

NEOEN

**PRELIMINARY VEGETATION
MANAGEMENT PLAN**

Mount Hopeful Windfarm

FINAL - ATTACHMENT F

August 2023



PRELIMINARY VEGETATION MANAGEMENT PLAN

Mount Hopeful Windfarm

FINAL - ATTACHMENT F

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Neoen Australia Pty Ltd

Report No. 22753/R05
Date: August 2023



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Abbreviations

Abbreviations	Description
AEMO	Australian Energy Market Operator
AHD	Australian Height Datum
BESS	battery energy storage systems
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DES	Department of Environment and Science
DoR	Department of Resources
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
EPMs	Exploration Permits for Minerals
ha	hectare
km	kilometres
LGA	Local Government Areas
MCU	Material Change of Use
MNES	Matters of National Environmental Significance
MSES	Matter of State Environmental Significance
MW	megawatts
NC Act	<i>Nature Conservation Act 1992</i> (Qld)
Neoen	Neoen Australia Pty Ltd
PO	Performance Outcome
PVMP	Preliminary Vegetation Management Plan
QREZ	Queensland Renewable Energy Zones
RE	Regional Ecosystem
SIS	State Infrastructure Strategy
TEC	Threatened Ecological Communities
the Project	Mount Hopeful Wind Farm
Umwelt	Umwelt (Australia) Pty Ltd
VM Act	<i>Vegetation Management Act 1999</i> (Qld)
WoNS	Weeds of National Significance
WTG	wind turbine generators

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1.0 Introduction

Umwelt is supporting Neoen Australia Pty Ltd (Neoen) in seeking project approvals for the Mount Hopeful Wind Farm (the Project). The Project is located approximately 45 kilometres (km) south of Rockhampton and 65 km west of Gladstone, within the Central Queensland Region.

The Project involves the development of a wind farm that contains 63 wind turbine generators (WTGs), ancillary infrastructure including up to ten temporary and ten permanent wind monitoring masts, six substations, battery energy storage systems (BESS), temporary construction compound/laydown areas, a concrete batching plant, high voltage (275 kilovolt (kV)) overhead powerlines, as well as underground power and communication cables. The Project includes a Road Access Corridor which would involve upgrades to approximately 30 km of existing road between the Burnett Highway at Dixalea and Glengowan Road to ensure the safe transport of Project infrastructure. The Project is expected to have a maximum generation capacity of approximately 400 megawatts (MW).

The purpose of this Preliminary Vegetation Management Plan (PVMP) is to inform State and Federal assessment agencies, and provide an overview of how vegetation, and overlapping threatened species will be managed for the Project.

1.1 Ecology Study Boundaries

Information contained within the Terrestrial Flora Assessment Report (Umwelt 2022), the Preliminary Translocation Management Plan for *Cycas megacarpa* (Attachment J of the Preliminary Documentation) and the *Cycas megacarpa* Species Management Plan (Attachment E of the Preliminary Documentation) have been used to inform and develop this plan for the Project. Three distinct boundaries are presented that are relevant to the Project and this management plan including:

- Study Area: refer to **Section 1.1.1**.
- Development Corridor: refer to **Section 1.1.2**.
- Disturbance Footprint: refer to **Section 1.1.3**.

Figure 1.1 displays the above boundaries.

1.1.1 Study Area

The Study Area refers to the boundaries of the 17 freehold land parcels which encompass the infrastructure that has been designed for the proposed wind farm, as well as the boundary of the access road corridor (inclusive of the local road reserve for Glengowan Road, Playfields Rd and McDonalds Rd and small area of one additional adjacent land parcel). The area covers approximately 16,975.8 hectares (ha) and extends approximately 25 km north-south at the longest point and 42 km east-west at the widest point (this includes approximately 30 km of access road). The Study Area represents the limit of the vegetation and habitat mapped for the Project. It should be noted however, that this boundary does not represent the spatial bounds in which all Project field surveys have been conducted (this area being larger and including areas outside of the Study Area).

Lot and plans relevant to the Study Area include:

- Those relevant to the proposed wind farm:
 - 148/DS151, 2420/DT4077, 21/RN46, 30/RN72, 50/DT40144, 1933/RAG4058, 21/RN1345, 100/SP289441, 33/DT40123, 2039/RAG4056, 23/RN25, 38/DT40131, 2057/RAG4059, 24/RN34, 25/RN25, 15/RN1089 and 2345/DT4077.
- That relevant to the access road corridor:
 - 17/RAG4094.

The Study Area is within the Rockhampton Regional Council and Banana Shire Council Local Government Areas (LGA). The predominant land use in both LGAs is rural agriculture comprising mostly beef cattle grazing and farmland cropping including cotton and lucerne. Some forestry, coal mining and power generation also occur. Elevations within the Study Area ranges from approximately 120 metres (m) Australian Height Datum (AHD) to 500 m AHD, characterised by varying landforms within the Study Area that comprises peaks and valleys, with areas of lower, generally flatter topography surrounding the Study Area to the east and west.

Major highways in proximity to the Study Area include the Bruce Highway to the east, Burnett Highway to the west, and the Dawson Highway to the south. These major transport corridors link to the cities of Rockhampton and Gladstone, as well as the Port of Gladstone from which the proposed turbine components will be transported. Access to the Study Area is primarily via the Burnett Highway located to the east of the Study Area, as well as lower order roads in Banana Shire Council including McDonalds Road and Playfields Road.

1.1.2 Development Corridor

The Development Corridor is a 'buffered' version of the indicative Project layout, covering approximately 1,555.1 ha. This area represents the maximum spatial extent where disturbance may occur within the Study Area and includes areas required for temporary and permanent Project infrastructure, equipment and materials laydown, installation and access.

1.1.3 Disturbance Footprint

The Disturbance Footprint covers approximately 883.4 ha and represents the maximum extent of clearing works and the indicative locations of Project infrastructure. It is a 'worst-case' scenario in terms of the extent of clearing works.

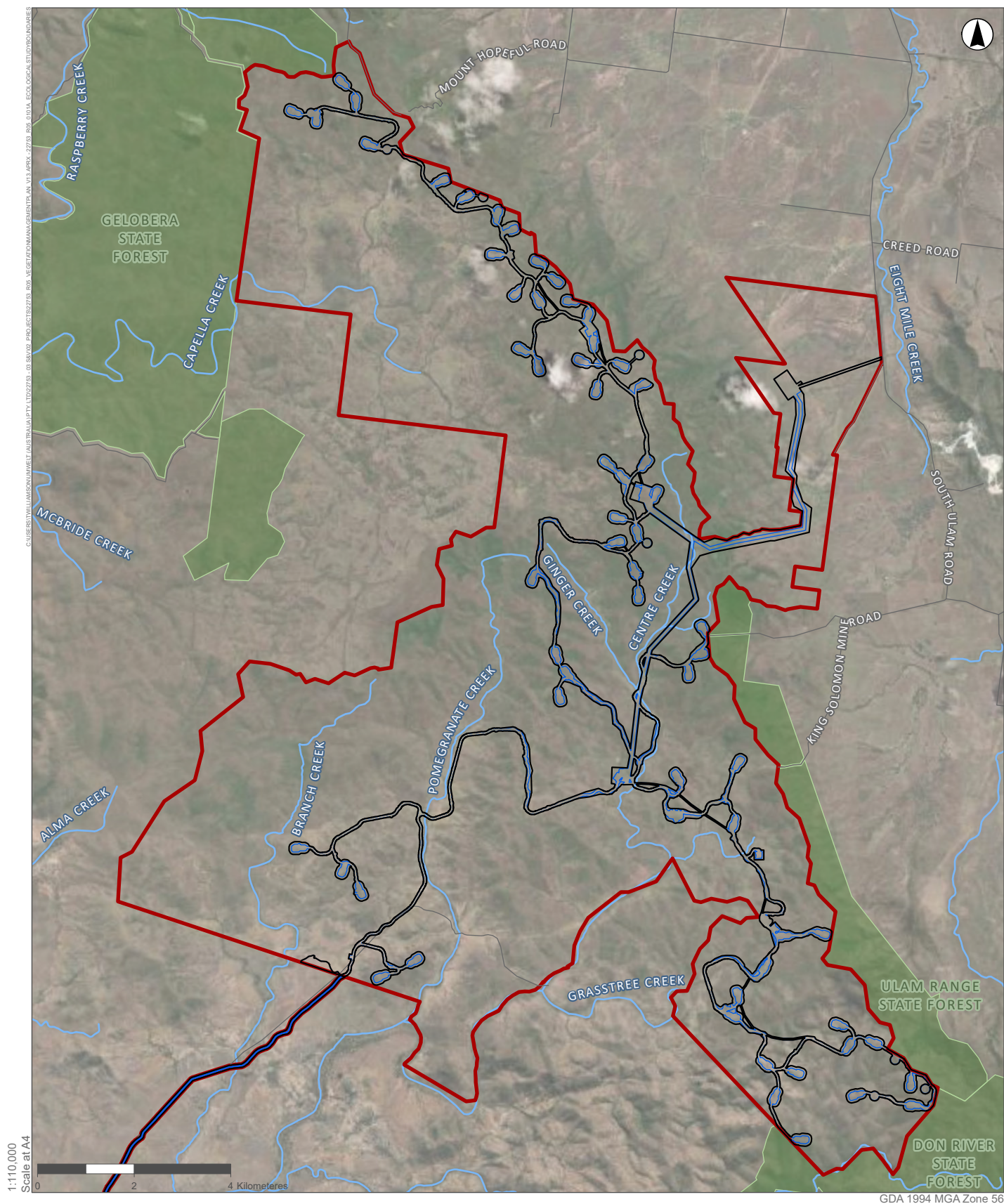


FIGURE 1.1A

Ecological Study Boundaries



GDA 1994 MGA Zone 56

- Legend**
- Roads
 - Watercourse
 - Disturbance Footprint
 - Development Corridor
 - Study Area
 - State Forest

FIGURE 1.1B

Ecological Study Boundaries

1.2 Project Description

1.2.1 Project Infrastructure

The Project will utilise existing infrastructure as well as construct new Project infrastructure, refer **Section 1.2.1.1** and **Section 1.2.1.2** below.

1.2.1.1 Existing Infrastructure

Powerlink electricity towers and associated overhead electricity transmission lines intersect the Study Area in a north-west to south-east direction. An existing telecommunication tower is located approximately 2 km north of the Study Area. A 120 m guyed lattice meteorological mast was erected over the Study Area in August 2020, as well as a 140 m and 110 m guyed lattice meteorological mast in November 2022.

Other rights and encumbrances of note include:

- An easement (A RP612717) for high voltage electricity transmission line intersecting the eastern portion of the Study Area on Lot 100 SP289441.
- A strata for a Profit à Prendre (030 RN72) over Lot 30 RN72 for a Forest Consent Area to the State of Queensland (represented by the Department of Agriculture and Fisheries).
- Three Exploration Permits for Minerals (EPMs) overlap the Study Area, comprising EPM 15810 held by Mount Morgan Exploration Pty Ltd, EPM 27098 held by GBM Resources Limited, and EMP Application area 27105 held by Prophet Resources Pty Ltd.
- An existing road reserve (Playfields, McDonalds and Glengowan Roads) exists within the western extent of the Study Area (the access road corridor).

1.2.1.2 Proposed Infrastructure

The Project will construct 63 WTGs with the turbine specifications used for the assessment shown in **Table 1.1**. These specifications are an upper limit and are intended to provide flexibility for any innovation in turbine design between now and the time of detailed design and construction.

Table 1.1 Turbine Specifications

Feature	Maximum Specifications
Project generation capacity	Approximately 400 MW
Turbine electrical output	Approximately 6.5 MW
Maximum number of turbines	63
Tip height	Up to 260 m
Blade length	Up to 90 m

The Project will also require the provision of ancillary infrastructure, including the following:

- Up to 10 temporary wind monitoring towers.
- Up to 10 permanent wind monitoring towers.
- Up to 6 substations, a BESS and ancillary electrical infrastructure.
- Up to 13 km of high voltage (275 kV) overhead powerlines.
- Site operational, maintenance and storage areas containing permanent site offices, workshops, warehouses, mobile offices, lunchroom, amenities and ablutions.
- Overhead and/or underground power and communication cables.
- Up to 175 km of gravel capped roads.
- Two permanent site access points.
- An access road corridor including approximate 30 km of road upgrades along McDonalds, Playfields and Glengowan Roads.
- A range of temporary infrastructure to facilitate the construction of the Project, including:
 - One construction compound.
 - A temporary worker's accommodation camp to provide for a peak construction workforce of up to 450 people and including a water treatment plant, sewage treatment plant and sprayfield.
 - Three concrete batching plants.
 - Two laydown areas.

1.2.2 Anticipated Project Timeline

A summary of the anticipated construction works associated with the Project are provided in **Table 1.2**.

Table 1.2 Anticipated Construction Works

Project Stage/Component	Description
Construction Commencement, Completion and Commissioning of Project	Commencement of construction works: Quarter 1, 2024. Completion of construction works: Quarter 4, 2025. Commissioning of the Project: Scheduled in Quarters 1 and 2, 2026.
Duration of Construction Works	Between 22–28 months.
Planned Construction Activities	<ul style="list-style-type: none"> • Site establishment (temporary site facilities, lay down areas, equipment and materials). • Earthworks for access roads and wind turbine hardstands. • Excavations for the foundations. • Construction of wind turbine foundations. • Installation of electrical and communications cabling and equipment.

Project Stage/Component	Description
	<ul style="list-style-type: none"> • Installation of wind turbine transformers, in parallel with electrical reticulation works. • Arrival of wind turbine components to the Project Site. • Installation of wind turbines. • Commissioning of wind turbines. • Reliability testing.

1.3 Aim and Objectives

The aim of this PVMP is to reduce the potential impact on flora and vegetation communities within the Study Area, by outlining mitigation and management measures to be implemented throughout the duration of the Project. The specific objectives of the PVMP are to:

- Provide a description of the nature and location of project activities including approximate timing where possible.
- Provide a description of the extent and condition of vegetation communities across the Study Area and Disturbance Footprint, including threatened flora habitat, known threatened species records and Threatened Ecological Communities (TEC).
- Provide a description of the location and extent of works required, including how Project activities have been designed to minimise impacts on flora and vegetation.
- Provide information on the roles, responsibilities, and training requirements in relation to vegetation management.
- Outline mitigation and management measure to be implemented throughout the duration of the Project to reduce impacts on flora and vegetation communities.
- Outline the pre-clearance survey methodology.
- Outline the restoration and rehabilitation measures, which will include the following:
 - Rehabilitation acceptance criteria.
 - A summary of the procedures, including contingency measures.
 - A summary of a monitoring program.
- Detail the monitoring and reporting requirements for pre-construction, construction, post-construction, and operation phases of the Project, including:
 - Threatened flora monitoring.
 - Introduced flora (weed) monitoring.
 - Rehabilitation monitoring.

In addition to this PVMP, a Construction Environmental Management Plan (CEMP) will be developed for the Project to address management of environmental values. This plan will include, but not be limited to, the management of noise and vibration, sediment and erosion control, air quality and weed and pest management.

Potential impacts on vegetation and flora values detailed in this document have been determined based on the Disturbance Footprint, which represents worst-case scenario direct impacts (see **Section 1.1.2** above).

2.0 Legislative Context

The legislation relevant to the PVMP is summarised in **Table 2.1**.

Table 2.1 **Legislation Relevant to the Project**

Relevant Legislation	Governing Agency	Summary	Project Relevance
Commonwealth Legislation			
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	The EPBC Act is Australia's key piece of environmental legislation. It outlines nine Matters of National Environmental Significance (MNES). Actions that adversely affect MNES may be deemed to be a controlled action under the EPBC Act.	The following MNES are relevant to the Project: <ul style="list-style-type: none"> Threatened Species. Migratory Species.
EPBC Act Environmental Offsets Policy	DCCEEW	The EPBC Act Environmental Offsets Policy outlines the use of environmental offsets under the EPBC Act and are considered during the assessment phase of an environmental impact assessment. Specifically, this policy applies to project assessments and approvals under Parts 8 and 9 of the EPBC Act, in addition to strategic assessments under Part 10.	Pending the outcomes of the EPBC Act referral decision, offsets may be required.
State Legislation			
<i>Planning Act 2016</i> (Planning Act)	Department of State Development, Infrastructure, Local Government and Planning (DSDILGP)	Applications for a Material Change of Use MCU for a new or expanding wind farm and Operational Works for Native Vegetation Clearing must be assessed against the benchmarks included in State Code 23 and State Code 16 of the State Development Assessment Provisions 16. Development that is a Material Change of Use (MCU) for a wind farm should demonstrate compliance with 13 performance outcomes (PO) and associated acceptable outcomes within the code.	State Code 23 requires assessment against PO5 – Flora and Fauna: <p><i>Development is designed, sited and operated to ensure that flora, fauna and associated ecological processes are protected from adverse impacts.</i></p> <p>State Code 16 requires assessment against benchmarks relating to offset areas, minimisation of clearing, and clearing associated with wetlands, watercourses and drainage features, connectivity areas, Endangered and Of Concern Regional Ecosystems (REs), and Essential Habitat.</p>

Relevant Legislation	Governing Agency	Summary	Project Relevance
<i>Nature Conservation Act 1992</i> (NC Act)	Department of Environment and Science (DES)	<p>The purpose of the NC Act is to conserve biodiversity by creating and managing protected areas, managing and protecting native wildlife, and managing the spread of non-native wildlife.</p> <p>The flora survey trigger map identifies high-risk areas where Endangered, Vulnerable or Near Threatened native plants are present or are likely to be present. The map is used to determine requirements to be considered before clearing native plants.</p>	<p>Where a proposed development will result in impacts to flora protected under the NC Act, authorisation from the Director General of the DES is required.</p> <p>The following values under the NC Act are relevant to the Project:</p> <ul style="list-style-type: none"> Threatened flora species. High-risk areas for protected plants are mapped within the Study Area, therefore a protected plants flora survey in accordance with the NC Act <i>Flora Survey Guidelines – Protected Plants</i> (DES 2020) is required prior to clearing native plants.
<i>Vegetation Management Act 1999</i> (VM Act)	Department of Resources (DoR)	<p>The purpose of the VM Act is to regulate the clearing of vegetation in a way that conserves REs, to prevent the loss of biodiversity and maintain ecological processes. REs are vegetation communities in a bioregion that are consistently associated with a combination of geology, landform, and soil (Sattler & Williams 1999).</p> <p>Under the VM Act, REs is assigned a conservation status based on an assessment of the pre-clearing and remnant extent of each RE.</p>	<p>The VM Act will be referred to prior to the development stage to conserve and minimise the impact to remnant and threatened ecosystem.</p> <p>The Project is required to obtain approval under section 22A of the VM Act.</p>
<i>Biosecurity Act 2014</i>	Department of Agriculture and Fisheries	The <i>Biosecurity Act 2014</i> lists flora pest species as either a Prohibited or Restricted biosecurity matter.	The <i>Biosecurity Act 2014</i> defines specific requirements for notification and management actions for all listed biosecurity matters, including specific requirements for the disposal of Restricted Matters.
<i>Environmental Offsets Act 2014</i> (EO Act)	DES	<p>An environmental offset condition may be imposed under certain Queensland legislation that applies to development assessment where the activity is a prescribed activity under the EO Act.</p> <p>Activities which have an impact on a Matter of State Environmental Significance (MSES) may require offsetting under the Act.</p>	Consideration of offsetting requirements for the Project will need to be determined once a fixed design for the Project is completed. Requirements for offsets are therefore not discussed as part of this report.

3.0 Vegetation Values

The field survey program completed for the Project extended over four years from 2019 to 2023. During this time, a total of 10 flora field surveys were completed over 45 field days by suitably qualified ecologists. The aim of these field assessments was to validate vegetation communities, including REs, and determine the presence of threatened species and communities within the Study Area. Field survey methods are detailed in the *Terrestrial Flora Report* (Umwelt 2022) and Section 4 of the Assessment of Matters of National Environmental Significance report (Attachment B1 of the Preliminary Documentation).

3.1 Study Area Characteristics

The Study Area is characterised by a variety of vegetated environments, including cleared agricultural land as well as regrowth and remnant eucalypt woodlands and vine thicket across an undulating terrain. The dominant vegetation communities across the Study Area are woodlands and forests dominated by *Eucalyptus crebra*, *Corymbia citriodora* and *Eucalyptus acmenoides*.

The Bouldercombe Gorge Resources Reserve, Gelobera State Forest, Don River State Forest and Ulam Range State Forest are Protected Areas located adjacent to the Study Area, providing connectivity to the broader region.

3.2 Vegetation Communities

Field surveys within the Study Area verified 20 REs, recorded in both remnant and regrowth condition. Within the Disturbance Footprint, 18 REs are mapped. The REs verified within the Study Area are described in **Table 3.1**.

Of the verified REs, four REs are listed as Of Concern and 16 REs are listed as Least Concern under the VM Act. Dominant vegetation communities within the Study Area include *Corymbia citriodora* open forest on igneous rocks (RE 11.12.6), *Eucalyptus crebra* woodlands on hills and slopes (RE 11.12.1) and *Corymbia citriodora*, *Eucalyptus crebra*, *Eucalyptus acmenoides* open forest on old sedimentary rocks (RE 11.11.3). Non-remnant vegetation is also relatively common within the Study Area, occurring primarily in the centre and to the north covering approximately 3,545.0 ha.

Table 3.1 Study Area Vegetation Communities as per the Field Verified Regional Ecosystems Map

RE	REDD Description	VM Act Class ¹
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	OC
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	OC
11.3.4a	<i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces	OC
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	LC
11.3.25b	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest fringing drainage lines	LC

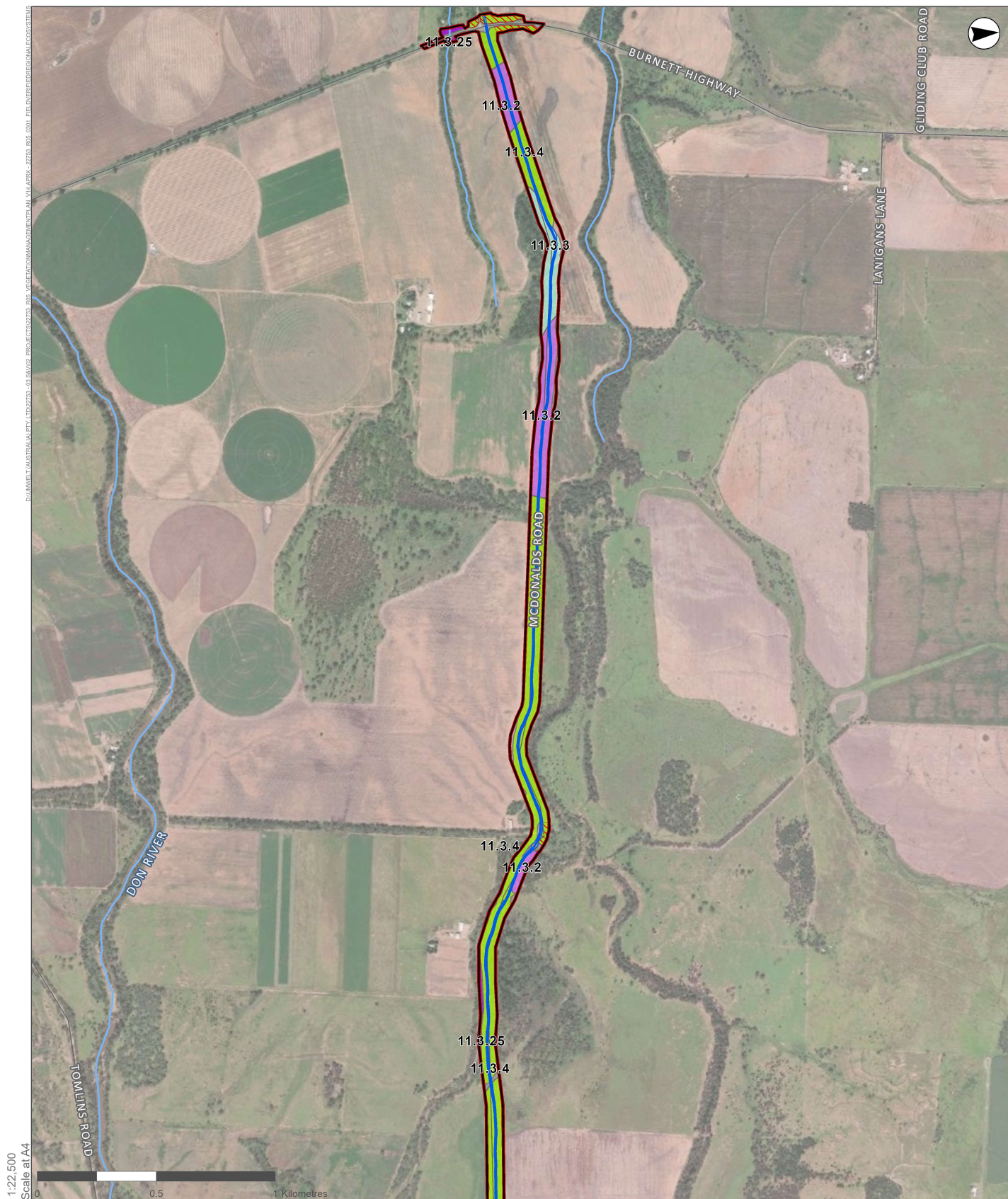
RE	REDD Description	VM Act Class ¹
11.11.3	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> , <i>E. acmenoides</i> open forest on old sedimentary rocks with varying degrees of metamorphism and folding	LC
11.11.3c	<i>Eucalyptus moluccana</i> woodland on lower slopes in association with <i>Eucalyptus crebra</i> and/or <i>Corymbia citriodora</i> and/or <i>Eucalyptus</i> spp.	LC
11.11.4	<i>Eucalyptus crebra</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding	LC
11.11.4a	<i>Eucalyptus tereticornis</i> dominated woodland with varying degrees of metamorphism and folding	LC
11.11.4b	<i>Corymbia trachyphloia</i> or <i>Eucalyptus acmenoides</i> , <i>E. crebra</i> woodland +/- <i>Acacia leiocalyx</i> with varying degrees of metamorphism and folding	LC
11.11.4c	<i>Eucalyptus moluccana</i> dominated woodland with varying degrees of metamorphism and folding	LC
11.11.4d ²	<i>Lophostemon</i> spp. with shrubs including <i>Acacia</i> spp. <i>Alphitonia excelsa</i> and <i>Xanthorrhoea johnsonii</i> . Occurs on coastal rocky short steep hills on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics and Permian sediments.	LC
11.11.5	Microphyll vine forest +/- <i>Araucaria cunninghamii</i> on old sedimentary rocks with varying degrees of metamorphism and folding	LC
11.11.5a	Vine thicket, usually with no <i>Araucaria cunninghamii</i> emergents on old sedimentary rocks with varying degrees of metamorphism and folding	LC
11.11.15	<i>Eucalyptus crebra</i> woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics	LC
11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks	LC
11.12.4 ²	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks	LC
11.12.6	<i>Corymbia citriodora</i> open forest on igneous rocks (granite)	LC
11.12.6a	<i>Eucalyptus crebra</i> +/- <i>Corymbia citriodora</i> and/or <i>E. acmenoides</i> +/- <i>Lophostemon suaveolens</i> woodland to open forest. Occurs on gently undulating lower slopes of hills formed from Mesozoic to Proterozoic igneous rocks (granite).	LC

¹ VM Act Class – OC = Of Concern and LC = Least Concern.

² Vegetation Communities that do not occur within the Disturbance Footprint.

3.2.1 Threatened Ecological Communities

As per the findings of the Terrestrial Flora Report (Umwelt 2022) and the Assessment of Matters of National Environmental Significance report (Attachment B1 of the Preliminary Documentation), there are no TECs within the Study Area or Disturbance Footprint. TECs are therefore not discussed further.



GDA 1994 MGA Zone 56

Legend

- Study Area
- Development Corridor
- Disturbance Footprint
- State Forest
- Roads
- Watercourse

Field Varied Regional Ecosystems

- Regrowth
- 11.11.15
- 11.11.3
- 11.11.3c
- 11.11.4
- 11.11.4a
- 11.11.4b
- 11.11.4c
- 11.11.4d
- 11.11.5
- 11.11.5a

- 11.12.1
- 11.12.4
- 11.12.6
- 11.12.6a
- 11.3.2
- 11.3.25
- 11.3.25b
- 11.3.3
- 11.3.4
- 11.3.4a

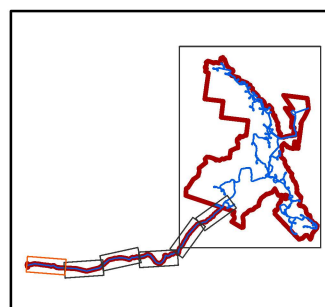


FIGURE 3.1A

Field Verified
Regional
Ecosystems



GDA 1994 MGA Zone 56

Legend

- Study Area
- Development Corridor
- Disturbance Footprint
- State Forest
- Roads
- Watercourse

Field Varied Regional Ecosystems

- Regrowth
- 11.11.15
- 11.11.3
- 11.11.3c
- 11.11.4
- 11.11.4a
- 11.11.4b
- 11.11.4c
- 11.11.4d
- 11.11.5
- 11.11.5a

- 11.12.1
- 11.12.4
- 11.12.6
- 11.12.6a
- 11.3.2
- 11.3.25
- 11.3.25b
- 11.3.3
- 11.3.4
- 11.3.4a

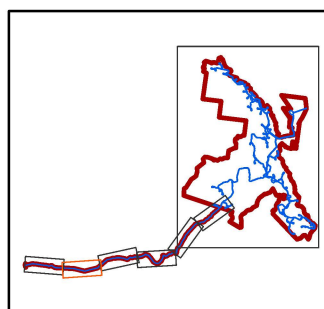
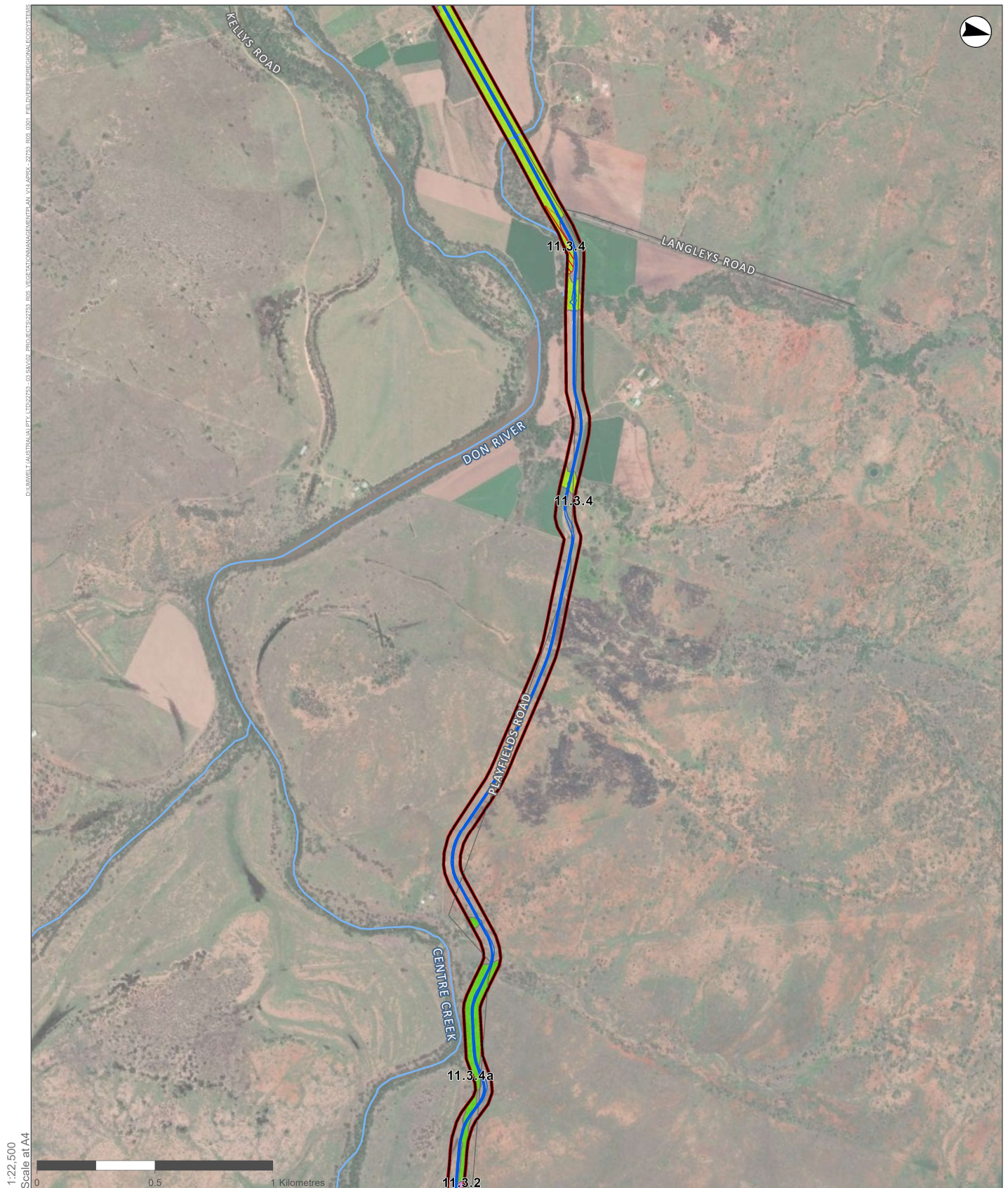


FIGURE 3.1B

Field Verified
Regional
Ecosystems



1:22,500
Scale at A4

GDA 1994 MGA Zone 56

Legend

- Study Area
- Development Corridor
- Disturbance Footprint
- State Forest
- Roads
- Watercourse

Field Verified Regional Ecosystems

 Regrowth

- 11.11.15
- 11.11.3
- 11.11.3c
- 11.11.4
- 11.11.4a
- 11.11.4b
- 11.11.4c
- 11.11.4d
- 11.11.5
- 11.11.5a

- 11.12.1
- 11.12.4
- 11.12.6
- 11.12.6a
- 11.3.2
- 11.3.25
- 11.3.25b
- 11.3.3
- 11.3.4
- 11.3.4a

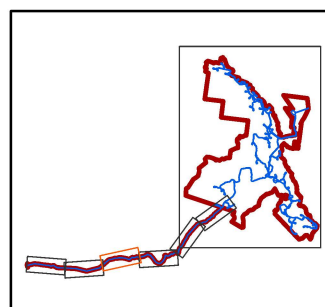
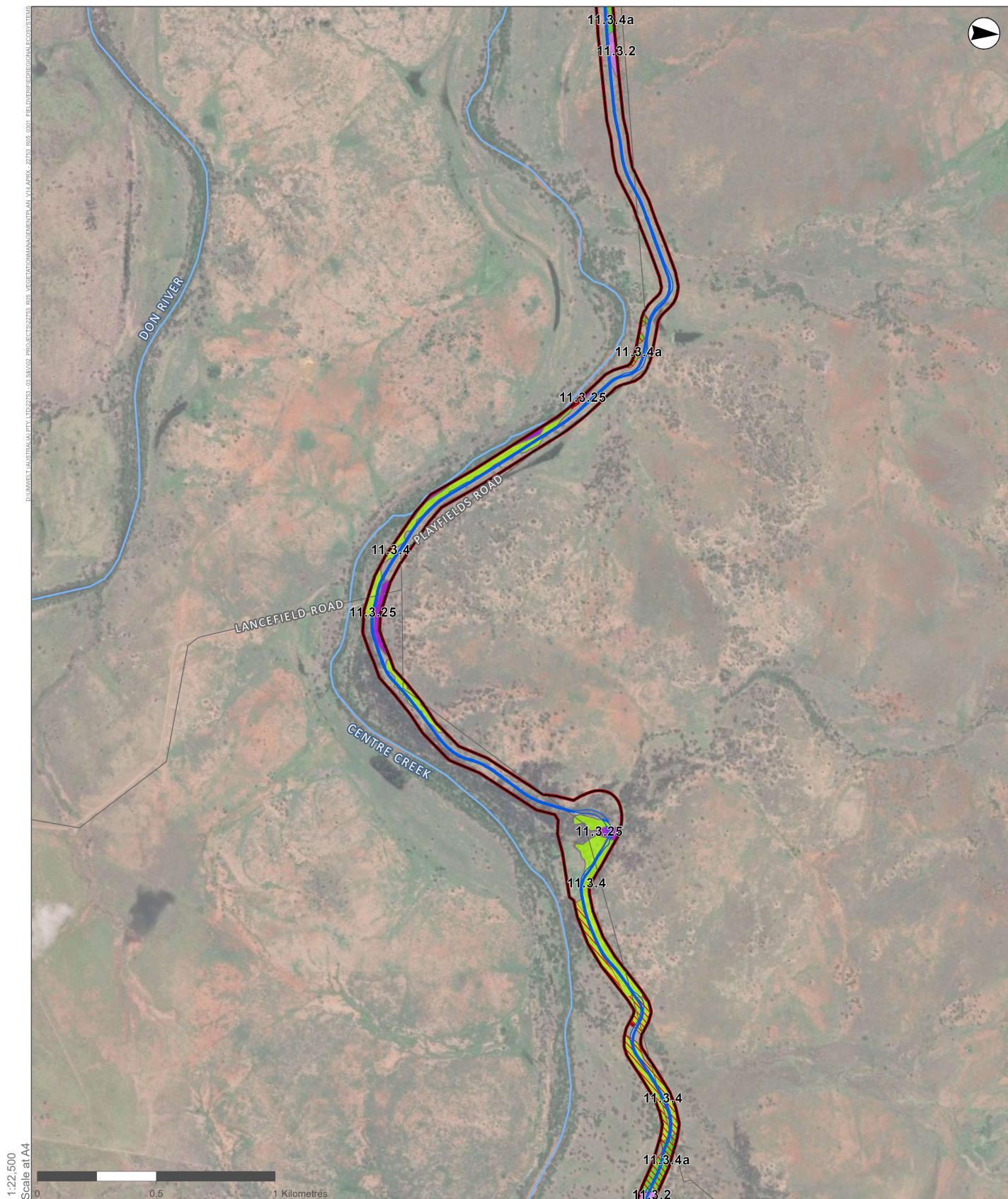


FIGURE 3.1C

Field Verified
Regional
Ecosystems



Legend

- Study Area
- Development Corridor
- Disturbance Footprint
- State Forest
- Roads
- Watercourse

Field Varied Regional Ecosystems

- Regrowth

- 11.11.15
- 11.11.3
- 11.11.3c
- 11.11.4
- 11.11.4a
- 11.11.4b
- 11.11.4c
- 11.11.4d
- 11.11.5
- 11.11.5a

- 11.12.1
- 11.12.4
- 11.12.6
- 11.12.6a
- 11.3.2
- 11.3.25
- 11.3.25b
- 11.3.3
- 11.3.4
- 11.3.4a

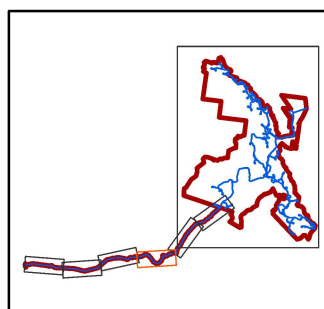
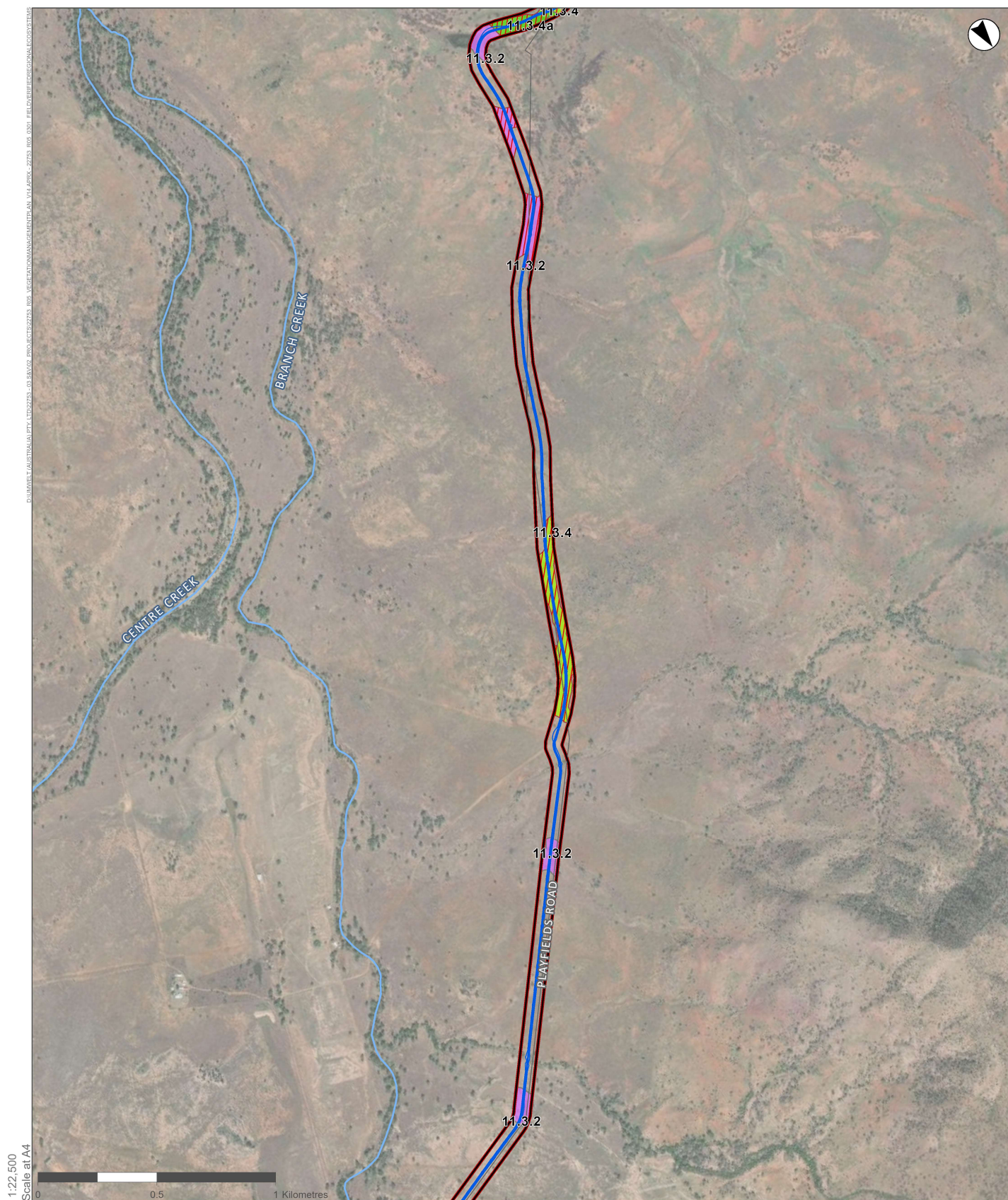


FIGURE 3.1D

Field Verified
Regional
Ecosystems



Legend

- Study Area
- Development Corridor
- Disturbance Footprint
- State Forest
- Roads
- Watercourse

Field Verified Regional Ecosystems

- Regrowth
- 11.11.15
- 11.11.3
- 11.11.3c
- 11.11.4
- 11.11.4a
- 11.11.4b
- 11.11.4c
- 11.11.4d
- 11.11.5
- 11.11.5a

- 11.12.1
- 11.12.4
- 11.12.6
- 11.12.6a
- 11.3.2
- 11.3.25
- 11.3.25b
- 11.3.3
- 11.3.4
- 11.3.4a

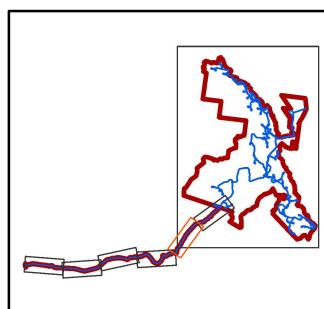
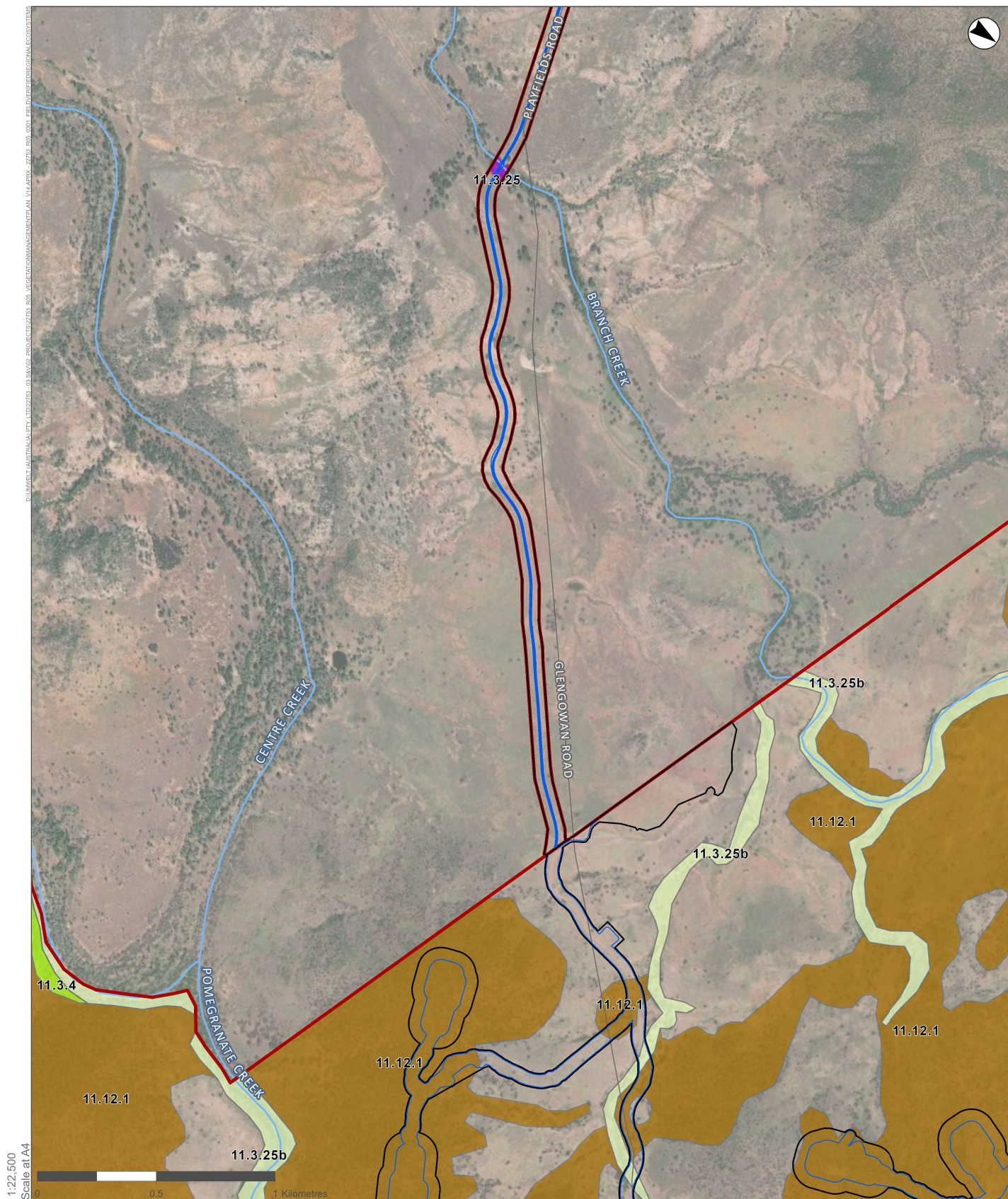


FIGURE 3.1E

Field Verified
Regional
Ecosystems



1:22,500
Scale at A4

GDA 1994 MGA Zone 56

Legend

- Study Area
- Development Corridor
- Disturbance Footprint
- State Forest
- Roads
- Watercourse

Field Verified Regional Ecosystems

Regrowth

- 11.11.15
- 11.11.3
- 11.11.3c
- 11.11.4
- 11.11.4a
- 11.11.4b
- 11.11.4c
- 11.11.4d
- 11.11.5
- 11.11.5a

- 11.12.1
- 11.12.4
- 11.12.6
- 11.12.6a
- 11.3.2
- 11.3.25
- 11.3.25b
- 11.3.3
- 11.3.4
- 11.3.4a

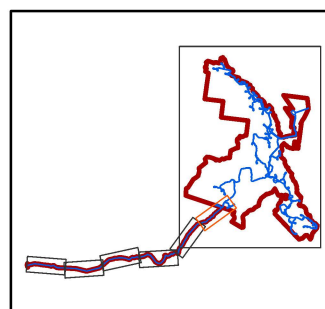
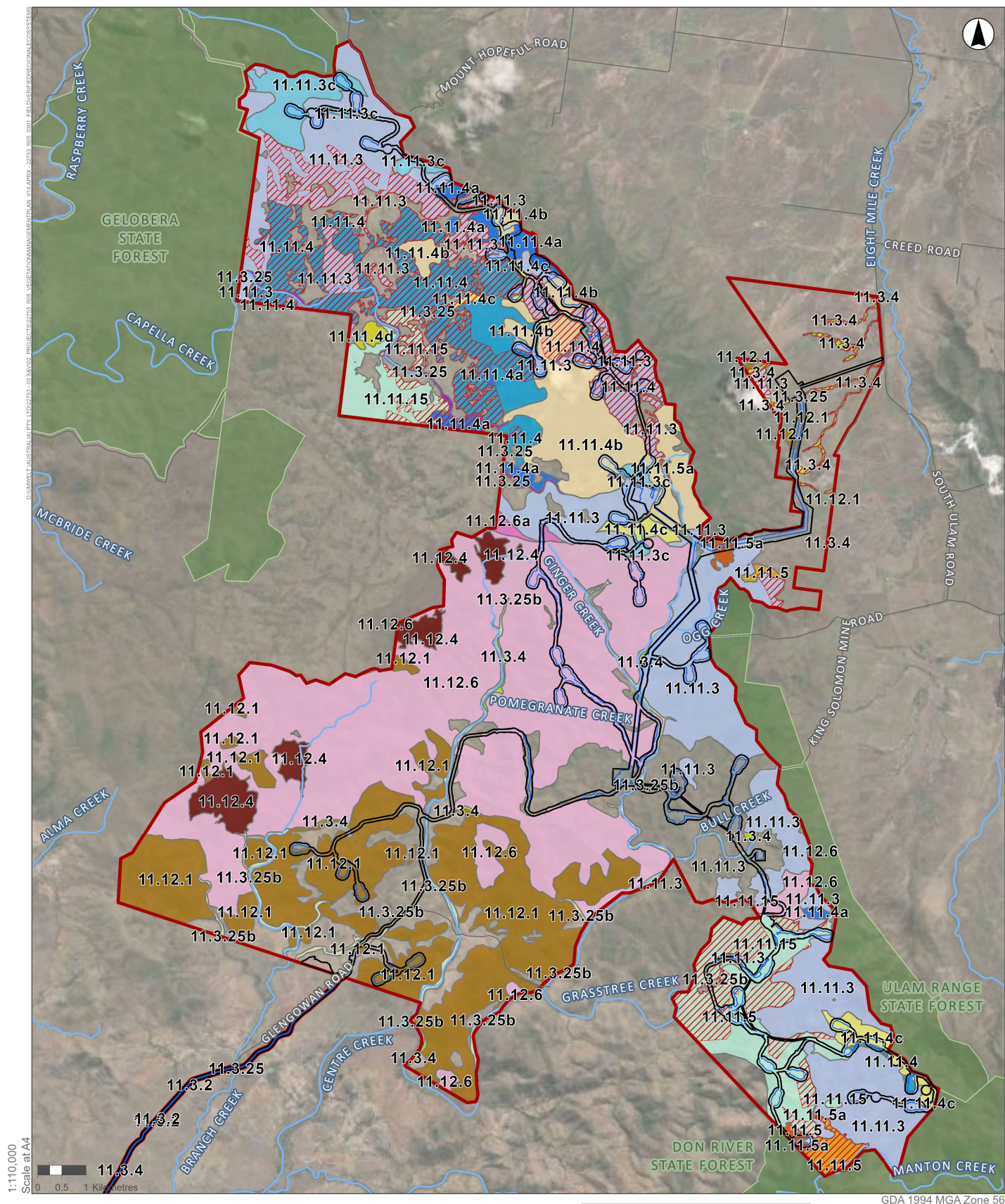


FIGURE 3.1F

Field Verified
Regional
Ecosystems



Legend

- Study Area
- Development Corridor
- Disturbance Footprint
- State Forest
- Roads
- Watercourse

Field Verified Regional Ecosystems

- Regrowth
- 11.11.15
- 11.11.3
- 11.11.3c
- 11.11.4
- 11.11.4a
- 11.11.4b
- 11.11.4c
- 11.11.4d
- 11.11.5
- 11.11.5a

- 11.12.1
- 11.12.4
- 11.12.6
- 11.12.6a
- 11.3.2
- 11.3.25
- 11.3.25b
- 11.3.3
- 11.3.4
- 11.3.4a

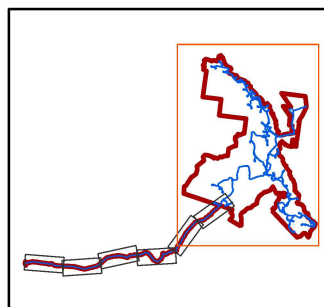


FIGURE 3.1G

Field Verified
Regional
Ecosystems

3.3 Flora Diversity

Field surveys identified 219 flora species from 59 families and 134 genera. The most represented plant families were Poaceae (32 species), Myrtaceae (26 species), Fabaceae (16 species), Asteraceae (13 species) and Mimosaceae (10 species).

The field surveys also identified 32 introduced flora species representing 15.5% of the total flora recorded, described further in **Section 3.3.1** below.

3.3.1 Introduced Flora

Of the 32 introduced flora species identified within the Study Area, 5 species are identified as Category 3 Restricted Matters under the *Biosecurity Act 2014* and Weeds of National Significance (WoNS) (refer **Table 3.2**). WoNS are weed species that have been agreed by Australian governments using an assessment process that prioritised these weeds based on their invasiveness, potential for spread and environmental, social, and economic impacts. High biomass grasses increase fire risk as well as smother the ground, reducing plant germination and threatened species growth and recovery.

Introduced flora classified as Category 3 Restricted Matters or WoNS, as well as high biomass grasses will be the target of management within this PVMP referred to as 'weed species' within this report (see **Section 5.0**). Commonly recorded high biomass grasses include *Cenchrus ciliaris* and *Megathyrsus maximus*.

Table 3.2 Introduced Flora Identified During Field Surveys

Scientific Name	Common Name	Biosecurity Act Category	WoNS
<i>Lantana camara</i>	Lantana	Category 3	Yes
<i>Opuntia stricta</i>	Prickly pear		
<i>Opuntia tomentosa</i>	Velvety pear		
<i>Cryptostegia grandiflora</i>	Rubber vine		
<i>Parthenium hysterophorus</i>	Parthenium		

3.3.2 Threatened Flora

Based on the findings of the Terrestrial Flora Report (Umwelt 2022), one threatened species is Known to occur, 1 species has a High likelihood of occurring and 4 species have a Moderate likelihood of occurring within the Study Area (**Table 3.3**). Potential habitat within the Study Area for these species includes vegetation communities in both remnant and regrowth condition.

Figure 3.2 displays the known threatened species records (*Cycas megacarpa* only) within the Study Area and the associated habitat types.

Table 3.3 Likelihood of Occurrence Assessment Results: Known, High or Moderate Flora Species

Species	Status (EPBC Act, NC Act) ¹	Likelihood of Occurrence	Suitable Vegetation Communities within Study Area	Potential Habitat Within the Study Area (ha)	Habitat Extent within the Disturbance Footprint (ha)
<i>Cycas megacarpa</i> ^{3, 4}	E, E	Known	RE 11.11.15, 11.11.3, 11.11.3c, 11.11.4, 11.11.4a, 11.11.4b, 11.11.4c, 11.11.4d, 11.11.5, 11.11.5a, 11.12.1, 11.12.4, 11.12.6, 11.12.6a, 11.3.25b, 11.3.4 and non-remnant areas	Not applicable - Potential habitat for <i>Cycas megacarpa</i> has only been mapped to the extent of the Development Corridor	224.4
<i>Hernandia bivalvis</i>	-, NT	High	11.11.5, 11.11.5a and 11.12.4	414.5	8.6
<i>Cossinia australiana</i> ²	E, E	Moderate	11.11.5, 11.11.5a and 11.12.4	414.0	8.6
<i>Dansiea elliptica</i>	-, NT	Moderate	11.11.5, 11.11.5a and 11.12.4	414.5	8.6
<i>Decaspermum struckoileicum</i> ²	E, CE	Moderate	11.11.5, 11.11.5a and 11.12.4	53.3	2.3
<i>Samadera bidwillii</i> ⁵	V, V	Moderate	11.3.4, 11.3.25, 11.3.25b, 11.11.3, 11.11.3c, 11.11.4, 11.11.4a, 11.11.4b, 11.11.4c, 11.11.4d, 11.11.5, 11.11.5a, 11.11.15, 11.12.1, 11.12.4, 11.12.6 and 11.12.6a	7,308.9	347.9

¹ EPBC Act and NC Act Status – CE = Critically Endangered, E = Endangered, V = Vulnerable, NT = Near Threatened.

² Regrowth communities excluded due to the prevalence of weeds.


³ Habitat associated with non-remnant vegetation has only been identified where associated with a known record of the species. To capture areas that may contain seed and/or root suckers, a conservative 80 m buffer was applied to the record location. The potential habitat within the Study Area is based on vegetation communities where this species has been recorded.


⁴ The Habitat Extent within the Disturbance Footprint includes 235.3 ha of confirmed and suspected known habitat. This consists of all land within 80 m of a confirmed record (confirmed known habitat) as well as areas where *Cycas megacarpa* presence is presumed or reasonably suspected and does not overlap with confirmed known habitat (suspected known habitat).


⁵ Potential habitat within the Study Area includes all areas of mapped remnant vegetation, below 510 m altitude. Non-remnant and regrowth vegetation has been excluded due to the high degrees of disturbance, including clearing and weed species.


Profiles of known and potentially occurring threatened species listed under the NC Act or EPBC Act with the potential to be impacted by Project activities are described in **Table 3.4**.



Table 3.4 Threatened Flora Species Profiles

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
<i>Cycas megacarpa</i> – Endangered under the EPBC Act and NC Act			
	<p><i>Cycas megacarpa</i> is a small to medium sized Cycad with an erect trunk standing around 3 m tall and approximately 15 cm wide.</p> <p>It is endemic to south-east Queensland, occurring from Woolooga in the south to Bouldercombe in the north. The extent of occurrence for <i>Cycas megacarpa</i> is 18,726 km², while the area of occupancy is 46 km². The Queensland Herbarium (2007) has identified 46 populations in total.</p> <p><i>Cycas megacarpa</i> occurs in <i>Eucalyptus maculata</i> and <i>Eucalyptus crebra</i> woodland and open forest with a grassy understorey. It has also been recorded on rainforest margins. The species usually grows on hill tops and steep slopes at altitudes of 40–600 m above sea level. The soil is typically a well-draining rocky or shallow clay, clay/loam, derived from acid volcanic, ironstone or mudstone.</p> <p>Many populations of <i>Cycas megacarpa</i> are very small and greatly fragmented, with only a handful of adult plants (Forster 2007). Cycad species are known to have little genetic flow between fragmented populations and do not disperse far from the parent plant.</p>	<p><i>Cycas megacarpa</i> was recorded across all vegetation communities within the Study Area including within regrowth and non-remnant areas. The primary habitat for this species (i.e. where the species was most consistently recorded and abundant) was woodland to open forest on upper slopes and crests consisting of <i>Corymbia citriodora</i>, <i>Eucalyptus crebra</i>, <i>Eucalyptus melanophloia</i>, <i>Corymbia intermedia</i> and <i>Eucalyptus tereticornis</i> on metamorphosed sediments and volcanic geologies at altitudes of between 200 and 500 m.</p> <p>Clearing within the Disturbance Footprint will result in the loss of approximately 3,727 <i>Cycas megacarpa</i> individuals and 145.1 ha of known confirmed habitat (confirmed records) and 79.3 ha of known suspected habitat (reasonable extrapolation of known habitat (confirmed) mapping) within the Disturbance Footprint.</p> <p>It should be noted that these numbers are subject to change as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Destruction due to land clearing. • Legal and illegal harvesting of adult plants and seed. • Loss of genetic variation and insect pollinators. • Predation and climate change. • Land management practises including fire, timber harvesting and drought. <p>The National Multi-Species Recovery Plan for cycads (Queensland Herbarium 2007) includes this species and provides additional details including measures to manage populations. No conservation advice is available for this species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	Cycads are unisexual, and generally considered to be long lived plants with Australian Macrozamia species ranging from 60 to 1530 years.		
<i>Hernandia bivalvis</i>- Near Threatened under the NC Act			
	<p><i>Hernandia bivalvis</i> is a tree growing up to 20 m. The leaves are ovate or ovate lanceolate and the upper surface is shining green, and the lower surface is paler and dull. The black, ovoid fruit is about 2 cm in diameter and has 10 ribs and the flowers are grouped in clusters comprising of one stalkless female and two short, stalked male flowers.</p> <p>The species is known to occur from Dryander Creek (near Proserpine) south down to Mt Tamborine. Most known occurrences of this species are from either vine thicket or microphyll vine forest or outcrops with shallow soils up to 620 m in altitude.</p>	<p>This species was not recorded during the field survey program but is considered a potential occurrence due to the presence of nearby records and suitable habitat.</p> <p>A total of 414.5 ha of potential habitat has been identified within the Study Area, associated with REs 11.11.5a and 11.12.4. A total of 8.6 ha of potential habitat will be directly impacted via vegetation clearing.</p>	<p>The possible threats for the species are:</p> <ul style="list-style-type: none"> • Habitat fragmentation. • Inappropriate fire regimes. • Degradation of habitat by weeds. • No recovery plan or approved conservation advice is available for this species, however there is a species management profile which identified the following additional threats: <ul style="list-style-type: none"> ○ Clearing of habitat for agriculture and urban development. ○ Inappropriate legal collection practises of seed and fruit.

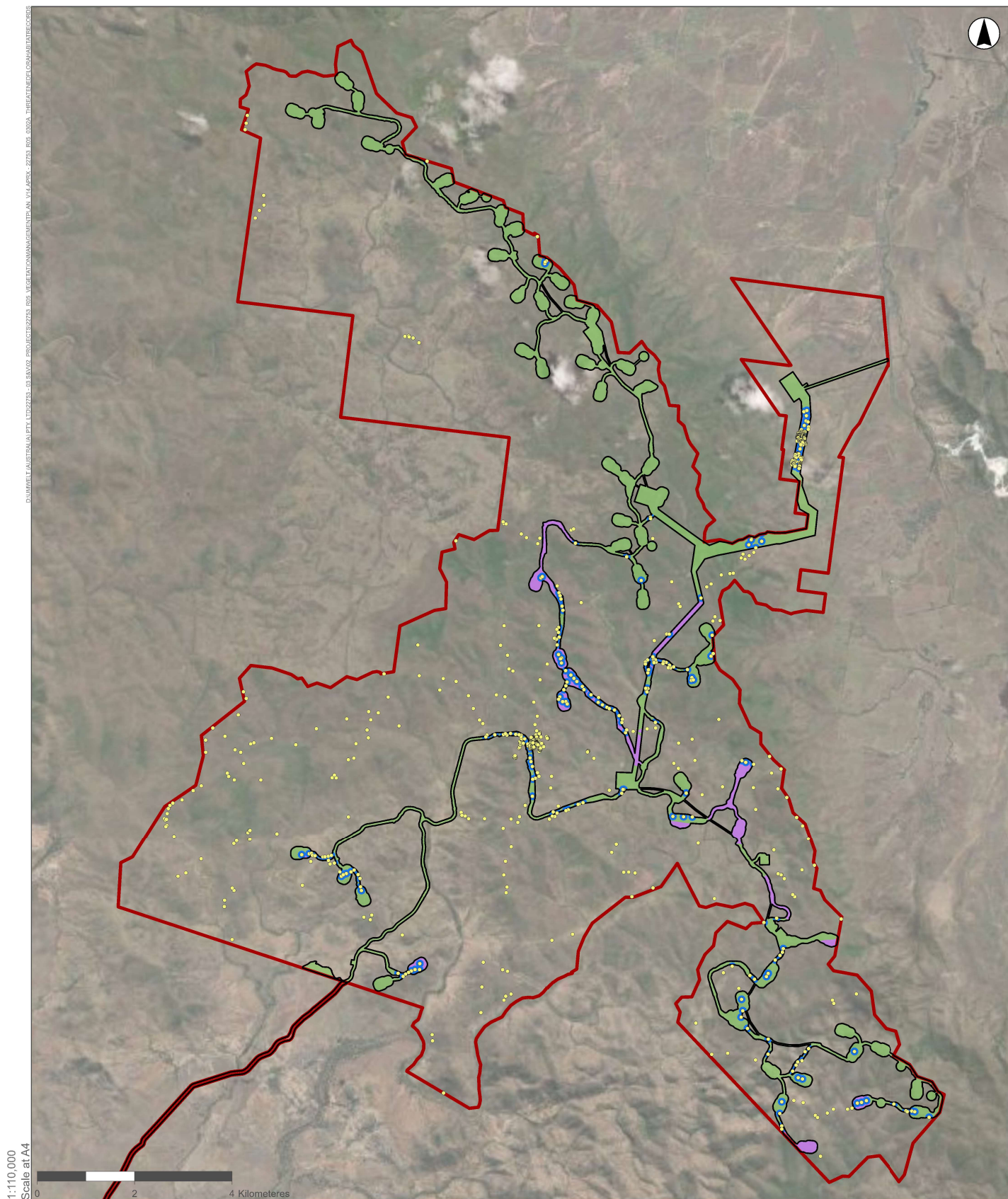
Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
<i>Cossinia australiana</i> - Endangered under the EPBC Act and NC Act			
	<p><i>Cossinia australiana</i> is a shrub or small slender tree to 7 m, with a sparse crown (Department of the Environment Water Heritage and the Arts 2008). Leaves are compound, usually with a winged rachis and 3–5 elliptical to oblong leaflets. Fruits are hairy, three-lobed, inflated capsules with an orange inner surface and brown seeds.</p> <p>The species is known to occur from Rockhampton to Kingaroy, east of the Great Dividing Range, at altitudes from 20 m to 520 m. It is found in Araucarian vine forest or vine thicket on fertile soils. Within these habitats it is generally uncommon, found as scattered individuals. The species appears to prefer ecotonal situations around dry rainforest edges. Trees and shrubs which <i>Cossinia australiana</i> is often associated include <i>Alyxia ruscifolia</i>, <i>Capparis arborea</i>, <i>Drypetes deplanchei</i>, <i>Flindersia australis</i>, <i>Owenia venosa</i> and <i>Siphonodon australis</i>.</p>	<p>This species was not recorded during the field survey program but is considered a potential occurrence due to the presence of nearby records and suitable habitat.</p> <p>A total of 414.0 ha of potential habitat has been identified within the Study Area, associated with REs 11.11.5a and 11.12.4. A total of 8.6 ha of potential habitat will be directly impacted via vegetation clearing.</p>	<p>The primary threats, as identified in the conservation advice, for the species are:</p> <ul style="list-style-type: none"> • Exotic weeds, including <i>Lantana camara</i>, <i>Aristolochia elegans</i>, <i>Anredera cordifolia</i>, <i>Macfadyena unguis-cati</i> and <i>Asparagus plumosus</i>. • Invasion of vine forest margins by weeds also increases fuel loads and leads to fire incursions. • Habitat loss due to clearing. • Increased disease and susceptibility to insects due to the very small, isolated populations and fragmented habitat. • Road widening and maintenance activities. • There is no recovery plan available for this species.

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
<i>Dansiea elliptica</i>- Near Threatened under the NC Act			
	<p><i>Dansiea elliptica</i> is a tree that grows up to 35 m. The leaves are spirally arranged or subopposite, elliptical in shape, apiculate at the apex and shortly attenuate at the base. The flowers are cream-pale green, about 20 cm long and the mature fruit are two or four winged, formed from two orbicular bracteoles below the flowers.</p> <p>The species is known to occur in several localities within Queensland including within Dinden National Park, Wooroonooran National Park, Rundle State Forest and Deep Water National Park. The area of occupancy in Queensland is less than 40 square km in total.</p> <p>Habitat for the species includes lowland dry rainforest and vine thicket on substrates derived from rhyolite, basalt and greywacke. Species associated with <i>Dansiea elliptica</i> include <i>Flindersia australis</i>, <i>Casuarina cristata</i>, <i>Gossia bidwillii</i>, <i>Drypetes deplanchei</i>, <i>Planchonella cotinifolia</i>, <i>Pleiogynium timorense</i>, <i>Terminalia porphyrocarpa</i>, <i>Polyscias elegans</i>, <i>Flindersia spp.</i>, <i>Elaeocarpus eumundi</i>, <i>Synima</i>, <i>Cryptocarya mackinnoniana</i> and <i>Cryptocarya vulgaris</i>.</p>	<p>This species was not recorded during the field survey program but is considered a potential occurrence due to the presence of nearby records and suitable habitat.</p> <p>A total of 414.5 ha of potential habitat has been identified within the Study Area, associated with REs 11.11.5a and 11.12.4. A total of 8.6 ha of potential habitat will be directly impacted via vegetation clearing.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Land clearing activities. • Inappropriate fire regimes. • There is no recovery plan or approved conservation advice for this species.

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
<i>Decaspermum struckoileum</i>- Endangered under the EPBC Act and Critically Endangered under the NC Act			
	<p><i>Decaspermum struckoileum</i> is an erect shrub or small tree growing to 4 m high (Department of the Environment Water Heritage and the Arts 2008a). The leaves are elliptical, arranged in opposite pairs along the branchlets. The flowers are borne in clusters in the leaf axils, white, with four or five petals and sepals and 16–25 stamens. The fruit is a globose berry up to 8.5 mm in diameter, soft and dark bluish-black when ripe.</p> <p>The species is known from five localities in an area known as Struck Oil, approximately 8 km east of Mount Morgan in Queensland. Records for the species are 10.5 km north of the Study area.</p> <p>It is known to occur in semi-evergreen vine thicket on chocolate or reddish soil, often in disturbed areas and at elevations up to 300 m.</p>	<p>This species was not recorded during the field survey program but is considered a potential occurrence due to the presence of nearby records and suitable habitat.</p> <p>A total of 53.3 ha of potential habitat has been identified within the Study Area, associated with REs 11.11.5a and 11.12.4. A total of 2.3 ha of potential habitat will be directly impacted via vegetation clearing.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Weed incursion, particularly by <i>Lantana camara</i>, <i>Megathyrus maximus</i> and <i>Cryptostegia grandiflora</i>. <p>Potential threats to the species include:</p> <ul style="list-style-type: none"> • Wildfire from adjoining sclerophyll forests. • Habitat disturbance from domestic stock. <p>There is no recovery plan available for this species as the conservation advice is consider sufficient. The conservation advice identifies the following additional threats:</p> <ul style="list-style-type: none"> • Land clearing for small-scale agriculture, mining and residential developments. • Accidental destruction during the construction of a firebreak.
<i>Samadera bidwillii</i>- Vulnerable under the EPBC Act and NC Act			
	<p><i>Samadera bidwillii</i> is a small shrub or tree that grows to about 6 m. Its leaves are narrowly elliptic or narrowly ovate, the apex is obtuse, the base cuneate to attenuate. The flowers occur in axillary clusters of 1 to 4, and each flower has 8 to 10 stamens.</p>	<p>This species was not recorded during the field survey program but is considered a potential occurrence due to the presence of nearby records and suitable habitat.</p>	<p>The primary threats, as identified in the approved conservation advice, for the species are:</p> <ul style="list-style-type: none"> • Soil erosion. • Habitat clearing. <p>Potential threats to the species include:</p> <ul style="list-style-type: none"> • Inappropriate fire regimes.

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>The fruits are compressed, ovoid or ellipsoid, about 1 cm long and are 1-seeded (Ross, 1984).</p> <p>The species is known to occur in several localities between Scawfell Island near Mackay and Goomboorian, north of Gympie within Queensland.</p> <p><i>Samadera bidwillii</i> prefers lowland rainforest or at rainforest margins, and can occur in other forest types, such as open eucalypt forests and woodlands. Species associated with <i>Samadera bidwillii</i> include: <i>Corymbia citriodora</i>, <i>Eucalyptus propinqua</i>, <i>Eucalyptus acmenoides</i>, <i>Eucalyptus tereticornis</i>, <i>Corymbia intermedia</i>, <i>Eucalyptus siderophloia</i>, <i>Eucalyptus moluccana</i>, <i>Eucalyptus cloeziana</i> and <i>Eucalyptus fibrosa</i>.</p> <p>It is commonly found in areas adjacent to both temporary and permanent watercourses up to 510 m altitude on lithosols, skeletal soils, loam soils, sands, silts and sands with clay subsoils.</p>	<p>A total of 7,308.9 ha of potential habitat has been identified within the Study Area, associated with REs 11.3.4, 11.3.25, 11.3.25b, 11.11.3, 11.11.3c, 11.11.4, 11.11.4a, 11.11.4b, 11.11.4c, 11.11.5a, 11.11.15, 11.12.1 11.12.4 and 11.12.6. A total of 347.9 ha of potential habitat will be directly impacted via vegetation clearing.</p>	<ul style="list-style-type: none"> Exotic shrubs and grasses (e.g., <i>Lantana camara</i>, <i>Megathyrsus maximus</i> and <i>Chloris gayana</i>). There is no recovery plan available for this species.

¹Species descriptions including key threats, distribution, habitat and ecology have been derived from information within DES Species Profiles (Department of Environment and Science 2021) and within the Species Profile and Threats Database (DCCEEW 2022).



1:110,000
Scale at A4

GDA 1994 MGA Zone 56

Legend

- Development Corridor
- Study Area
- *Cycas megacarpa* (Endangered EPBC Act and NC Act) Records

***Cycas megacarpa* Habitat**

- Known (confirmed)
- Known (suspected)
- Nil Recorded

FIGURE 3.2A

**Known Threatened Flora
Habitat and Records**



Legend

- Development Corridor
- Study Area
- *Cycas megacarpa* (Endangered EPBC Act and NC Act) Records
- Known (confirmed)
- Known (suspected)
- Nil Recorded

FIGURE 3.2B

Known Threatened Flora
Habitat and Records

4.0 Potential Impacts

4.1 Overview

The Project has the potential to impact on flora and vegetation values within the Study Area during the construction, operation and maintenance and decommissioning phases of the Project. The key potential impacts associated with the different Project phases have been summarised below in **Table 4.1**.

The greatest potential impact on ecological values will be from direct impacts associated with the clearing of vegetation during the construction phase of the Project. Within the Study Area, a maximum area of approximately 883.4 ha will be directly impacted as determined by the Disturbance Footprint (**Figure 1.1**). Approximate impacts on vegetation communities have been provided below in **Table 4.2**.

Mitigation and management measures to reduce Project impacts are discussed in **Section 5.0**.

Table 4.1 Project Activities, Risks and Potential Impacts

Project Phase	Project Activity	Risk/ Threat	Potential Impacts
Construction	Site establishment and vegetation clearing	Habitat loss, fragmentation, and degradation	<ul style="list-style-type: none"> • Increase or the introduction of edge effects. • Reduce the extent and condition of suitable habitat. • Reduction in population size and number of individuals within a community.
		Introduction and exacerbation of weed species	
	Construction activities including vehicular movement	Dust generation	
		Soil erosion and sedimentation	
Operation and Maintenance	Project activities	Introduction and exacerbation of weed species	
Decommissioning	Project conclusion and rehabilitation works	Dust generation	
		Introduction and exacerbation of weed species	

4.2 Potential Impacts to Vegetation Communities

As per the field validated mapping, the Project will result in the removal of up to 347.9 ha of remnant vegetation, 292.2 ha of regrowth vegetation and 243.3 ha of non-remnant cleared vegetation within the Disturbance Footprint (**Figure 3.1**). **Table 4.2** below provides a breakdown per RE and details the mapped extent of each community within the Development Corridor and within the Disturbance Footprint. As described in **Section 3.2.1**, no impacts on TECs are anticipated as none are considered likely to occur.

Table 4.2 Extent of Ground-truthed REs Within the Development Corridor and Disturbance Footprint

Regional Ecosystem	Remnant Area (ha) within Development Corridor	Regrowth Area (ha) within Development Corridor	Remnant Area (ha) within Disturbance Footprint	Regrowth Area (ha) within Disturbance Footprint
VM Act Class: Of Concern				
11.3.2	10.0	2.9	0.8	0.2
11.3.3	3.1	0	0.3	0
11.3.4	68.0	11.4	6.0	0.9
11.3.4a	4.7	1.8	0.3	0.1
VM Act Class: Least Concern				
11.3.25	3.4	0.7	0.2	0.2
11.3.25b	4.0	1.6	3.1	1.4
11.11.3	202.7	117.6	128.0	117.5
11.11.3c	38.6	0	23.8	0
11.11.4	11.3	5.5	6.0	2.5
11.11.4a	11.9	10.5	6.8	7.3
11.11.4b	75.2	3.3	44.5	2.1
11.11.4c	54.7	6.1	35.3	5.0
11.11.5	0	0.2	0	0.2
11.11.5a	20.9	0	8.4	0
11.11.15	15.7	121.9	10.9	82.0
11.12.1	0	75.6	0	47.2
11.12.6	113.7	38.3	72.5	25.3
11.12.6a	1.4	0	1.1	0
Total	638.9	475.5	347.9	292.2

4.2.1 Threatened Flora

The Project may result in the removal of *Cycas megacarpa* individuals within the Disturbance Footprint. The Project will also result in the removal of suitable habitat for both known and potentially occurring threatened flora species, as outlined in **Table 3.3**. Several threatened species or species habitat with a likelihood of occurrence of Known, High or Moderate (**Table 3.3**) may also require offsetting under the EPBC Act or EO Act.

Significant impact assessments were undertaken in accordance with the MNES Guidelines (Department of the Environment 2013) for *Cycas megacarpa*, *Cossinia australiana*, *Decaspermum struckoiligum* and *Samadera bidwillii* within the Assessment of Matters of National Environmental Significance (Attachment B4 of the Preliminary Documentation), as these species are listed under the EPBC Act (refer **Section 2.0**). The Assessment of Matters of National Environmental Significance provides details on the potential impacts to these species, including habitat loss and degradation, population fragmentation and introduction of weeds.

In summary, this assessment identified that after avoidance and mitigation measures were considered, the Project is likely to have a significant impact on *Cycas megacarpa*.

An assessment against the Significant Residual Impact Guideline: For matters of state environmental significance and prescribed activities under the Sustainable Planning Act 2009 (Department of State Development Infrastructure and Planning 2014) was also undertaken to determine whether the Project is likely to have a Significant Residual Impact on a MSES (refer **Section 2.0**). As per the Significant Residual Impact assessments detailed in the Terrestrial Flora Report (Umwelt 2022), related impacts on *Cycas megacarpa* and *Hernandia bivalvis* may result in a Significant Residual Impact and require offsetting under the EO Act (Queensland). It should be noted, that while Essential Habitat is mapped for both *Cycas megacarpa* and *Hernandia bivalvis*, the field survey did not identify any appropriate habitat for *Hernandia bivalvis* within the mapped Essential Habitat extent that covers the Study Area.

5.0 Mitigation and Management

5.1 Objectives

To reduce impacts to remnant vegetation and threatened flora species due to vegetation clearance, the following management and mitigation measures have been developed with the aim to achieve the following objectives:

- No loss of known populations of threatened flora species.
- Identification of all threatened flora species within the Disturbance Footprint during pre-clearance surveys.
- Clear communication and delineation of 'no-go' areas where impacts will be avoided during construction.
- Approved clearing limits will not be exceeded, as outlined in Project's Development Approval.
- Management of weed species, to ensure there are no new species or infestations identified within the Disturbance Footprint.
- Restoration and rehabilitation to be undertaken of disturbed areas no longer required for active use or construction, including creek lines.
- Implementation of erosion and sediment control and dust suppression measures.
- Micro-siting does not result in additional disturbance to threatened flora above the approved limits.

5.2 Roles and Responsibilities

The roles and responsibilities for Project staff are outlined in **Table 5.1** below.

Table 5.1 Roles and Responsibilities

Role	Responsibility	Duties
Project Manager	Oversees the construction and operation phases of the Project.	<ul style="list-style-type: none"> • Ensure contractors and all on site personnel are given adequate training in the requirements of this PVMP. • Ensure processes and procedures are in place prior to site mobilisation to ensure the successful implementation of this PVMP. • Implement the monitoring program, outlined in Section 6.2. • Undertake and record corrective actions and non-compliance. • Report to administering authorities where required.
Construction Manager	Oversees site construction and reports to the Project Manager.	<ul style="list-style-type: none"> • Ensure the implementation of this PVMP and the CEMP throughout the construction phase.

Role	Responsibility	Duties
Environment Officer or suitable delegate	Ensures the implementation this PVMP through the construction and operation phases. Reports to the Project Manager.	<ul style="list-style-type: none"> Notify the Project Manager of any environmental incidents/ non compliances that occur on site. Audit site works in accordance with this PVMP. Notify the Project Manager on project progression. Undertake environmental monitoring and reporting, where applicable.
Rehabilitation Contractor	Undertakes rehabilitation works. Reports to the Environment Officer.	<ul style="list-style-type: none"> Undertake rehabilitation works as per the requirements of this PVMP and the Rehabilitation Management Plan to be developed.
Suitably Qualified Ecologist	Provides independent ecological expertise. Reports to the Environment Officer.	<ul style="list-style-type: none"> Undertake pre-clearance surveys and baseline monitoring as per the requirements of this PVMP. Undertake environmental monitoring and reporting, where applicable.
All Project personnel	Construction, operation, and maintenance. Reporting requirements will differ depending on Project roles.	<ul style="list-style-type: none"> Reports environmental incidents and non-compliance to the Environment Officer. Undertake site and role specific training. Follow the requirements outlined in this PVMP.

5.3 Measures

The mitigation and management measures presented in this PVMP have been developed with the aim to achieve the objectives outlined in **Section 5.1**. Mitigation and management measures are based on information within the following supporting documents:

- *Mitigating Biodiversity Impacts Associated with Solar and Wind Energy Development* (Bennun *et al.* 2021).
- Rockhampton Region Planning Scheme (Rockhampton Regional Council 2015).
- Banana Shire Planning Scheme 2021 (Banana Shire Council 2021).
- *Environmental Management Plan Guidelines* (Department of Environment 2014).
- Information contained within Conservation Advice and Recovery plans for relevant species (DCCEEW, 2022).

Table 5.2 contains the mitigation and management measures that relate to flora and vegetation communities identified within and adjacent to the Disturbance Footprint. Measures have been provided for the following key risks:

- Vegetation clearing, habitat loss, fragmentation and degradation.
- Soil erosion and sedimentation.
- Dust generation.
- Introduction and exacerbation of introduced flora species.

It should be noted that specific mitigation and management measures relating to *Cycas megacarpa* are detailed within the Preliminary Translocation and Management Plan for *Cycas megacarpa* prepared by Ecologica Consulting 2022 (Attachment J of the Preliminary Documentation) and the Preliminary *Cycas megacarpa* Species Management Plan (Attachment E of the Preliminary Documentation) to reduce threats and minimise impacts to the species.

Table 5.2 Management and Mitigation Measures for the Avoidance of Impacts to Flora and Vegetation Communities

Risk/ Threat	Associated Performance Criteria	Mitigation Measures and Management Action(s)	Timing
Vegetation clearing, habitat loss, fragmentation and degradation	Approved clearing limits will not be exceeded, as outlined in approval document	<ul style="list-style-type: none"> All Project activities including site access, laydown of plant and equipment and construction activities must be within the finalised Disturbance Footprint. Retention of vegetation for use in on-site rehabilitation and specific requirements for clearing vegetation surrounding creek lines and watercourses. To ensure all Project activities are within the finalised Disturbance Footprint the following measures will be implemented: <ul style="list-style-type: none"> Final clearing extents within the Disturbance Footprint will be demarcated with flagging tape and fencing. Spatial files (shapefile format) will be provided detailing the Disturbance Footprint and clearing extents. The Environment Officer will inspect this area on a weekly basis to ensure work is being undertaken within the final clearing extents within the Disturbance Footprint, and that the fencing/ flagging tape is still within the correct location. Where possible, locate access tracks and electrical connections adjacent to existing access or farm tracks to minimise clearing. 	Prior to commencement of site disturbance and any construction activities
	Micro-siting does not result in additional disturbance to threatened flora or communities above the approved limits	<p>Pre-clearance surveys will be undertaken within appropriate habitat for the threatened species known and likely to occur within the Disturbance Footprint and 5 m either side of the Disturbance Footprint to inform the micro-siting process.</p> <p>Where possible, optimise the placement of infrastructure within the Disturbance Footprint to further minimise disturbance to:</p> <ul style="list-style-type: none"> known <i>Cycas megacarpa</i> individuals (particularly large reproductive age individuals and mature female plants) riparian zones, including avoiding placement of turbines within 50 m of waterways potential threatened flora species habitat. <p>Refer to Section 5.4 for details pertaining to pre-clearance survey methods.</p>	Prior to commencement of site disturbance and any construction activities

Risk/ Threat	Associated Performance Criteria	Mitigation Measures and Management Action(s)	Timing
	No loss or decline of Known populations of threatened flora species	<ul style="list-style-type: none"> Personnel will be informed of the sensitive areas¹ within the Disturbance Footprint as well as the procedures for minimising ecological impacts through site inductions, training, and toolbox talks. Pre-clearance surveys within the Disturbance Footprint will include searches for threatened species that have a Moderate or High likelihood of occurring (Refer to Table 3.3). If any individuals or populations are located during the targeted surveys, a detailed account of their occurrence will be recorded including number of individuals, GPS location and extent. The plants or population area including a 5 m buffer must be demarcated and avoided via micro-siting. No direct or indirect impacts will be permitted without prior consultation with DCCEEW and DES. Refer to the Preliminary <i>Cycas megacarpa</i> Species Management Plan (Attachment E of the Preliminary Documentation) for specific details pertaining to the management of <i>Cycas megacarpa</i>. A pre-approved translocation plan will be implemented for <i>Cycas megacarpa</i> individuals that would otherwise be removed through clearing for the Project. The plan will specify pre and post monitoring requirements, translocation and propagation methods protocols, reporting requirements and performance criteria. Refer to the Preliminary <i>Cycas megacarpa</i> Translocation and Management Plan (Attachment J of the Preliminary Documentation). 	Prior to personnel entering and working on the Project site
	Delineation of conservation/ sensitive areas	<ul style="list-style-type: none"> 'No-go' areas, including clearing limits will be clearly demarcated including the implementation of signage and fencing. Information fact sheets will also be given to applicable land holders. 'No go' areas will include the following: <ul style="list-style-type: none"> Where watercourses intersect linear areas of the Project (i.e. access tracks and reticulation cabling), the clearing width will be reduced to 25 m or less wherever it is feasible. The full implementation of this measure is subject to final design, and safe transport of Project components. Refer to the Preliminary <i>Cycas megacarpa</i> Species Management Plan (Attachment E of the Preliminary Documentation) for specific details pertaining to the management of <i>Cycas megacarpa</i> and delineation of no-go areas for this species. Where Of Concern remnant REs occur immediately adjacent to areas of earthworks, tree protection measures will be installed in accordance with Australian Standard: Protection of trees on development sites (AS 4970–2009). 	Prior to commencement of site disturbance and any construction activities

¹ Sensitive areas are defined as locations outside the Disturbance Footprint which contain known threatened species records or habitat.

Risk/ Threat	Associated Performance Criteria	Mitigation Measures and Management Action(s)	Timing
		<ul style="list-style-type: none"> Personnel will be informed of the sensitive areas within the Disturbance Footprint as well as the procedures for minimising ecological impacts through site inductions, training, and toolbox talks. 	
	Restoration and rehabilitation to be undertaken of disturbed areas no longer required for active use or construction.	<p>Pre-construction</p> <ul style="list-style-type: none"> Soil (topsoil and subsoil) and vegetation stockpile locations will be identified prior to construction. The location will be in previously cleared areas and will be clearly communicated to personnel prior to the commencement of onsite works. Stockpiles will be used for the retention of soil and reinstatement of vegetation for rehabilitation works. <p>Post-construction</p> <ul style="list-style-type: none"> The period between construction activities and restoration of disturbed areas will be kept to a minimum to prevent the establishment of exotic species and loss of soil. Disturbed areas that do not form part of the operational footprint will be re-profiled to stable and/or original contours, re-establishing surface drainage lines and other land features. Refer to the Project's Preliminary Erosion and Sediment Control Plan (Attachment H of the Preliminary Documentation) for specific erosion and sediment mitigation measures. Compacted areas to be ripped where required and practicable to do so. Seed mix to contain relevant species, aligned with prior land use. The species that will be used in rehabilitation works will be identified in consultation with the landowners. Where practicable vegetation best aligned with the historic vegetation at the rehabilitation site will be selected. In areas where the Disturbance Footprint is adjacent to sensitive areas¹, revegetation is to occur through natural regeneration and through assisted planting to create a vegetated buffer between the Disturbance Footprint and sensitive areas. The vegetation within these areas will consist of native species analogous to adjacent vegetation community. Where rock was naturally occurring on the ground surface, the rock can be reinstated as part of rehabilitation works. Rock is not to be reinstated where its use will create a new impact or hazard to the landowner's ability to utilise their land. Cleared native vegetation will be mulched and reused during progressive rehabilitation activities. 	<p>Pre-construction:</p> <p>0–6 months prior to commencement of site disturbance and any construction activities.</p> <p>Post-construction:</p> <p>Restoration and rehabilitation work of disturbed, non-operational areas will be undertaken progressively throughout the Disturbance Footprint. Initial rehabilitation works will be completed within 3 months of the construction phase (Section 1.2.2).</p> <p>Monitoring of rehabilitated areas will be ongoing until the disturbance is stabilised.</p>

Risk/ Threat	Associated Performance Criteria	Mitigation Measures and Management Action(s)	Timing
Soil erosion and sedimentation	Implementation of erosion and sediment control and dust suppression measures during the construction phase.	<ul style="list-style-type: none"> The potential impacts of erosion and sedimentation will be mitigated and managed through the development and implementation of an Erosion and Sediment Control Plan (ESCP). The Preliminary ESCP is provided as Attachment H of the Preliminary Documentation. This will include the establishment of temporary erosion and sediment control until construction is complete or exposed areas have been rehabilitated to prevent the sedimentation of waterways within the Disturbance Footprint. 	Prior to commencement of site disturbance and any construction activities.
Dust generation		<ul style="list-style-type: none"> Progressive rehabilitation of bare/ disturbed areas will be completed as soon as the area is no longer needed for construction. Areas of bare earth will be limited to essential areas needed for the construction of Project infrastructure. Vegetation cover, mulch, and other suitable methods to prevent dust generation will be adopted, where practicable. Stockpiles (topsoil and subsoil) will be maintained to prevent windblown dust generation, especially during dry and/or windy conditions. This will include watering or covering of material as per the Preliminary ESCP (Attachment H of the Preliminary Documentation). A maximum speed limit of 40 km/hr will apply to access tracks within the wind farm area. The speed limit will be reduced to 20 km/hr where tracks occur in proximity to dwellings or site offices. When passing livestock and stationary work crew's vehicles must not exceed 10 km/hr. Speeds on public roads are to be observed as per road signage. Restrict vehicles to approved access tracks (where constructed, or where approval for use exists with the landowner) and only vehicles required for the safe and essential construction activities will be allowed in work areas. Cover all loose loads for transport to and from the work site. Construction water cart will be used to suppress dust during earthworks. Where watering is used, ensure that there is no surface ponding/pooling of water as per the Preliminary ESCP (Attachment H of the Preliminary Documentation). Secure an appropriately licensed water source for dust suppression during the construction phase. Immediately clean up spilled materials on traffic areas before it will be disturbed by vehicle movement. 	During all phases of the Project lifecycle.

Risk/ Threat	Associated Performance Criteria	Mitigation Measures and Management Action(s)	Timing
Introduction and exacerbation of weeds	Management of introduced flora to ensure that new species or infestations are identified within the Disturbance Footprint.	<p>Pre-construction</p> <ul style="list-style-type: none"> Pre-clearance surveys will be undertaken within the Disturbance Footprint (plus 5 m buffer) to record the presence and abundance of introduced flora considered a high biomass grass, and those classified as Category 3 Restricted Matters and/or WoNS, defined as a weed species within this report (see Section 3.3.1). These surveys will serve to identify areas requiring treatment and establish baseline conditions prior to construction such that impacts from the Project can be monitored throughout the Project lifecycle. Areas containing infestations will be treated prior to the commencement of site disturbance and any construction activities. Refer to Appendix A for species specific control methods. Chemical treatment adjacent to sensitive areas¹ should be avoided, where possible. If chemical treatment is required, spot spraying methods will be undertaken. <p>Construction and Operation</p> <ul style="list-style-type: none"> Ongoing weed inspections and management will be completed within the Disturbance Footprint during construction and operation. The weed management area shall be increased where operational maintenance activities are required to be undertaken from unformed areas of the Project site until such time when weed presence in this area (if existing) can no longer be directly attributed to the project. Management of weeds within areas disturbed as part of Project construction (including rehabilitation areas) will continue up to two years post construction, or until weed presence in these areas can no longer be directly attributed to Project activities. Refer to Appendix A for species specific control methods. Chemical treatment adjacent to sensitive areas¹ should be avoided, where possible. If chemical treatment is required, spot spraying methods will be undertaken. Use of chemical treatment in infestation areas, to be prioritised for use in the early wet season to limit seed formation. Personnel using herbicides are to receive appropriate training prior to commencing work and hold any necessary licences required under Queensland law. Only herbicides registered for use over water will be used within 10 m of watercourses. Site vehicles (mobile plant including light vehicles) must drive to conditions and remain on approved access tracks, to avoid mud, organic matter and weed seeds becoming attached to the vehicle. Offroad driving will be minimised to avoid contamination when driving between properties within the project site. A wash down area with a capture vessel will be established on or in proximity to the Project Site to ensure machinery hygiene. 	<p>Pre-construction:</p> <p>0–12 months prior to commencement of site disturbance and any construction activities (during suitable seasonal conditions).</p> <p>Construction and Operation:</p> <p>During all phases of the Project lifecycle.</p>

Risk/ Threat	Associated Performance Criteria	Mitigation Measures and Management Action(s)	Timing
		<ul style="list-style-type: none"> • Site vehicles to be washed down after working in areas where infestations are noted within the project site (where identified), and where weed control measures have not been implemented. • During the annual wet season light vehicles shall be maintained, washed down periodically, and kept in a clean condition. • Light vehicles and worker transport vehicles to remain on sealed roads when offsite, for example between work shifts. Further inspections will not be required when this action is implemented. • Site vehicles (mobile plant including light vehicles) and equipment is to arrive on site 'clean' of weed seeds and other organic matter. Site vehicles are to be inspected and recorded with documented evidence, via a washdown register and weed and seed certificate, prior to site mobilisation. • Personnel boots must be cleaned regularly, as well as between properties by removing excess mud / organic material. Clothing to be checked for weed seeds prior to moving between properties and offsite. • Equipment or material being brought into port facilities for direct transfer to the Project site is required to pass the quarantine inspections and protocols, as per by the Australian Quarantine and Inspection Service. • Material imported into the Study Area (i.e. for use as road base etc) must be obtained from an appropriately licensed source where the source location is deemed 'weed clean'. Evidence must be obtained from the provider prior to importation of material to the Project site. Imported fill (rocks/screenings) shall be free of contamination from mud clumps and weed seeds. • Use only native or certified weed free seeds in all rehabilitation works, including hydro mulch. No viable weed species are to be mulched or chipped in rehabilitation works. • All personnel are to be trained in the identification of key weed species (refer Section 3.3.1) during general induction and toolbox talks. Known weed species on the site are to be displayed on posters on the HSE board and any other suitable locations around the Project site. 	

¹Sensitive areas are defined as locations outside the Disturbance Footprint which contain known threatened species records or habitat.

5.4 Pre-Clearance Survey Methodology

Pre-clearance surveys are ecological surveys that will be undertaken prior to clearing works and the permanent removal of vegetation. The following will be conducted prior to and during the pre-clearance surveys within the Disturbance Footprint:

- Desktop assessment will be undertaken to understand the extent, locality, and presence of vegetation communities and threatened flora species.
- Field surveys will be completed by suitably qualified ecologists² and will include:
 - Threatened species searches for the five threatened species with a 'high' to 'moderate' likelihood of occurrence within vegetation communities with potential habitat (**Table 3.3**), to inform the micro-siting process. Other threatened species (with a 'low', 'unlikely' or newly identified as part of a desktop process) will also be opportunistically searched for in areas of suitable habitat. It should be noted that pre-clearance surveys will also occur within the areas 5 m either side of the Disturbance Footprint (to account for GPS inaccuracies) and include detecting the presence of *Cycas megacarpa* individuals. Pre-clearance requirements for *Cycas megacarpa* has been addressed separately within the Preliminary *Cycas megacarpa* Species Management Plan (Attachment E of the Preliminary Documentation).
 - Habitat assessments to mark fauna habitat features, including hollow-bearing trees, logs, nest boxes to be avoided or managed during clearing.
 - Weed surveys to record the presence and abundance weed species (see **Section 3.3.1**). Areas containing infestations will be treated prior to the commencement of site disturbance and any construction activities.
 - Protected plant survey in accordance with the *Flora Survey Guidelines – Protected Plants* (DES 2020).

Where threatened species (NC Act or EPBC Act) and weed species have been identified then the following information will be recorded:

- GPS location.
- Collector, date and time.
- Species (scientific and common name).
- Number or density of individuals.
- Habit.
- Vegetation communities known to occur in.
- General notes on the feature identified.
- Collect a reference specimen.

² A suitably qualified ecologist is a person who possessed a degree in environmental planning, environmental science, environmental management or similar from a recognised tertiary institution, and has at least five years of relevant experience in environmental assessment.

If threatened flora species (excluding *Cycas megacarpa* which will be managed separately) are located within the Disturbance Footprint, the plants or population area including a 5 m buffer must be demarcated and completely avoided via micro-siting. No direct or indirect impacts to a confirmed population will be permitted without prior consultation with DCCEE and/or DES. The pre-clearance survey constraints protocol (see **Section 5.4.1** below and also Section 9.3.2.2 of Attachment B4 of the Preliminary Documentation (Assessment of Matters of National Environmental Significance)) will then be followed to ensure any potential impacts on the species are avoided or managed appropriately.

The specific pre-clearance survey requirements and management measures relevant to *Cycas megacarpa* are outlined in the Project's Preliminary *Cycas megacarpa* Translocation and Management Plan (Attachment J of the Preliminary Documentation) the Preliminary *Cycas megacarpa* Species Management Plan (Attachment E of the Preliminary Documentation). A pre-clearance survey report will be populated after the field surveys as detailed in **Section 6.2**.

5.4.1 Pre-clearance Surveys Constraints Protocol

An adaptive management response is to be engaged if unexpected MNES are observed during pre-clearance surveys or any other surveys undertaken prior to construction. Whilst the occurrence of new MNES is considered highly unlikely, the intent of this protocol is to ensure the appropriate adaptive management response is implemented and adverse impacts mitigated should they be discovered. If a new threatened species is found, the constraints protocol below will be followed.

STEP 1: Halt construction/clearing activities in the area (i.e. adjacent areas within the Disturbance Footprint where suitable habitat is present – to be determined by a suitably qualified ecologist).

STEP 2: Undertake investigation into potential impacts on the species. This should include:

- Updating of habitat mapping.
- Updating of Significant Impact Assessment.
- Determination of avoidance and mitigation strategies.
- **STEP 3:** Communicate outcomes with DCCEE and determine next steps.

5.5 Restoration and Rehabilitation

Rehabilitation of Project areas no longer used for construction activities will further reduce potential impacts to threatened species and vegetation. Refer to **Table 5.2** for the management and mitigation measures that will be undertaken within disturbed areas no longer required for active use or construction.

Successful rehabilitation of these areas includes the implementation of rehabilitation objectives and rehabilitation acceptance criteria. Rehabilitation objectives provide a clear explanation of proposed rehabilitation outcomes, whereas acceptance criteria are the indicators used to measure rehabilitation success, to demonstrate that the rehabilitation objective has been achieved.

- Rehabilitation objectives for the Project include the following:
- Safe to humans and wildlife.

- Stable.
- Self-sustaining.

To achieve this, the following acceptance criteria is proposed:

- Vegetation and species composition are consistent with prior land use (prior to clearing for the Project) and reflect the species composition of the surrounding vegetation.
- Weed species presence/absence is consistent with undisturbed areas.
- Landform stable and generally free of significant erosion features such as rills and gullies.

Progressive rehabilitation monitoring will occur as per the requirements stipulated in **Table 6.2** and **Table 6.3**. If rehabilitated areas are not tracking towards the assigned acceptance criteria, then additional mitigation measures will be implemented. This will be determined at a later stage and as rehabilitation and rehabilitation monitoring progresses.

Examples of contingency measures could include:

- Additional planting/ seeding could occur to establish or re-establish species within rehabilitated areas consistent with the surrounding vegetation.
- Additional treatments of new weed infestations.
- Backfill the erosion, divert runoff through doming, and cap the inflow entrance point. Topsoil the channel (if topsoil available) and seed with native grass seed mix.

5.5.1 Progressive Rehabilitation Monitoring

A Rehabilitation Monitoring Program will be prepared which includes the detailed monitoring methodology, refined rehabilitation acceptance criteria, monitoring sites and monitoring implementation schedule. Refer to **Table 6.2** and **Table 6.3** for the frequency of rehabilitation monitoring during construction and operation.

6.0 Compliance Management

6.1 Training Requirements

Training will be undertaken to ensure site personnel are familiar with the content and requirements of this PVMP. The site manager will be responsible for ensuring individuals are aware of their responsibilities and reporting requirements. Site inductions and toolbox talks will be used as implementation methods before commencing work on site.

6.2 Monitoring and Reporting

The mitigation and management measures outlined in **Section 5.0** will be monitored throughout the duration of the Project. Regularly monitoring the effectiveness of the mitigation and management measures allows the PVMP to be reviewed and updated if performance criteria are not being met.

As part of compliance reporting an Annual Compliance Report will be provided to DCCEEW in accordance with Project approval conditions. It is anticipated that all actions relating to the management of vegetation will be included, including any non-compliance items. Non-compliance items will also require notification to DCCEEW within 5 business days of being reported to the Project Manager and the Construction Manager.

6.2.1 Pre-Construction

A set of baseline data showing the condition of environmental values prior to disturbance will be undertaken during the pre-construction phase. **Table 6.1** below outlines the monitoring requirements associated with the pre-construction phase, which includes a pre-clearance survey. Refer to **Section 5.4** for details pertaining to the pre-clearance survey methodology.

Table 6.1 Pre-construction Monitoring Requirements

Activity	Frequency	Timing	Purpose and Requirements	Deliverable	Responsibility
Pre-clearance survey	Once off activity	Within 12 months prior to clearing activities	Identify and quantify known threatened flora and weed infestations to be avoided or managed during construction with the Disturbance Footprint.	Pre-clearance Report	Independent qualified ecologist

6.2.1.1 Pre-Clearance Report

Following completion of the pre-clearance survey, a report will be developed that includes the following details:

- The total area (ha) of disturbance required for Project activities within the Disturbance Footprint.
- The location, extent and abundance of introduced flora classified as weed species (refer **Section 3.3.1**).

6.2.2 Construction

The key monitoring and reporting requirements during the construction phase pertain to vegetation protection, the management of weed species and rehabilitation works as outlined in **Section 5.0**. Regular site inspections will be undertaken to ensure adherence to the performance criteria and management objectives. **Table 6.2** contains the monitoring requirements associated with the construction phase.

Table 6.2 Construction Monitoring Requirements

Activity	Frequency	Timing	Purpose and Requirements	Deliverable	Responsibility
Construction audits	Weekly	During Project construction	Site inspections will be completed to monitor the environmental controls as per this PVMP and to ensure corrective actions are being implemented, where required. A site inspection checklist will include the key performance indicators to be monitored, as per Section 5.1 .	Site Inspection Checklist and Environmental Incidents Register	Site Construction Manager
Post-clearing audit	Once off activity	After construction has been completed	Provide an update on the extent, status and condition of ecological values removed during construction. Including the location and number of threatened flora species removed and the total area of disturbance. The post-clearing audit will also include an assessment of weed species presence to determine if additional treatment of infestation areas is required.	Post-clearing Monitoring Report	Environment Officer
Rehabilitation monitoring	Every 6 months for the first 2 years and then reassessed after this period based on progression towards completion criteria.	During Project construction and continuing until meets completion objectives.	The intent of rehabilitation monitoring is to re-establish a native ground cover after disturbance to prevent the establishment of weed species and to assist with erosion mitigation measures.	Progressive Rehabilitation Monitoring Report	Independent qualified ecologist

6.2.3 Post-Construction and Operation

The key monitoring and reporting requirements during the post-construction and operation phase pertain to vegetation protection, management of weed species and rehabilitation management and mitigation measures as outlined in **Section 5.0**. **Table 6.3** below contains the monitoring requirements associated with this phase.

Table 6.3 Post-construction and Operation Monitoring Requirements

Activity	Frequency	Purpose and Requirements	Deliverable	Responsibility
Weed monitoring	To be determined in the final VMP, however it is anticipated that monitoring will be undertaken annually for the first two years of operation and then be undertaken every five years for the remainder of the EPBC Act approval (should it be granted).	Weed monitoring will be undertaken to prevent the establishment or exacerbation of weed species within the Disturbance Footprint.	Monitoring report detailing the areas requiring management, the weeds that require management and associated treatment options.	Environment Officer
Rehabilitation monitoring	Timing will be based on progression towards completion criteria.	The intent of rehabilitation monitoring is to re-establish a native ground cover after disturbance to prevent the establishment of weed species and to assist with erosion mitigation measures.	Progressive Rehabilitation Monitoring Report	Independent qualified ecologist

6.3 Additional Reporting Requirements

Any activity resulting in the unlawful/unauthorised removal of native vegetation or threatened flora species during site activities shall be reported to the Project Environment Officer immediately. Any known instance of ecological disturbance occurring due to Project activities, where the disturbance results in impacts to MSES or MNES outside of the Disturbance Footprint, will be reported to the Project Environment Officer who will escalate and report this occurrence to the relevant government authority.

A series of registers relevant to vegetation management practices will be maintained throughout the life of the Project, and include:

- Training register.
- Vehicle washdown register.
- Environmental incident register.
- Site Inspection Checklist.

6.4 PVMP Amendments and Corrective Actions

The PVMP is a dynamic document that requires review and amendment throughout the life of the Project to ensure the measures within remain effective. It is recommended that this plan be updated:

- When additional ecological data relevant to the protection of vegetation and threatened flora values is collected for the Project.
- Where there is significant change to the Project schedule, Disturbance Footprint or a change in the construction methods.
- Where a change in legislation or best practice methodology has been identified.

To ensure compliance with this PVMP a schedule of obligations will be developed to outline all obligations and track how obligations are being met.

During the Project lifecycle corrective actions should be implemented if the performance criteria and management objectives outlined in **Section 5.1** are not being adhered to, when undertaking monitoring activities outlined in **Table 6.1**, **Table 6.2** and **Table 6.3**. The Project Manager and the Construction Manager will be notified within 1 week of each monitoring event (outlined in **Section 6.2**) if any of the following triggers in **Table 6.4** occur, resulting in non-compliance.

Table 6.4 Corrective Actions

Risk/ threat	Trigger	Corrective Action
Vegetation Clearing: approved clearing limits are exceeded	Clearing outside of the Disturbance Footprint or approved clearing limits exceeded	<ul style="list-style-type: none"> • Review clearing procedures. • Install additional fencing or flagging to reinforce no go areas. • Undertake toolbox talks and re-educate site personnel on site practices and management obligations.
Loss or decline of known populations of threatened flora species	Loss, damage or severe stress of individuals or populations noted	<ul style="list-style-type: none"> • Undertake toolbox talks and re-educate site personnel on site practises management obligations. • Review and update this PVMP. • Install additional control measures such as additional fencing, signs, and flagging tape.
Reduced vegetation condition or species health from dust generation, soil erosion and/or sedimentation	Evidence of dust deposition on adjacent individuals or vegetation.	<ul style="list-style-type: none"> • Review mitigation and management procedures within the Erosion and Sediment Control Plan. • Increase frequency of dust suppression measures. • Undertake toolbox talks and re-educate site personnel on site practises and management obligations.
Introduction and exacerbation of introduced flora	Evidence of infestations by introduced flora species	<ul style="list-style-type: none"> • Treat new infestations within the Disturbance Footprint (plus 5 m buffer). • Undertake additional monitoring to review the success of treatment on infestations. • Undertake toolbox talks and re-educate site personnel on site practices and management obligations. • Review weed management procedures contained within this PVMP.

7.0 References

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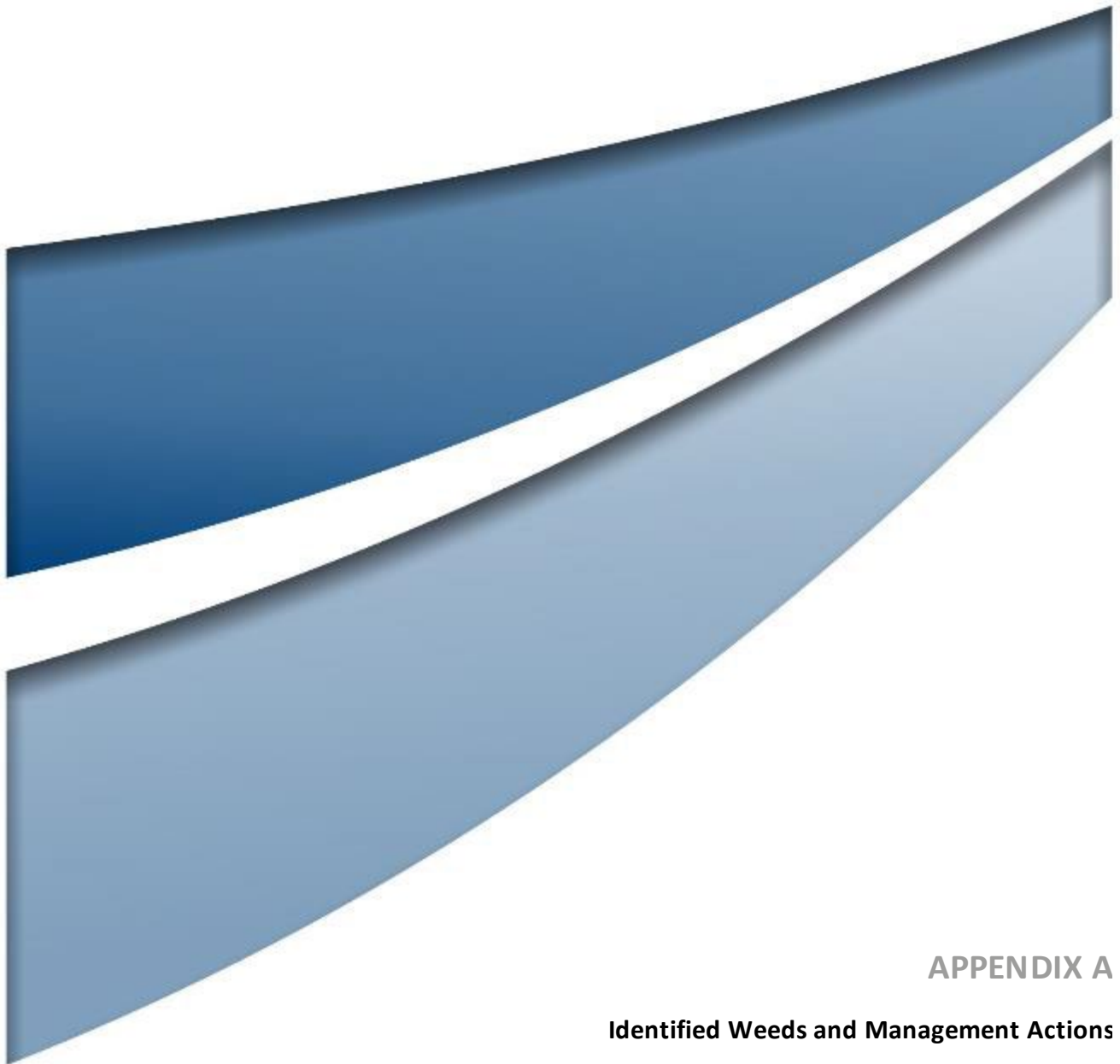
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APPENDIX A

Identified Weeds and Management Actions

Species	Classification	Management Actions ¹	Image ²
<i>Cryptostegia grandiflora</i> (rubber vine)	Category 3 Restricted Matter and WoNS	<p>Physical Control: Infestations of rubber vine can be controlled by burning individuals and/or infestations.</p> <p>Mechanical Control: Repeated slashing of individuals close to ground level is recommended for scattered or medium density infestations. Blade ploughing or stick raking also reduces infestation size.</p> <p>Herbicide Control: Several methods are recommended for the chemical treatment of rubber vine, such as:</p> <ul style="list-style-type: none"> • Aerial application: foliar and soil applied. • Foliar spray: Most effective on plants less than 2 m high. Large plants with stem diameter over 8 cm may not be killed. • Basal bark treatment: Spray around base of plant to 20–100 cm above ground level on smaller plants. • Cut stump treatment: Horizontally cut stem off as close to ground as possible. Then, spray or swab cut surface. • Soil application: soil-applied herbicide applied after 50–80 mm of rainfall. 	
<i>Lantana camara</i> (lantana)	Category 3 Restricted Matter and WoNS	<p>Physical Control: Using fire and implementing a fire control program reduces the survival rate of lantana. Effectiveness of burning will depend on the suitability of available fuel loads, fire intensity, temperature, relative humidity, soil moisture and season.</p> <p>Mechanical Control: Grubbing, slashing, stick raking, or ploughing are suggested mechanical control methods for lantana.</p> <p>Herbicide Control: Different control methods are suggested for single-stemmed and multi stemmed individuals. Basal bark spraying and cut-stump methods is suggested for single stems, whereas foliage spraying is suggested for multi stemmed plants less than 2 m tall.</p> <p>Biological Control: The most popular biological control agents to treat lantana are sap-sucking bug (<i>Teleonemia scrupulosa</i>), leaf-mining beetle (<i>Uroplata girardi</i>), leaf-mining beetle (<i>Octotoma scabripennis</i>) and seed-feeding fly (<i>Ophiomyia lantanae</i>).</p>	

Species	Classification	Management Actions ¹	Image ²
<i>Opuntia stricta</i>	Category 3 Restricted Matter and WoNS	<p>Mechanical Control: Fire is an effective control method for dense <i>Opuntia</i> spp. infestations. Before burning, speak to Biosecurity Queensland to see if this practice is suitable for your pasture and land management practices.</p> <p>Herbicide Control: Refer to the “Opuntoid cacti Restricted Invasive Plant” factsheet as control methods differ between species.</p> <p>Biological Control: There are several biological control agents that remain established in Queensland with the most successful including the Cactoblastis stem-boring moth and the 4 cochineal mealybugs.</p>	
<i>Opuntia tomentosa</i> (velvety tree pear)	Category 3 Restricted Matter and WoNS		
<i>Parthenium hysterophorus</i> (parthenium)	Category 3 Restricted Matter and WoNS	<p>Herbicide Control: Herbicide control differs between cropping and non-cropping areas. In non-cropping areas treat small and/or isolated infestations with a knockdown herbicide and a residual herbicide to control future germinations. For cropping areas use a selective herbicide and/or undertake crop rotations.</p> <p>Biological Control: Ten biological control agents are suggested to reduce parthenium's density and vigour, including but not limited to, stem galling moth (<i>Epiblema strenuana</i>), stem weevil (<i>Listronotus setosipennis</i>), leaf beetle (<i>Zygogramma bicolorata</i>), seed weevil (<i>Smicronyx lutulentus</i>) and stem galling weevil (<i>Conotrachelus albocinereus</i>).</p>	

¹ For detailed management actions pertaining to this species refer to the Queensland Government Restricted invasive plants factsheets (Department of Agriculture and Fisheries 2021).

² Photos are taken from government factsheets based on the species mentioned above (Department of Agriculture and Fisheries 2021) or publicly available google images (2022).

