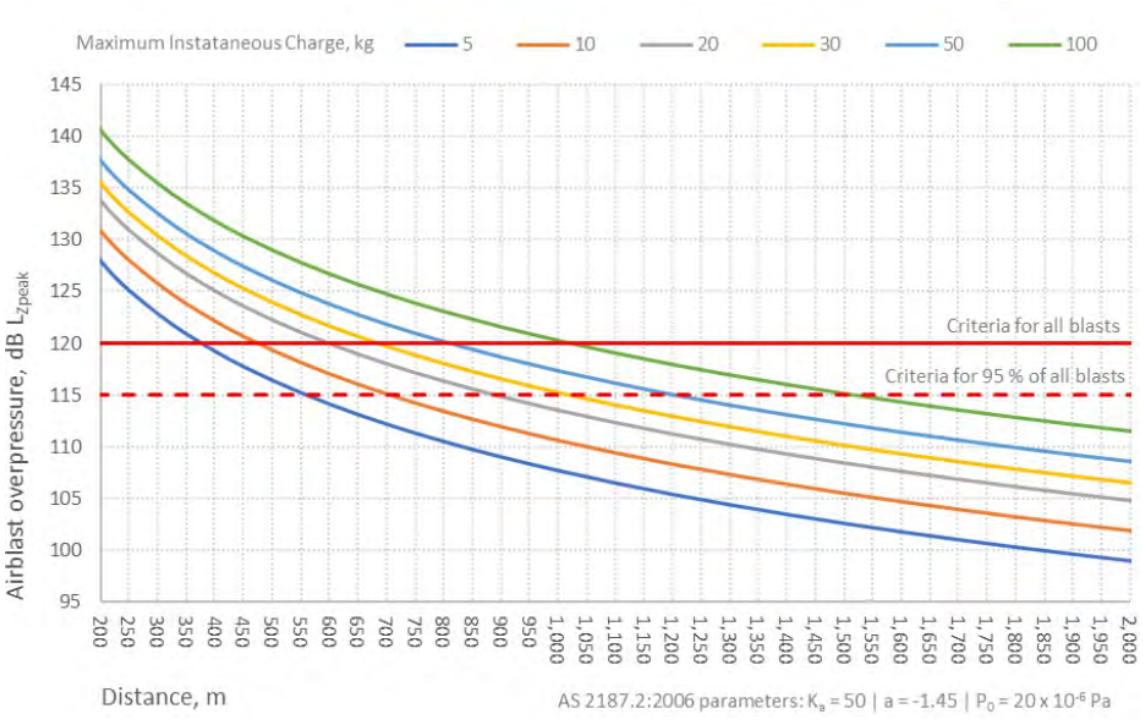


Figure 6-18 Estimated airblast overpressure levels for Ka = 50 and a = -1.45 (Marshall Day, 2023)

Offsite traffic

Offsite construction noise generated by traffic associated with the Project also has the potential to impact on sensitive receivers along the haul routes to site. Marshall Day addresses offsite construction traffic noise in its report (Section 8.1.3 of Appendix D), and further information on construction traffic volumes and movements is included in Section 6.14. It notes there is no Tasmanian guidance document in relation to the assessment of construction traffic noise levels on public roads and instead a pragmatic approach to minimising offsite traffic noise is applied. Marshall Day notes that some oversized WTG component deliveries may need to occur at night in order to reduce potential traffic disruption on local roads and makes several recommendations for mitigation measures to manage this potential risk, as adopted in Section 6.4.4.1. With these measures applied, the impact of offsite traffic noise during construction is considered to be manageable and is not expected to significantly impact on sensitive receivers.

6.4.3.2 Operation

Once operational, the key noise generating source from the Project will be the WTGs themselves, which produce levels of noise that have the potential to cause impacts to noise sensitive receivers.

To assess the potential noise impacts from the WTGs on the amenity of sensitive receivers, a suitable noise limit was first established in accordance with the new EPA limit. The EPA defines acceptable noise limits at (non-involved) noise sensitive locations as 35 dB or the background $_{LA90}$ + 5 dB, whichever is greater. As 40 dB $_{LA90}$ is considered by NZS 6808 as appropriate for the protection of sleep, health and amenity of residents at most sensitive receivers, it is assumed the Tasmanian limit achieves this to a higher degree.

Noise limits for the Project were established slightly differently for involved and non-involved sensitive receivers in accordance with NZS 6808. For non-involved receivers, applicable background dependent noise limits were calculated based on the background monitoring data as presented in full in Table 6 of Appendix D. The adopted levels vary at each receiver location and vary with wind speed. In most instances 35 dB $_{LA90}$ has been adopted at low wind speeds (wind speeds under 8 m/s) and up to 48 dB $_{LA90}$ at the highest wind speeds where the noise of the wind itself masks other noise to a degree.

For the involved receivers within the predicted 35 dB limit, a base noise limit was agreed to between the owners and the Proponent, consistent with similar circumstances in other Australian states.

Using the modelled contours for the candidate WTG – the Vestas V162 6.2 MW WTG[27] – the highest predicted noise levels at non-involved receivers were all found to be below the base noise limit of 35 dB $_{LA90}$.

The highest modelled noise level for involved receivers was 38.2 dB $_{LA90}$ at receiver M12-1 (noting this is below the 40 dB $_{LA90}$ level nominated in NZS 6808 as appropriate for the protection of sleep, health and amenity of residents).

The potential for significant impact to sensitive receivers as a result of WTG noise is therefore considered negligible.

Cumulative impacts

With regard to cumulative impacts, in accordance with NZS 6808, the noise limits determined for a wind farm apply to the total combined operational wind farm noise level and the contribution of any neighbouring wind farm developments. In the Project's case, Cattle Hill Wind Farm, which lies within 10 km of the Project, is considered the only neighbouring wind farm; any wind farms further away than 10 km from the Project would not have a cumulative effect (Marshall Day, 2023). Noise Standard NZS 6808 states that "*if the predicted wind farm sound levels for a new wind farm are at least 10 dB below any existing wind farm sound levels permitted by any resource consent of plan, then the cumulative effect shall not be taken into account*".

Given the relatively large distance between the sites (approximately 10 km between the nearest WTGs between the two sites), a simplified assessment was undertaken to identify any likely cumulative effect. This was done by comparing the predicted contour for the applicable noise limit of one site against the same applicable noise limit at the other site minus 10 dB (from the NZS 6808 statement above), and then the same methodology applied in reverse for the other site. This gives the following two scenarios:

- For the potential cumulative impact from the Project to the Cattle Hill Wind Farm, the predicted 30 dB $_{LA90}$ noise contour of the Project (i.e. 10 dB $_{LA90}$ below the Cattle Hill Wind Farm applicable limit)

[27] The noise assessment assumes WTGs operating in unconstrained generation mode and with the application of blade serrations. Blade serrations are routinely used to reduce wind turbine noise emissions and their use is now market standard in Australia, hence the WTGs for the Project will include blade serrations. WTGs can be operated in a noise-reduced operating mode in situations where noise emissions (particularly night-time emissions) are in excess of adopted noise limits; however, energy generation is limited in this mode. Noise assessment for the Project has assumed normal operating mode (this mode generates the most efficient energy) and found the predicted noise levels to be within adopted noise limits.

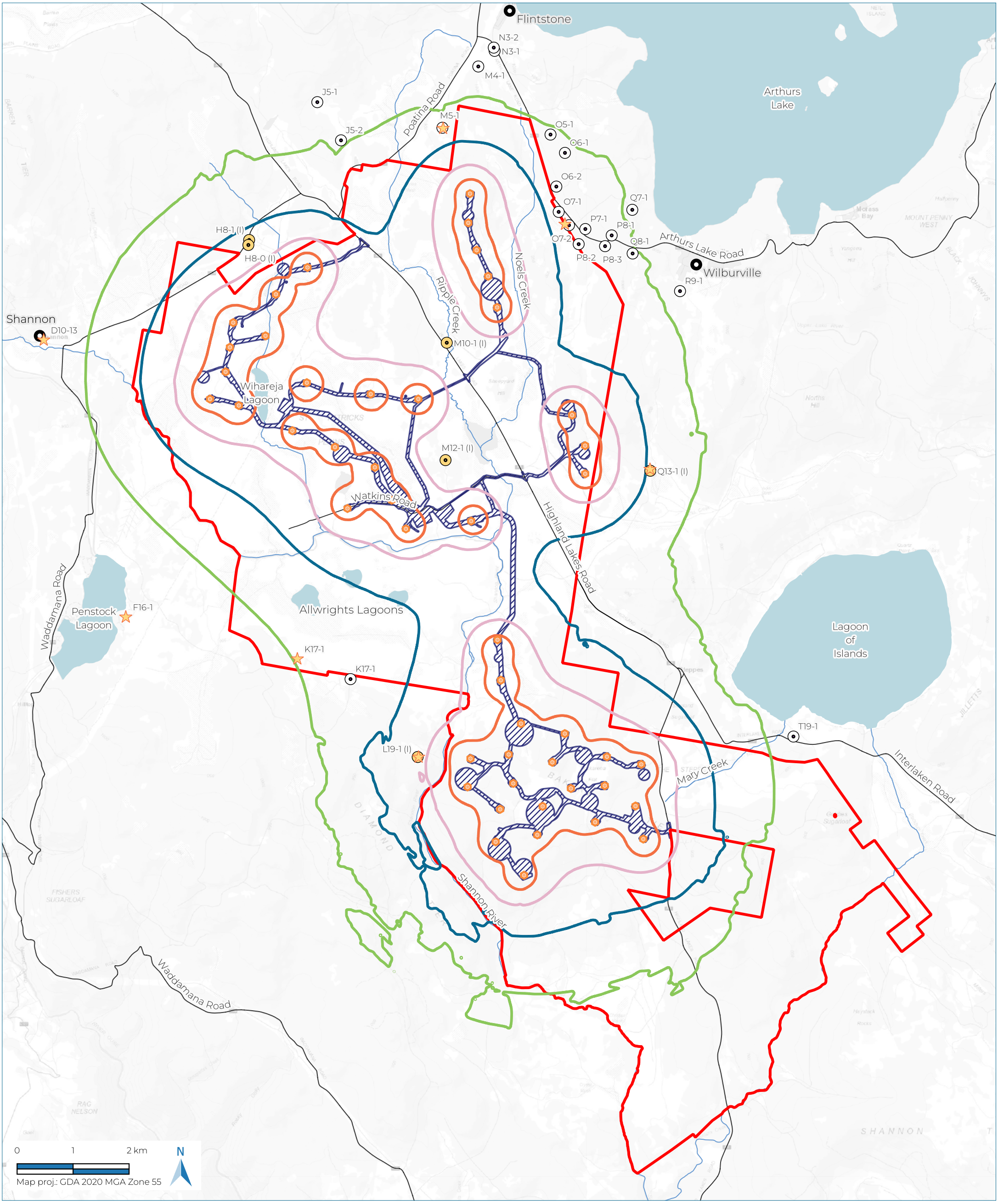
is plotted against the predicted 40 dB $_{LA90}$ noise contour from the Cattle Hill Wind Farm (i.e. the Cattle Hill Wind Farm applicable base noise limit).

- For the potential cumulative impact from the Cattle Hill Wind Farm to the Project, the predicted 25 dB $_{LA90}$ noise contour from the Cattle Hill Wind Farm (i.e. 10 dB $_{LA90}$ below the Project's applicable limit) is plotted against the predicted 35 dB $_{LA90}$ noise contour of the Project (i.e. the Project's applicable base noise limit).

These two scenarios are plotted in Figure 3 and Figure 4 respectively in Appendix D. As can be seen in the figures, the contours from both scenarios do not overlap, indicating that the "*at least 10 dB below any existing wind farm sound levels*" requirement from NZS 6808 is met and no cumulative effect is required to be taken into account.

The other piece of infrastructure that may generate noise levels with the potential for annoyance during operation is the substation, with the main sound sources being the transformers and associated cooling equipment within the facility. Noise emissions were assessed for two potential substation locations within the Project Site, shown in Figure 6 of Appendix D. Sound power levels for the substations were estimated using available Australian Standards, explained further in Appendix D. The substation location has since been selected and the outcome of the assessment was that the nearest receiver to the substation site chosen for the Project would experience an estimated 18 dB $_{Laeq}$ as a result of the substation, which is well below the EPP's average outdoor acoustic environment indicator level of 45 dB $_{Laeq}$, applicable except in bedrooms. This suggests measurable impacts from noise associated with the proposed substation site are unlikely to occur.

Traffic during the operational phase will be limited in volume and generally only occur during daylight hours (refer Section 6.14) and as such any additional noise generated from operational phase traffic is expected to be negligible in the context of existing traffic noise.



Project site (the Land)

EXISTING INFRASTRUCTURE
- Towns/communities
- Involved dwelling/receiver
- Dwelling/receiver
- Roads

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Construction footprint
- Wind Turbine

HIGHEST PREDICTED NOISE CONTOUR (from Marshall Day)
- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA

MONITORING
- Background monitoring locations

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 6-19
Noise sensitive receivers with modelled noise contours

6.4.4 Management, mitigation and monitoring

6.4.4.1 Construction

The following management, mitigation and monitoring is proposed for the construction phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Noise MM 1	Where possible, operation of machinery and equipment with potential for high noise generation during construction will be restricted to normal daytime operating hours, in line with the *Environmental Management and Pollution Control (Noise) Regulations 2016*, namely: • 07:00 to 18:00 Monday to Friday • 08:00 to 18:00 Saturday • 10:00 to 18:00 Sundays and public holidays Where this is not possible, prior communication with potentially effected residents will be undertaken.
Noise MM 2	Low-noise-generating plant and equipment will be used where practicable.
Noise MM 3	Broadband reversing alarms will be used where practicable over traditional tonal alarms to minimise any nuisance noise generated.
Noise MM 4	The Proponent will require the contractor to have regularly serviced and maintained equipment to minimise noise emissions.
Noise MM 5	Where practical, machinery will be operated at low speed or power and be switched off when not in use, rather than left idling for prolonged periods.
Noise MM 6	Delivery trucks will be advised to not use exhaust brakes in populated areas, especially during night-time deliveries of the WTG components.
Noise MM 7	Relevant local communities will be notified in advance of any deliveries required outside normal working hours (6 am to 6 pm seven days per week).
Noise MM 8	Regular community updates will be completed at identified noise sensitive receivers to inform of upcoming construction timeframes.
Noise MM 9	Prior to construction, a pre-development noise assessment will be prepared in accordance with NZS 6808, based on the final WTGs model and layout, to verify the impacts of the final design and equipment selections, including consideration of special audible characteristics. The noise assessment will be submitted to the EPA prior to commencement of construction.
Noise MM 10	If blasting is required, dedicated blast management procedures will be documented in construction management plans, including identifying the locations where blasting can be conducted and describing the testing, management and monitoring measures that would be implemented to achieve the Quarry Code of Practice criteria.
Various MM 8	Project information and construction schedules will be provided to local residents, advising them of potential dust, odour, noise and traffic generation during construction and the mitigation measures to be applied.
Various MM 9	A construction phase online complaints register and contact phone number will be established to capture any dust, odour, noise, traffic or other complaints received from the public. Complaints will be actioned, the complainant notified and a record kept of the resolution.
Monitoring	
There is no specific noise related monitoring proposed during the construction phase, noting that the online complaints	

Reference number	Management, mitigation or monitoring measure
register (refer Various MM 9) will provide a mechanism to identify and resolve noise issues if they occur.	

6.4.4.2 Operation

The following management, mitigation and monitoring is proposed for the operational phase of the Project.

Where measures are directly applicable to several topics, they are referenced as 'Various' and replicated in all relevant sections of this EIS for completeness.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Noise MM 11	During the operational phase, any high-noise-generating maintenance activities will be undertaken during normal operating hours (Monday to Friday 8 am to 6 pm) whenever possible.
Various MM 10	An operational phase online complaints register and contact phone number will be established to capture any noise, traffic of other complaints received from the public. Complaints will be actioned, the complainant notified and a record kept of the resolution. Any complaints and their resolution will be documented and provided to the EPA as part of annual environmental reporting.
Monitoring	
Noise MON 1	Within 6 months of the date of commencement of operation a noise assessment will be undertaken in accordance with NZS 6808 demonstrating compliance with the operational noise requirements.

6.4.5 Residual impacts

The largest potential noise impacts associated with the Project arise from the operation of the WTGs, as they will be a constant sound source over the life of the Project. The modelling undertaken for the candidate turbine and proposed layout has shown that predicted noise levels are within the prescribed noise limits, and noise impacts to sensitive receivers during operations are expected to be negligible. These modelling outcomes demonstrate that the Project can operate in a sustainable manner with respect to noise levels.

As outlined above, the construction phase of the Project will be managed in line with the *Environmental Management and Pollution Control (Noise) Regulations 2016* regarding limitations on construction hours for plant and equipment. This will ensure that noise levels outside the allowable construction hours are not generated, unless previously approved in writing by Council. Also, the additional management and mitigation proposed will aid in reducing the noise generated during the allowable construction hours. Given the remoteness of the site and the low number of potential receivers in the vicinity of the Project, significant impacts to the community at large are not expected to occur.

Offsite traffic noise will be generated but is expected to be managed and mitigated with a detailed traffic management plan, as outlined in Section 6.14.

Through the control and mitigation measures outlined above, the Project is considered to meet the objectives of the EPP for noise and other relevant guidelines and legislation.

6.5 Air quality

6.5.1 Existing environment

The Central Highlands is a vast area, with virtually no industrial activities present and a relatively small residential population. There are no significant industrial operations in or near the Project Site and the existing potential for dust and odour generation is very limited. There may be sporadic minor dust generation throughout the year as a result of the usage of several areas of unsealed roads in the region by the public or through agriculture or silviculture activities. In general the local air quality is expected to be high.

6.5.2 Legal and other requirements

The *Tasmanian Environment Protection Policy (Air Quality) 2004* provides a framework for management and regulation of diffuse and point source air emissions in Tasmania. The policy sets out environmental values to be protected including the life, health and wellbeing of humans and other forms of life, visual amenity and buildings, property and materials.

The key objective for this Project is to manage air emissions in a way that does not compromise the values the policy sets out to protect.

6.5.3 Potential impacts

There are no point source air emissions proposed for the Project, and potential for air emissions is limited to dust generation and potentially very minor odour generation associated with onsite wastewater management.

6.5.3.1 Construction

Dust

Dust may be generated during the construction phase of the Project throughout the drier summer months of the year from various construction activities, including excavating, trenching, stockpiling of materials and movement of vehicles around the unsealed roads of the Project Site.

The potential severity of dust generation will be related to the soil type and the climatic conditions present around the Project Site, which given the high rainfall and generally damp conditions, is expected to be low.

Generation of dust in high quantities must be managed as it can potentially impact on a number of receivers:

- Vegetation can be coated in dust particles which can affect photosynthetic and transpiration processes.
- Both fauna and humans can inhale dust particles leading to respiratory stress.
- Dust clouds can result in a loss of local amenity and can result in health and safety impacts from reduced visibility.

The closest sensitive receiver to potential dust generating activities, such as excavating, is M5-1 at 1,283 m distance from the closest activity, as shown in Figure 1-2.

Significant dust generation and associated impacts to nearby sensitive receivers are not expected for the majority of the year, given the climatic conditions generally encountered in the area (e.g. high rainfall). While dust may be experienced adjacent to construction areas and along stretches of road within the Project Site, these impacts are expected to be localised and limited in duration and no significant impacts to sensitive receivers are likely, especially given the distance to the nearest sensitive receiver. The exception to this may

be during periods of exceptionally dry weather, where dust generation may temporarily become problematic without appropriate management (refer Section 6.5.4).

Odour

There is a very small possibility of fugitive odour emissions from the toilet facilities and waste storage locations in the construction compounds.

The construction toilet facilities will include either a fully containerised temporary sewage treatment system or several portable toilets within the construction compound(s). Either system will include regular collection of waste by a licensed contractor. These facilities have the potential to produce odour; however, given the distance to the nearest sensitive receiver, impacts are expected to be negligible.

If stored incorrectly, various other waste streams, such as putrescible waste bins, have the potential to release fugitive odour emissions; however, given the distance to the nearest sensitive receiver, impacts are expected to be negligible.

Despite potentially negligible impact to the environment, management and mitigation measures will be implemented for the amenity and hygiene of construction contractors and operational workers (refer Section 6.5.4).

6.5.3.2 Operation

During operation of the Project the potential for air emissions is negligible. There may be very minor dust generation from vehicle movements on unsealed roads, but the very low traffic volumes during operation would result in a negligible increase in dust compared to existing site conditions.

During operation, toilet facilities will be fully plumbed enviro-cycle toilets with a very low chance of odour emissions, with negligible impacts to sensitive receivers expected.

6.5.4 Management, mitigation and monitoring

Although the potential for air emissions from the Project is considered to be very low, and the nearest sensitive receiver is a considerable distance from the Project Site, management and mitigation is still appropriate and will be applied as follows.

6.5.4.1 Construction

The following management, mitigation and monitoring is proposed for the construction phase of the Project. Where management measures are directly applicable to several topics, they are referenced as 'Various' and replicated in all relevant sections of this EIS for completeness.

Relevant management, mitigation and monitoring from Section 6.8 – Waste management (regarding toilets and waste streams) will also assist in minimising potential odour risks.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Air Quality MM 1	Potential dust-generating material stockpiles, roads or excavated areas will be sprayed during periods of dry weather with water or a suitable dust suppressant as required.
Air Quality MM 2	Speed restrictions will be applied to all roads within the Project Site, which will minimise dust generation.
Various MM 8	Project information and construction schedules will be provided to local residents, advising them of potential dust, odour, noise and traffic generation during construction and the mitigation measures to be applied.

Reference number	Management, mitigation or monitoring measure
Various MM 9	A construction phase online complaints register and contact phone number will be established to capture any dust, odour, noise, traffic or other complaints received from the public. Complaints will be actioned, the complainant notified and a record kept of the resolution.
Monitoring	
Daily monitoring of visible dust at the construction sites will be undertaken as part of the CEMP monitoring program as documented in Section 6 (refer Various MON 1).	

6.5.4.2 Operation

Once operational, the Project is not expected to result in any significant dust or odour generation, given the small number of road users within the Project Site and the fully installed enviro-cycle sewage system and small general waste stream, therefore operational phase management and mitigation (beyond standard design controls and maintenance) are not considered necessary. Waste management matters are addressed in Section 6.8.

6.5.5 Residual impacts

The overall potential impacts for odour and dust generation from the Project during both construction and operation were considered very low prior to the application of management, mitigation and monitoring, and are likely to be negligible with the application of such measures.

6.6 Surface water and aquatic fauna

6.6.1 Existing environment

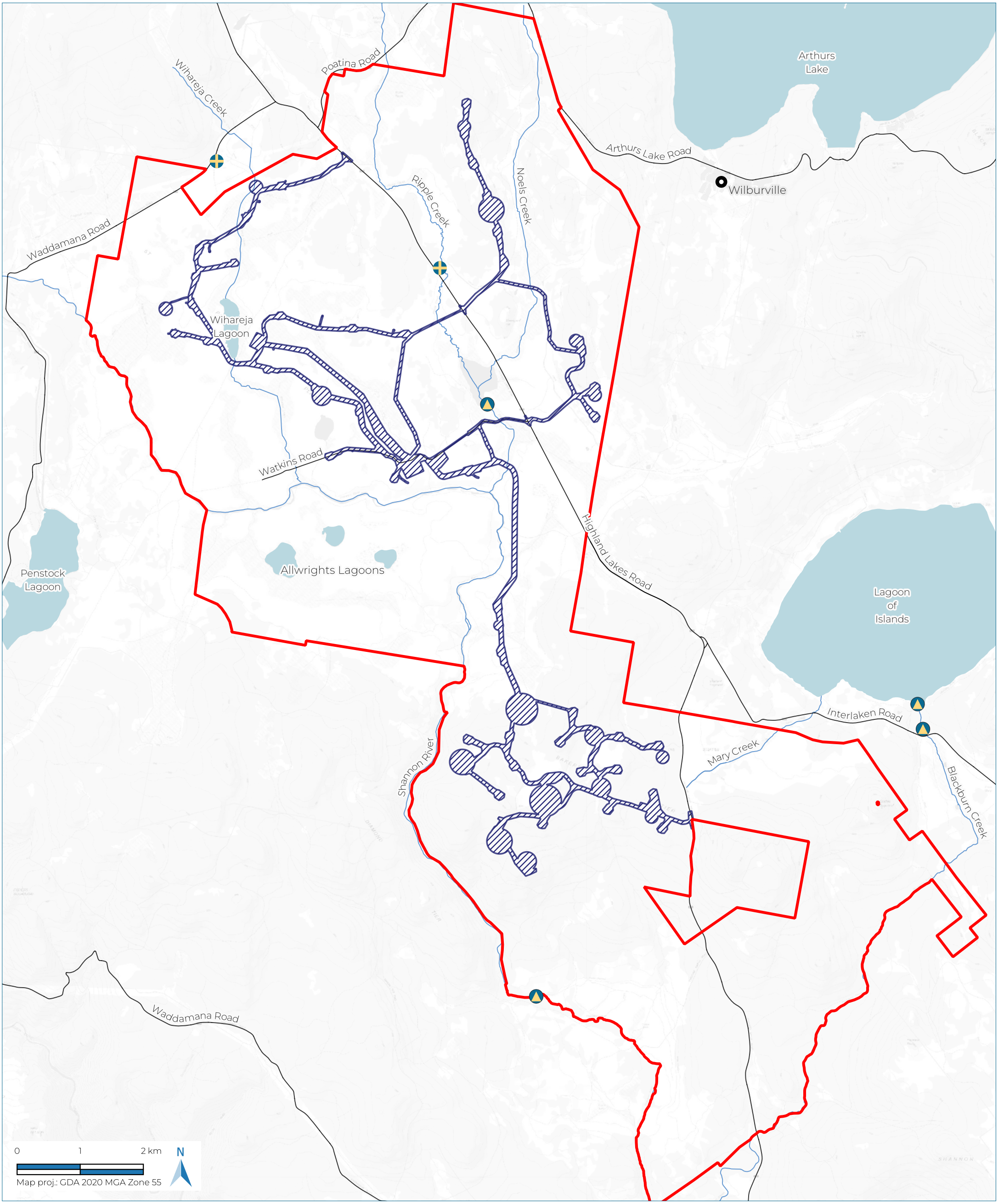
As described in Section 5.2, there is a variety of waterbodies throughout the Project Site, generally concentrated in the northern half. The main water course is the Shannon River, which borders sections of the Project Site to the west and also enters the site near the Allwrights Lagoons area (three lagoons occur in the group) in the mid-section of the Project Site. Other waterways include Ripple and Wihareja creeks, and a number of unnamed creeks, tributaries and drainage lines; there are also several unnamed lagoons and large tracts of ephemeral wetlands. These waterways can be seen in Figure 6-20.

The majority of fish species likely to be encountered within the waterways of the Project Site are the introduced brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). There is also a chance that occasional galaxiid species could occur within the Project Site, with the most likely species to occur based on the linkages in the area being the Shannon galaxias (*Paragalaxias dissimilis*), listed as vulnerable under the TSP Act and Vulnerable under the EPBC Act; there are two historical NVA records of the species in the Shannon River (NBES, 2023b).

The Shannon galaxias is endemic to Tasmania and is only known from the Great Lake, Shannon Lagoon and Penstock Lagoon (all of which lie outside the Project Site) (NRE, 2022) (Department of Primary Industries and Water, 2006), with controlled releases from the Hydro Tasmania infrastructure at the Great Lake and the Shannon Lagoon preventing free movement of this species through to the Shannon River. Although there are two historical NVA records of the species from the Shannon River within the Project Site, these records date back to the 1930s and are likely derived from an environmental flow release from Great Lake, with NBES concluding that it is uncertain if the river could sustain a permanent population (NBES, 2023b).

There is also the chance, albeit low according to NBES (2023b), that various species of listed aquatic invertebrates, including isopods, amphipods caddis flies and aquatic snails, could be present within the waterways of the Project Site (NBES, 2023b).

There are no additional listed fish species or aquatic flora that are likely to occur within the ephemeral wetlands and creeks that may be affected by the Project footprint.



Project site (the Land)

EXISTING INFRASTRUCTURE
- Towns/communities
- Roads

NATURAL FEATURES
- Rivers and streams
- Lakes and lagoons

PROPOSED INFRASTRUCTURE
- Construction footprint

WATER RESOURCES
- Water licence offtakes
- Groundwater bores

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 6-20
Surface water

6.6.2 Legal and other requirements

The proposal must be consistent with the objectives and requirements of the:

- *Environmental Management and Pollution Control Act 1994*
- *Threatened Species Protection Act 1995*
- *Environment Protection & Biodiversity Conservation Act 1999*
- *Water Management Act 1999*
- *Inland Fisheries Act 1995*
- *State Policy on Water Quality Management 1997.*

The *State Policy on Water Quality Management 1997* sets out to *"... ensure that diffuse source and point source pollution does not prejudice the achievement of water quality objectives and that pollutants discharged to waterways are reduced as far as is reasonable and practical by the use of best practice environmental management"* (Part 2, 6.1b).

Under the policy, a range of environmental values are identified for any given aquatic areas that are to be protected; these are referred to as protected environmental values (PEVs). It must be demonstrated that the Project will not prejudice the achievement of any water quality objectives set for water bodies under the policy, which defines water quality objectives as the most stringent set of water quality guidelines that should be met to achieve all the PEVs nominated for that body of water.

The PEVs for the surface waters within the Project Site are drawn from *Environmental Management Goals for Tasmanian Waters: Derwent River Catchment* (DPIWE, 2003), specifically *Surface Waters on Private Land in the Central Highlands and Derwent Valley Municipal Areas (including forest on private property)* which includes:

- A: Protection of Aquatic Ecosystems (ii) Modified (not pristine) ecosystems (a) from which edible fish are harvested
- B: Recreational Water Quality & Aesthetics (ii) Secondary contact water quality and (iii) Aesthetic water quality
- C: Raw Water for Drinking Water Supply (ii) Subject to coarse screening plus disinfection
- D: Agricultural Water Uses Irrigation (ii) Stock watering
- E: Industrial Water Supply (Aquaculture, pulp and paper mill, hydro-electricity generation).

That is, the Project must be designed and managed to ensure that any discharge does not prejudice the PEVs listed above.

6.6.3 Potential impacts

There are no point source water emissions proposed for the operation of the Project, and with appropriate stormwater design in place, the potential for surface water impacts is generally localised and limited to the construction phase.

6.6.3.1 Construction

The Project has the potential to impact on surface waters during construction through vegetation clearance, sedimentation and erosion, spills of environmentally hazardous materials, and release or run-off of polluted (including sediment laden) stormwater or floodwater, or from potential acid sulfate soils (PASS) (as discussed in Section 6.10).

The Project has been designed to avoid construction works within or adjacent to waterways and water bodies where possible; the major waterways and waterbodies within the Project Site have been avoided

completely, including the Shannon River, Wihareja Lagoon, and Allwrights Lagoons. This offers both practical and environmental benefits. There are, however, some areas of the Project, such as roads or powerlines, that are required to cross areas of ephemeral inundation or creeks in order to make the Project connectable to the grid and road networks.

In terms of number of crossings of creeks, Noels Creek requires one crossing by an access road, and Ripple Creek is required to be crossed twice by access road and will be directionally drilled under for a section of electrical cabling. Wihareja Creek will require an access road crossing upstream of Wihareja Lagoon and one downstream. Disturbance to remaining surface waters is limited to areas of ephemeral wetlands and minor drainage lines.

All crossings are relatively minor in nature (e.g. concrete culverts) but will need to be designed and managed to avoid aquatic impacts, including loss of riparian vegetation, release of sediment, erosion, and blockage to fish passage. The Project's culverts will be designed in accordance with the general design principles outlined in Appendix A and will be fish and frog friendly, ensuring minimal impact to any passage of these species.

As there will be no substantive construction in permanent lagoon or wetland areas, aside from a met mast with a minimal footprint, and only minor construction works associated with the linear crossings of creeks, mentioned above, the potential environmental impacts can be readily managed through appropriate design and construction controls (refer Section 6.6.4), which will be in accordance with the general design principles outlined in Appendix A.

There are no proposed direct footprint impacts to the Shannon River, and areas of ephemeral flow throughout the Project Site have also been avoided, with the exception of several minor creek and drainage line crossing points (for roads and cable trenches) as mentioned; therefore, potential for impacts to fish species, including the Shannon galaxias, is very low.

As water is required to be abstracted from the Shannon River (proposed to be from an existing Hydro Tasmania gauging station within the Project Site) for a construction water supply (outlined in Section 2.4.3.1), when water is required to be pumped, intake screening will be used to prevent fish and other aquatic species from entrainment. All approvals for water abstraction, which will equate to approximately 84.6 ML for all uses across the construction period, would be obtained from Hydro Tasmania by the construction contractor, with appropriate calculations made by Hydro Tasmania to ensure environmental flows are maintained and threatened species habitat protected. Hydro Tasmania has noted the volume requirements to be relatively small for the Project and would be unlikely to require the release of any additional water to the current environmental flow releases occurring from the upstream Miena Dam.

Spills or leaks of environmentally hazardous materials, such as hydrocarbons (fuels, oils, lubricants), cement, pesticides/herbicides, or various waste streams, all have the potential to reach surface waters either directly or via stormwater drainage, flooding or seepage if not properly managed. If these materials reach waterways in significant concentrations, they can lead to serious impacts to aquatic flora and fauna through direct toxicity or via secondary effects to water quality and habitat.

Stormwater and floodwater have the potential to entrain contaminants, including sediment and environmentally hazardous materials, as it passes over various surfaces and through drainage systems. Once this affected water reaches natural surface water bodies, it has the potential to impact aquatic flora and fauna as mentioned above. Furthermore, if not mitigated and managed correctly, stormwater can lead to serious erosion damage of both terrestrial and aquatic habitats. The design of all stormwater infrastructure will be in accordance with the general design principles outlined in Appendix A, including being designed to withstand foreseeable flood events.

During construction, portable toilets will be used and all wastewater removed from site. Wastewater from the bunded vehicle washdown facility will be collected and disposed of at a licensed facility on a regular

basis, as disinfectant will have been applied to the washdown water and will present a risk of environmental harm.

6.6.3.2 Operation

Once operational, the Project poses very little risk to surface waters at the Project Site, noting that onsite amenities (toilets, kitchen etc.) will be plumbed to an onsite 'enviro-cycle' system or similar, designed to all relevant standards. There will be no discharge to municipal sewers. With appropriate roof and stormwater collection and drainage systems in place, the potential for ongoing impact can be eliminated.

6.6.4 Management, mitigation and monitoring

6.6.4.1 Design

The following management and mitigation is proposed for the design phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Surface Water MM 1	The following key design measures will be applied to the project and will be fully documented in the final Wind Farm Design Report, to be submitted to the EPA for review and approval prior to construction: • All waterway crossings will include suitable fish and frog friendly culverts to minimise habitat fragmentation and transitory impacts to these fauna groups. • All culvert designs will include suitable stabilisation of surrounding sediments to minimise erosion impacts. • Roads will be designed with suitable drainage, including appropriate camber and natural drainage swales, and any concentrated discharges will pass through water mitigation infrastructure such as rock filters. • All buildings will be designed to take flood risk into account, as is required by the building code. This will include storage locations of all environmentally hazardous materials.
Monitoring	
There is no surface water quality monitoring proposed during the design phase.	

6.6.4.2 Construction

The following management, mitigation and monitoring is proposed for the construction phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Surface Water MM 2	Prior to construction commencing, a sediment and erosion control plan for the Project will be developed (either as a standalone document or part of the CEMP) and submitted to the EPA for approval prior to commencement of construction. The plan will then be implemented throughout construction. The plan will identify all major drainage lines and waterways and site-specific management and mitigation to be implemented, including controls such as sandbags, sediment fences, sediment traps and diffusion paths to ensure stormwater is suitably contained, managed and released to avoid and minimise sediment release, pollution and erosion.

Reference number	Management, mitigation or monitoring measure
	The sediment and erosion control plan will include measures for stormwater and flood waters, and a dewatering management process.
Surface Water MM 3	No materials will be stockpiled on existing drainage lines, and stockpile perimeter drains and sediment fencing will be used as required.
Surface Water MM 4	Disinfected washdown water will be collected on a regular basis from the washdown facility and carted off site by a contractor to a licensed wastewater facility.
Monitoring	
Sediment and erosion control features will be assessed for functionality and condition on a fortnightly basis during construction and immediately following extreme weather events as part of the CEMP monitoring program, as documented in Section 6 (refer Various MON 1). Daily visual monitoring of water bodies adjacent to active construction areas for signs of impact, such as high sediment load or surface sheen, will be undertaken as part of the CEMP monitoring program as documented in Section 6 (refer Various MON 1).	

Additional management and mitigation for water quality during construction is provided in the following sections:

- Section 6.7 – Groundwater
- Section 6.8 – Waste management
- Section 6.9 – Dangerous goods and environmentally hazardous materials
- Section 6.10 – Natural values (specifically ASS management).

As impacts to waterways are considered unlikely to occur with the management and mitigation in place, no additional specific water quality monitoring (other than visual monitoring associated with sediment and erosion control monitoring and what will be included in the ASS Management Plan) is proposed.

6.6.4.3 Operation

Once operational, the Project poses very little risk to surface waters, so operational phase mitigation and monitoring is not proposed, noting the operating Project consists of static structures with no point source discharges.

6.6.5 Residual impacts

The Project Site contains a considerable number of different waterbodies throughout, including rivers, creeks, lagoons and wetlands. The design of the Project has taken these areas into account and avoided them where possible to minimise impacts and engineering constraints, which has resulted in a design with minimised potential for direct impacts to waterways through clearance; major waterways and waterbodies have been avoided completely, including the Shannon River, Wihareja Lagoon, and Allwrights Lagoons.

As mentioned, the crossing of some small creeks and tributaries / areas of ephemeral inundation by access roads and cable trenches is unavoidable in some instances. In terms of number of crossings of creeks, Noels Creek requires one crossing by an access road, and Ripple Creek is required to be crossed twice by access road and will require to be directionally drilled under for a section of underground 33 kV electrical cabling. Wihareja Creek will require an access road crossing upstream of Wihareja Lagoon and one downstream. Disturbance to remaining surface waters are limited to areas of ephemeral wetlands and minor drainage lines.

Ensuring that the crossing designs contain suitable sediment and erosion control and (where needed) fish / frog friendly culverts, the potential for long-term impacts to aquatic habitat, including habitat segregation, are considered to be adequately minimised. Overall risks to the Shannon galaxias are therefore considered negligible with the main population of this species occurring outside the Project Site and its influence.

If general construction is managed in accordance with a site-specific sediment and erosion control plan and the additional management and mitigation controls cross-referenced above for the various other sections, the potential for impacts to surface waters is considered very low and the Project is therefore very unlikely to prejudice the PEVs of the area. This will be measured by the success of audits of the management, mitigation and monitoring controls for sediment and erosion, dangerous goods and environmentally hazardous materials, waste management, groundwater and ASS in the CEMP for the Project.

6.7 Groundwater

6.7.1 Existing environment

A hydrogeological investigation was undertaken for the Project in October 2022, the results of which are provided in the full report attached as Appendix J (Cromer, 2022a). The investigation included aquifer flow testing of available groundwater bores in the area, sampling of groundwater and surface waters for water quality analysis, and generation of a conceptual groundwater model for the Project Site and surrounds.

The geology of the area is dominated by Jurassic-age dolerite, with small areas of Permian-age sedimentary rocks in the south of the Project Site; extensive areas of volcanic rocks (basalt) occur over St Patricks Plains also. Superficial deposits of unconsolidated Quaternary-age alluvium occupy many of the drainage lines in the district (Cromer, 2022a).

The conceptual groundwater model is included in Appendix J. Observations from the model indicate that the Project Site can be considered a single unconfined aquifer, with groundwater moving through joints in the hard rock present and between mineral grains in the areas of alluvium. Groundwater flow rates are judged to be very low (centimetres per day) and travel times relatively long (i.e. years).

Two groundwater bores associated with existing properties occur in the Project Site, as shown in Figure 6-20, one near Wihareja Creek just off of Waddamana Road (4244a Waddamana Rd, Steppes, Tas 7030) and one off Highland Lakes Road adjacent to Ripple Creek (6300 Highland Lakes Rd, Steppes, Tas 7030). Both bores are listed as functional, with standing water levels of 1.1 and 0.91 metres below ground respectively; both bores are listed as drilled in Jurassic dolerite (DPIPWE, 2021b).

Flow testing of the bores showed that a maximum of around 1 L/s continuous pumping could be sustainable for the surrounding unconfined aquifer. Note that this rate would likely be unsuitable for the construction of the Project as large quantities would be needed rapidly but intermittently, so on this basis, only the river source is considered suitable.

Groundwater quality was found to be similar to surface water quality but with higher electrical conductivity (~180 µS/cm) and significantly higher nitrate concentrations; nitrate was found to be around 10 times higher than the default toxicant trigger levels outlined in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) for freshwater at 95% species protection. Traces of iron and zinc were detected in the groundwater, but well below ANZG (2018) default toxicant concentrations.

6.7.2 Legal and other requirements

Protection of groundwater resources in Tasmania is generally governed by the:

- *Water Management Act 1999*
- *State Policy on Water Quality Management 1997 (Water Quality Policy)*.

Under the policy, interim PEVs for groundwater have been adopted and default guideline values (DGVs) for aquatic ecosystems of groundwater have been set by the EPA (EPA Tasmania, August 2020), to protect the identified PEVs. The Project must not compromise the PEVs set for groundwater in Tasmania.

6.7.3 Potential impacts

6.7.3.1 Construction

As discussed in Section 6.6.3.1, approximately 84.6 ML of water will be required for the Project for concrete foundations and general construction requirements. During the operational phase there will be very little water required for the Project, and all water requirements will be met using rainwater collected in tanks at the operations facility and potentially water deliveries during periods of dry weather. The current proposal is to source construction water from the Shannon River from an offtake site within the Project Site, as

indicated in Figure 2-2, which will be managed by Hydro Tasmania in conjunction with the building contractor. Therefore, no groundwater abstraction is proposed as part of the Project.

The abstraction of groundwater was initially considered for the Project as a potential water source; however, water quality requirements with respect to concrete batching are generally not able to be met by groundwater, and surface water is preferred. Groundwater investigations were undertaken, including drawdown flow testing and water quality testing, to ensure the information was available if groundwater abstraction became a requirement. The results of these investigations are included in the hydrogeology report in Appendix J.

Given groundwater is expected to be relatively shallow adjacent to the many waterbodies around the Project Site, excavations for WTG footings and cable trenching may encounter groundwater from time to time that may require dewatering, albeit unlikely given WTG site selection has been carefully planned to avoid inundation-prone areas around the Project Site. Furthermore, higher elevation sites have been chosen over lower elevation sites for increased wind capture, therefore minimising the likelihood of encountering groundwater. In the event groundwater is required to be dewatered, water abstraction and discharge would be appropriately managed to avoid any sediment and erosion impacts from the discharge of the water back to surface drainage lines and any water quality impacts to surface waters, including the potential for ASS impacted water.

Spills of environmentally hazardous materials during construction, if uncontrolled, have the potential to permeate through to groundwater and potentially migrate to one of several surface water bodies throughout the Project Site, albeit extremely slowly as reported in Cromer (2022a), potentially impacting on aquatic flora and fauna. This matter is addressed separately in Section 6.9.

6.7.3.2 Operation

Once operational, the Project poses a low risk to groundwater, with the only remaining risks associated with spills of environmentally hazardous materials (addressed separately in Section 6.9) or drainage from any ASS areas exposed during construction (addressed in Section 6.10.3). As mentioned, no groundwater abstraction will occur during the operational phase of the Project.

6.7.4 Management, mitigation and monitoring

6.7.4.1 Construction

The following management and mitigation are proposed for the construction phase of the Project:

- The sediment and erosion control plan set out in Section 6.6 (refer Surface Water MM 2) will include measures to manage the environmental effects of dewatering.
- See Section 6.9 for management and mitigation of environmentally hazardous materials during construction.

No specific groundwater monitoring during construction is proposed for the Project.

6.7.4.2 Operation

No operational management, mitigation or monitoring is proposed for groundwater.

6.7.5 Residual impacts

With appropriate construction controls in place to manage dewatering and environmentally hazardous materials (as documented in Sections 6.6 and 6.9 respectively) the Project is unlikely to have a residual impact to groundwater during construction or operational periods of the Project.

6.8 Waste management

6.8.1 Legal and other requirements

Waste management in Tasmania is largely governed through the:

- *Environmental Management and Pollution Control Act 1994*
- *Environmental Management and Pollution Control (Waste Management) Regulations 2020*.

Tasmania is also a signatory to the following national environment protection measures, both of which automatically become state policies in Tasmania in accordance with the *State Policies and Projects Act 1993*:

- *National Environment Protection Measure (Used Packaging Materials)*
- *National Environment Protection Measure (Movement of Controlled Waste between States and Territories)*.

As well as complying with the above, the Project must also manage all waste materials in accordance with the waste hierarchy, namely avoidance, re-use, recycling / reclamation, treatment to reduce potentially adverse impacts, and disposal.

6.8.2 Potential impacts

6.8.2.1 Construction

During the construction period, a variety of wastes will be generated. This is likely to include:

- Waste construction materials such as concrete, plastic and steel (hundreds of tonnes)
- General waste including general recyclables (several tonnes)
- Small quantities of controlled wastes including solvents and paints (<5,000 L)
- Waste oil or hydraulic fluid (<5,000 L)
- Possibly ASS soils (quantities unknown)
- Waste from transportable toilets (to be removed from site by a licensed contractor).

Left unmanaged, these waste streams have the potential to harm the environment from both an ecological and aesthetic perspective. Wastes containing environmentally hazardous material have the potential to impact the environment through numerous pathways, as outlined in Section 6.9.

ASS risks are addressed separately in Section 6.10. The other construction waste streams can be readily managed with appropriate sorting, storage and removal from site as outlined below in Section 6.8.3.

It is noted that construction will involve some vegetation removal (to facilitate construction and provide necessary clearance for the avifauna curtailment devices) resulting in cleared vegetation to be managed. It is proposed that any such cleared vegetation will either be left in situ in a stable condition to provide ongoing habitat, or offered to local landholders (or a commercial timber harvester) as a timber resource (where this triggers the need for other approvals, e.g. for timber harvesting, this will be addressed separately by the landowner/harvester).

6.8.2.2 Operation

Waste generated during the operational phase of the Project will be limited to smaller quantities of paints, oils and lubricants used for maintenance, general waste from the operations facility, and any wastewater generated from onsite sewage treatment (to be managed via a pre-engineered solution such as an onsite enviro-cycle system).

6.8.3 Management, mitigation and monitoring

6.8.3.1 Construction

The following management, mitigation and monitoring is proposed for the construction phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Waste Management MM 1	Waste from onsite toilets will be stored in the portable toilet system and removed from site by a suitably licensed contractor.
Waste Management MM 2	A waste management area will be delineated within the construction compound(s), with all wastes to be segregated (into recyclables and non-recyclables) and all putrescible and/or potentially windblown waste to be stored in sealed bins.
Waste Management MM 3	All waste classed as environmentally hazardous materials will be stored in appropriately bunded containers.
Waste Management MM 4	Waste will be removed from site on a regular basis by a suitably qualified operator and disposed of at a suitably licensed facility.
Waste Management MM 5	Residual vegetation cleared to facilitate construction will either be left in situ in a stable condition to provide ongoing habitat or offered to local landholders (or a commercial timber harvester) as a timber resource. (Where this triggers the need for other approvals, e.g. for timber harvesting, this will be addressed separately by the landowner/harvester).
Monitoring	
Waste Management MON 1	The construction contractor will maintain records of waste volumes generated and disposal locations, including disposal facility receipts.
Fortnightly audits of the waste management system will be undertaken (to ensure the system is effective, clean up any windblown or otherwise escaped waste, and modify storage arrangements if necessary) as part of the CEMP monitoring program as documented in Section 6 (refer Various MON 1).	

6.8.3.2 Operation

The following management, mitigation and monitoring is proposed for the operational phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Waste Management MM 6	A waste management area will be delineated within the operations facility with all waste to be segregated (into recyclables and non-recyclables) and all putrescible and/or potentially windblown waste to be stored in sealed bins.
Monitoring	
Waste Management MON 2	An estimate of annual waste volumes generated on site will be provided in Annual Environmental Reports.

6.8.4 Residual impacts

With the implementation of the management and mitigation measures outlined above, wastes can and will be suitably managed and pose no measurable risk to environmental values at the Project Site. No measurable impacts to the current or future land use are anticipated.

6.9 Dangerous goods and environmentally hazardous materials

6.9.1 Legal and other requirements

The Project must comply with the following legislation and policy in relation to dangerous goods and environmentally hazardous materials:

- *Australian Code for the Transport of Dangerous Goods by Road and Rail (Edition 7.7 2020)*
- *Dangerous Substances (Safe Handling) Act 2005* and associated regulations
- *Dangerous Goods (Road and Rail Transport) Act 2010* and associated regulations
- *Work Health and Safety Regulations 2012*
- *Australian Standard AS 1940:2017 The Storage and Handling of Flammable and Combustible Liquids.*

6.9.2 Potential impacts

6.9.2.1 Construction

Several dangerous goods and environmentally hazardous materials may be used during the construction period, including:

- Fuel for machinery and vehicles (several hundred thousand litres)
- Hydraulic oil and various lubricants for machinery (several thousand litres)
- Paints and solvents (several thousand litres)
- Cement (approximately 33,000 m^3)
- Disinfectants and/or weed control chemicals (several hundred litres).

Refuelling and maintenance of equipment will likely occur on site within the construction compounds (refer Figure 2-2). This will require bulk storage of fuels, oils and chemicals on site.

Dangerous goods and environmentally hazardous materials present a risk to the environment and human health if used, stored or disposed of incorrectly. Spills of these materials to waterways, drainage lines and wetlands can present significant risks to aquatic flora and fauna ranging from direct toxicity impacts to smothering effects (e.g. from hydrocarbons). Spills of these materials to ground can present similar risks if the water table is reached by the spilt materials or washed into drainage lines during rains. The key tools for managing this risk are suitable storage, bunding, handling and disposal as outlined in Section 6.9.3.

6.9.2.2 Operation

Significantly smaller amounts of dangerous goods or environmentally hazardous materials will be required during the operational period of the Project, with some small volumes of fuels, oils, lubricants and paints required to be stored on site within the operations facility (refer Figure 2-1) for maintenance purposes.

6.9.3 Management, mitigation and monitoring

6.9.3.1 Construction

The following management, mitigation and monitoring is proposed for the construction phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Dangerous Goods and Environmentally Hazardous Materials MM 1	All dangerous goods or environmentally hazardous materials will be stored in appropriately bunded containers within the construction compound(s), in accordance with relevant Australian Standards and state regulations.
Dangerous Goods and Environmentally Hazardous Materials MM 2	Fuel storage on site during construction will be via tankers (approximately 50,000 L in size) that will be parked in bunded hardstands within the construction compound(s). Machinery and equipment will then either be refuelled within the compound or in situ via a refuelling truck, which will have on board spill kits and temporary bunding equipment.
Dangerous Goods and Environmentally Hazardous Materials MM 3	A register of dangerous goods and environmentally hazardous materials used on site will be maintained throughout the construction period. The register will be accompanied by the appropriate safety, storage, segregation and handling information (including Safety Data Sheets).
Dangerous Goods and Environmentally Hazardous Materials MM 4	Hydrocarbon and chemical spill kits will be stored within the construction compound(s) and wherever dangerous goods and environmentally hazardous materials are used throughout the Project area. Spill kits will also be stored on select site vehicles.
Dangerous Goods and Environmentally Hazardous Materials MM 5	All disposal of dangerous goods and environmentally hazardous materials will be undertaken in accordance with relevant Australian Standards and state regulations.
Dangerous Goods and Environmentally Hazardous Materials MM 6	Clean-up measures, reporting and notification procedures for equipment breakdowns and accidental releases will be incorporated in an Emergency Response Plan for the Project. This will include clean-up procedures in aquatic environments as well as incident response in the event of fire, chemical release or an explosion.
Dangerous Goods and Environmentally Hazardous Materials MM 7	All spills of dangerous goods or environmentally hazardous materials will be reported to the site supervisor, with spills >100 L or any spills >5 L direct to the aquatic environment to be reported to the EPA within 24 hours of the incident occurring.
Dangerous Goods and Environmentally Hazardous Materials MM 8	The site induction for all workers will include training in the use and disposal of all dangerous goods and environmentally hazardous materials to be used on site as well as protocols to follow in the event of an incident involving these materials.

Reference number	Management, mitigation or monitoring measure
Monitoring	
Dangerous Goods and Environmentally Hazardous Materials MON 1	Records of volumes of all dangerous goods or environmentally hazardous materials used for the Project will be maintained by the construction contractor and be made available to EPA upon request.
Monthly audits of all aspects of dangerous goods and environmentally hazardous materials management, mitigation, and monitoring will be undertaken as part of the CEMP monitoring program as documented in Section 6 (refer Various MON 1) and made available to the Director, EPA upon request.	

6.9.3.2 Operation

The following management, mitigation and monitoring is proposed for the operational phase of the Project.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Dangerous Goods and Environmentally Hazardous Materials MM 9	Onsite procedures will be established for the handling, storage and disposal of dangerous goods and environmentally hazardous materials for the operation phase of the Project and will include: • A register of dangerous goods and environmentally hazardous materials stored on site, accompanied by the appropriate safety, storage, segregation and handling information (including Safety Data Sheets). • Storage, handling and disposal of dangerous goods and environmentally hazardous materials in accordance with relevant Australian Standards and state regulations. • Installation of hydrocarbon and chemical spill kits within the operations facility and on select vehicles. • Clean-up measures, reporting and notification procedures, including reporting of any spill >100 L or any spills >5 L direct to the aquatic environment to the EPA within 24 hours of the incident occurring. • Site induction for site staff including training in use and disposal of all dangerous goods and environmentally hazardous materials.
Monitoring	
No specific operational phase monitoring is proposed.	

6.9.4 Residual impacts

With the implementation of the management, mitigation and monitoring measures outlined above, the risk from dangerous goods and environmentally hazardous materials can be well managed and residual risks are considered very low. No measurable impacts to the current or future land use are anticipated.

6.10 Natural values

Natural values are considered in several sections of this EIS including:

- Fauna – Section 6.1 (avifauna) and Section 6.2 (terrestrial fauna)
- Flora and vegetation communities – Section 6.3
- Surface and groundwater – Section 6.6 and 6.7 respectively.

The following sections address other matters relating to natural values not already addressed in the above-mentioned sections.

6.10.1 Existing environment

Geoconservation sites

The northern half of the Project Site occurs within the Central Plateau Terrain Geoconservation Site. The Central Plateau is a very large-scale landform of more than 1,000 km^2, bounded by the Mersey Valley to the west and the Great Western Tiers to the north. As a large-scale landform, the Central Plateau is an outstanding example of a continental erosion surface and a passive margin horst block (Tasmanian Goverment, 2021).

Conservation areas and reserves

There is one formal conservation area within the Project Site, namely a portion of the Shannon River Conservation Area, which is restricted to the footprint of the Shannon River itself (and associated flood plains). The Steppes State Reserve and the Steppes Conservation Area occur outside the boundary of the Project Site to the east. There are also 10 individual conservation covenants within the Project Site totalling approximately 1,084 ha, protected in perpetuity under the NC Act. Reserved land is illustrated in Figure 5-5.

High-quality wilderness

The Project Site does not contain any high-quality wilderness in accordance with the definition outlined in the Tasmanian Regional Forest Agreement.

Conservation significant waterbodies

With respect to the Conservation of Freshwater Ecosystem Values (CFEV) database, within the Project Site there are multiple wetlands listed as having a high conservation value, multiple rivers listed as having a high or very high conservation value, and multiple waterbodies listed as having a high conservation value. These sites are shown in Figure 6-21.

The Project Site supports several wetlands and waterways including Allwrights Lagoons, which is listed as a Nationally Important Wetland under the EPBC Act, and Wihareja Lagoon.

Potential acid sulfate soils

As discussed in Section 5.2, there are large areas of potential acid sulfate soils (PASS) within the Project Site, as mapped in Figure 5-4; this is associated with wetlands and other areas of regular inundation in the Project Site. It was also noted that even the area mapped as 'low probability inland ASS' has a 6-70% chance of ASS occurrence in the mapping unit, not affording an accurate indication of the presence of the material.

As part of the hydrogeological investigation undertaken in October 2022, soil testing for ASS potential was undertaken in areas where Project infrastructure passes through the areas mapped as PASS. The site-specific ASS soil testing was undertaken in the areas mapped as low probability of occurrence (6-70%), which was the highest rating identified from the site, with no 'high probability of occurrence' mapping where infrastructure is proposed to go. The locations of the four sample sites are shown in Figure 1 of

Appendix K. Samples were taken from the upper soil layers of the sites using a small excavator, which dug test pits down to the dolerite bedrock, which was hit at a depth of approximately 1.6 m.

The results of the testing indicate that at least low ASS potential exists in the samples taken in the upper layers of the test pits. The results, discussed in detail in Appendix K (Cromer, 2022b), show:

- The dark organic topsoils identified during the testing were found to be ASS, and there is the potential for deeper extents of occurrence at the sites sampled in some instances; however, the sample results indicate a reducing ASS severity with depth at all sites sampled.
- The surface samples of three of the four sampled locations showed a reduction between pH (field) and pH (fox) of at least 3 pH units, one indicator of PASS, as outlined in the *Tasmanian Acid Sulfate Soil Management Guidelines (2015)*.
- The surface samples of all four sites showed net acidity in terms of percentage oxidizable sulphur units above the threshold action criteria from the *Tasmanian Acid Sulfate Soil Management Guidelines (2015)* for 100–1,000 tonnes of disturbed material, and all samples showed multiple results above the guideline threshold criteria for >1,000 tonnes of disturbed material (DPIPWE, 2015c).

6.10.2 Potential impacts

6.10.2.1 Construction

The construction phase has limited potential for impact to the natural values identified above.

Geoconservation sites

Parts of the Project will include construction within the Central Plateau Terrain Geosite, but this is a very large and robust site and considered almost immune to human disturbance (Tasmanian Goverment, 2021). The PSGs for the Project state the geosite is *"... effectively immune to human disturbance and the proposal is extremely unlikely to have any effect on its values"*.

Conservation areas and reserves

The layout of the Project has been specifically designed to avoid the Shannon River Conservation Area and all conservation covenants mapped in the Project Site except for a very small area of the WTG 13 laydown area, which may encroach slightly along the boundary of the conservation covenant near Wihareja Creek (Foreign ID 14316). In this way impacts to these reserved lands will be avoided, apart from a very small encroachment on the abovementioned conservation covenant.

Conservation significant waterbodies

Water bodies with high and very high integrated conservation values from the CFEV database have been avoided completely. Wetland areas of high conservation value from the CFEV database have been avoided where possible; however, several crossings of these wetlands and some areas of disturbance are required to make the Project constructable, as identified in Figure 6-21. The areas of wetland to be disturbed are highly ephemeral in nature and the crossings and areas of disturbance are not expected to significantly alter the function of the wetlands once construction of the Project is complete. As outlined in Section 6.6, culverts will be placed where required, for both environmental reasons and from an engineering standpoint to protect the longevity of infrastructure. There will be no operational disturbance to the wetlands once the infrastructure has been constructed and the management and mitigation control outlined in Section 6.6 will ensure that the potential for impacts to water bodies is minimised.

It is noted that there will be no direct impact to the Nationally Important Wetland, Allwrights Lagoons, which lies centrally within the Project Site.

Potential acid sulfate soils

As identified in Section 5.2 and Figure 5-4, the Project Site is mapped as having several areas of PASS, including low probability (6–70%) and extremely low probability (1–5%) areas. The construction footprint intercepts approximately 43.5 ha of low probability PASS, which is approximately 9% of the construction footprint and approximately 4.5 ha of extremely low probability PASS, which is approximately 1% of the construction footprint.

Disturbance of PASS during construction has the potential to expose soils to oxygen, leading to oxidation of sulfides, and, subsequent to any rains, production of sulfuric acid. Run-off of acidic waters generated through this process can have significant impacts on waterways and environmental values through direct exposure to low pH and the heavy metals that can be released from sediments (if present) as a result of the low pH.

ASS risks have been minimised through the design process, which has avoided the placement of infrastructure in the inundation-prone areas of the Project Site that ASS soils are generally associated with, as outlined in Section 6.6. This avoidance principle is generally due to engineering constraints, with the secondary effect that impacts to these areas are minimised for environmental concerns. Nevertheless, some construction areas will intersect PASS soils, as identified from Cromer (2022b), and will require management to avoid environmental impacts.

6.10.2.2 Operation

Once operational, the Project poses no ongoing risk to the natural values identified above.

6.10.3 Management, mitigation and monitoring

6.10.3.1 Construction

The most commonly used method of managing and mitigating ASS in construction is through treatment of affected soils by the addition and blending of agricultural lime with the soil immediately after excavation from the ground to neutralise any acid generated, which is usually mixed on a bunded treatment pad before either being removed off site or re-used on site.

Aside from the WTG foundations, which can require excavation several metres into the ground, the majority of the Project areas will only require scraping back of surface topsoils for foundation development, especially for roads, and therefore it is expected that management of PASS can be achieved in small incremental volumes in bunded stockpiles over the construction period rather than large-scale, multi-hectare soil treatment pads that are common for large, localised excavation projects (e.g. open-cut mine pits).

Extensive testing of soils for PASS will be undertaken in conjunction with detailed site-wide geotechnical work required to be undertaken for the detailed design of the Project. The results of these investigations will guide the level of management required for the Project Site, including likely tonnages of soil required to be treated. This information will be included in the ASS Management Plan to be developed for the Project, which will be submitted to the EPA as part of the overall CEMP for the Project.

Potential stockpile areas for ASS treatment would be either associated with the laydown areas identified in Figure 2-2 or sited within the construction disturbance footprint at the most suitable location(s).

The following management measures are therefore proposed for the construction phase of the Project to manage ASS risks.

Management for other natural values is included in the relevant sections for fauna (Section 6.1 and Section 6.2), flora (Section 6.3), vegetation communities (Section 6.3) and surface water (Section 6.6).

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Natural Values MM 1	ASS risk and management will be addressed through the development of an ASS Management Plan in accordance with the DNRE Tasmania document *Tasmanian Acid Sulfate Soil Management Guidelines 2015* (DPIPWE, 2015c). The plan will draw from the results of an extensive PASS assessment that will be undertaken as part of the site-wide geotechnical assessment. The ASS Management Plan will form part of the CEMP for the Project and will be submitted to the EPA for approval prior to construction. The ASS Management Plan will include all aspects of identification, management and monitoring of ASS (including any downstream waterways). The ASS will be implemented in full and will continue to apply post construction until all ASS risks associated with Project construction and rehabilitation have been successfully resolved.
Monitoring	
There is no specific ASS monitoring proposed during the construction period, noting that the ASS Management Plan may identify monitoring requirements, which will be duly implemented. Other natural value monitoring (e.g. flora and fauna) is addressed separately in the relevant sections of the EIS.	

6.10.3.2 Operation

Once operational, the Project poses no ongoing risk to natural values and operational phase management, mitigation, and monitoring is not proposed.

6.10.4 Residual impacts

With the management and mitigation measures in place, the residual risk to the natural values identified above is very low.

Arthurs Lake
Arthurs Lake Road
Wilburville
Poatina Road
Wihareja Creek
Ripple Creek
Noels Creek
Waddamana Road
Wihareja Lagoon
Watkins Road
Penstock Lagoon
Allwrights Lagoons
Highland Lakes Road
Lagoon of Islands
Interlaken Road
Shannon River
Mary Creek
Blackburn Creek
Waddamana Road
0 1 2 km
N
Map proj.: GDA 2020 MGA Zone 55

Project site (the Land)

EXISTING INFRASTRUCTURE
- Towns/communities
- Roads
- Power line

NATURAL FEATURES
- Rivers and streams

PROPOSED INFRASTRUCTURE
- Construction footprint

WETLAND INTEGRATED CONSERVATION VALUE
- Low
- Medium
- High
- Very High

WATER BODY INTEGRATED CONSERVATION VALUE
- High
- Very High

ARK ENERGY

era PLANNING & ENVIRONMENT

Job Number	2021_132
Revision	V.12
Date	28 June 2023
Paper size	A3

St Patricks Plains Wind Farm

Figure 6-21
CFEV waterbodies

6.11 Greenhouse gases

Greenhouse gas reporting is currently regulated under the *National Greenhouse and Energy Reporting Act 2007*. The Act determines whether reporting through the National Greenhouse and Energy Reporting Scheme (NGERS) is required for a facility via financial year thresholds for greenhouse gas generation, energy consumption, or energy production for a controlling corporation's group as follows:

- The total amount of greenhouse gases emitted from the operation of facilities under the operational control of entities that are members of the group has a carbon dioxide equivalence of 50 kilotonnes or more.
- The total amount of energy produced from the operation of facilities under the operational control of entities that are members of the group is greater than 200 terajoules.
- The total amount of energy consumed from the operation of facilities under the operational control of entities that are members of the group is greater than 200 terajoules.
- An entity that is a member of the group has operational control of a facility the operation of which during the year causes:
    - emission of greenhouse gases that have a carbon dioxide equivalence of 25 kilotonnes or more; or
    - production of energy of 100 terajoules or more; or
    - consumption of energy of 100 terajoules or more.

As the owner of the built Project is not known at this stage, it is not currently possible to predict the NGERS reporting requirements for the Project. However, in isolation, the Project will not trigger any of the thresholds identified above.

In terms of the Tasmanian Climate Change Action Plan 2017 – 2021 targets, the Project is a net positive contributor to the plan, specifically in terms of actions set out in Section 2 of the plan – "*Advancing our renewable energy capability*" – towards meeting the goal of "*Maximising the generation of renewable energy in meeting the State's electricity needs and supporting national electricity security and affordability*".

Action 2.1 from the plan is most relevant to the Project, namely the promotion of Tasmanian and national emissions reduction and energy security through a coordinated approach to renewable energy advancement in Tasmania. The plan proposes this be achieved through progressing opportunities for further renewable energy development to support Tasmania's aim to be a net exporter of electricity.

The Project will contribute up to 300 MW of green energy to the Tasmanian grid, which, along with the numerous other renewable energy projects throughout the state, will help to achieve Tasmania's aim of being a net exporter of energy.

6.12 Infrastructure and offsite facilities

6.12.1 Port

The Port of Bell Bay operated by Tasmanian Ports Corporation has been identified as the port most suitable to receive the large WTG components required for the Project. The port also contains a 3.5 ha laydown yard within 1 km of the shipping berth, suitable for use as a staging point for the delivery of the components to the Project Site.

The port has successfully been used for this function previously in the development of the Cattle Hill Wind Farm, which is located near the proposed Project. There are no adverse environmental impacts likely to result from the Project's use of the port during the construction phase in addition to what is currently experienced at the port, and no upgrades to the port are required to facilitate the Project.

6.12.2 Roads and associated infrastructure

The delivery of the WTG components from the Port of Bell Bay to the Project Site will require specific oversize haul routes to be followed depending on the component size. A haul route study was commissioned for the Project (Rex J Andrews, 2023) to identify suitable routes for various load sizes. One main route was identified for components up to 5.4 m in height and several alternatives for the larger tower sections up to 5.9 m. The proposed haul routes used similar road sections to those used in the Cattle Hill project and therefore are generally seen as capable of repeating the process. All routes will require some minor alterations to the road network. Any alterations to the road network will be undertaken in consultation with the Department of State Growth or the relevant local council at least six months prior to the commencement of component delivery and are excluded from this application.

In addition to impacts along oversize haul routes for WTG components, there will also be additional use of the road network for the delivery of quarried materials, other materials such as cement, and equipment and machinery. This is not expected to require any alterations to the road network but will increase traffic numbers.

The third potential for offsite road impacts will be via the workforce, who will require weekly travel to the local area from the major population centres.

The potential impacts of the Project on traffic volumes and proposed management and mitigation are covered in detail in Section 6.14 (traffic), Section 6.2 (fauna roadkill risks of increased traffic) and Section 6.4 (offsite traffic noise impacts).

Associated infrastructure, such as service stations and local shops, are expected to receive a net positive impact to business from an economic standpoint and will be advised of the expected increase in local traffic from the construction activity well in advance of its commencement.

6.12.3 Quarries

There are several local quarries that are expected to be used for the construction of the Project, including two local gravel/aggregate quarries at Cluny (near Bothwell) and off Arthurs Lake Road. Additional materials will be required from quarries further afield, which will be identified by the construction contractor. There is no requirement for upgrade or expansion of any quarries to supply the materials necessary for the Project, nor are there any new quarries proposed. Subject to geotechnical assessment, there is the potential to re-use rock material excavated on site by processing through a mobile rock crusher for use as gravel or fill; this would be determined post-approval. If excavated material were to be re-used, and require crushing, the mobile rock crusher will be located and used in a manner to avoid any dust or noise impacts to human receivers or sensitive fauna (e.g. eagle nests) and will be documented in the CEMP, for submission to the EPA.

The traffic impact assessment (refer Section 6.14) makes the conservative assumption that all gravel and aggregate will be transported to the site.

6.12.4 Electrical infrastructure

The TasNetworks Liapootah-Palmerston 220 kV transmission line will be used to deliver the generated power to the Tasmanian grid. The electricity will be sold into the electricity market or to a customer directly and distributed via the grid. It may be used for Tasmanian customers or mainland customers via the existing Bass Link or proposed Marinus Link cable. The Liapootah-Palmerston 220 kV transmission line has sufficient capacity to accept the generated power from the Project and no additional direct environmental impacts are expected as a result of the line's use by the Project.

6.12.5 Accommodation

It is expected that a variety of accommodation options will be used for the Project construction period, ranging from existing locally available accommodation in the highland lakes region and surrounding towns such as Bothwell, Miena, Flintstone and Wilburville to dedicated semi-permanent construction camps, if required.

The use of existing accommodation in the region offers a positive economic benefit. If new, purpose-built accommodation is selected, this will be subject to separate approvals and is outside the scope of this application.

6.13 Cumulative and interactive impacts

The Cattle Hill Wind Farm operated by Goldwind Australia is the only other major wind farm development in the Central Highlands region; the nearest existing WTG at the Cattle Hill Wind Farm site lies approximately 10 km south-west of the nearest proposed WTG at the Project Site. It currently operates with a full-time team of nine employees, and a further equal-sized team of contractors who undertake site management, operation and maintenance work (Cattle Hill Wind Farm, 2021). A number of other wind farms are understood to be in early development in the Central Highlands region but if they proceed, they will come through the planning process after the Project.

As the Cattle Hill Wind Farm is in the operational phase, there are no anticipated negative interactions from a construction perspective in terms of demand for accommodation and other infrastructure such as roads, quarries, or specialised equipment.

From an environmental perspective, key considerations for potential operational cumulative effects are associated with noise and avifauna. Potential cumulative effects of noise on sensitive receivers have been discussed in detail in Section 6.4, with no significant cumulative noise impacts expected. Cumulative effects relating to avifauna, specifically WTEs, have been discussed in detail in Section 6.1.

Once operational, there will be up to an additional ~20 FTE workers required for the Project on top of those already working at the Cattle Hill site. This will assist with the recovery of the LGA and region in terms of retention of working age residents, lowering of the average age, increase in investment and spending, and increase in the pool of individuals available to work and volunteer in the community.

At a broader level, the Project will add to the growing number of wind farms around the state and the growing number of sustainable jobs in renewable energy in the state. It will increase the volume of renewable energy supply to the grid, helping Tasmania reach its goal as a net exporter of power.

6.14 Traffic

6.14.1 Construction traffic

The Project will have several sources of construction traffic, which can be broadly broken down into three categories:

- Delivery of oversized WTG components, including the tower sections, nacelles and blades
- Delivery of construction machinery and equipment, raw materials, and various other components
- Workforce transport to and from site.

A Traffic Impact Assessment (TIA) which considers each of the above components was completed for the Project and is provided in full as Appendix G (Hubble Traffic, 2023).

As previously mentioned, all road upgrades required outside the Project Site will be covered in separate approvals. All five entrances (including one junction) to the Project Site will be upgraded to suit the turning circle and site distances required by the vehicles that will use them, including blade delivery trucks which will extend beyond 80 m in length.

Oversized WTG components

It is expected that most oversized WTG components for the Project will be shipped to Tasmania and arrive at the Port of Bell Bay on the Tamar River in northern Tasmania. From here they will be stored for further transport at a dedicated laydown yard in the port facility. Based on the candidate WTG, each WTG has 13 oversized components including the nacelle, rotor hub, blades (three), drive train, and tower sections (seven), with 611 oversized components required to be delivered to the Project Site in total. The components will be delivered with vehicles suited to each item, including low loaders, bookend transporters, and B-double semi-trailers. A total of 311 laden trips are expected to be required for the WTG components, taking into account the use of two trucks in a convoy for the majority of components, counting as a single trip.

A route study analysis was completed for the Project (Rex J Andrews, 2023), to determine the optimal delivery route for the components from Bell Bay to the Project Site. The analysis identified that the majority of the WTG components could be delivered by a single route, with the exception of several of the bottom sections of the WTG towers, which could not fit under several bridge sections along the primary route. This resulted in the need for alternative routes to be identified for these components.

The primary route for the majority of WTG components is a 254 km trip along Bell Bay Road, East Tamar Highway, Midland Highway, and Highland Lakes Road via Bothwell to the Project Site. The alternative routes for the large tower sections will leave Bell Bay and essentially avoid the majority of the East Tamar Highway via detours to avoid the bridge/overpass sections that occur along the route, before rejoining the primary route back in Launceston. This alternative route includes turning off from Bell Bay Road onto the East Tamar Highway then onto Bridport Road, then Dalrymple Road, East Arm Road, and then back onto the East Tamar Highway.

The primary route is identical to that used to transport WTG components to the neighbouring Cattle Hill Wind Farm and is therefore already proven as viable; however, some infrastructure improvements will need to be made in consultation with the Department of State Growth (State Growth) as the involved roads have been upgraded in several sections since the Cattle Hill development.

The alternative routes are not considered a high-risk proposition in terms of traffic disruption as they avoid major population centres and the roads involved are not major arterial roads; also, these routes require a significantly lower number of laden trips to be made in comparison to the main route. As with the primary route, several infrastructure improvements on alternative routes will be required to be made in collaboration with the responsible jurisdiction (i.e. State Growth/council).

The transport of the oversized components will occur in convoys of two trucks to minimise the number of days of disruption to the road network, with escorting vehicles present at either end of the convoy. The loads would leave Bell Bay around 3 am to enable the convoy to pass through Launceston before 6 am. The convoy would reach Bothwell around 9 am and then progress to the Project Site. It is expected that all components will be delivered and transported to site within a 6 to 12-month period subject to trucking, police and escort availability.

The permitting and approval process for the delivery of oversized WTG components, as well as the subsequent management and mitigation, does not form part of this assessment; it is dealt with separately with State Growth and relevant councils and is included here for context only and to provide an indication of any indirect impacts that may occur as a result of the activity. Alterations to roads internal to the Project Site and the five entrance points (including the junction with two entrance points to the Project Site) are the only road aspects assessed as part of the Project.

Raw materials, machinery, and equipment

As discussed in detail in Section 2.4.2 and 2.4.3, the Project requires a variety of equipment and materials to be delivered to site from both local and further afield suppliers (e.g. Hobart/Launceston). While the delivery of equipment and machinery will generally be isolated trips at the commencement and end of a project, the delivery of raw materials will be a more constant requirement due to the sheer volumes required for the Project.

For the delivery of equipment and machinery, approximately 1,050 heavy vehicle trips over the construction period of the Project have been included in the Traffic Impact Assessment, representing approximately 2 trips per day on average.

It is estimated that in the order of 876,460 metric tonnes of raw materials will be required over the Project construction period, including pavement gravel, cement, aggregate, sand, fly ash, and steel reinforcement. This equates to approximately 20,055 total deliveries using a 43.7 tonne payload truck, which equates to ~29 laden trips per day respectively over a 700 working day period (i.e. the approximate life of the construction stage). Alternatively, if a smaller truck were used this would equate to 29,215 trips to site from various locations using a truck with a 30-tonne payload (i.e. ~42 laden trips per day respectively over a 700 working day period). Preference will be given to using large capacity trucks to minimise traffic generation, hence ~29 laden trips per day has been used in the traffic assessment.

The above figures assume materials will be sourced from major cities (except aggregate, which is available regionally, potentially at Cluny, near Bothwell or from an existing quarry on Arthurs Lake Road). Where possible, raw materials will be sourced locally to reduce travel times, which will reduce the potential for traffic impacts along major routes, including the Midland Highway. There is also potentially the opportunity to re-use some material on site and process it through a rock crusher (if found to be suitable), which could reduce the required cartable volume of quarry material to the Project Site. Concrete will be batched on site to avoid the haulage of the additional water weight in the mix.

Workforce

As discussed in detail in Section 2.4.4 and 2.4.5, the total construction workforce is expected to peak at 200 employees during the construction phase. Construction workers will work 10–12 hour day shifts between 6 am and 6 pm on 7 days per week on a rotating drive-in/drive-out roster, to be determined by the construction contractor. Activities with potential to generate significant noise will be restricted to the timeframes outlined in Section 6.4.

Workers will be housed locally during shifts in either semi-permanent construction camp style accommodation or spread throughout the local area in locations including Bothwell, Miena, Bronte Park, Waddamana, Flintstone and Wilburville.

Workers will use a combination of their own vehicles, shared vehicles, or construction contractor supplied buses to move between their accommodation and the construction site. During peak construction this could be up to 400 light vehicle movements per day with workers travelling to and from site if only individual vehicles are used. The traffic impact assessment (and hence the numbers shown in Table 6-11) assume individual light vehicles are used, in order to provide the 'worst case scenario' traffic estimate.

Construction crews will work in rotating swing shifts (i.e. a period of several days on, followed by several days off), with not all swing shifts necessarily overlapping as there will be a number of contractors doing different works (e.g. civil, electrical, installation); these details will be determined post-approval by the various construction contractors. At the changeover of shifts, additional traffic movements occur as each crew leaves or enters the region to end or start their shift accordingly.

Summary

Table 6-11 provides a summary of the estimated traffic generation from the project used in the Traffic Impact Assessment. This is considered to represent a 'worst-case' scenario as it assumes the peak workforce number of construction employees travel to site in individual cars for two years and that all raw materials for construction are imported to the site. The actual traffic numbers are likely to be considerably lower.

Table 6-11 Summary of construction phase traffic generation

Process	Type of vehicle	Total Project trips (approx.)	Average daily trips[28] (approx.)
Permanent infrastructure	Heavy vehicles	1,050	2
Turbine components	Over-dimensional loads (these will travel in convoys of 2 vehicles and are counted as one movement for the Traffic Impact Assessment)	311 convoys	1
General employees		280,000	400
Raw materials	Laden heavy vehicles	20,055	29
	Unladen heavy vehicles	20,055	29
Total		**321,471**	**461**

6.14.2 Operational traffic

With the Project requiring up to 10 FTE workers on site to manage the operation of the Project and another 10 FTE associated contractors, the traffic that will be generated throughout the operational phase will be very minor in comparison to the construction phase and is not considered in any detail in the impact assessment.

6.14.3 Potential impacts, management and mitigation

Potential impacts from traffic include impacts to traffic flow and safety, impacts to road infrastructure, noise disturbance to local communities, and potential impacts to wildlife. Impacts directly related to traffic are assessed here, with impacts to noise and wildlife assessed in their respective sections in this document, namely Section 6.4 and Section 6.2.

[28] Note there is not a direct mathematical correlation between total Project trips and average daily trips in all cases, as some data has been amalgamated and rounded. Refer to Traffic Impact Assessment for additional data.

The over-dimensional loads have the largest potential to directly impact on traffic flow due to the slow pace the convoys must travel at and the requirement to use lanes in both directions at various locations along the delivery route. The Project is expected to have similar traffic impacts to the Cattle Hill project, which was carried out successfully and so the Project will use similar traffic arrangements, management and mitigation (which will be put in place by the logistics contractor). Some learnings will be put in place from local community feedback, including incorporation of several additional overtaking sites between Bothwell and the Project Site. The main mitigation that will be used is timing the deliveries to occur during the periods of lowest traffic density. The deliveries of over-dimensional lower tower sections are not expected to add any significant additional traffic nuisances owing to the low number of convoy days required.

Raw material delivery is likely to have the largest overall impact to traffic owing to the sheer number of heavy vehicle trips required to be made to site each day. The impacts to traffic flow will be reduced by sourcing locally available materials where possible, such as gravel/aggregate from the quarries at Bothwell and Arthurs Lake. Using onsite concrete batching will also reduce the water weight required to be carted to site. It is expected that on average approximately 29 ladened heavy vehicles will be required to deliver to the Project Site per day across the construction period. Deliveries will use multiple routes to site and will be staggered across each day, which will minimise the impact of the activity.

The highest number of movements per hour per route is expected to be around six on any one route, but most likely along the Highland Lakes Road from Bothwell to the Project Site as it is expected to be the most commonly used route. Deliveries will occur throughout the day and will be unlikely to interact significantly with other construction traffic (e.g. workforce or oversize transport). Deliveries are also likely to occur in intermittent stages depending on which segment of the Project is being worked on at the time, rather than in a linear fashion across the 24-month construction period; seasonality may also play a part in delivery timing, with winter weather potentially restricting construction, and hence delivery rates. Overall, this delivery rate is considered manageable using the current state road network and is not expected to result in any adverse safety or traffic efficiency impacts or significant pavement wear (Hubble Traffic, 2023).

Assessment of the highest number of potential worker vehicle movements (200 to and from the Project Site per day) found that Highland Lakes Road, south of Poatina Main Road is estimated as having the largest potential increase in traffic, with a predicted daily volume increase from 30 to 160 trips (noting not all vehicle movements will come from the same direction). Based on the RTA Guide (RTA, 2002), this increase in traffic will see no deterioration of 'level of service' (known as LOS), with motorists continuing to receive an unchanged LOS rating of 'B', as reported in the RTA Guide (2002); this is mainly due to the low levels of traffic that the local road network currently receives. No roads are predicted to receive a decrease in LOS rating as a result of the Project, with further assessment provided in the full Traffic Impact Assessment report in Appendix G.

In summary, the key management and mitigation measures for construction phase traffic impacts are summarised in the table below (noting that management specific to noise and roadkill are addressed separately in Sections 6.4 and Section 6.2). There are no specific management measures proposed for operational phase traffic, given the relatively low traffic volumes in comparison to existing road use.

Overall, while the increased traffic requirements of the Project during the construction phase will cause some disruption and disturbance to traffic flow, it is considered an acceptable impact, and no long-term effects are predicted for traffic flow, safety or road integrity.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Traffic MM 1	Construction phase traffic impacts will be minimised by: • Sourcing locally available materials where possible.

Reference number	Management, mitigation or monitoring measure
	• Sourcing water for construction from the Project Site to avoid cartage. • Timing the deliveries to occur during the periods of lowest traffic density. • Communicating with landowners along the transportation route about expected traffic movements. • Establishing and maintaining an online complaints register, and resolving any complaint received.
Monitoring	
There is no specific construction phase traffic monitoring proposed (noting roadkill monitoring is addressed separately).	

6.15 Visual

Visual amenity has been addressed in the following section of the EIS for completeness and as required by the PSGs. However, the EPA Board does not have responsibility for visual amenity issues and assessment of visual impact will be undertaken as part of the planning assessment by Council. The separately available planning report draws upon the information herein and considers the visual impact in the context of the planning scheme requirements.

6.15.1 Landscape and visual impact analysis

A comprehensive visual impact assessment was completed for the Project by Inspiring Place and is provided in full in Appendix H. The assessment was based on industry standard techniques used in Tasmania, developed in part by Forestry Tasmania. The system used to classify impacts considers affects to the landscape scenic quality, its character, and people's likely reaction to changes to these. The outcome of the report is a significance rating on the expected visual impact from the Project on the environment and its viewers.

The assessment used a 50 WTG layout (provided by the Proponent), which had already gone through the preliminary environmental constraints process (and included all the WTGs currently proposed in this EIS, plus an additional three that have since been removed). The assessment also considered ancillary infrastructure such as the substation, switchyard and power cabling.

Analysis included identification of all potential viewing opportunities from roads most used in the area, and also used a topographical viewshed assessment to identify where WTG hubs and blade tips would be visible from in the surrounding area.

A sensitivity analysis was then undertaken for a variety of viewpoints with differing visual sensitivity ratings, which consider frequency of views, vegetation cover, distance from infrastructure, and more subjective categories such as 'viewer expectation', which describes what the average frequent traveller or tourist may expect to see in a certain area. The resultant 'sensitivity of the place' is a score from 'low – moderate – high', with combinations in between.

Magnitudes of impact were then assessed at the same key viewpoint locations, including various shack settlements, sections of road, fishing locations, and other points of interest. This essentially considered how strongly the Project may change the landscape characteristics of an area; this is also scored from 'low – moderate – high' in the assessment.

Combining the sensitivity score of a place with the likely magnitude of visual impact in a matrix provides a means of allocating a significance of impact rating, in this case low, moderate, or high, as discussed further in Appendix H. The results indicated two sections of the A5 highway (Highlands Lakes Road), to the general area north and south of the Project, would score a 'high' significance of impact rating if left unmitigated, with the main issue being that some WTGs were considered too close to the road. No additional areas were considered to have a high significance of impacts, but several were considered moderate, including from Penstock Lagoon, the Steppes Hall and Steppes Historic Site, with the remaining public viewpoints considered low.

Overall, the Project was considered to have a moderate to high significance of visual impact without any management and mitigation measures in place. To address the concerns behind this rating, the Proponent elected to follow the recommendations in the visual impact assessment and remove all three WTGs from the layout that were considered too close to the highway, thus reducing the visual dominance of the WTGs and Project as a whole. The result is the 47 WTG layout proposed herein. With the three WTGs removed and one set further back from the road, the residual visual impact was assessed as having a moderate impact.

The other main mitigation measures outlined in the visual impact assessment included reducing the height of a significant number of WTGs visible above trees from the north. However, this was not considered to be a viable option for the Proponent as it affected the production viability of the Project.

Construction phase mitigation measures suggested in the visual impact assessment (e.g. staged and early commencement of revegetation, careful siting of construction facilities to minimise visibility, dust control, waste management) are consistent with mitigation measures proposed throughout other sections of this EIS and will be incorporated into construction management plans where practical and appropriate.

The visual impact assessment was completed on the premise that obstacle lighting will not be required at the wind farm (noting that to date the Civil Aviation and Safety Authority has not required obstacle lighting at any of the Tasmanian wind farms including Cattle Hill).

Appendix H provides photomontages of the Project with WTGs in place from various viewpoints around the Project, and two examples are provided in Figure 6-22 and Figure 6-23.

St Patricks Plains Wind Farm Revised Layout Oct 2021 – 47 Turbines

Photomontage view from Highland Lakes Road near Steppes Hall

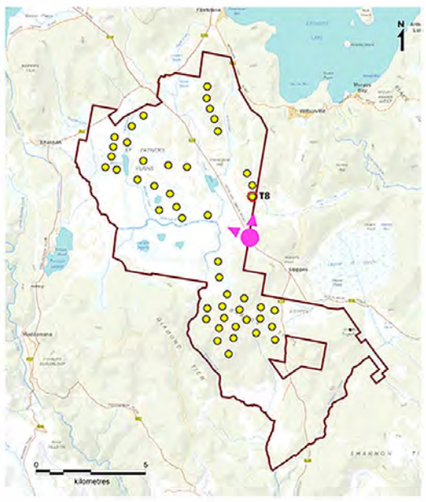
Approximate distance to closest visible wind turbine T8 is 1,930 metres

Legend

Approximate photo location and indicative view direction toward St Patricks Plains Wind Farm turbines

0m 1km

Aerial of photograph location – Steppes Hall



Site layout plan – 47 turbines

Previous Layout

General Notes

Photos taken at 10:34am on 26th June 2019.

Coordinates: E:489509, N:5340513

Elevation: 878m AHD

Camera: Nikon D610, 50mm 1:1.4D Lens

Original Format - A0 Landscape

240m tip height, 150m hub height and 180m rotor.

This viewpoint has a horizontal view angle of around 71 degrees.

This is a preliminary layout only and is subject to change as detailed planning proceeds.

Closest turbine indicated by red line.

* The purpose of this Photomontage & Wireframe is to provide a 'representation' of the possible visual impact of this project for the purpose of discussion. The layout is subject to change in accordance with the planning process. These images give a reasonable impression of the scale of turbines and the distance to turbines, but due to vegetation screening and the complexity of working off useful landscape features, they cannot be 100% accurate. A static image cannot convey turbine movement, different lighting, weather and seasonal conditions that vary through time and resolution of image.

St Patricks Plains Wind Farm Revised Layout Oct 2021 – 47 Turbines

Photomontage view from Poatina Road

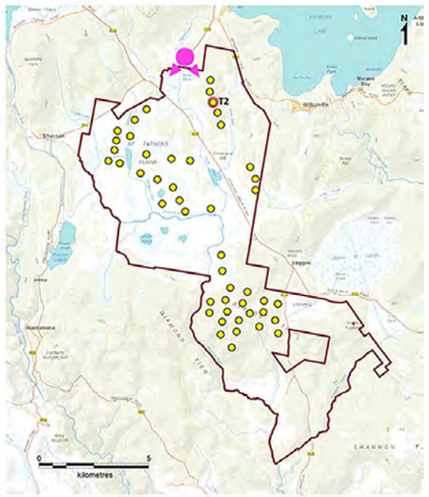
Approximate distance to closest visible wind turbine T2 is 2,310 metres

Legend

Approximate photo location and indicative view direction toward St Patricks Plains Wind Farm turbines

0m 500m

Aerial of photograph location - Poatina Road



Site layout plan – 47 turbines

Previous Layout

General Notes

Photos taken at 11:01am on 11th November 2019.

Coordinates: E:486516, N:5348436

Elevation: 916m

Camera: Nikon D610, 50mm 1:1.4D Lens

Original Format - A0 Landscape

240m tip height, 150m hub height and 180m rotor.

This viewpoint has a horizontal view angle of around 79 degrees.

This is a preliminary layout only and is subject to change as detailed planning proceeds.

Closest turbine indicated by red line.

* The purpose of this Photomontage & Wireframe is to provide a 'representation' of the possible visual impact of this project for the purpose of discussion. The layout is subject to change in accordance with the planning process. These images give a reasonable impression of the scale of turbines and the distance to turbines, but due to vegetation screening and the complexity of working off useful landscape features, they cannot be 100% accurate. A static image cannot convey turbine movement, different lighting, weather and seasonal conditions that vary through time and resolution of image.

6.15.2 Consideration of black blade

As discussed in Section 6.1.4, an adaptive management technique for bird strike minimisation that involves painting a single WTG blade black has been included as a potential future mitigation measure for impacts to eagles for the Project. The painting of one blade black on selected WTGs has been shown in a controlled experiment to make rotating blades more visible to avifauna to alert them to the presence of the blades.

There is no available scientific research on the effects of the black blade technique on visual amenity in Australia, nor globally. It can be surmised that the addition of a single black blade would have some impact on how the rotating blades appear to the human eye, as that is the aim of the technique in the context of visibility to avifauna. However, the extent to which this would impact on the amenity of the Project Site can only be qualitatively predicted, with the only real predictors being that the higher the number of WTGs with a painted black blade, the higher the potential for a visual impact. Like most visual aspects, the amount of cloud cover could also have an effect on visibility. Studies are underway in Norway to assess the potential visual impact on humans, but at the time of writing were incomplete (see www.reneweconomy.com.au/new-study-probes-effect-of-blackened-turbine-blades-on-bird-collisions).

Following the release of any research on the topic, its application as adaptive management can be further reviewed. The application of the black blade technique as adaptive management to minimise the impacts of selected WTGs on eagles would be weighed against the potential for visual impact.

It is most likely that if the technique is employed, it would only be used on selected WTGs where bird strikes had occurred on a number of occasions, with the remaining WTGs left as all white bladed.

Given the paucity of information globally on the visual impact of this avifauna mitigation, the visual impact of such a feature would be part of the study of the application of this adaptive management.

6.15.3 Blade glint

A blade glint assessment was not undertaken for the Project. This follows general industry practice to now use low reflectivity RAL 7035 (light grey) coatings on all WTG parts, reducing the chance of generating significant blade glint. Any black coating used for black blade adaptive management would not increase the risk of blade glint, as black has a lower reflectivity value than RAL 7035.

6.15.4 Shadow flicker

Shadow flicker may occur when the sun passes behind the rotating blades of the WTGs and casts a moving shadow over neighbouring dwellings. When viewed from a stationary position this moving shadow can cause flickering of light from the sun, giving rise to the phenomenon of shadow flicker. The effect is most noticeable inside buildings, where the flicker appears through a window opening, and the likelihood and duration of the effect depends on several factors including WTG dimensions and position in relation to the receiver, weather conditions, and the time of year and day.

To address the risk of shadow flicker, DNV was commissioned to assess the expected annual shadow flicker durations in the vicinity of the Project. The full assessment is provided in Appendix I and summarised below.

The assessment was undertaken in general accordance with the *Development of Wind Energy Facilities in Victoria*, Policy and Planning Guidelines (DELWP, 2021) and the *National Wind Farm Development Guidelines – Draft* (Draft National Guidelines) prepared by the Environment Protection and Heritage Council in July 2010 (EPHC, 2010). The Draft National Guidelines recommend that the modelled theoretical shadow flicker duration should not exceed 30 hours per year and that the actual measured shadow flicker duration should not exceed 10 hours per year. The Draft National Guidelines also provide background information, a proposed methodology, and a suite of assumptions for assessing shadow flicker durations in the vicinity of a wind farm.

DNV considered a list of 60 dwellings within 5 km of the Project and identified 17 of these as having potential to experience shadow flicker, which were subsequently considered further in the assessment. Of these 17 dwellings, five are participating dwellings (i.e. belonging to an involved landowner who has entered into a formal agreement with the Proponent) and the remaining 12 are neighbouring dwellings.

The theoretical number of hours of shadow flicker experienced annually at each location was calculated using a geometric model which incorporates the sun path, topographic variation and WTG details (such as rotor diameter and hub height). In line with the Draft National Guidelines, DNV assessed the shadow flicker at the surveyed house locations and determined the highest shadow flicker duration within 50 m of each location.

As outlined in the DNV report (Section 4.1.2 in Appendix I) there are several methods for calculating how far from the WTG shadow flicker may be experienced to the extent that it could cause annoyance. The DNV report discusses two calculation approaches, the United Kingdom wind industry and planning guidelines (which uses a distance of 10 times the WTG rotor diameter [referred to as 10D]) and the Draft National Guidelines (which uses a distance of 265 times the maximum blade chord [or width] [referred to as 265C]). DNV considered the calculation results using both of these methods and has provided the results for both the 10D distance calculation (1,620 m) and the 265C calculation (1,145 m) (with C being 4.32 m for the WTGs modelled for all other studies in the Project); DNV has elected to use the results of the more conservative 10D distance (1,620 m). The results are therefore derived from a combination of a UK standard and the Draft National Guidelines' recommendations of theoretical and predicted shadow flicker, and the predictions in the table below reflect the UK guideline value of 10D, which is notably larger (by 475 m) than the distance adopted in the Australian Draft National Guidelines.

The model is used to generate theoretical annual shadow flicker duration, and then refined (taking into account factors such as cloud cover and orientation) to generate predicted annual shadow flicker duration. These theoretical and predicted shadow flicker durations are compared to the relevant guideline values, namely a theoretical limit of 30 hours per year and an actual limit of 10 hours per year respectively.

The results of the modelling are provided in tabulated and mapped format in the DNV report (Appendix I) and summarised here. Table 6-12 below shows a simplified summary of the information in the DNV report, illustrating the modelled results at 2 m above ground level (considered to be ground floor window height) using the 10D calculation for zone of influence of shadows[29].

The modelling showed a total of seven dwellings predicted to experience some shadow flicker above a moderate level of intensity (using a distance calculation of 10D), five of which are participating dwellings and two of which are neighbouring dwellings.

Out of the five affected participating dwellings, four are predicted to experience theoretical shadow flicker durations (within 50 m of the dwelling) that exceed the relevant limit recommended by the current guidelines (guideline value of 30 hours per year, modelled results of approximately 42 to 52 hours per year). When considering the likely reduction due to cloud cover and orientation, the predicted actual shadow flicker durations within 50 m of two participating dwellings remain slightly above the adopted guideline limit (guideline value of 10 hours per year, modelled results of 10.3 to 12.4 hours per year).

Of the two neighbouring dwellings, one (O7-1) is predicted to experience theoretical shadow flicker durations (within 50 m of the dwelling) that exceed the relevant guideline limit (guideline value of 30 hours per year, modelled result of approximately 37 hr/yr at the dwelling and 51 hr/yr within 50m). When taking cloud cover and orientation into account, the predicted actual shadow flicker duration at that same

[29] The DNV report notes that, beyond the 10D distance limit, it is assumed that any shadow flicker experienced will be below a moderate level of intensity and thus unlikely to cause annoyance. Nonetheless, for completeness, DNV has modelled potential for shadow flicker beyond the adopted 10D distance limit and identified five additional dwellings that could potentially experience shadow flicker, below a moderate level of intensity. A complaints management system will be put in place and Ark Energy will work proactively to resolve any nuisance caused by shadow flicker at any such dwelling.

dwelling remains slightly above the adopted guideline limit (guideline value of 10 hr/yr, modelled result of 9 hr/yr at the dwelling and 12 hr/yr within 50 m). It should be noted that 50 m from the dwelling is at least 20 m inside the Project Site boundary and well removed from the dwelling location, underlining the theoretical nature of the assessment. All other neighbouring dwellings showed modelled results well below the guideline values.

In contrast to the above predictions, when the Project was modelled using the 265C calculation from the Australian Draft National Guidelines, only three participating dwellings exceed the theoretical annual limit, two participating dwellings exceed the predicted actual limit, and none of the neighbouring dwellings exceeded any of the guideline limits. This modelling therefore shows compliance with the relevant Australian guidelines at all neighbouring dwellings.

The DNV report sets out potential mitigation measures to reduce shadow flicker at affected dwellings. The Proponent is committed to the mitigation measures as recommended by the DNV report for the single dwelling potentially affected under the 10D assessment (dwelling O7-1), to bring measured shadow flicker to below threshold levels. These measures may include planting of trees and vegetation, installation of additional screening structures, industrial strength curtains or blinds, or curtailment of the WTGs contributing significantly to shadow flicker at this dwelling. Management measures will be determined in consultation with the residents of the affected dwelling.

With the appropriate mitigation measures in place, the shadow flicker can, and will, be managed such that it does not create undue annoyance for neighbouring dwellings.

Table 6-12 Theoretical and predicted actual annual shadow flicker duration

		Theoretical annual shadow flicker duration (2m height) (hr/yr)		**Predicted actual annual shadow flicker duration (2m height) (hr/yr)**	
Dwelling ID	**Status**	**At dwelling**	**Max within 50m**	**At dwelling**	**Max within 50m**
H8-1	Participating	36.4	44.7	10.0	12.4
L19-1	Participating	30.3	45.8	7.1	10.3
M10-1	Participating	39.7	51.6	7.2	9.6
M12-1	Participating	17.4	18.7	4.0	4.4
Q13-1	Participating	38.4	41.9	8.9	9.7
O6-1	Neighbour	0.0	0.0	0.0	0.0
O6-2	Neighbour	11.9	12.8	2.8	3.0
O7-1	Neighbour	37.0	51.2	8.9	12.1
O7-2	Neighbour	0.0	0.0	0.0	0.0
P7-1	Neighbour	0.0	0.0	0.0	0.0
P8-1	Neighbour	0.0	0.0	0.0	0.0
P8-2	Neighbour	0.0	0.0	0.0	0.0
P8-3	Neighbour	0.0	0.0	0.0	0.0
Recommended duration limit		**30 hr/yr**		**10 hr/yr**	

- Table Note – Shading denotes exceedance of recommended duration limit

6.15.5 Summary of management measures

The following table documents the key management measures to be applied to minimise visual impacts of the Project on surrounding land users.

Staged revegetation (as discussed in Section 6.3) will also assist in minimising visual impact during construction.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Visual MM 1	Construction facilities will be sited with due consideration of potential visibility by surrounding land users and public road users.
Visual MM 2	Low reflectivity RAL 7035 (light grey) coatings will be used on all WTG parts, reducing the chance of generating significant blade glint.
Visual MM 3	Management and mitigation of shadow flicker for dwelling O7-1 will be implemented to bring measured shadow flicker to below threshold levels; potentially this will include planting of trees and vegetation, installation of additional screening structures, installation of industrial strength curtains or blinds, or curtailment of the WTGs contributing most significantly to shadow flicker at this dwelling. Final site-specific management measures will be determined in consultation with the residents of the potentially affected dwelling.
Monitoring	
There is no specific visual monitoring proposed for the Project.	

6.16 Fire risk

Fire risks will be present during the construction phase of the Project through storage and use of fuel and other flammable liquids, hot works, use of machinery, mismanagement of waste or incorrect disposal of cigarettes. During operation, similar risks will exist, albeit at a smaller scale. In addition to these risks there will also be fire risks associated with the operation of the WTGs, substation, switchyard and other electrified components.

Potential environmental impacts from fires on site range from minor to catastrophic and depend on a variety of variables such as natural fuel availability, weather and location of fire. There is a large diversity of vegetation, flora and fauna that could be significantly affected by a fire on site.

Fire risks during the construction and operational phases of the Project will be managed in line with relevant health and safety legislation, including the *Work Health and Safety Act 2012*. In addition, an Emergency Response Plan will be developed for the Project that will incorporate a Fire Management Plan, which will integrate with any relevant fire management documentation in the area; this will be completed in consultation with Tasmania Fire Service (TFS) and local fire chiefs.

In addition to the Emergency Response Plan, the following management and mitigation measures will also be applied:

- All flammable goods will be stored in accordance with Australian Standard requirements, as outlined in Section 6.9.
- Site inductions will include information on fire safety and emergency response.
- Designated smoking areas will be provided for workers.

Additional to the risk of fire generated by the Project, there is also a risk that bushfires may impact upon the Project. The proposed Project infrastructure is not particularly susceptible to fire, and all buildings will be constructed to the relevant standards in relation to fire risk. Hence, bushfire poses a risk to the Project, but one that can be reasonably managed. It is also relevant to consider whether the Project presents a barrier to the fighting of bushfires (as addressed below).

To ascertain whether the Project presented additional fire risk to the area or alters the ability to fight bushfires in the area due to restrictions in access it may cause, the TFS Regional Chief was contacted for advice. The salient points from the advice provided from the TFS are outlined as follows:

- The Australasian Fire and Emergency Services Authorities Council (AFAC) has developed the guideline *Wind Farms and Bushfire Operations* (AFAC, 2018), which in summary advises:
    - Wind farms are not expected to adversely affect fire behaviour, nor create major ignition risks.
    - Automatic shutdown and isolation procedures are generally installed within the turbine system to help prevent accidental ignitions on the ground in the event of a malfunction.
    - Wind turbines can attract lightning during thunderstorms; therefore, it is possible that wind turbines may reduce the risk of bushfires caused by lightning. If struck, turbine generators are generally not expected to start fires as they have built-in protection measures (in contrast to tree strike which can result in bushfire).
    - Wind farms may result in aerial firefighting limitations due to aerial obstacles created by wind turbines. However, it should also be noted that this is only for the area immediately around the tower infrastructure; they can still be approached from various directions to within a safe operating distance.
    - Wind farms are not expected to adversely affect fire behaviour in their vicinity. Local wind speeds and direction are already highly variable across landscapes affected by turbulence from ridgelines.

    - Sufficient planning for road access and fuel modified buffer zones will reduce the risk of wind farm ignitions spreading beyond the property.
- The TFS also considers that the fire risk will be changed, as increased access to the site through new roads will allow for greater access by ground crews for fuel mitigation and firefighting.
- The TFS has several operating doctrines that address the use of aircraft for observation and firefighting. Risk mitigation strategies would prevent operations in proximity to wind turbines, but this would be counteracted by additional ground crew access to control bushfires through the proposed road network.
- The regional TFS chief considered the risk of the Project preventing adequate bushfire management in the area as low (between 2–4 out of a maximum of 25 based on AS/NZS ISO 31000:2009).

In conclusion, the Project poses a reasonably low risk of fire ignition with the appropriate mitigation measures in place; it is somewhat but not overly susceptible to damage from bushfires originating outside the Project Site; and it does not present significant limitations to the ability of fire services to fight fires in the event of bushfire in the region.

The key management and mitigation measures to manage fire risk are summarised in the table below.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Fire Risk MM 1	An Emergency Response Plan (or Plans) will be developed for the Project (for construction and operational phases) which will incorporate a Fire Management Plan (or Plans). The Fire Management Plan(s) will be prepared by a suitably qualified professional and take into account other relevant documents (including Tasmania Fire Service Local Area Fire Management Plan, Forestry Tasmania Fire Management Plan and Parks and Wildlife Service Fire Action Plan where relevant); this will be completed in consultation with the Tasmania Fire Service and local fire chiefs.
Fire Risk MM 2	During both construction and operation: • All flammable goods will be stored in accordance with Australian Standard requirements. • Site inductions will include information on fire safety and emergency response. • Designated smoking areas will be provided for workers.
Monitoring	
There are no specific monitoring measures proposed to address fire risk.	

7 EPBC Act assessment

This section summarises salient points, relevant to the EPBC Act, from other sections of this EIS (and associated specialist reports provided as Appendices), with more detailed analysis provided in the relevant sections (specifically 6.1, 6.2, and 6.3) and appendices (Appendix B and Appendix C).

7.1 Referral details

As discussed in Section 1.5, the Project was referred under the EPBC Act to the Commonwealth in September 2019 (referral number 2019 / 8497) and was subsequently deemed a controlled action as it was assessed that the Project had the potential to significantly impact matters of national environmental significance (MNES), namely listed threatened species and ecological communities (relevant controlling provision).

The Proponent opted for the Project to be assessed under the bilateral agreement between the Australian and Tasmanian governments under Section 45 of the EPBC Act, which effectively accredits the State assessment process.

7.2 Matters of national environmental significance

Under the EPBC Act there are nine MNES, including listed threatened species and communities, listed migratory species, Ramsar wetlands, the Commonwealth marine environment, world heritage properties, national heritage places, the Great Barrier Reef Marine Park, nuclear actions, and water resources in relation to coal seam gas and large coal mining.

Only one of these matters was deemed to be a controlling provision for the purposes of this Project, namely listed threatened species and communities. All relevant threatened species and ecological communities with potential to occur in the area have been assessed in detail by NBES (Appendix B and Appendix C), with the following species known to occur on site and considered against the Significant Impact Criteria in Section 7.3 below:

- Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*) – Endangered
- Tasmanian devil (*Sarcophilus harrisii*) – Endangered
- Eastern quoll (*Dasyurus viverrinus*) – Endangered
- Ptunarra brown butterfly (*Oreixenica ptunarra*) – Endangered
- Tasmanian masked owl (*Tyto novaehollandiae castanops*) – Vulnerable
- Spotted-tailed quoll (*Dasyurus maculatus ssp. Maculatus*) – Vulnerable
- Liawenee greenhood (*Pterostylis pratensis*) – Vulnerable.

There were no vegetation communities listed under the EPBC Act identified within the Project Site (refer Section 6.3). Therefore, EPBC Act listed vegetation communities have not been considered further here.

Several EPBC Act listed flora species were identified in the Project Site. However, the Project layout has been designed to avoid all but one of these species, namely the Liawenee greenhood *Pterostylis pratensis* (vulnerable), which is addressed in Section 7.3 below.

Although some migratory species are known from the area, particularly Latham's snipe which has been recorded near wetland areas in the Project Site, NBES assessed the potential impact to migratory species to be low and not significant for the purposes of the EPBC Act. Migratory species were not triggered as a controlling provision under the Act given the relatively limited potential for impact. Further detail on

migratory species is provided in the NBES reports (Appendix B and Appendix C) and relevant sections of this EIS (Section 6.1 and 6.2).

7.3 Assessment of relevant matters against MNES Significant Impact Guidelines

The Significant Impact Guidelines 1.1 (DOTE, 2013) present the criteria to determine whether a project is likely to have a significant impact on a species or community. Those EPBC Act listed threatened species and communities considered at risk of potential impact by the Project are considered below against the relevant listing criteria. Where flora and fauna assessments, as outlined in Section 6.1.1 (Avifauna), Section 6.2.1 (Terrestrial fauna) and Section 6.3.1 (Flora and vegetation communities) identified that species are considered unlikely to occur on the Project Site or have a low probability of interaction with the Project, those species are not considered here and further information on these species can be found in the relevant sections of this EIS and associated appendices.

For species found to be at risk of significant impact even with the application of management and mitigation measures (i.e. the effect of residual impacts), an offset is required in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) (refer Section 7.4).

NBES has conducted an assessment for relevant species against the Significant Impact Guidelines as documented in Appendix B for avifauna species and Appendix C for terrestrial species. Where relevant this information has been summarised in the following tables (Table 7-1 and Table 7-2) to provide a consolidated overview of the assessment of significant impact for key species. These tables present summary information only with further detail, including supporting evidence and references where relevant, provided in the NBES reports (Appendix B and Appendix C). Some of the information in the below tables is drawn, verbatim, from the NBES reports.

7.3.1 Endangered species

An action (i.e. the Project) is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that any of the criteria are met for the species in Table 7-1 below, in which event an offset will be required.

7.3.2 Vulnerable species

An action (i.e. the Project) is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that any of the criteria are met for the species in Table 7-2 below, in which event an offset will be required. For EPBC Act listed Vulnerable species, the majority of the significant impact criteria refer to impacts to an important population of a species. An important population is well defined for some species in the literature and either not defined or vaguely defined for others; the spotted-tailed quoll for example has defined important populations in the species' recovery plan (DOTE, 2016). For the Tasmanian sub-species of the masked owl (*Tyto novaehollandiae* ssp. *Castanops*), important populations are not defined in the literature and therefore open to interpretation by ecologists and regulators alike.

NBES has completed an assessment for the relevant species to determine whether (in its opinion) the populations within the Project Site would be considered 'important populations'.

For terrestrial species NBES (2023b) concluded that the population of spotted-tailed quoll does not constitute an important population and the population of Liawenee greenhood does constitute an important population (as discussed in Sections 5.1.2 and 5.1.7 of Appendix C respectively).

For avifauna, NBES (2023a) is of the opinion that the masked owl population in the vicinity of the Project Site (essentially part of the Central Highlands population) does not constitute an important population, following the premise that the connotation of an important population is that it is a separate population to the whole of the population. NBES (2023a) notes that the most important habitat for the species is the core,

most productive habitat where the highest number of owls are recorded; it is therefore assumed that these owls make up the most important population in Tasmania as it is responsible for the maintenance of the greatest number of the population. This is opposed to interpretations of fringe populations at the margins of geographical or climatic occurrence being important populations. Refer to Section 13.3 of Appendix B for details. For this assessment, it is assumed, following the advice of NBES, that the population of the Tasmanian sub-species of the masked owl at and adjacent to the Project Site does not form part of an important population.

Table 7-1 Assessment of endangered species against EPBC Act Significant Impact Criteria

Significant Impact Criteria	**Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)**	**Tasmanian devil (*Sarcophilus harrisii*)**	**Eastern quoll (*Dasyurus viverrinus*)**	**Ptunarra brown butterfly (*Oreixenica ptunarra*)**
Lead to a long-term decrease in the size of a population	There is a possibility of WTE collision with WTGs, resulting in the loss of birds and therefore the possibility of leading to a long-term decrease in the size of the local population if breeding success is disrupted.	NBES (NBES, 2023b) notes that there are two genetically distinct populations of the species in Tasmanian (in accordance with the Species Profile and Threats Database), namely north-western and eastern/south-western with the Project Site falling within the latter. NBES go on to state that the only conceivable way that the Project could lead to a long-term decrease in the size of the Tasmanian devil population across that entire region would be if the Project led to major changes in habitat availability or substantially increased demographic pressures on the species at the regional level. The eastern/south-western population ranges across 50,630 km^2. Thus, the total Project impact area of 481.13 ha is only 0.009% of the range of the population, and the total permanent loss of habitat of 102.79 ha is only 0.002% of the range (with the 0.2 ha of additional loss of denning suitability only making a negligible difference). The proposal is therefore extremely unlikely to substantially impact the size of this devil population as the area within which impacts are contained is simply too small in proportion to the size and	Similarly to the devil, most of the habitat impacts from the Project constitute habitat modification rather than habitat loss. NBES (2023b) concludes that with the proposed mitigation measures in place (den management and roadkill management) the species is likely to continue to use the Project Site in the operational period and there is no likelihood of breeding disturbance, therefore no risk of long-term decrease in the size of a population.	NBES (2023b) concludes that the Project Site is likely to support one single population, rather than discrete colonies. Although habitat for the species may extend beyond the Project Site (particularly to the north) in the absence of additional habitat mapping and survey, a conservative approach has been applied and it is assumed the extent of habitat within the Project Site represents the extent of a single population. NBES (2023b) surveys established that the population consisted of around 200,000 individuals across around 4000 ha of habitat. The Project layout has avoided the vast majority of mapped habitat for this species, with a residual loss of approximately 50 ha of high-quality habitat (in relation to a total of 1,208 ha mapped on site), approximately 157 ha of medium quality habitat (in relation to a total of 2,135 ha mapped on site) and approximately 23 ha of low quality habitat (in relation to a total of 444 ha mapped on site) expected to be impacted. This represents retention/avoidance of approximately 96% of high quality habitat, 93% of moderate quality habitat and 95% of low quality habitat

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
		extent of the overall population. The potential impact from the Project applies to a greater extent to local individuals. NBES notes that the loss of habitat of 102.79 ha (plus the loss of denning suitability within 0.2 ha) is equivalent to the potential loss of carrying capacity equivalent to 1.03 devils. For a population covering over 50,000 km^2 and conceivably (based on density modelling) supporting in the order of 50,000 individuals, this is not considered to be a significant loss. NBES (2023b) concludes that with mitigation measures in place (including Den Management Protocol and roadkill management), based on the small footprint of impact within a vast population area, this action will not lead to a long-term decrease in the size of a population.		mapped on site, with the impacts dispersed across the population extent (i.e. not concentrated in one area). Given the extent of disturbance to the species (based on the relative quality of habitat) NBES (2023b) concludes that the extent of habitat loss from the proposal is not considered sufficient to be responsible for a potential long-term decrease in the entire population.
Reduce the area of occupancy of the species	If one or more WTEs are lost as a result of the Project, then the area of occupancy may be reduced if another WTE or pair do not replace the lost individual/pair.	NBES (2023b) concludes that given most of the Project impact is habitat modification rather than habitat loss, and as a network of forest patches will persist even after Project operations, devils are expected to continue to use the area much as before and their area of occupancy is unlikely to decline. Additionally, the landscape of the project is already fragmented, containing a patchwork of pasture and forest (plantation and native), so	NBES (2023b) concludes that (with roadkill and den management measures in place) there will be no meaningful reduction in the area of occupancy of the species, given that permanent habitat losses are only likely to constitute a very minor and occasional potential foraging resource.	The Project layout has been designed to avoid the majority of the available habitat of the species. NBES (2023b) concludes that given the small extent of habitat to be lost (230 ha) compared to the area of statewide occupancy (estimated at approximately 13,900 ha), the Project is not considered to be a meaningful risk of reducing the area of occupancy of the species at the species level.

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
		further fragmentation will not cause major changes to the general landscape composition. NBES concludes the Project will not reduce the area of occupancy of this species.		
Fragment an existing population into two or more populations	As WTE move in solitary pairs, the Project is not expected to result in population fragmentation.	To fragment a population into two or more populations the Project would have to create a barrier that devils could not or would not cross. The Project instead involves clearing patches of vegetation and connecting them by roads, with patches of remaining forest habitat among them. Devils readily move through human modified landscapes and will even select roads for movement and foraging, so it is highly unlikely that the Project would prevent ongoing interaction among devils in the population nor impact the ability of devils to disperse through the surrounding, already fragmented, landscape. NBES (2023b) concludes the Project does not pose any risk of population fragmentation).	NBES (2023b) concludes the Project does not pose any risk of population fragmentation (internal roads can be crossed without restriction during the operation of the Project by quolls).	Given the existing habitat distribution within the Project Site and the extent of clearance proposed, NBES (2023b) concludes that the Project does not fragment habitat to any greater extent than the existing habitat distribution on the Project Site; the Project is not considered likely to have a significant impact on the population by fragmenting it.
Adversely affect habitat critical to the survival of a species	The Project will reduce the amount of foraging habitat available to the species but is unlikely to significantly affect the availability of breeding habitat (with buffers to protect known	The Draft Tasmanian Devil Recovery Plan states that critical devil habitat includes 'all disease-free areas within mainland Tasmania with suitable devil habitat', 'all areas of pre-disease	NBES (2023b) concludes that (with roadkill and den management measures in place) as the Project poses no likelihood of breeding disturbance, there are no adverse	NBES (2023b) concludes that given the extent of expected habitat loss within the broader available habitat being retained and with mitigation measures (for European wasps) in

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
	nests and no clearance of potential nest sites). Sufficient foraging habitat is available in areas adjacent to the Project Site.	core habitat', and 'areas that may be required under the recovery program for the future introduction of Tasmanian devils'. 'Disease' refers to Devil Facial Tumour Disease (DFTD). The Project Site has been diseased for ~20 years. It is however within pre-disease core habitat and the Project Site contains a patchwork of forest and pasture, which is good devil habitat. In a hypothetical scenario where the eradication or suppression of DFTD from the area was possible (e.g. due to a successful vaccine), it is expected the area could support high numbers of devils once more (such as in the pre-DFTD era) and could return to supporting some of the highest densities of devils in the State. However, pre-disease core habitat areas, as defined by the Recovery Plan, stretch across most of central, eastern and northern Tasmania, covering ~50% of Tasmania, and are thus a very coarsely defined area. The relatively small scale of the Project by comparison to this coarse area renders it likely to have a negligible impact on total devil core habitat, especially as most of the habitat affected will be changed rather than removed (as outlined in Section 6.2). Furthermore, since devils can favour	impacts expected on habitat critical to the survival of the species.	place, the aspects critical to the survival of the population will be preserved and at the species level this change in habitat is not considered to be significant.

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
		some features of fragmented habitat, and the project area is already fragmented, the Project may not significantly adversely affect devil habitat or change devil use of the local landscape. Thus, NBES (2023b) concludes that the Project will not adversely affect habitat critical to the survival of the species.		
Disrupt the breeding cycle of a population	If an adult WTE is lost as a result of collision, then the breeding cycle of the local population could be disrupted.	NBES (NBES, 2023b) identifies that the most significant risk to devil breeding cycles from the Project is destruction of den sites. Habitat clearance could reduce the number of den sites available to devils, and even injure or kill devils trapped inside dens during operations. This is a particular risk to maternal dens, where young devils may be left in dens and unable to escape. To mitigate this risk, standard den management protocols will be implemented prior to clearance of habitat as outlined in Section 6.2. NBES (2023b) concludes that with the proposed pre-clearance den survey and den management protocols in place, the Project will not disrupt the breeding cycle of a population.	With pre-clearance den surveys in place, the Project does not pose a risk of disturbance to the breeding cycle of the species.	NBES (2023b) concludes that overall at the species and population level the vast majority of individuals are not likely to have any measurable interruption to breeding activities as a result of the Project. The Project is thus not considered likely to breach this significant impact criterion.

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	With buffers in place for known eagle nest sites and no potential nesting sites to be cleared, habitat clearance is limited to areas of potential foraging habitat. The loss of this habitat alone is unlikely to result in a decline of the species.	While the total impact footprint of the project is 481.13 ha, most of these impacts will be temporary or indirect from construction operations. The direct impacts from the operational footprint cover only 193.88 ha. Of this, 91.09 ha will be vegetation management for IDF units and overhead powerline (hence vegetation trimming not removal) and 40.85 ha will be roads, which devils use for ease of travel, 43.26 ha will be concrete hardstands, involving complete removal of habitat, though devils can still move across these areas as they do roads. Nearly all of the impact footprint, therefore, involves a change in habitat rather than removal, and these changes in habitat may not even be detrimental to devils. Devils are habitat generalists and can persist in fragmented habitat, even favouring some features of fragmentation for foraging opportunities and rapid travel. As the Project will only clear patches of vegetation within an already fragmented landscape, this may not decrease habitat quality for devils and even local devil populations are unlikely to significantly decline. This, combined with the very small scale of the Project compared to the species' range, means it is extremely unlikely	Given the quality of quoll habitat that will be lost by disturbance is considered a minor foraging resource and the Project does not pose a risk of breeding disturbance (with pre-clearance den surveys in place), NBES (2023b) concludes the Project will not impact on habitat to the extent the species is likely to decline.	NBES (2023b) concludes that, given the extent of habitat loss in relation to habitat retained, the Project is not expected to impact on habitat to the extent the species is likely to decline.

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
		that clearing habitat for the project will result in devil species decline. Thus, NBES (2023b) concludes that the action will not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline.		
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The Project is not likely to result in the introduction of an invasive species that could be harmful to the WTE.	NBES (2023b) notes there is no likelihood of introduction of an invasive species that could be harmful to the devil that does not already exist in the region (noting that foxes, although briefly introduced to Tasmania, have now most likely been exterminated from the state and there is no reason to believe this Project would introduce them to the area).	NBES (2023b) notes there is no likelihood of introduction of an invasive species that could be harmful to the quoll that does not already exist in the region.	With mitigation measures in place (including weed and European wasp control) NBES (2023b) concludes that invasive species can be controlled such that this significant impact criterion will not be breached.
Introduce disease that may cause the species to decline	The Project is not likely to result in the introduction of a disease that could be harmful to the WTE.	NBES (2023b) concludes that the devil facial tumour disease is already extremely prevalent in the area, and it is highly unlikely that any increases in contact rates from roads in the Project Site would result in significant changes in disease transmission. No other disease is recognised as a major threat to the devil nor is there one likely to be found on site or introduced as a result of the Project.	NBES (2023b) notes there is no likelihood of introduction of a disease that could be harmful to the quoll.	NBES (2023b) notes there is a low likelihood of diseases like root rot surviving in the area (due to altitude), therefore no specific known diseases are at risk of introduction that would cause the species to decline.

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
Interfere with the recovery of the species	The potential risk of collision and therefore disruption of breeding indicates the Project has the potential to interfere with the recovery of the species.	Currently the recovery of the Tasmanian devil is based around the work being undertaken by the Save the Tasmanian Devil Program. The Draft Tasmanian Devil Recovery Plan identifies key actions for the recovery of the species, most of which are focused on the Tasmanian Devil Facial Tumour Diseases, as the main threat to the species. The key action of relevance for this Project is 'managing other threats in the wild' which includes collision with vehicles and habitat loss. As outlined previously the Project is considered unlikely to cause significant habitat loss for devils. Although the Project poses some risk of vehicle collision, this is largely restricted to the construction phase as operational traffic volumes will be very low and with the mitigation measures set out in this EIS in place the risk can be well managed. NBES (2023b) concludes that with mitigation measures in place the Project will not interfere with the recovery of the species.	Given the overall scale of impacts, NBES (2023b) concludes the Project poses no potential for interference with the recovery of the species.	Given the overall scale of impacts, NBES (2023b) concludes the Project poses no potential for interference with the recovery of the species.
Summary				
	The Project has the potential to trigger several of the Significant Impact Criteria with respect to WTE	With proposed avoidance and mitigation measures in place the residual impact to the Tasmanian	With proposed avoidance and mitigation measures in place, the Project is considered unlikely to	With proposed avoidance and mitigation measures in place, the Project is considered unlikely to

Significant Impact Criteria	Tasmanian wedge-tailed eagle (*Aquila audax subsp. Fleayi*)	Tasmanian devil (*Sarcophilus harrisii*)	Eastern quoll (*Dasyurus viverrinus*)	Ptunarra brown butterfly (*Oreixenica ptunarra*)
	and therefore, even with mitigation measures in place, offsets are considered likely to be required (refer Section 7.4).	devil is not considered likely to be significant. Despite NBES concluding that the residual impact to the species is not considered to constitute a significant impact in accordance with the EPBC Act, the Proponent understand the Commonwealth may form a different opinion and therefore an offset is proposed (refer Section 7.4).	trigger any of the Significant Impact Criteria, and offsets under the EPBC Act are not expected to be required.	trigger any of the Significant Impact Criteria, and offsets under the EPBC Act are not expected to be required.

Table 7-2 Assessment of vulnerable species against EPBC Act Significant Impact Criteria

Significant Impact Criteria	**Tasmanian masked owl (*Tyto novaehollandiae ssp. Castanops*)**	**Spotted-tailed quoll (*Dasyurus maculatus ssp. Maculatus*)**	**Liawenee greenhood (*Pterostylis pratensis*)**
Lead to a long-term decrease in the size of an important population of a species	The species is expected to be at the Project Site (heard during call playback at adjacent Lagoon of Islands) in relatively small numbers. NBES (2023a) notes that the Project Site provides mostly suboptimal habitat for the species, with only a small proportion of the assessed suitable habitat proposed to be impacted by the Project, and the species is considered outside its core range. The site is not considered to support an important population of the species (refer Section 13.3 of Appendix B). Given the low likelihood of collision with WTGs (NBES, 2023a), the small area of habitat clearance and the fact that no nests have been identified or are expected to be impacted, the Project is highly unlikely to lead to long-term decrease in the size of any population (noting the Project Site is not expected to support an important population).	NBES (2023b) notes that spotted-tailed quoll is present within the Project Site but the area is not located within the range of what are considered to constitute important populations. As the population is not classified as an important population, this criterion is not triggered. It is noted that (with mitigation measures in place) NBES (2023b) concludes the species is likely to continue to use the site following works.	The occurrence of this species on the Project Site is noted by NBES as representing an important population referenced within the Threatened Species Listing Statement (Department of Primary Industries and Water, 2008). For context, the Listing Statement indicates the St Patricks Plains population constitutes only 60 individual plants over an area of 2 ha. This is considered outdated information and the data collected for the current study are likely to be the most detailed assessment of the population to date. As demonstrated by NBES, the St Patricks Plains subpopulation contains at least 742 individual plants (both historical records and data collected during surveys for this Project) and NBES estimate the subpopulation extends over a large area (~3,500ha) which could contain in the order of several thousand plants. The species is thought to have a state-wide population > 10,000 plants (NBES, 2023b). The Project is expected to impact on a relatively small number of individual plants and area of potential habitat. As outlined in Section 6.3.4, the Proponent commits to the establishment of exclusion zones for this species during construction, to minimise the extent of impact. With these exclusion zones in place, the Project is expected to result in the loss of 28

Significant Impact Criteria	Tasmanian masked owl (*Tyto novaehollandiae ssp. Castanops*)	Spotted-tailed quoll (*Dasyurus maculatus ssp. Maculatus*)	Liawenee greenhood (*Pterostylis pratensis*)
			individual plants, out of a total 742 records in the subpopulation (i.e. ~3.8% of the total recorded), noting that NBES estimate the subpopulation is actually far greater in size than the number of records observed to date. NBES also provide a calculation of the predicted impact to potential habitat for the species, noting the Project is expected to impact on a maximum of ~ 203 ha of potential available habitat for the species, out of approximately 3,227 ha mapped on site (i.e. ~6%), noting this is the maximum upper limit of impact and does not take into account the proposed exclusion zones or the eventual rehabilitation of the construction buffer. NBES (2023b) concludes that given the relatively small number of plants to be impacted in the context of the overall subpopulation, the impact to the population is minor. Given the species is locally abundant across the Project Site and potentially more abundant in the extent of the population overall, NBES conclude the action will not lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of an important population	As above, the loss of small areas of habitat is not expected to result in the reduction in the area of occupancy of any population, noting the Project Site is not expected to support an important population.	As above, the population at the Project Site and surrounds is not considered an important population, therefore this criterion is not triggered. It is noted that (with mitigation measures in place) NBES concludes that the Project is not expected to reduce the area of occupancy of	According to the Threatened Tasmanian Orchids Recovery Plan 2017, the current known extent of this species is ~150,000 ha, spread across a linear range of ~123 km. The St. Patricks Plains population extends over a large area ~3,500 ha. Given that the Project will impact only ~28

Significant Impact Criteria	Tasmanian masked owl (*Tyto novaehollandiae ssp. Castanops*)	Spotted-tailed quoll (*Dasyurus maculatus ssp. Maculatus*)	Liawenee greenhood (*Pterostylis pratensis*)
		any population given that permanent habitat losses are only likely to constitute a very minor and occasional potential foraging resource.	individual plants and up to ~ 203 ha of potential habitat this is considered to constitute a very small area in relation to the overall area of occupancy at the state-wide (~150,000 ha) and local population (~3,500 ha) level. Thus NBES (2023b) concludes this action will not meaningfully reduce the area of occupancy of this population.
Fragment an existing important population into two or more populations	The layout of the Project does not present a risk of fragmentation of any population, noting the Project Site is not expected to support an important population.	As above, the population at the Project Site and surrounds is not considered an important population, therefore this criterion is not triggered. It is noted that with mitigation measures in place NBES concludes the Project is not expected to fragment any population.	The St Patricks Plains subpopulation of this species extends over a large area (~3,500 ha). The impact to a small number of individual plants (~ 28) at 3 locations will not fragment the broader population at this site given the development components will not represent impassable barriers to seeds or pollinators (both of which are capable of wind dispersal) and that the site already includes equivalent infrastructure (e.g., roads and dams) that is not considered to have fragmented the existing population. Thus, this action will not fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	The majority of habitat available on the Project Site is considered suboptimal for the species (and is considered to be outside its core range) and therefore is unlikely to be critical to the survival of the species (NBES, 2023a).	Given the quality of quoll habitat that will be lost by disturbance is considered a minor foraging resource, NBES concludes that the habitat impacted by the Project is highly unlikely to be critical to the survival of the species.	Given that the species is locally abundant at the Project Site, the impact to ~ 203 ha of potential habitat is considered to be minor in context of the broader landscape. High quality habitat for this species will remain extant within the Project Site and will not be impacted by the proposed development. There is nothing critically important about the locations proposed to

Significant Impact Criteria	Tasmanian masked owl (*Tyto novaehollandiae ssp. Castanops*)	Spotted-tailed quoll (*Dasyurus maculatus ssp. Maculatus*)	Liawenee greenhood (*Pterostylis pratensis*)
			be impacted to suggest the loss will impact the population as a whole. Thus NBES (NBES, 2023b) conclude the action will not adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Given the expected low density of the species on site, the loss of a relatively small area of potential habitat and the fact that impacts to nests are not expected, the Project is highly unlikely to disrupt the breeding cycle of any population, noting the Project Site is not expected to support an important population.	The population at the Project Site and surrounds is not considered an important population, therefore this criterion is not triggered. It is noted that with mitigation measures in place the Project is not expected to disrupt the breeding cycle of any population.	As the species is pollinated by insects (trapping the insects in a trigger mechanism) the removal of approximately 28 plants will not impact upon the ability of the remaining population to pollinate. As such the Project will have no meaningful impact on the breeding cycle of the population (NBES, 2023b).
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The majority of habitat available on site is considered suboptimal and the relatively small areas of loss are not expected to result in reduction in the availability of quality habitat to the extent the species is likely to decline.	Given the quality of quoll habitat that will be lost by disturbance is considered a minor foraging resource, no decline in quoll numbers is anticipated as a result of the disturbance.	The proposed development will impact on up to ~ 203 ha of potential habitat for the species, which account for ~ 6% of the available potential habitat mapped on the Project Site. Given the availability of habitat across the broader project area (and beyond), the impact to habitat for this species is very low. In addition, there is scope for rehabilitation and avoidance of areas of potential habitat that may be temporarily disturbed within the construction disturbance buffer, further reducing proportional impacts. NBES (2023b) concludes that the impact to habitat for this species, in the context of remaining suitable habitat, is very low and will not impact habitat to the extent the species is likely to decline.

Significant Impact Criteria	Tasmanian masked owl (*Tyto novaehollandiae ssp. Castanops*)	Spotted-tailed quoll (*Dasyurus maculatus ssp. Maculatus*)	Liawenee greenhood (*Pterostylis pratensis*)
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is no expectation of introduction of invasive species that would be harmful to the Tasmanian masked owl.	NBES (2023b) notes there is no likelihood of introduction of an invasive species that could be harmful to the quoll.	With weed management measures in place, the Project is unlikely to result in an invasive species that is harmful to the species becoming established.
Introduce disease that may cause the species to decline.	There is a low likelihood of introduction of a disease that would be harmful to the Tasmanian masked owl.	NBES (2023b) notes there is no likelihood of introduction of a disease that could be harmful to the quoll.	There are no documented diseases that may impact on the viability of this species (NBES, 2023b).
Interfere substantially with the recovery of the species.	Given the scale of predicted impacts and the fact the Project Site is outside the core range of the species (and provides mainly suboptimal habitat) the Project is not expected to interfere with the recovery of the species.	Given the overall scale of impacts, NBES (2023b) concludes the Project poses no potential for interference with the recovery of the species.	NBES (2023b) has assessed the Project in accordance with the recovery plan for the species and concludes that the loss of ~28 plants is not considered likely to interfere with the recovery of the species.
Summary			
	With proposed avoidance and mitigation measures in place, the Project is considered unlikely to trigger any of the Significant Impact Criteria, and offsets under the EPBC Act are not expected to be required.	With proposed avoidance and mitigation measures in place, the Project is considered unlikely to trigger any of the Significant Impact Criteria, and offsets under the EPBC Act are not expected to be required.	The impact to approximately 28 mapped individuals (and up to ~ 203 ha of potential habitat) will not have a significant impact on this species given its localised abundance on site, the extent of retained plants and habitat, and the existing size of the St Patricks Plains subpopulation as documented in Appendix C. The Project is therefore considered unlikely to trigger any of the Significant Impact Criteria, and offsets under the EPBC Act are not expected to be required.

7.4 Offsets

As summarised in the preceding tables (Table 7-1 and Table 7-2) and documented in the NBES reports (Appendix B and Appendix C), the assessment presented herein concludes that the Tasmanian WTE is the only threatened species listed under the EPBC Act for which residual impacts are likely to be significant and therefore an offset proposal is required in accordance with the Environmental Offsets Policy (DSEWPaC, 2012).

The assessment conducted by NBES (Appendix C) and summarised herein concludes that residual impacts to the Tasmanian devil are not considered to be significant, as defined under the Significant Impact Guidelines. However, early communication with the DCCEEW indicated that the Commonwealth may form an alternative opinion and may seek an offset proposal for this species. In response to this feedback from DCCEEW, the Proponent has elected to offer an offset proposal for the Tasmanian devil as outlined in the following sections.

In accordance with the EPBC Act Environmental Offsets Policy, the offset proposals presented herein will be subject to assessment by DCCEEW and, if not considered suitable, the Proponent will be provided an opportunity to submit a revised proposal to address the issues raised by DCCEEW prior to the decision stage under the EPBC Act assessment process. If an offset proposal is accepted by the DCCEEW, it will form a condition of approval.

7.4.1 Tasmanian wedge-tailed eagle offset proposal

The assessment of the key species protected under the EPBC Act likely to occur within the Project Site has found that only the Tasmanian WTE has the potential to be significantly impacted by the Project and therefore is the only species that requires an offset to be developed in accordance with the Environmental Offsets Policy (DSEWPaC, 2012).

Following consultation with the EPA and with regard to the DCCEEW EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) and DNRE *Offset Guidelines for Impacts to Threatened Eagles from Wind Farm Developments*, the offset for the Tasmanian WTE will be based on a monetary contribution to the Wedge-tailed Eagle Research Fund, administered by NRM South. The Proponent commits to providing $100,000 per Tasmanian WTE mortality resulting from WTG collision towards the Wedge-tailed Eagle Research Fund.

The fund is administered by NRM South, one of three non-government organisations (NGOs) in Tasmania established under the *Natural Resource Management Act 2002* to act as conduit between government, industry and the community. NRM South has well-established governance arrangements including the NRM South Board, which is responsible for the provision of effective governance and strategic guidance to the organisation.

The fund was originally established from financial contributions from the Cattle Hill Wind Farm as part of the offset requirements for that project and has become the suggested recipient of monetary offsets for Tasmania-based projects. The objective of the fund is to support high-quality ecological or other relevant scientific research on the Tasmanian WTE to assist with understanding, management and protection of the species.

The fund is overseen by an independent Technical Advisory Committee (TAC) tasked with reviewing and selecting applications for support from the fund and monitoring progress of projects that have been supported. The TAC is comprised of independent eagle specialists and representatives from DNRE, DCCEEW and NRM South. Support from the fund is provided to research that is scientifically rigorous, is conducted by suitably qualified, knowledgeable and experienced scientists, and is consistent with the objectives of the *Threatened Tasmanian Eagles Recovery Plan 2001-2020* or any subsequent Eagle Recovery Plan (NRM South, 2022).

The fund has been supporting projects since 2020, including a research project investigating the spatial ecology and habitat use of the Tasmanian WTE using high frequency GPS telemetry in unmodified landscapes, a project estimating the population size of the Tasmanian WTE using modern genetic techniques, and a project monitoring Tasmanian WTE population trends using data collected by the *Where? Where? Wedgie!* Project (www.nrmsouth.org.au/wedge-tailed-eagle-research-fund).

The proposed offset will meet the offset principles outlined in DCCEEW's Environmental Offsets Policy (DSEWPaC, 2012), as shown in Table 7-3.

Table 7-3 Assessment of proposed wedge-tailed eagle offset against the EPBC Act offset principles

EPBC Act offset principles	Assessment of proposed offset against principle
1 Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action.	The monetary contribution to the Wedge-tailed Eagle Research Fund will go towards research that aims to improve or maintain the viability of the Tasmanian WTE. The fund is overseen by an independent Technical Advisory Group which is tasked with ensuring all research projects supported by the fund are scientifically rigorous, conducted by suitably qualified people and consistent with the objectives of relevant eagle recovery plans. The fund was originally established as an offset requirement of the Cattle Hill Wind Farm and serves to offset the potential impact of wedge-tailed eagle mortalities due to collisions with wind turbines (NRM South, 2022). By combining offset contributions from all Tasmanian wind farms into a single fund, there is potential for the fund to achieve greater overall environmental benefit for the species than may be achieved via a piecemeal approach from project to project.
2 Be built around direct offsets but may include other compensatory measures.	Direct offsets are those that provide a measurable conservation gain for an impacted protected matter, including improving existing habitat, creating new habitat, reducing threats to the species or averting the loss of the species or its habitat that is under threat. In the context of the Tasmanian WTE, potential direct offsets for the species include nest and/or land covenants. Given the broad foraging habitat requirements for the species, the most valuable direct offset would be related to the protection of known nests or nesting habitat for the species. Harris (Harris, 2019) undertook a study into the efficacy of conservation covenants for protection of eagle nesting sites on private land in Tasmania. This research documented the activity status of eagle nests across private land protected by covenants, permanent timber production zones and unprotected private freehold, and it found no difference between nest activity across these three management regimes. Although conservation covenants can provide a valuable contribution to species protection, there are limitations to their application and efficacy. As established by Harris, they do not necessarily offer better nesting outcomes than nests on unprotected land and their use needs to be considered in the context of existing protections in place for eagle nests within the Tasmanian landscape. Eagle nests in Tasmania are already afforded a level of protection through state and federal legislation, noting these protections are only applicable when the nest location is known, and hence they do not necessarily afford protection to nesting habitat or undocumented nests. When considering the value of a direct offset (such as a conservation covenant for a nest site) its beneficial effect is less certain where the

EPBC Act offset principles	Assessment of proposed offset against principle
	value being protected is not under immediate threat (i.e. already protected via other means). Hence the use of conservation covenants in this instance could be considered to have limited value given the threat to known nest sites is already at least partially controlled through existing provisions. The EPBC Act Offsets Policy states that a deviation from the standard 90% direct offset requirement can be considered where it can be demonstrated that a greater benefit is likely to be achieved through other measures, or where scientific uncertainty is so high that it isn't possible to determine a direct offset that is likely to benefit the species. In this instance the benefit of rigorous scientific research directly aimed at management and protection of the species facilitated through the independent Wedge-tailed Eagle Research Fund is considered to present a greater benefit to the species than a direct offset, via conservation covenant, particularly given the level of protection already afforded to eagle nests in Tasmania. In considering the relatively benefit of direct offsets (such as conservation covenants) or other compensatory measures (such as the financial contribution proposed here) it is also useful to reference the Australian Government's recent reform approach under the Nature Positive Plan, which stipulates that 'averted loss' offsets (protecting one patch of existing habitat in exchange for clearing or loss of another) will be discontinued (unless it can be demonstrated that the habitat is under clear and imminent threat). The Nature Positive Plan also notes that many existing offsets deliver no benefit, as they involve protection of areas that would not have been cleared or the values are not maintained in the long term. These statements further support the assertion that in this instance projects supported by a financial contribution (to an established fund) may be better able to provide measurable beneficial outcomes for the species recovery than a direct offset, such as averted loss through conservation covenants for nesting sites in the region that are not under immediate threat and already afforded a level of protection under existing legislation. The offset proposed herein is consistent with the approach applied to other wind farms in Tasmania in recent years.
3 Be in proportion to the level of statutory protection that applies to the protected matter.	The Tasmanian WTE is listed as endangered under the EPBC Act and the proposed financial contribution (in the form of a financial contribution for any single WTE eagle death) is considered to be commensurate with the level of statutory protection that applies to the species. The proposed offset is commensurate with other wind farms operating in Tasmania and is considered sufficient to incentivise wind farm proponents to minimise all impacts.
4 Be of a size and scale proportionate to the residual impacts on the protected matter.	The proposal for a financial contribution for any individual Tasmanian WTE mortality caused as a result of the Project is considered to be of a size and scale proportionate to the residual impact to the species and is commensurate with the offsets provided for other wind farms operating in Tasmania.
5 Effectively account for and manage the risks of the offset not succeeding.	The Wedge-tailed Eagle Research Fund is managed by NRM South, is supported by DNRE Tasmania and is overseen by a Technical Advisory Committee comprised of well-respected members from federal and state government agencies as well as NRM South and independent members.

EPBC Act offset principles	Assessment of proposed offset against principle
	The fund has been operational since 2020 and has already funded three successful scientific research projects. Given the fund is well established and administered with a proven track record, effective controls are in place to ensure the success of the offset.
6 Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action).	The Tasmanian regulatory system has measures in place to protect the clearance or direct impact to known nests and measures to control the clearance of habitat that supports threatened species but does not have a formal offset policy in place for either direct or habitat-scale impacts to the species. As such the proposed offset is considered commensurate with the offsetting requirements under the EPBC Act and is in addition to what is required under Tasmanian environmental law and planning regulations.
7 Be efficient, effective, timely, transparent, scientifically robust and reasonable.	The Wedge-tailed Eagle Research Fund is managed by a government-recognised NGO in Tasmania and is overseen by a Technical Advisory Committee including eagle specialists and representatives from DCCEEW and DNRE; hence these requirements are deemed to be met.
8 Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The Wedge-tailed Eagle Research Fund is managed by NRM South (a government-recognised NGO in Tasmania) and is overseen by a Technical Advisory Committee including eagle specialists and representatives from DCCEEW and DNRE. NRM South is an independent natural resource management body, formed under the Tasmanian *Natural Resources Management Act 2002* and incorporated and operated in accordance with the Tasmanian *Incorporated Associations Act* 1964. NRM South was declared as a Regional Committee under the Act in 2003 and has well-established governance arrangements including the NRM South Board, which is responsible for the provision of effective governance and strategic guidance to NRM South. NRM South monitors and evaluates all its programs and refers to the *Australian Government Natural Resource Management Monitoring, Evaluation, Reporting and Improvement Framework*.

7.4.2 Tasmanian devil offset proposal

The assessment presented in this EIS and the NBES supporting report (Appendix C) concludes that, in the author's opinion, the residual impacts to Tasmanian devil are not considered likely to constitute a significant impact under the EPBC Act. Nonetheless it is understood the Commonwealth may form an alternative opinion and may seek an offset proposal for this species and therefore the Proponent has elected to offer an offset proposal for the Tasmanian devil as outlined in the following sections.

With regard to the DCCEEW Environmental Offsets Policy (DSEWPaC, 2012) and advice from NBES about the suitability of different offset options, the Proponent believes that a financial contribution is the most effective way to address the principles required of an EPBC Act offset and therefore commits to a one-off contribution of $250,000 to the Save the Tasmanian Devil Program to support ongoing management and protection of the species.

The Environmental Offsets Policy states that, in determining the appropriateness of offset activities proposed, the Department will consult the relevant Commonwealth approved recovery plan, threat abatement plan, conservation advice, ecological character description, management plan or listing

document and that in the absence of Commonwealth approved guidance documentation additional information sources will be considered (such as state management plans).

There is currently no formal Recovery Plan for the Tasmanian Devil, however the approved Conservation Advice for the species (dated 2009) specifies that research priorities and priority actions are set out under the 'Save the Tasmanian Devil' Program (STDP), led by the Tasmanian Government. It is also noted that a Draft Tasmanian Devil Recovery Plan (DPIPWE, 2010) has been developed and although it is not finalised or Commonwealth approved, it still provides useful information on the recovery of the species and is therefore referenced herein. Additionally, the Survey Guidelines and Management Advice for Development Proposals That May Impact on the Tasmanian Devil (PCAB, 2015) provide offset considerations for the species and also hold some relevance.

The EPBC Act Environmental Offsets Policy provides guidance on the types of offsets that may be adopted. It discusses direct offsets (e.g. improving existing habitat, creating new habitat or averting the loss of a protected matter that is under threat) and compensatory measures (e.g. funding research or educational programs). The Policy stipulates that a minimum of 90% of the offset requirement for any given impact must be met through direct offsets except where it can be demonstrated that a greater benefit to the protected matter is likely to be achieved through increasing the proportion of other compensatory measures or scientific uncertainty is so high that it isn't possible to determine a direct offset that is likely to benefit the protected matter.

The Conservation Advice and Draft Tasmanian Devil Recovery Plan identify that the main threat to the Tasmanian devil is the Devil Facial Tumour Disease (DFTD). The Tasmanian Devil Recovery Plan sets out a strategy for recovery which focuses heavily on addressing the DFTD as the key threat to the species. The recovery strategy focuses on developing an insurance population while trying to manage the disease in the wild and maintain the species' ecological function. Providing a financial contribution to the implementation of the Draft Tasmanian Devil Recovery Plan and the priorities of the STDP is a highly effective way of achieving direct benefit to the species and in this instance is likely to achieve a greater benefit than direct measures (such as conservation covenants or habitat restoration) would, given that the key threat to the species is the DFTD, not habitat loss.

NBES supports this assertion, noting that there is limited value to these species through a direct offset such as a covenant of additional land, as this is not considered likely to represent a net gain for the species, considering available land is not limiting their populations, and tenure and reservation status have little relationship to devil density (NBES, 2023b).

Therefore, in this instance, the greatest benefit to the protected matter is considered to be through the funding of research and priority actions set out under the STDP. The STDP is an initiative of the Australian and Tasmanian governments and was established in 2003 following a national workshop of specialists on the decline of the Tasmanian devil due to DFTD. The STDP is the official response to the threat of DFTD and is recognised as setting the research priorities and priority actions for the species in the approved Conservation Advice.

This approach is consistent with previous offsets established for the Tasmanian devil, which have generally focused on financial contributions to the STDP (DCCEEW Offsets Register (DCCEEW, 2023)).

The proposed offset will meet the offset principles outlined in DCCEEW's Environmental Offsets Policy (DSEWPaC, 2012), as shown in Table 7-4.

Table 7-4 Assessment of proposed Tasmanian devil offset against the EPBC Act offset principles

EPBC Act offset principles	Assessment of proposed offset against principle
1 Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is	By contributing funding to the STDP the proposed offset will directly contribute to implementation of priority actions to maintain the viability of the species. The threat to Tasmanian devils from the

EPBC Act offset principles	Assessment of proposed offset against principle
protected by national environment law and affected by the proposed action.	DFTD is an evolving threat with new data and research becoming available all the time. The STDP is officially recognised in the approved Conservation Advice as setting priority actions and is best placed to respond to the evolving priorities for the species. This includes the Draft Tasmanian Devil Recovery Plan focus on insurance populations and the emerging research into vaccines.
2 Be built around direct offsets but may include other compensatory measures.	Direct offsets are those that provide a measurable conservation gain for an impacted protected matter, including improving existing habitat, creating new habitat, reducing threats to the species or averting the loss of the species or its habitat that is under threat. In the context of the Tasmanian devil, potential direct offsets for the species could include land covenants, protection of individual dens under imminent threat or potentially the creation of artificial dens in some instances. NBES have identified that covenanting of additional land would be of limited value to the species considering available land is not limiting their populations and tenure and reservation status have little relationship to devil density (NBES, 2023b). This view is supported by the offset considerations in the Tasmanian Survey Guidelines and Management Advice for Development Proposals That May Impact on the Tasmanian Devil (PCAB, 2015), which state that in most instances it is not feasible to set aside or reserve a viable area of specifically devil habitat as an offset as most parts of Tasmania can serve as devil habitat. The Project already proposes measures to manage the risk of impact to individual dens through pre-clearance surveys and den management protocols (refer Section 6.2) including prioritisation of the protection of natal dens (noting none have been identified in the footprint) and establishing specific compensatory measures in the event a natal den is identified during pre-clearance surveys and cannot be avoided. Given the abundance of denning opportunities across the Project Site, protection of dens outside the construction footprint (i.e. in the unimpacted parts of the Project Site) or construction of artificial dens affords little additional benefit to the species. It is relevant to note here that existing legislative provisions in Tasmania already afford a level of protection to all den sites from other impacts, through the requirement for a Permit to Take in the event of impact to a known den site. The EPBC Act Offsets Policy states that a deviation from the standard 90% direct offset requirement can be considered where it can be demonstrated that a greater benefit is likely to be achieved through other measures, or where scientific uncertainty is so high that it isn't possible to determine a direct offset that is likely to benefit the species. In this instance the benefit of research and implementation of priority actions set out in the Draft Tasmanian Devil Recovery Plan and coordinated by the STDP is considered to present a far greater benefit to the species, whose greatest threat is the DFTD, than a direct offset, via conservation covenant, given that available land is not limiting the species' population.

EPBC Act offset principles	Assessment of proposed offset against principle
3 Be in proportion to the level of statutory protection that applies to the protected matter.	The Tasmanian devil is listed as endangered under the EPBC Act and the proposed financial contribution is considered to be commensurate with the level of statutory protection that applies to the species. The Proponent has reviewed previous offsets for the Tasmanian devil documented on the DCCEEW Offsets Register (DCCEEW, 2023) and the proposed financial contribution is considered to be commensurate with other recent Projects given the scale and nature of residual impacts and the fact that the Project Site does not support a disease-free population.
4 Be of a size and scale proportionate to the residual impacts on the protected matter.	NBES has assessed the potential impact to the Tasmanian devil and (as outlined in 6.2 Appendix C) concludes that residual impacts to the Tasmanian devil are not considered to be significant, as defined under the Significant Impact Guidelines. To this end compensatory measures are being proposed here in the form of an offset in the interests of satisfying the Commonwealth and are considered, by the proponent, to be of a suitable size and scale for the residual impacts to the species. The Proponent has been informed by previous offsets for the species in preparing the proposed compensatory measure.
5 Effectively account for and manage the risks of the offset not succeeding.	The STDP is led by the Tasmanian government and is recognised as coordinating the conservation effort for the species. The STDP was established in 2003 as a joint initiative by the Australian and Tasmanian governments and has been guiding the conservation of the species in Tasmania for the past twenty years. Given the STDP establishment and proven track record, effective controls are in place to ensure the success of the offset.
6 Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action).	The Tasmanian regulatory system has measures in place to protect the clearance or direct impact to individual animals and known den sites and measures to control the clearance of habitat that supports threatened species but does not have a formal offset policy in place for either direct or habitat-scale impacts to the species. Separate compensatory measures have been proposed for possible devil roadkill and possible maternal den impacts (if located during pre-clearance surveys) as required by State agencies (refer 6.2.5). As such the financial contribution proposed herein is in addition to what is required under Tasmanian environmental law and planning regulations.
7 Be efficient, effective, timely, transparent, scientifically robust and reasonable.	The EPBC Act Environmental Offsets Policy defines efficient and effective offsets as those that maintain or improve the viability of a protected matter through the sound allocation of resources. As the STDP is recognised as coordinating the conservation effort for the species it is best placed to ensure sound allocation of resources aligned with priority actions for the species.
8 Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The STDP is well established and delivered by the Tasmanian government via the DNRE. As it is a part of the DNRE the Program has established governance arrangements and regular reporting.

7.5 Summary of matters specified in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000

The PSGs require a summary table to be provided, showing that the EIS addresses all matters specified in Schedule 4 of the *Commonwealth Environment Protection and Biodiversity Conservation Regulations 2000*. Table 7-5 provides a summary of the Section of the EIS where the relevant information is provided.

Table 7-5 Summary of response to Schedule 4 of the EPBC Regulations 2000

Content of Regulations		Section of EIS
1	General information	Section 1 (Introduction)
2	Description	Description of the action is provided in Section 2 (Proposal description), alternatives to the action are provided in Section 3 (Project alternatives), safeguards and mitigation are provided in the relevant subsections in Section 6 (Potential impacts and their management) and consultation is provided in Section 4 (Consultation).
3	Relevant impacts	Assessment of impacts is provided in Section 6 (Potential impacts and their management), with the most relevant subsections for consideration under the EPBC Act being Section 6.1 (Avifauna), Section 6.2 (Terrestrial fauna) and Section 6.3 (Flora and vegetation communities).
4	Proposed safeguards and mitigation measures	Proposed safeguards and mitigation measures are provided in Section 6 (Potential impacts and their management), with the most relevant subsections for consideration under the EPBC Act being Section 6.1 (Avifauna), Section 6.2 (Terrestrial fauna) and Section 6.3 (Flora and vegetation communities).
5	Other approvals and conditions	Section 1 (Introduction)
6	Environmental records of person proposing to take the action	Section 1 (Introduction)
7	Information sources	A list of references is provided in Section 12, and all relevant technical reports commissioned for this Project are included as appendices. Where relevant, information sources used and their reliability are discussed in the relevant sections throughout this EIS.

8 Monitoring and review

The proposed monitoring regime for the Project includes construction phase monitoring to ensure compliance with the controls set out in this EIS and operational phase monitoring to assess the impacts of the Project on the environment.

8.1 Construction phase monitoring

The proposed construction phase monitoring commitments have been documented in the relevant sections of this EIS and are summarised in Table 8-1.

Table 8-1 Construction phase monitoring

Reference number	Aspect / EIS section	Monitoring commitment
Various MON 1	All (Section 6)	Monitoring procedures for construction environmental controls will be documented in the CEMP and implemented during the construction phase, including as a minimum: • Daily visual monitoring of active construction areas for dust and other visible emissions (e.g. wind-blown waste and visible water quality issues including high sediment loads or surface sheen). • Fortnightly audits of the physical site construction controls (including sediment and erosion control measures, exclusion fencing, signage, fauna management controls and waste management). Additional audits will be undertaken after extreme weather events. • Monthly audits of all management measures set out in the CEMP. • Any non-conformance identified during inspections and audits will be documented, investigated and resolved. • Audits will be made available to the EPA on request. • Any non-conformance or incident with the potential for serious or material environmental harm will be reported to the Director, EPA within 24 hours.
Eagle MON 1	Avifauna (Section 6.1)	An eagle nest search will be undertaken by a suitably qualified person (outside of the eagle management constraint period as defined by the Forest Practices Authority) prior to construction. The results of the nest search will be reported to the EPA (prior to the commencement of construction) and will be used to inform the final wind farm layout to be included in the final Wind Farm Design Report. A 1 km WTG exclusion zone will be applied to any new active nest identified. Any new nest locations identified will also be submitted to the Natural Values Atlas in accordance with normal process.
Eagle MON 2	Avifauna (Section 6.1)	Nest activity and productivity surveys for all known nest locations will be undertaken by a suitably qualified person on an annual basis from the commencement of construction, throughout operation. Surveys will be undertaken in accordance with all relevant guidelines. The results of annual nest activity and productivity surveys will be reported to the EPA (as part of the Project's annual environmental reporting).
Terrestrial Fauna MON 1	Terrestrial Fauna (Section 6.2)	Pre-clearance den surveys will be undertaken in accordance with the Devil and Quoll Den Management Protocol (draft protocol provided as Appendix L to NBES (2023b) (Appendix C)). Identified dens will be avoided where possible. Where this is not possible, den decommissioning will be undertaken in accordance with the Devil and Quoll Den Management Protocol.

Reference number	Aspect / EIS section	Monitoring commitment
Terrestrial Fauna MON 2	Terrestrial Fauna (Section 6.2)	Ptunarra brown butterfly and European wasp monitoring will be undertaken in accordance with an approved Ptunarra Brown Butterfly Monitoring and European Wasp Monitoring and Control Strategy (draft strategy provided as Appendix M to NBES (2023b) (Appendix C)) to be commenced in the year prior to construction and then annually during construction and for the first five years post construction.
Terrestrial Fauna MON 3	Terrestrial Fauna (Section 6.2)	Roadkill monitoring will be undertaken during the pre-construction and construction phase in accordance with the Roadkill Monitoring and Adaptive Management Plan and the PCAB devil survey guidelines (PCAB, 2015) including as a minimum: • Weekly pre-construction monitoring along relevant public roads external to the Project Site for a minimum period prior to construction of either a 3-month period during devil weening or for 6 months outside this period, to form a baseline against which construction phase monitoring can be compared. • Weekly construction monitoring along relevant public roads external to the Project Site and all roads internal to the Project Site used by construction personnel for the duration of construction.
Flora & Vegetation Communities MON 1	Flora & Vegetation Communities (Section 6.3)	Rehabilitated sites will be monitored every 3 months to assess progress, and monitoring will continue post-construction on a 3-monthly basis until sites are rehabilitated in accordance with the target attributes to be developed in the rehabilitation plan for the Project.
Flora & Vegetation Communities MON 2	Flora & Vegetation Communities (Section 6.3)	Weed, disease and hygiene monitoring will be undertaken in accordance with the Weed, Disease and Hygiene Management Plan developed for the Project.
Waste Management MON 1	Waste Management (Section 6.8)	The construction contractor will maintain records of waste volumes generated and disposal locations, including disposal facility receipts.
Dangerous Goods and Environmentally Hazardous Materials MON 1	Dangerous Goods and Environmentally Hazardous Materials (Section 6.9)	Records of volumes of all dangerous goods or environmentally hazardous materials used for the Project will be maintained by the construction contractor and be made available to EPA upon request.

8.2 Operational phase monitoring

The proposed operational phase monitoring commitments are identified in Table 8-2.

Table 8-2 Operational phase monitoring

Reference number	Aspect / EIS section	Monitoring commitment
Eagle MON 2 (monitoring measure carried over from construction)	Avifauna (Section 6.1.4)	Nest activity and productivity surveys for all known nest locations will be undertaken, by a suitably qualified person, on an annual basis from the commencement of construction, throughout operation. Surveys will be undertaken in accordance with all relevant guidelines. The results of annual nest activity and productivity surveys will be reported to the EPA (as part of the Project's annual environmental reporting).
Eagle MON 3	Avifauna (Section 6.1.4)	Avian mortality monitoring will be undertaken in accordance with the Final Eagle Monitoring and Management Plan (inclusive of the Final Avian Mortality Monitoring Plan). The results of avian mortality monitoring will be reviewed and reported to the EPA as part of the Project's annual environmental reporting.
Eagle MON 4	Avifauna (Section 6.1.4)	In the event of a threatened avian species detected during avian mortality monitoring: • The Director, EPA will be notified within 24 hours of completion of that day's survey. • A mortality report will be prepared by a suitably qualified professional to document the particulars of the mortality and, where possible, investigate the likely cause of death and related factors that may provide insight into how the mortality has occurred and what (if anything) can be adjusted in the management measures to mitigate a future event. Recommendations from the mortality report will be implemented, where possible (including adjustments to curtailment devices such as vegetation management, operator training and if necessary, changes to unit heights or locations). • The mortality report will be provided to the EPA and Commonwealth (for EPBC Act listed species) within one week of its completion.
Flora and Vegetation Communities MON 3	Flora & Vegetation Communities (Section 6.3)	During the operational phase, annual audits of weed, disease and hygiene management protocols and infrastructure will be undertaken for the operational footprint and made available to the Director, EPA upon request.
Noise MON 1	Noise (Section 6.4)	Within 6 months of the date of commencement of operation a noise assessment will be undertaken in accordance with NZS 6808 demonstrating compliance with the operational noise requirements.
Waste Management MON 2	Waste Management (Section 6.8)	An estimate of annual waste volumes generated on site will be provided in Annual Environmental Reports.

9 Decommissioning and rehabilitation

Decommissioning will occur at the end of the life of the Project. There will be two main stages of rehabilitation for the Project, the first during and post-construction and the second at decommissioning or the end of the operational life of the Project, currently proposed to be up to 30 years.

9.1 Construction

Detailed information on the construction phase demobilisation and rehabilitation will be provided in the CEMP for the Project and made available to the EPA prior to the commencement of construction. This will include but not be limited to:

- Decommissioning and removal of all transportable and semi-permanent construction facilities, such as demountable offices and crib rooms, toilet facilities and storage containers.
- Contouring, ripping and reinstating stockpiled topsoil[30], and, if suitable, re-seeding (in consultation with a qualified agricultural/botany consultant) of all temporary laydown, disturbance and road areas not required during operation.
- Clean-up and removal of all stockpiled materials and waste left over from construction.
- Treatment and removal of any established weed outbreaks.
- Reinstatement of any natural waterway features altered for construction purposes and stabilising of any features required to ensure erosion is minimised.

Rehabilitation activities will continue on into the operational phase of the Project to ensure the goals outlined in the relevant section of the CEMP are achieved. Any ongoing rehabilitation monitoring and management requirements associated with the Project will be passed on to the operator.

9.2 Operation

The Project has been designed to have an operational life of up to 30 years; however, it is more than likely the Project will be extended beyond this through upgrade and replacement of infrastructure. In light of this, only an outline of the concepts to be included in a Decommissioning and Rehabilitation Plan are provided here, with a Decommissioning and Rehabilitation Plan to be provided to the Director, EPA for approval within 3 years of completion of construction, to allow a more comprehensive plan to be developed closer to the time.

The decommissioning process for the Project would be expected to include the following actions (in consultation with the landowners and their ongoing requirements), the order of which would depend on the final plan:

- Disconnection of power from the switchyard to the Liapootah-Palmerston 220 kV transmission line.
- Decommissioning and removal of substation and switchyard equipment, with most of the transformer materials likely to be recyclable.
- Dismantling of WTGs, including removal of nacelles and turbine blades, and then tower sections, with the disassembled parts subject to reuse and recycling where possible. Vestas is actively researching recycling options for WTG components, working towards a goal of zero waste WTGs by 2040 (www.vestas.com/en/sustainability/environment/zero-waste). Already much of the WTG can be recycled, with official figures in the order of 85% of the weight of the WTG that can be fully recycled or

[30] Management of PASS and other potential contaminants in disturbed soils will be addressed as part of the CEMP as described in Section 6.10.

re-used. This is a rapidly progressing field, with Vestas announcing in February 2023 a new solution to the difficult to recycle epoxy-based turbine blades, allowing them to be chemically treated and turned into a source of raw materials. The most contemporary technologies for recycling and resource recovery will be applied at the time of decommissioning.

- WTG footings would be cut down to below ground level (up to 500 mm below ground level) and the remaining underground portions left in-situ. The buried portions of the inert footings would be unlikely to cause any ongoing impact to the environment, and removing them would likely cause greater disturbance to the environment.
- Removal of buried electrical cable network within 500 mm of ground level throughout the Project Site; this would be recycled.
- Removal of final ancillary infrastructure if unwanted by landowners; this would include the operations facility, met masts, washdown facility etc.
- Ripping, contouring and reseeding of all voids left by structures, and roads/hardstands not to be kept in place (this would be decided in consultation with landowners and Council). Reseeding would be undertaken in consultation with a qualified agricultural/botany consultant.
- Treatment and removal of any established weed outbreaks.
- Installation of long-term sedimentation and erosion controls to stabilise the environment.
- Reinstatement of any natural waterways through removal of culverts as required and installation of stabilising rock armour to prevent erosion.

A completed Decommissioning and Rehabilitation Plan will be provided to the Director, EPA for approval within 3 years of completion of construction of the Project.

9.3 Summary

In summary, the following key management and mitigation measures are proposed to address Project decommissioning and rehabilitation risks during both construction and operation.

Reference number	Management, mitigation or monitoring measure
Management and mitigation	
Decommissioning & Rehabilitation MM 1	The CEMP developed for the Project by the building contractor will contain a Decommissioning and Rehabilitation Plan for the construction phase. This plan will be implemented during and post construction as necessary to achieve the plan objectives. Any ongoing rehabilitation monitoring and management requirements associated with the Project at the conclusion of the contractor's role during and post construction will be passed on to the operator for completion.
Decommissioning & Rehabilitation MM 2	A completed Decommissioning and Rehabilitation Plan will be provided to the Director, EPA for approval within 3 years of completion of construction of the Project.
Monitoring	
Decommissioning and rehabilitation monitoring will be established in the construction and operational phase decommissioning and rehabilitation plans.	

10 Management measures

Management and mitigation measures proposed for each environmental aspect are documented throughout this EIS and summarised in Table 10-1.

Table 10-1 Summary of management and mitigation measures

Reference number	Management or mitigation measure	Project phase	EIS section
Various – applicable across many different disciplines			
Various MM 1	A Wind Farm Design Report will be submitted to the EPA for approval prior to the commencement of construction. The Wind Farm Design Report will be informed by geotechnical assessment and further environmental surveys of the Project Site to inform the finalised road design, final design and micro-siting of all WTGs and ancillary infrastructure, and stormwater management design. Micro-siting of infrastructure will take into consideration a variety of environmental and physical constraints, including topography, environmental values and geotechnical results. Micro-siting will be cross-checked against the environmental constraints in this assessment to ensure no greater environmental impact than that approved in this EIS would result.	Pre-construction (report preparation) Construction (implement-tation)	Section 6
Various MM 2	A Construction Environmental Management Plan (CEMP) capturing all relevant construction phase management measures set out in this EIS (and any resulting approval conditions) will be prepared and made available to the EPA prior to the commencement of construction. The approved CEMP will be implemented throughout construction. Any residual management or monitoring measures remaining at the conclusion of construction will be transferred to the Operational Environmental Management Plan (OEMP).	Pre-construction (plan preparation) Construction (implement-tation)	Section 6
Various MM 3	An Operational Environmental Management Plan (OEMP) capturing all relevant operational phase management measures as set out in the EIS (and any resulting approval conditions) will be prepared and made available to the EPA prior to the commencement of operation. The approved OEMP will be implemented throughout operation.	Construction (plan preparation) Operation (implement-tation)	Section 6
Various MM 4	During the operational phase of the Project, the results of relevant environmental management and monitoring stipulated in this EIS (and any resulting approval conditions) will be documented in annual environmental reports to be submitted to the EPA within 3 months of the conclusion of the reporting period.	Operation	Section 6

Reference number	Management or mitigation measure	Project phase	EIS section
Various MM 5	All WTG and other infrastructure will be micro-sited, with the assistance of a trained ecologist, to ensure disturbance of listed species, listed communities and habitat for listed species is avoided as far as practicable and infrastructure is located in areas with relatively lower ecological value where possible[31]. Micro-siting will include consideration of the construction buffer areas, with these to be reduced as far as reasonably practical in areas of important ecological value to minimise construction phase impacts.	Pre-construction and construction	Sections 6.1 6.2 6.3
Various MM 6	Approved site disturbance boundaries within the Project Site will be clearly articulated to the construction contractors through electronic means, onsite documentation and (where appropriate) physical demarcation, and it will be specified that all works, vehicles and materials will be confined to the designated impact areas. For areas of specific ecological value (threatened fauna habitat, threatened flora locations, threatened vegetation communities) that are not within the final footprint and can be retained, exclusion zones will apply. These will be marked on construction plans, communicated to all construction personnel and, where they lie adjacent to the works area, will also be physically cordoned off with temporary fencing (or similar) to avoid inadvertent impacts. No ground disturbance, stockpiling or alteration of drainage patterns will be permitted within exclusion zones.	Construction	Sections 6.1 6.2 6.3
Various MM 7	A rehabilitation plan (either as a standalone document or to be included in the CEMP) will be prepared prior to the commencement of construction to detail the rehabilitation approach. Rehabilitation will be undertaken in accordance with the plan. Rehabilitation of any disturbed areas suitable for rehabilitation will commence as soon as practicable following the completion of each Project component (i.e. in a staged fashion), with reinstatement of any stripped topsoil and seeding with local provenance where appropriate, noting the topsoil seedbank may be sufficient in some cases.	Pre-construction (plan preparation) Construction (implement-tation)	Sections 6.2 6.3
Various MM 8	Project information and construction schedules will be provided to local residents, advising them of potential dust, odour, noise and traffic generation during construction and the mitigation measures to be applied.	Construction	Sections 6.4 6.5 6.14
Various MM 9	A construction phase online complaints register and contact phone number will be established to capture any dust, odour, noise, traffic or other complaints received from the public. Complaints will be actioned, the complainant notified and a record kept of the resolution.	Construction	Sections 6.4 6.5 6.14

[31] Micro-siting considerations will include but not be limited to habitat for eagles, Latham's snipe, Tasmanian masked owl, Miena jewel beetle (including the species' host plant *Ozothemnus hookeri*), ptunarra brown butterfly, Tasmanian devil and spotted-tailed quoll (including potential den sites), wetland and waterway habitat for listed species, threatened vegetation communities (including highland Poa grassland and highland grassy sedgeland) and threatened flora (including Liawenee greenhood, matted lignum, ferny buttercup, longhair fireweed and *Eucalyptus gunnii*).

Reference number	Management or mitigation measure	Project phase	EIS section
Various MM 10	An operational phase online complaints register and contact phone number will be established to capture any noise, traffic or other complaints received from the public. Complaints will be actioned, the complainant notified and a record kept of the resolution. Any complaints and their resolution will be documented and provided to the EPA as part of annual environmental reporting.	Operation	Sections 6.4 6.5 6.14
Eagles			
Eagle MM 1	Building upon the Preliminary Eagle Monitoring and Management Plan set out in this EIS, a Final Eagle Monitoring and Management Plan will be developed for the Project and submitted to the EPA and DCCEEW for approval prior to commencement of construction. The plan will be prepared by a suitably qualified professional, in accordance with the EPA *Avian Mortality Monitoring Plan Guidelines* and the DCCEEW document *Onshore Wind Farms – interim guidance on bird and bat management* and will include, as a minimum: • Avian collision avoidance measures and other mitigation o WTG positioning o Management of other works within 1 km of known eagle nests o WTG curtailment systems o Carcass management o Adaptive management measures o Reporting • Eagle nest monitoring o Eagle nest searches o Nest activity and productivity surveys o Reporting • Avian mortality monitoring o Monitoring trials o Avian mortality monitoring plan o Reporting • Offset strategy	Pre-construction (plan preparation) Pre-construction, construction and operation (implement-tation)	Section 6.1
Eagle MM 2	Final WTG positioning as documented in the final Wind Farm Design Report will ensure no WTG is installed within 1 km of any known eagle nest site.	Pre-construction and construction	Section 6.1
Eagle MM 3	For any sections of road or other infrastructure that fall between 500 m and 1 km of an active nest site, the construction activity will occur outside the eagle management constraint period (July to January inclusive, or as varied by the Forest Practices Authority) to minimise risk of nest abandonment. Blasting will not be undertaken within 1 km of any known active eagle nest during the eagle management constraint period.	Construction	Section 6.1

Reference number	Management or mitigation measure	Project phase	EIS section
Eagle MM 4	Overhead powerlines and the guy wires of met masts will include regular interval flags or 'flappers' on the wires to reduce collision risk.	Pre-construction and construction	Section 6.1
Eagle MM 5	A total of 24 WTG curtailment system units will be installed across the Project Site, providing curtailment system coverage for all proposed WTGs (as individual curtailment units cover more than one WTG). Vegetation management measures will be applied within the radial arc identified by the system operator for each individual unit to ensure tree heights are maintained at a suitable level to provide visibility and effective operation of the units.	Construction	Section 6.1
Eagle MM 6	A Carcass Management Plan will be prepared by a suitably qualified professional and submitted to the EPA and DCCEEW as part of the Final Eagle Monitoring and Management Plan. The Carcass Management Plan will include, as a minimum: • Procedures for removal of all carcasses identified through the avian mortality monitoring program. • Removal of any carcass found within 500 m of a WTG. • Removal of carcasses observed along roads within the Project Site, both during construction and operation. • Procedures for appropriate carcass disposal (to be at least 500 m from any WTG) including separate procedures for handling and notification in the event of a threatened species carcass identification. • Documentation of any recommended changes to land management practices (e.g. hunting or livestock restrictions) within the Project Site, to be developed in conjunction with landholders.	Pre-construction (plan preparation) Pre-construction, construction and operation (implement-tation)	Section 6.1
Eagle MM 7	Two separate scavenger trials will be undertaken at the Project Site prior to construction (one during winter and the other during spring or summer). The detailed trial methodology will be designed by a suitably qualified person and take into account Project Site conditions, WTG layout, carcass type to use, search technique, data collection and analysis. The detailed trial methodology will be determined in consultation with DNRE Tasmania and have a statistically sound design. The results of the scavenger trials will be subject to statistical analysis, used to inform the final avian mortality monitoring approach, and incorporated into the Final Eagle Monitoring and Management Plan to be submitted to the EPA and DCCEEW prior to construction.	Pre-construction	Section 6.1

Reference number	Management or mitigation measure	Project phase	EIS section
Eagle MM 8	Two separate carcass detectability trials will be undertaken at the Project Site prior to construction (one during winter and the other during spring or summer. The detailed trial methodology will be designed by a suitably qualified person and take into account Project Site conditions (e.g. topography and vegetation), WTG layout, search technique, data collection and analysis. The detailed trial methodology will be determined in consultation with DNRE Tasmania and have a statistically sound design. The results of the carcass detectability trials will be subject to statistical analysis, used to inform the final avian mortality monitoring approach, and incorporated into the Final Eagle Monitoring and Management Plan to be submitted to the EPA and DCCEEW prior to construction.	Pre-construction	Section 6.1
Eagle MM 9	A final Avian Mortality Monitoring Plan (informed by pre-construction trials and site conditions) will be prepared by a suitably qualified person and documented as part of the Final Eagle Monitoring and Management Plan which will be submitted to the EPA and DCCEEW for approval prior to construction commencing. The avian mortality monitoring approach will include, as a minimum: • Avian mortality surveys to be undertaken around selected WTGs, met masts and overhead powerlines constructed for the Project. • A sufficient number of WTGs surveyed (across suitably varied terrain and vegetation communities) to provide statistically robust collision estimates for the Project Site. • Survey interval timing, transect spacing, survey area and survey methods informed (as appropriate) by scavenger and carcass detectability trials to generate statistically sound collision estimates for the Project Site. • Detailed protocols for avian carcass removal and injured bird management including staff training, notification and handling protocols in the event of native and threatened species mortality and carcass storage and disposal.	Pre-construction (plan preparation) Construction (implement-tation)	Section 6.1
Eagle MM 10	The Final Eagle Monitoring and Management Plan (inclusive of the Carcass Management Plan and Avian Mortality Monitoring Plan) will be implemented throughout the operational life of the wind farm and will be subject to five-yearly reviews (to be submitted to the EPA and DCCEEW).	Operation	Section 6.1
Eagle MM 11	In the event of an eagle death attributable to the Project, the Proponent commits to providing $100,000 per eagle mortality resulting from WTG collision to the Wedge-tailed Eagle Research Fund.	Operation	Section 6.1
Eagle MM 12	In the event that a new eagle nest is incidentally observed within the Project Site during operations, it will be reported to DNRE and the EPA and included in subsequent nest activity and productivity surveys and associated reporting.	Operation	Section 6.1

Reference number	Management or mitigation measure	Project phase	EIS section
Other avifauna			
Other Avifauna MM 1	Any areas of temporary disturbance within mapped terrestrial habitat for Latham's snipe will be rehabilitated post construction.	Construction and post construction	Section 6.1
Other Avifauna MM 2	Potential nesting trees for Tasmanian masked owls will be surveyed prior to commencement of construction (during the nesting period from October to March) to inform micro-siting of infrastructure. Any confirmed nests will have a 100 m buffer allocated from WTGs and a 50 m buffer from other infrastructure and any construction or maintenance activities involving heavy machinery, where practicable. If a nest is required to be decommissioned, a permit to take will be sought and decommissioning delayed until after the conclusion of the breeding season.	Pre-construction and construction	Section 6.1
Other Avifauna MM 3	In the event an active masked owl nest is identified on site there will be no blasting undertaken within 1km of the nest site during the breeding season.	Construction	Section 6.1
Terrestrial fauna			
Terrestrial Fauna MM 1	Pre-clearance surveys of identified disturbance footprints will be undertaken by a suitably qualified person to ensure all wildlife is clear of the area as far as reasonably practicable.	Pre-construction	Section 6.2
Terrestrial Fauna MM 2	A den management protocol will be applied before and during construction. A draft Devil and Quoll Den Management Protocol has been prepared and provided as Appendix L to NBES (2023b) (Appendix C). This protocol sets out pre-clearance surveys, den monitoring, den decommissioning, and reporting requirements. Any dens identified during previous surveys or pre-clearance surveys will be avoided where possible, with priority given to the avoidance of natal dens. In the event that avoidance is not possible, dens will be decommissioned in accordance with an approved version of the decommissioning protocol. The draft protocol will be further developed and submitted to DNRE Tasmania for review and then to the Director, EPA for approval prior to construction commencement. The protocol will also include decommissioning of wombat burrows. In the event a natal den is identified in the footprint and cannot be avoided an offset will be applied in accordance with the *Survey Guidelines and Management Advice for Development Proposals That May Impact On the Tasmanian Devil* (PCAB, 2015) and in conjunction with NRE.	Pre-construction (plan preparation) Pre-construction and construction (implement-tation)	Section 6.2

Reference number	Management or mitigation measure	Project phase	EIS section
Terrestrial Fauna MM 3	To manage the residual risk to ptunarra brown butterfly from European wasps, monitoring and management will be undertaken during construction, and for the first five years following construction, in accordance with an approved Ptunarra Brown Butterfly Monitoring and European Wasp Monitoring and Control Strategy. A draft strategy has been prepared and included as Appendix M to NBES (2023b) (Appendix C). This strategy sets out a monitoring program, trigger levels for intervention and control measures in the event trigger levels are breached. This strategy will be further refined and submitted to DNRE Tasmania for review and then to the Director, EPA for approval prior to construction commencement.	Pre-construction (plan preparation) Construction and operation (implement-tation)	Section 6.2
Terrestrial Fauna MM 4	A permit to take any species listed as threatened under the TSP Act (which includes to kill, injure, pursue, catch, damage, destroy, and collect) will be in place prior to relocation of any listed species. A Permit Activity Report will be completed and returned to DNRE Tasmania covering all species taken.	Pre-construction	Section 6.2
Terrestrial Fauna MM 5	A permit to take any product of wildlife under the NC Act will be in place prior to relocation of all relevant fauna species or decommissioning of burrows.	Pre-construction	Section 6.2
Terrestrial Fauna MM 6	Trenching for cables and other components will be managed to minimise the length of open trench at any one time to avoid fauna entrapment. Trenches that need to remain open overnight or for extended periods will either be covered, or fauna egress points will be provided at regular intervals (<10 m) along the open trench length.	Construction	Section 6.2
Terrestrial Fauna MM 7	Traffic management controls will be applied to minimise the risk of fauna roadkill during construction, including: • A maximum speed limit of 40 km/h permitted throughout the Project Site during daylight hours. • Vehicle movements within the Project Site restricted to formed tracks only (once constructed). • Scheduling of material deliveries and worker shifts to restrict vehicle movements to daylight hours, where practicable, to avoid times of elevated fauna activity. • The use of buses and car pooling for site workers, where possible. • Roadkill removed from roads internal to the Project Site and some select external roads from the chosen accommodation facility(s)[32] on a daily basis to minimise roadside scavenging by Tasmanian devils and quolls.	Construction	Section 6.2
Terrestrial Fauna MM 8	A Roadkill Monitoring and Adaptive Management Plan will be prepared and submitted to the EPA for approval prior to commencement of construction. The plan will include all roads internal to the Project Site (to be used by construction personnel) and external public roads used to access the Project	Pre-construction and construction	Section 6.2

[32] The final location for worker accommodation is not yet known, and will be dependent on the contractor and workforce employed, hence the specific roads to which this management measure applies will be confirmed at a later date, and documented in the Roadkill Monitoring and Adaptive Management Plan.

Reference number	Management or mitigation measure	Project phase	EIS section
	Site that are predicted to experience a 10% (or greater) increase in traffic as a result of the Project (relevant public roads), in accordance with the requirements of the devil survey guidelines (PCAB, 2015). The Roadkill Monitoring and Adaptive Management Plan will include as a minimum: • Preconstruction monitoring (relevant public roads external to the Project Site) – Weekly roadkill monitoring (using a methodology compliant with the PCAB guidelines) will be undertaken on the relevant public roads for a minimum period of 6 months prior to construction, to form a baseline against which construction phase monitoring can be compared. Note that weekly roadkill monitoring was commenced in January 2023 using a methodology compliant with the PCAB guidelines[33]. • Construction monitoring (relevant public roads external to the Project Site) – Weekly roadkill monitoring will be undertaken on relevant public roads (using a methodology compliant with the PCAB guidelines) for the duration of construction. • Construction monitoring (internal Project Site roads) – Weekly roadkill monitoring (using a methodology compliant with the PCAB guidelines) will be undertaken for all roads within the Project Site with active construction traffic, for the duration of construction. • Carcass removal – Carcasses will be removed from roads (and verges) to reduce the risk of scavenging and secondary roadkill. Removed carcasses from the relevant public road monitoring will be handled and disposed of in accordance with Department of State Growth procedures. Removed carcasses from internal roads will be placed in sealed bins or disposed of at an onsite carcass pit in accordance with the Carcass Management Plan. • Injured animals – All staff involved in monitoring will be trained in safe animal handling, and procedures will be in place for care of injured animals. • Review and adaptive management – The results of pre-construction monitoring will be used to identify any hotspots on the existing public road network for management measures to be put in place prior to commencement of construction. The results of construction phase roadkill monitoring will be reviewed against the baseline data (where relevant) on a quarterly basis and any increase in fauna roadkill attributable to the Project (or hotspots identified) will be subject to adaptive management. The proposed trigger level for adaptive management measures to be implemented will be defined as an increase (above baseline) of more than two Tasmanian devils, spotted-tailed quoll or other listed		

[33] Roadkill monitoring on relevant public roads is being undertaken by the Department of State Growth, with an agreement to provide the results of this monitoring to the Proponent on a monthly basis. The Proponent approached the Department of State Growth in 2022 regarding undertaking monitoring on the roads in question. The Department confirmed that it would already be undertaking ongoing monitoring on the required roads from January 2023 and did not want additional surveying undertaken by a third party to avoid compromised roadkill counts. As such, an agreement was made that the Department would undertake the monitoring and supply the required data to the Proponent on a monthly basis. Although the commitment in this EIS is for a minimum of 6 months baseline data (in accordance with the PCAB guidelines), data collection commenced in January 2023 will be ongoing and hence a minimum of 12 months data is expected to be available pre-construction.

Reference number	Management or mitigation measure	Project phase	EIS section
	threatened fauna species killed in a 12-month period. Options for adaptive management and mitigation of roadkill risk will be discussed and agreed upon with the EPA and DNRE Tasmania, to be documented in the final Roadkill and Adaptive Management Plan. These may include reductions in speed limits for Project-related vehicles, installation of mitigation devices, or alterations in travel hours for Project-related vehicles where reasonable and feasible. • Residual impacts – To compensate for the residual fauna roadkill risk from increased road traffic, the Proponent proposes a donation of $8,000 to the Save the Tasmanian Devil Program (STDP) for any Tasmanian devil fatality recorded above the baseline level. This proposed compensation will be discussed and agreed upon with the EPA and DNRE Tasmania prior to the commencement of construction and formalised in the final Roadkill Monitoring and Adaptive Management Plan. • Reporting – The results of construction phase roadkill monitoring and any adaptive management measures applied will be reviewed and reported quarterly (most likely as part of quarterly CEMP auditing reports). Each quarter will review the effect of any adaptive management measure put in place the previous quarter. Quarterly reports will be made available to the EPA.		
Terrestrial Fauna MM 9	In the event that blasting is required for construction, a 250 m exclusion zone will be applied around any known active devil or quoll den and blasting will not be undertaken within the exclusion zone while the den is in use.	Construction	Section 6.2
Terrestrial Fauna MM 10	Prior to the commencement of construction, a density survey will be undertaken for the Miena jewel beetle to characterise the relative density of the species in the Project footprint in comparison to adjacent habitat. This will involve an assessment of density of the species host plant (*Ozothamnus hookeri*) and the species itself (via counts of larval bore holes) in patches of habitat both within and outside the Project footprint to allow a more accurate determination of the relative impact. The results of the density assessment will be reported to the EPA and DNRE to inform the need or otherwise for additional mitigation measures and a permit to take. If the area of habitat to be impacted by the Project is found to represent a disproportionally high density of the species (based on statistical analysis of the survey results) additional mitigation measures will be applied, as informed by recommendations in the NBES report (NBES, 2023b) and in consultation with DNRE.	Pre-construction	Section 6.2
Terrestrial Fauna MM 11	To compensate for residual impacts to Tasmanian devil, the Proponent proposes to make a one-off contribution of $250,000 to the Save the Tasmanian Devil Program to support ongoing management and protection of the species.	Pre-construction	Section 6.2

Reference number	Management or mitigation measure	Project phase	EIS section
Terrestrial Fauna MM 12	Operational staff will be required to record any fauna roadkill event (collision) they are involved in (including details of the location, date, time and species) both within the Project Site and on their way to and from the Project Site. This information will be included in annual environmental reporting provided to the Director, EPA. The Annual Environmental Report will review the results of reported collisions over time and if any roadkill hotspots are identified, additional mitigation measures will be applied (e.g. signage within the Project Site, operator training, or management of the timing of vehicle movements). Any carcass resulting from a collision will be collected (to minimise roadside scavenging) and placed in a sealed bin or carcass pit in accordance with the Carcass Management Plan.	Operation	Section 6.2
Terrestrial Fauna MM 13	Roadkill will be removed from roads internal to the Project Site on an opportunistic basis during operations to minimise roadside scavenging by Tasmanian devils, quolls and other predators such as eagles. All removed carcasses will be placed in a sealed bin or carcass pit in accordance with the Carcass Management Plan. Any threatened species carcass collected will be recorded (date, species and location) and the data provided to the EPA as part of the Annual Environmental Report.	Operation	Section 6.2
Terrestrial Fauna MM 14	During operations, traffic management controls will apply to all Project vehicles within the Project Site, including: • A maximum speed limit of 40 km/h permitted throughout the Project Site during daylight hours. • Vehicle movements within the Project Site restricted to formed tracks only. • Vehicle movements scheduled to avoid dawn and dusk periods where practicable to avoid times of elevated fauna activity.	Operation	Section 6.2
Flora and vegetation communities			
Flora & Vegetation Communities MM 1	A Weed, Disease and Hygiene Management Plan will be prepared prior to construction. This plan will be prepared in general accordance with the *Weed, Disease Planning and Hygiene Guidelines* (DPIPWE, 2015b) and include provisions for: • Pre-construction weed control for areas of existing weed infestation where construction equipment will be required to work. • Hygiene protocols, including vehicle washdown prior to site entry/exit to avoid the spread of weeds and pathogens in general accordance with the *Tasmanian Washdown Guidelines for Weed and Disease Control* and *Keep It Clean – A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens*. • Control measures for material brought onto the site for construction to ensure it is free from weed seeds or disease. The Plan will be informed by a pre-construction weed survey of the finalised Project footprint, to provide contemporary information on pre-existing conditions and inform management actions.	Pre-construction (plan preparation) Pre-construction and construction (implementation)	Section 6.3

Reference number	Management or mitigation measure	Project phase	EIS section
Flora & Vegetation Communities MM2	Prior to the commencement of construction, the IDF vegetation management areas and overhead power line easements will be surveyed by a suitably qualified person to provide fine-scale mapping of any conservation significant values (including vegetation communities, threatened flora and threatened fauna habitat) and advice on vegetation clearance approach that best supports long term viability of these values where possible. Where ecological values can be retained by selective vegetation clearance (noting the IDF vegetation management areas do not require full clearance, only management of tall vegetation) they will be marked as exclusion zones (on construction site plans and on ground where appropriate) and protected during vegetation clearance. At the conclusion of construction these exclusion zones will be marked on operational site plans and protected during routine vegetation management for IDF visibility during operations.	Pre-construction (site survey) Construction and operation (implementation)	Section 6.3
Flora & Vegetation Communities MM 3	Prior to the commencement of construction, the margin of the final footprint will be surveyed for *Eucalyptus gunnii* spp *divaricata* to a radius of 15m and any individual of the species found within the buffer and alive, that can be avoided by the footprint, will be protected with a radial exclusion zone proportional to 12 times diameter at breast height.	Pre-construction (survey) and construction (implmentation)	Section 6.3
Flora & Vegetation Communities MM 4	The threatened flora exclusion zones recommended in Figure 11 of Appendix C will be applied during the construction phase to minimise impacts to listed flora species, particularly *Pterostylis pratensis* and *Senecio longipilus*. These areas will be marked on construction plans, communicated to all construction personnel and physically cordoned off with temporary fencing (or similar) to avoid inadvertent impacts. No construction access will be permitted to these areas.	Construction	Section 6.3
Flora & Vegetation Communities MM 5	To supplement the expected natural recolonization of *Senecio longipilus* of the Project Site post construction, seed collection for the species will be undertaken in the season prior to construction. This collected seed will be used as a targeted source of rehabilitation post works in proximity to remaining occurrences and within areas in which plants were impacted. A collection of these seeds will be lodged with the Tasmanian Seed Conservation Centre.	Pre-construction (seed collection) and post-construction (rehabilitation))	Section 6.3
Flora & Vegetation Communities MM 6	For individuals of flora species listed under the *Threatened Species Protection Act 1995* that cannot be avoided a permit to take will be sought in accordance with the *Nature Conservation Act 2002*.	Pre-construction	Section 6.3

Reference number	Management or mitigation measure	Project phase	EIS section
Flora & Vegetation Communities MM 7	Prior to the commencement of operation, a suitably qualified person will be engaged to prepare a Native Vegetation Management Plan for the balance land within the Project Site (i.e. remaining native vegetation not impacted by the Project), to provide guidance on the management regimes best suited to promoting the long term viability of listed ecological values on site inclusive of native grassland and sedgelands, threatened flora and habitat for threatened fauna. This information will be used to prepare voluntary Stewardship Agreements with the landowners of the balance land, whereby the Proponent will provide an annual monetary contribution to each landowner to support the implementation of on ground actions in accordance with the Stewardship Agreement. The Stewardship Agreements will be specific to each landowner and will be subject to auditing, with monetary contributions contingent upon implementation. In the event a landowner does not partake in a Stewardship Agreement (either at the outset or demonstrates non-compliance during routine auditing) the relevant monetary contribution will instead be provided to a suitable research or conservation effort specific to the ecological values being managed. This annual contribution will remain in effect for the predicted operational life of the wind farm, 30 years and may be renegotiated at that time.	Construction (preparation) and operation (implementation)	Section 6.3
Flora & Vegetation Communities MM 8	Ecological values, including all listed native vegetation communities, known areas of listed flora species, and areas of known weed infestation will be marked on an operational site plan and communicated to all operational personnel to ensure values are maintained and weed areas avoided throughout the operational phase.	Operation	Section 6.3
Flora & Vegetation Communities MM 9	A Weed, Disease and Hygiene Management Plan will be developed, and implemented, for the operational phase of the Project.	Operation	Section 6.3
Noise			
Noise MM 1	Where possible, operation of machinery and equipment with potential for high noise generation during construction will be restricted to normal daytime operating hours, in line with the *Environmental Management and Pollution Control (Noise) Regulations 2016*, namely: • 07:00 to 18:00 Monday to Friday • 08:00 to 18:00 Saturday • 10:00 to 18:00 Sundays and public holidays Where this is not possible, prior communication with potentially effected residents will be undertaken.	Construction	Section 6.4
Noise MM 2	Low-noise-generating plant and equipment will be used where practicable.	Construction	Section 6.4
Noise MM 3	Broadband reversing alarms will be used where practicable over traditional tonal alarms to minimise any nuisance noise generated.	Construction	Section 6.4

Reference number	Management or mitigation measure	Project phase	EIS section
Noise MM 4	The Proponent will require the contractor to have regularly serviced and maintained equipment to minimise noise emissions.	Construction	Section 6.4
Noise MM 5	Where practical, machinery will be operated at low speed or power and be switched off when not in use, rather than left idling for prolonged periods.	Construction	Section 6.4
Noise MM 6	Delivery trucks will be advised to not use exhaust brakes in populated areas, especially during night-time deliveries of the WTG components.	Construction	Section 6.4
Noise MM 7	Relevant local communities will be notified in advance of any deliveries required outside normal working hours (6 am to 6 pm seven days per week).	Construction	Section 6.4
Noise MM 8	Regular community updates will be completed at identified noise sensitive receivers to inform of upcoming construction timeframes.	Construction	Section 6.4
Noise MM 9	Prior to construction, a pre-development noise assessment will be prepared in accordance with NZS 6808, based on the final WTGs model and layout, to verify the impacts of the final design and equipment selections, including consideration of special audible characteristics. The noise assessment will be submitted to the EPA prior to commencement of construction.	Pre-construction	Section 6.4
Noise MM 10	If blasting is required, dedicated blast management procedures will be documented in construction management plans, including identifying the locations where blasting can be conducted and describing the testing, management and monitoring measures that would be implemented to achieve the Quarry Code of Practice criteria.	Pre-construction (plan) Construction (implementation)	Section 6.4
Noise MM 11	During the operational phase, any high-noise-generating maintenance activities will be undertaken during normal operating hours (Monday to Friday 8 am to 6 pm) whenever possible.	Operation	Section 6.4
Air quality			
Air Quality MM 1	Potential dust-generating material stockpiles, roads or excavated areas will be sprayed during periods of dry weather with water or a suitable dust suppressant as required.	Construction	Section 6.5
Air Quality MM 2	Speed restrictions will be applied to all roads within the Project Site, which will minimise dust generation.	Construction	Section 6.5
Surface water			
Surface Water MM 1	The following key design measures will be applied to the project and will be fully documented in the final Wind Farm Design Report, to be submitted to the EPA for review and approval prior to construction: • All waterway crossings will include suitable fish and frog friendly culverts to minimise habitat fragmentation and transitory impacts to these fauna groups. • All culvert designs will include suitable stabilisation of surrounding sediments to minimise erosion impacts.	Pre-construction	Section 6.6

Reference number	Management or mitigation measure	Project phase	EIS section
	• Roads will be designed with suitable drainage, including appropriate camber and natural drainage swales, and any concentrated discharges will pass through water mitigation infrastructure such as rock filters. • All buildings will take flood risk into account during the design phase, as is required by the building code. This will include storage locations of all environmentally hazardous materials.		
Surface Water MM 2	Prior to construction commencing, a sediment and erosion control plan for the Project will be developed (either as a standalone document or part of the CEMP) and submitted to the EPA for approval prior to commencement of construction. The plan will then be implemented throughout construction. The plan will identify all major drainage lines and waterways and site-specific management and mitigation to be implemented, including controls such as sandbags, sediment fences, sediment traps and diffusion paths to ensure stormwater is suitably contained, managed and released to avoid and minimise sediment release, pollution and erosion. The sediment and erosion control plan will include measures for stormwater and flood waters, and a dewatering management process.	Pre-construction (plan preparation) Construction (implementation)	Section 6.6
Surface Water MM 3	No materials will be stockpiled on existing drainage lines, and stockpile perimeter drains and sediment fencing will be used as required.	Construction	Section 6.6
Surface Water MM 4	Disinfected washdown water will be collected on a regular basis from the washdown facility and carted off site by a contractor to a licensed wastewater facility.	Construction	Section 6.6
Waste management			
Waste Management MM 1	Waste from onsite toilets will be stored in the portable toilet system and removed from site by a suitably licensed contractor.	Construction	Section 6.8
Waste Management MM 2	A waste management area will be delineated within the construction compound(s), with all wastes to be segregated (into recyclables and non-recyclables) and all putrescible and/or potentially windblown waste to be stored in sealed bins.	Construction	Section 6.8
Waste Management MM 3	All waste classed as environmentally hazardous materials will be stored in appropriately bunded containers.	Construction	Section 6.8
Waste Management MM 4	Waste will be removed from site on a regular basis by a suitably qualified operator and disposed of at a suitably licensed facility.	Construction	Section 6.8
Waste Management MM 5	Residual vegetation cleared to facilitate construction will either be left in situ in a stable condition to provide ongoing habitat or offered to local landholders (or a commercial timber harvester) as a timber resource. (Where this triggers the need for other approvals, e.g. for timber harvesting, this will be addressed separately by the landowner/harvester).	Construction	Section 6.8

Reference number	Management or mitigation measure	Project phase	EIS section
Waste Management MM 6	A waste management area will be delineated within the operations facility with all waste to be segregated (into recyclables and non-recyclables) and all putrescible and/or potentially windblown waste to be stored in sealed bins.	Operation	Section 6.8
Dangerous goods and environmentally hazardous materials			
Dangerous Goods and Environmentally Hazardous Materials MM 1	All dangerous goods or environmentally hazardous materials will be stored in appropriately bunded containers within the construction compound(s), in accordance with relevant Australian Standards and state regulations.	Construction	Section 6.9
Dangerous Goods and Environmentally Hazardous Materials MM 2	Fuel storage on site during construction will be via tankers (approximately 50,000 L in size) that will be parked in bunded hardstands within the construction compound(s). Machinery and equipment will then either be refuelled within the compound or in situ via a refuelling truck, which will have on board spill kits and temporary bunding equipment.	Construction	Section 6.9
Dangerous Goods and Environmentally Hazardous Materials MM 3	A register of dangerous goods and environmentally hazardous materials used on site will be maintained throughout the construction period. The register will be accompanied by the appropriate safety, storage, segregation, and handling information (including Safety Data Sheets).	Construction	Section 6.9
Dangerous Goods and Environmentally Hazardous Materials MM 4	Hydrocarbon and chemical spill kits will be stored within the construction compound(s) and wherever dangerous goods and environmentally hazardous materials are used throughout the Project area. Spill kits will also be stored on select site vehicles.	Construction	Section 6.9
Dangerous Goods and Environmentally Hazardous Materials MM 5	All disposal of dangerous goods and environmentally hazardous materials will be undertaken in accordance with relevant Australian Standards and state regulations.	Construction	Section 6.9
Dangerous Goods and Environmentally Hazardous Materials MM 6	Clean-up measures, reporting and notification procedures for equipment breakdowns and accidental releases will be incorporated in an Emergency Response Plan for the Project. This will include clean-up procedures in aquatic environments as well as incident response in the event of fire, chemical release or an explosion.	Construction	Section 6.9
Dangerous Goods and Environmentally Hazardous Materials MM 7	All spills of dangerous goods or environmentally hazardous materials will be reported to the site supervisor, with spills >100 L or any spills >5 L direct to the aquatic environment to be reported to the EPA within 24 hours of the incident occurring.	Construction	Section 6.9
Dangerous Goods and Environmentally Hazardous Materials MM 8	The site induction for all workers will include training in use and disposal of all dangerous goods and environmentally hazardous materials to be used on site as well as protocols to follow in the event of an incident involving these materials.	Construction	Section 6.9

Reference number	Management or mitigation measure	Project phase	EIS section
Dangerous Goods and Environmentally Hazardous Materials MM 9	Onsite procedures will be established for the handling, storage and disposal of dangerous goods and environmentally hazardous materials for the operation phase of the Project and will include: • A register of dangerous goods and environmentally hazardous materials stored on site, accompanied by the appropriate safety, storage, segregation, and handling information (including Safety Data Sheets). • Storage, handling and disposal of dangerous goods and environmentally hazardous materials in accordance with relevant Australian Standards and state regulations. • Installation of hydrocarbon and chemical spill kits within the operations facility and on select vehicles. • Clean-up measures, reporting and notification procedures, including reporting of any spill >100 L or any spills >5 L direct to the aquatic environment to the EPA within 24 hours of the incident occurring. • Site induction for site staff including training in use and disposal of all dangerous goods and environmentally hazardous materials.	Operation	Section 6.9
Natural values			
Natural Values MM 1	ASS risk and management will be addressed through the development of an ASS Management Plan in accordance with the DNRE Tasmania document *Tasmanian Acid Sulfate Soil Management Guidelines 2015* (DPIPWE, 2015c). The plan will draw from the results of an extensive PASS assessment that will be undertaken as part of the site-wide geotechnical assessment. The ASS Management Plan will form part of the CEMP for the Project and will be submitted to the EPA for approval prior to construction. The ASS Management Plan will include all aspects of identification, management and monitoring of ASS (including any downstream waterways). The ASS will be implemented in full and will continue to apply post-construction until all ASS risks associated with Project construction and rehabilitation have been successfully resolved.	Pre-construction (plan preparation) Construction (implementation)	Section 6.10
Traffic			
Traffic MM 1	Construction phase traffic impacts will be minimised by: • Sourcing locally available materials where possible. • Sourcing water for construction from the Project Site to avoid cartage. • Timing the deliveries to occur during the periods of lowest traffic density. • Communicating with landowners along the transportation route about expected traffic movements. • Establishing and maintaining an online complaints register, and resolving any complaint received.	Construction	Section 6.14

Reference number	Management or mitigation measure	Project phase	EIS section
Visual			
Visual MM 1	Construction facilities will be sited with due consideration of potential visibility by surrounding land users and public road users.	Construction	Section 6.15
Visual MM 2	Low reflectivity RAL 7035 (light grey) coatings will be used on all WTG parts, reducing the chance of generating significant blade glint.	Construction	Section 6.15
Visual MM 3	Management and mitigation of shadow flicker for dwelling O7-1 will be implemented to bring measured shadow flicker to below threshold levels; potentially this will include planting of trees and vegetation, installation of additional screening structures, installation of industrial strength curtains or blinds, or curtailment of the WTGs contributing most significantly to shadow flicker at this dwelling. Final site-specific management measures will be determined in consultation with the residents of the affected dwelling.	Construction and operation	Section 6.15
Fire risk			
Fire Risk MM 1	An Emergency Response Plan (or Plans) will be developed for the Project (for construction and operational phases) which will incorporate a Fire Management Plan (or Plans). The Fire Management Plan(s) will be prepared by a suitably qualified professional and take into account other relevant documents (including Tasmania Fire Service Local Area Fire Management Plan, Forestry Tasmania Fire Management Plan and Parks and Wildlife Service Fire Action Plan where relevant); this will be completed in consultation with Tasmania Fire Service (TFS) and local fire chiefs.	Construction and operation	Section 6.16
Fire Risk MM 2	During both construction and operation: • All flammable goods will be stored in accordance with Australian Standard requirements. • Site inductions will include information on fire safety and emergency response. • Designated smoking areas will be provided for workers.	Construction and operation	Section 6.16
Decommissioning and rehabilitation			
Decommis-sioning & Rehabilitation MM 1	The CEMP developed for the Project by the building contractor will contain a decommissioning and rehabilitation plan for the construction phase. This plan will be implemented during and post construction as necessary to achieve the plan objectives. Any ongoing rehabilitation monitoring and management requirements associated with the Project at the conclusion of the contractor's role during and post construction will be passed on to the operator for completion.	Pre-construction (plan preparation) Construction and post construction (implemen-tation)	Section 9
Decommis-sioning & Rehabilitation MM 2	A completed Decommissioning and Rehabilitation Plan will be provided to the Director, EPA for approval within 3 years of completion of construction of the Project.	Operation	Section 9

11 Conclusion

The Project will result in the development of a 47 wind turbine generator (WTG) wind farm with a maximum power generating capacity of 300 MW in the Central Highlands region of Tasmania. Along with the WTGs, the Project will also include a variety of electrical infrastructure, turbine data and control units, an operations facility, and a network of new access tracks. The Project will supply electricity into the grid at the existing onsite TasNetworks Liapootah-Palmerston 220 kV transmission line, helping Tasmania to reach its renewable energy target of 150% of its current needs by 2030 and 200% of its current needs by 2040.

The Project is likely to follow similar construction and logistical techniques used in the development of the nearby Cattle Hill Wind Farm, which was successfully constructed in 2020. This will include delivery of oversized WTG and electrical parts to the Project Site along the existing road network from the Port of Bell Bay via Bothwell, with some minor road alterations required. Subject to the planning process timeframe, construction is proposed to commence in late 2024, with a 24-month construction window.

The most significant environmental challenges identified for the Project, and many other wind farms in Tasmania, are associated with the prevention of avian fauna colliding with rotating WTG blades. The Project Site and general area attracts a variety of bird species but is prominent for Tasmanian wedge-tailed eagles (WTEs). The WTE has a history of collisions with WTGs in other locations in Tasmania owing to their foraging flight altitudes being within rotor swept heights of most modern WTGs. Most other bird species are not considered at risk from collision given either their rarity in the region or their flight path behaviours.

A significant effort, including two years of eagle utilisation studies, has been undertaken at the Project Site to adequately understand and characterise the use of the site by WTEs and white-bellied sea-eagles (WBSE). The collision risk model (CRM) developed for the Project informed the removal of 17 WTG from the original 67 WTG layout as well as several key mitigation measures that were deemed necessary to prevent significant impacts to the local populations of these species (more specifically the WTE). An extensive WTG curtailment system to minimise eagle collisions has been included in the Project specifications, which includes significant learnings from the neighbouring Cattle Hill Wind Farm which is successfully using the nominated system. With additional onsite management during operation, including nest monitoring and carcass management throughout the Project Site, it is expected that the Project will operate successfully while adequately managing the risk to WTEs and WBSEs.

In the event that the above management and mitigation does not adequately minimise the risk of collision to these species, additional adaptive management options will be assessed by the Project operator as a commitment, including the potential use of the black blade methodology explained in Section 6.1.4. As used at other wind farms, monetary offsets to the Wedge-tailed Eagle Research Fund, consistent with the relevant offset principles, are proposed for the mortality of any WTE as a result of WTG collision, as discussed in Section 7.4, to be contributed towards research or minimising risk to the species elsewhere in the state. All mitigation information, adaptive management, monitoring programs and offset details will be contained in a Final Eagle Management and Monitoring Plan for the Project, which must be approved by the Tasmanian EPA prior to implementation. A Preliminary Eagle Management and Monitoring Plan is contained within this EIS and will be further refined to inform the final plan.

The design of the Project layout in this EIS considered environmental constraints data for flora, vegetation communities, and fauna habitat, among several other aspects. This has led to the avoidance of impacts to the majority of listed flora and habitat for listed fauna and has prioritised disturbance of non-native over native vegetation communities. Overall, the Project is not predicted to lead to significant impacts to terrestrial flora and fauna, including aquatic species. Aside from careful planning, this is also partly due to the relatively small operating footprints required for wind farm projects such as this one. The Project has not led to the fragmentation of any significant fauna habitat.

With respect to the species impacts under the EPBC Act, the WTE was identified as having the potential to be significantly impacted by the Project. As described above, potential for impacts to the species has been reduced using the mitigation hierarchy of avoid, minimise, mitigate and offset. The initial layout of 67 WTGs was reduced to an amended 50 WTG layout to minimise potential impacts as guided by CRM results. This minimisation also addressed other issues raised by community members. The design and implementation of a curtailment system on the final 47 WTG layout, plus the option of adaptive management to address any emerging issues, is considered a thorough approach to minimising any residual risks to the species. As the residual impact to WTE may be considered significant in the event of collision, an offset has also been proposed for this species. The NBES assessments concluded that residual impacts to all other EPBC Act listed species are not expected to constitute significant impacts. However, early communication with DCCEEW has indicated that the Commonwealth may form a different view in relation to residual impacts to Tasmanian devils. In response to this feedback, the Proponent has elected to offer an offset proposal for the Tasmanian devil.

The isolated nature of the Project Site minimises the potential for noise impacts to sensitive receivers, and predictive modelling shows the Project can achieve compliance with the noise standard during construction and operation.

Very little impact to surface water or groundwater is predicted to occur as a result of the Project, with the layout designed to avoid major waterways and water bodies, resulting in only minor construction phase impacts, predominantly associated with locations where road or powerlines cross areas of ephemeral inundation or creeks, and these can be managed via construction environmental controls.

Water requirements for the Project, estimated to be up to 84.6 ML over 24 months for concrete batching and general construction purposes, will be met via abstraction from the Shannon River from an existing Hydro Tasmania gauging station within the Project Site. This would be via an agreement between Hydro Tasmania and the construction contractor. Hydro Tasmania has noted that 100 ML is available to be sold to the Proponent over a 24-month period. The water requirements are likely to be relatively small quantities at a time and would be unlikely to require the release of any additional water to the current environmental flow releases occurring from the upstream Miena Dam; Hydro Tasmania would be responsible for managing any additional releases should they be required.

The Project presents a logistical challenge for the transport of oversized WTG and electrical parts to site from Bell Bay but will be guided by the proven methods used in the development of the neighbouring Cattle Hill Wind Farm. Traffic increases will be managed carefully during construction so as to minimise any disruption to local traffic flow; this will include timing deliveries to coincide with low traffic flow times where practicable.

Very little impact to traffic (and accommodation) is expected during the operation of the Project, given the comparatively small full-time workforce (up to 20 full-time equivalent workers) required to run the Project.

The Project will result in a moderate impact to the visual amenity of the area according to the assessment undertaken for the Project. This has been reduced from an initial assessment of high to moderate impact, primarily through the removal of three WTGs closest to the main access road which were assessed as visually intrusive by the visual consultant, and through the movement of a fourth WTG further into a forested area.

The Project will be constructed in accordance with a CEMP, which will outline all environmental management, mitigation and monitoring required by project-specific approval documentation and any relevant state / Commonwealth environmental law.

The EIS illustrates how the Project adheres to the principles of ecologically sustainable development outlined in the EPBC Act by providing a thorough analysis of short and long-term impacts and benefits of the Project. It provides robust scientific data to support the assessment of key matters, applying the principles of intergenerational equity by minimising impacts, reducing Australia's reliance on non-

renewable energy, and demonstrating the conservation of ecological values through informed iterations of the wind farm layout and management and mitigation measures aimed at reducing impact to flora and fauna to within acceptable limits.

The Project has been carefully designed to minimise potential environmental impacts to the area and surrounding community and any possible downstream effects. If the management and mitigation measures and associated monitoring committed to in this EIS are adhered to, the potential environmental impacts as a result of the Project are considered, in ERA's professional opinion, manageable and acceptable under state and Commonwealth law.

Overall, the Project is considered to present a net environmental benefit to Tasmania by significantly increasing the state's production of renewable energy, putting downward pressure on electricity prices by increasing supply, addressing the increasingly pressing need for generation to address Tasmania's load growth and contributing to Tasmania's renewable energy targets. More broadly the Project would contribute to a reduction in Australia's carbon emissions from energy production.

The minimisation of environmental harm is matched by maximising social opportunity through community benefits and economic gains including investment, jobs and business opportunities to the local area, region and state.

12 References

AFAC. (2018). *Wind Farms and Bushfire Operations (AFAC Publication No. 2053)*. Melbourne, Australia: Australasian Fire and Emergency Service Authorities Council.

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra, ACT, Australia: Australian and New Zealand Governments and Australian state and territory governments.

Biosis Research. (2006). *Impacts of avian collisions with wind power turbines: an overview of the modelling of cumulative risks posed by multiple wind farms*. Melbourne: Biosis Research.

Bureau of Meteorology. (2021, February 20). *Climate Data Online*. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/

Cattle Hill Wind Farm. (2021, November 10). *Cattle Hill Wind Farm*. Retrieved from Goldwind Australia: https://cattlehillwindfarm.com/

Cromer. (2022a). *Hydrogeological Report, Proposed Wind Farm, St. Patricks Plains, Central Highlands Tasmania*. Hobart: William C. Cromer Pty. Ltd.

Cromer. (2022b). *Reconnaissance acid sulfate soils report, proposed wind farm, St. Patricks Plains, central highlands Tasmania*. Hobart: William C. Cromer Pty Ltd.

DCCEEW. (2023, June 19). *EPBC Act Public Portal*. Retrieved from Ossfets Register: https://epbcpublicportal.awe.gov.au/offsets-register/

DELWP. (2021). *Development of Wind Energy Facilities in Victoria, Policy and Planning Guidelines*. Melbourne: Department of Environment, Land, Water and Planning.

Department of Environment, L. W. (2016). *National Recovery Plan for the Orange-bellied Parrot Neophema chrysogaster*. Canberra: Australian Government.

Department of Primary Industries and Water. (2006). *Recovery Plan: Tasmanian Galaxiidae 2006 - 2010*. Hobart: Department of Primary Industries and Water.

Department of Primary Industries and Water. (2008, June 1). Listing Statement Pterostylis pratensis. Hobart, Tasmania, Australia.

Department of the Environment. (2013). *Matters of National Environmental Significance: Significant Impact Guidelines 1.1 - Environmental Protection and Biodiversity Conservation Act 1999*. Canberra ACT: Commonwealth of Australia.

DOTE. (2013). *Matters of National Environmental Significance - Significant impact guidelines 1.1, Environment Protectiona and Biodiversity Conservation Act 1999*. Canberra ACT: Commonwealth of Australia - Department of the Environment.

DOTE. (2016). *National Recovery Plan for the Spotted-tailed Quoll (Dasyurus maculatus)*. Canberra: Australian Government Department of the Environment.

DPIPWE. (2010). *Draft Recovery Plan for the Tasmanian Devil*. Hobart: DPIPWE.

DPIPWE. (2015a). *Guidelines for Natural Values Surveys - Terrestrial Development Proposals*. Hobart, Tasmania: Department of Primary Industries, Parks, Water and Environment.

DPIPWE. (2015b). *Weed and Disease Planning and Hygeine Guidelines - Preventing the spread of weeds and diseases in*. Hobart: Department of Primary Industries, Parks, Water and Environment.

DPIPWE. (2015c). *Tasmanian Acid Sulfate Soil Management Guidelines*. Hobart: Department of Primary Industries, Parks, Water and the Environment.

DPIPWE. (2021a). *Tasmanian Threatened Species Listing Statement - Miena jewel beetle*. Hobart, TAS: Threatened Species Section – Department of Primary Industries, Parks, Water and Environment.

DPIPWE. (2021b, February 5). *The Groundwater Information Access Portal*. Retrieved from Water Information Tasmania Web Portal: http://wrt.tas.gov.au/groundwater-info

DPIPWE Threatened Species Section. (2021, Novemebr 22). *Species Management Profile: Aquila audax subsp. fleayi - Tasmanian Wedge-tailed Eagle*. Retrieved from Threatened Species Link: https://www.threatenedspecieslink.tas.gov.au/Pages/Wedge-tailed-Eagle.aspx

DPIW. (2006). *Threatened Tasmanian Eagles: Recovery Plan 2006-2010*. Hobart, Tasmania: Threatened Species Section, Department of Primary Industries and Water.

DPIWE. (2003). *Environmental Management Goals for Tasmanian Waters - Derwent River Catchment*. Hobart: Department of Primary Industries, Water and Environment.

DSEWPaC. (2012). *Environmental Protection and Biodiversity Conservation Act 1999 - Environmental Offsets Policy*. Canberra ACT: Department of Sustainability, Environment, Water, Population and Communities, Commonwealth of Australia.

EPA. (2008). *Noise Measurement Procedures Manual*. Hobart, TAS: Department of Environment, Parks, Heritage and the Arts - Environment Division.

EPHC. (2010). *National Wind Farm Development Guidelines - Draft*. Canberra: Environment Protection and Heritage Council.

Forest Practices Authority. (2007). *Fauna Technical Note Series: Eagle Nest Management*. Tasmania: Forest Practices Authority.

FPA. (2014). *Fauna Technical Note No. 6: Wedge-tailed eagle nesting habitat model*. Tasmania: Forest Practices Authority.

FPA. (2016). *Mature habitat availability map*. Hobart, Tasmania: Forest Practices Authority.

FPA. (2020a). *Wedge-tailed Eagle Nest Activity Assessment*. Hobart, Tasmania: Forest Practices Authority.

FPA. (2020b). *Wedge-tailed Eagle Nest Activity Assessment*. Hobart, Tasmania: Forest Practices Auth.

FPA. (2021). *Wedge-tailed Eagle Nest Activity Assessment*. Hobart, Tasmania: Forest Practices Authority.

Goldwind. (2022). *Assessment of Effectiveness of the IdentiFlight Avian Detection System - Wild Cattle Hill Wind Farm*. Hobart: Goldwind .

Harris, E. (2019). *The effectiveness of conservation covenants in enhancing the breeding activity of wedge-tailed eagle and white-bellied sea-eagle on private land in Tasmania*. Hobart: University of Tasmania.

Hodos, W. (2002). *Minimization of motion smear: Reducing avian collisions*. Golden, Colorado: National Renewable Energy Laboratory.

Hubble Traffic. (2023). *Development of the St Patricks Plains Wind Farm*. Hobart: Hubble Traffic.

Hull, & Muir. (2010). Search areas for monitoring bird and bat carcasses at wind farms using a Monte-Carlo model. *Australasian Journal of Environmental Management*, 17(2): 77-87.

LISTmap. (2021, September 13). *LISTmap*. Retrieved from LISTmap: https://maps.thelist.tas.gov.au/listmap/app/list/map

Marshall Day. (2023). *St Patricks Plains Wind Farm Environmental Noise Assessment*. Victoria, Australia: Marshall Day Acoustics.

May, R., Nygard, T., Falkdalen, U., Astrom, J., Hamre, O., & Stokke, B. G. (2020). Paint it black: Efficacy of increased wind turbine rotor blade visibility to reduce avian fatalities. *Ecology and Evolution*, 10:8927-8935.

McClure, C. J., Rolek, B. W., Dunn, L., McCabe, J. D., Martinson, L., & Katzner, T. (2021). Eagle fatalities are reduced by automated curtailment of wind turbines. *Journal of Applied Ecology*, 446-452.

NBES. (2023a). *St Patricks Plains Wind Farm - Threatened Avian Fauna - Site Utlisation.* Hobart, Tasmania: North Barker Ecosystem Services.

NBES. (2023b). *St Patricks Plains Wind Farm Flora and Fauna Assessment (Excluding Avifauna and Their Habitats).* Hobart, Tasmania: North Barker Ecosystem Services.

NRE. (2022, 09 21). *Threatened Species Section (2022) Paragalaxias dissimilis Shannon Galaxias*. Retrieved from Threatened Species Link: https://www.threatenedspecieslink.tas.gov.au/Pages/Shannon-Paragalaxias.aspx

NRM South. (2022). *Annual Report NRM South.* Hobart: NRM South.

NRM South. (2022, June). *The Wedge-tailed Eagle Research Fund Guidelines.* Retrieved from Ecological Society of Australia: https://www.ecolsoc.org.au/wp-content/uploads/WTE-Research-Fund-Guidelines_2022.pdf

PCAB. (2015). *Survey Guidelines and Management Advice for Development Proposals that may Impact on the Tasmanian Devil (Sarcophilus Harrisii): A Supplement to the Guidelines for Natural Values Surveys - Terrestrial Development Proposals* . Hobart, Tasmania: Policy and Conservation Advice Branch, DPIPWE.

Rex J Andrews. (2023). *Route Study: St Patricks Plains Wind Farm.* Adelaide, Australia: Rex J Andrews Engineered Transportation.

RTA. (2002). *Guide to Traffic Generating Developments Version 2.2.* NSW: Roads and Traffic Authority.

SGS. (2022). *St Patricks Plains Wind Farm - Social & Economic Impact Assessment.* Hobart: SGS Economics & Planning.

Smales, I., Muir, S., Meredith, C., & Baird, R. (2013). A Description of the Biosis Model to Assess Risk of Bird Collisions With Wind Turbines. *Wind Energy adn Wildlife Conservations, 37*(1), 59-65.

Symbolix. (2021). *St Patricks Plains Wind Farm Eagle Flight Analysis.* North Melbourne, Australia: Symbolix.

Tasmanian Goverment. (2021, December). *Natural Values Atlas*. Retrieved from Geodiversity: http://www.naturalvaluesatlas.tas.gov.au/#GeositePage:2684

Appendix A General design principles

Appendix B Avifauna reports

Appendix C Terrestrial flora and fauna report

Appendix D Noise assessment

Appendix E Background noise assessment

Appendix F Socio-economic report

Appendix G Traffic impact assessment

Appendix H Visual impact assessment

Appendix I Shadow flicker assessment

Appendix J Hydrogeology report

Appendix K Reconnaissance acid sulfate soils report

Appendix L EPA Tasmania avian mortality monitoring plan guidelines

era
PLANNING
& ENVIRONMENT

Contact us
ERA Planning & Environment
Level 1, 125A Elizabeth St Hobart 7000
(03) 6165 0443
enquiries@eraplanning.com.au
eraplanning.com.au