

CopperString 2.0

Draft Biodiversity Offset Management Plan

Volume 4 Attachment G



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Abbreviations

Abbreviation	Description
BOMS	Biodiversity Offset Management Strategy
BPA	Biodiversity Planning Assessment
BVG	Broad Vegetation Group
CEMP	Construction Environment Management Plan
DAF	Department of Agriculture and Fisheries
DES	Department of Environment and Science
DAWE (formerly)	Department of Agriculture, Water and Environment.
DEWHA	Department of Environment, Heritage, Water and the Arts
DotE	Department of the Environment
DoEE	Department of the Environment and Energy
EIS	Environmental Impact Statement
ESCP	Erosion and Sediment Control Plan
SEIS	Supplementary information to the Environmental Impact Statement
EO Act	<i>Environmental Offsets Act 2014</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ha	Hectares
km	Kilometres
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
m	Metres
NC Act	<i>Nature Conservation Act 1992</i>
NEM	National Electricity Market
NWPS	North West Power System
OAMP	Offset Area Management Plan
RE	Regional Ecosystem
SPRAT	Species Profile and Threats Database
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
ToR	Terms of Reference
VM Act	<i>Vegetation Management Act 1999</i>



1. Introduction

This draft Biodiversity Offsets Management Strategy (BOMS) outlines in general terms, the overarching offsets delivery approach that would be required from significant residual impacts to Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES).

This BOMS builds on the Environmental Offsets identified in Volume 2 Chapter 21 of the draft Environmental Impact Statement (EIS) and includes a revised list of matters that may trigger land-based offsets. The impact assessment methodology has been refined in the Supplementary Information to the EIS (SEIS), to clarify which project activities, in the various mapped landscape types, are expected to result in residual or non-residual impacts to conservation significant species. This is outlined in Volume 4, EIS Supplement, Attachment E Revised MNES Report, section 18.5.5.

The quantification of impacts has also been updated to utilise a concept design and construction methodologies developed after the completion of the draft EIS, by the Early Contractor Involvement Joint Venture (ECI JV). This included an evaluation of project activities with reference to the landscape context, dimension, area, extent, duration, and ability for temporary disturbances or permanent infrastructure to successfully rehabilitate or integrate with the surrounding natural environment. This process, when coupled with the quality and availability of mapped habitat features and likelihood of occurrence for flora and fauna species, more clearly outlines the individual risks to MNES and MSES which are likely to contribute to an unavoidable residual impact.

The extent and scale of residual impacts have informed the species-specific significant impact assessment (SIA). Where residual impacts have the potential to result in a Significant Residual Impact (SRI) to environmental matters, they have been included within this BOMS.

The Ballara Nature Refuge is a protected area under the *Nature Conservation Act 1992* (NC Act) which is interested by the Projects Southern Connection corridor section, between KP 22DS and 54DS. Potential residual impacts or loss of available land within the refuge have also been included within this BOMS.

1.1. Background

CuString Pty Ltd (CuString) proposes to construct and operate the CopperString 2.0 Project (the Project), which involves the construction and operation of approximately 1,000 km of extra high voltage overhead electricity transmission line that will connect the North West Power System (NWPS), and foundation customers at isolated mine sites along the Project route, to the state electricity grid. The Project overview is shown in Figure 1-1.

Currently, electricity consumers connected to the NWPS, which covers Mount Isa, Cloncurry, Gunpowder and Century Mine, do not have access to the National Electricity Market (NEM). Within the NWPS, electricity is supplied by bi-lateral agreements between generators and consumers. The system is managed under an access protocol authorised by the Australian Competition and Consumer Commission. Many of the mines in the NWMP, such as Phosphate Hill Mine, Mount Dore Mine and Cannington Mine, currently generate their own electricity. Electricity generation for the NWPS and isolated mines is mainly based on gas or diesel as fuel.

Access to the state electricity grid will be provided through connection to the Powerlink transmission network, at a location near Mulgrave (between Collinsville and Townsville).

The Project will facilitate the participation of this economically important region in the NEM, substantially reducing the cost of electricity delivered to the region. This reduction in the cost of electricity is expected to facilitate substantial growth in the resources sector by reducing the cost of mining and minerals processing.



The Project will also pass through the southern extent of the North Queensland Clean Energy Hub, a renewable energy zone containing both 'A' class wind and 'A' class solar resources. The Project includes construction of a major substation south-west of Hughenden (Flinders substation) that can facilitate NEM participation of future renewable energy-based generation from these resources.

The Project is divided into the following six sections:

1. Woodstock Substation

The Woodstock Substation will connect the CopperString transmission network to the existing Powerlink 275 kV transmission network and will transform voltage between 275 kV and 330 kV.

The connection to the existing Powerlink 275 kV Strathmore to Ross transmission network consists of the Mulgrave Substation and two sections of 275 kV double circuit transmission line, each about 1 km long. The Mulgrave Substation will be contiguous with the north-eastern boundary of the Woodstock Substation.

2. Renewable Energy Hub

The first 342 km of the Project from the Woodstock Substation, consisting of a double circuit 330 kV transmission line and the Flinders Substation (south-west of Hughenden) to which it connects, forms the Renewable Energy Hub.

3. CopperString Core

Moving further westward, the next 395 km of the Project, consisting of a double circuit 330 kV transmission line and the Dajarra Road Substation to which it connects, forms the CopperString Core. The CopperString Core connects the eastern-most bulk supply substation of the NWPS 220 kV network, at Cloncurry, to the Flinders Substation.

The Dajarra Road Substation will transform the voltage between 330 kV and 220 kV (the NWPS transmission voltage) for connections to the Ergon Energy Chumvale Substation, Dugald River Mine, Ernest Henry Mine, and the Mt Isa Augmentation and Southern Connection.

4. Mount Isa Augmentation

The Mount Isa Augmentation will upgrade and supplement the transfer capacity between the Chumvale Substation and the Mica Creek Complex at Mount Isa. The Mount Isa Augmentation will consist of a new substation south of Mount Isa, near the Mica Creek complex, with a double circuit 220 kV transmission line connection to the Dajarra Road Substation.

5. Southern Connection

Running south from Dajarra Road Substation, a 90 km double circuit 220 kV transmission and the Selwyn Substation, to which it connects, form the Southern Connection. The Southern Connection will enable connection of the southern mines, such as Mount Dore Mine and Phosphate Hill Mine (via the Woodya Connection) that are presently not connected to the NWPS. The Selwyn Substation will form a transmission node to supply nearby energy consumers such as the Mount Dore Mine, Osborne Mine and Cannington.

6. Woodya Connection

Running south-west from Selwyn Substation, a double circuit 132 kV transmission line and the Woodya Substation, to which it connects, form the Woodya Connection. The Woodya Substation will form a transmission node to supply nearby energy consumers such as the Phosphate Hill Mine.

The project will utilise conventional alternating current and will comply with all relevant aspects of the National Electricity Rules (NER), including those required for system security, positively impacting the quality and reliability of supply.



Figure 1-1 Project overview

Insert figure



1.1.1. Corridor selection

The corridor selection process has considered the following:

- Changes to land use and updates to environmental constraint mapping layers that have occurred since 2010 as well as results of CopperString 1.0 investigations.
- Consultation with landholders to identify constraints on land such as infrastructure (cattle yards, fencing, water storage), interference with heli-mustering, proximity to homesteads and visual amenity.
- Technical constraints such as engineering limitations, crossing of existing power lines and connections to substations.
- Environmental constraints including presence of essential habitat, proximity to wetlands and revisions to ‘of concern’ ecosystems.
- Identified cultural heritage places and any buffers around these places.

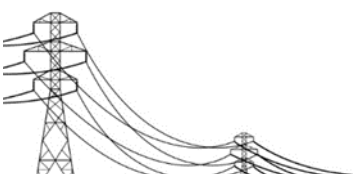
Extensive investigations and consultation resulted in requests to avoid or minimise impacts along the corridor and proposed easement (60m – 120m wide). Requests to move the corridor were assessed against a number of criteria including:

- Improved environmental outcome.
- Reduced impact on landholders.
- Improved cultural heritage outcome.
- Technical feasibility.

The sections of the corridor selection are summarised in Table 1-1.

Table 1-1 Transmission line easement description

Transmission Line Section	Approximate Distance (km)	Voltage (kV)	Easement Width (m)	Corresponding Kilometre Points (KP)
Mulgrave cut-in (North)	0.98	275	60	0 – 0.980MN
Mulgrave cut-in (South)	1.07			0 – 1.066MS
Renewable Energy Hub	342	330	120	0 - 342.4WD
CopperString Core	395	330	120	342.4– 737.5WD
Dajarra Road Connection for connection to the Ernest Henry and Chumvale Substation	4	220	120	0 - 3.67 EE
Dajarra Road Connection for the connection to the Dugald River	3	220	80	0 - 2.68MMG
Mount Isa Augmentation	99	220	60	0 - 98.6DM
Southern Connection	90	220	60	0 -91.40DS
Woodya Connection	61	132	60	0 - 61.78SW



1.2. Offset strategy scope and purpose

The significant impact assessments undertaken in Volume 4, EIS Supplement, Attachment E, identified residual and non-residual impacts to conservation significant species and determined that the residual impacts resulting from the Project will have no significant residual impacts on any MNES.

Avoidance and mitigation strategies implemented during the corridor selection, concept design tower sighting and methodologies and management measures applied during construction, will avoid or minimise loss of foraging or breeding habitats over the medium to long term for most species. However, significant residual impacts are expected where unavoidable residual impacts within important habitat areas, are deemed significant.

The linear nature of the transmission infrastructure, limited earthworks and significant distances between discreet temporary assembly and tower locations, avoids loss of fauna connectivity or permanent alterations to the classification of surrounding landscape character values or remnant ecosystems. Notwithstanding, the project will result in loss of canopy cover for line clearance and at tower locations, as well as clearing for ground level vehicle access, particularly within coastal ranges, woodland and riparian landscapes, that will result in unavoidable residual impacts. The cumulative impacts across the vast extent of the project (approximately 1,000 km), regardless of the individual dimension, size or scale of individual activities, may reduce the extent and quality of EVNT species habitat to a significant extent.

These significant impacts apply to several conservation significant species impacted by this Project and a land-based offset may be required. Therefore, this BOMS has been prepared with the expectation that offset would be required for the koala, black-throated finch and squatter pigeon.

The purpose of this BOMS is to:

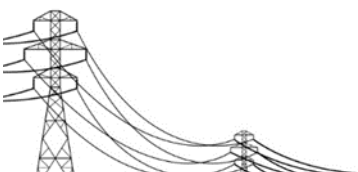
- Present the matters of national and state environmental significance (MNES and MSES) where residual impacts have the potential to be significant including the loss or alienation of protected areas (Ballara Nature Refuge) and may require land-based offsets.
- Outline the habitat quality evaluation and assessment methods to be undertaken at the impact site and offset area(s) using the Queensland Guide to Determining Terrestrial Habitat Quality, Version 1.3 (DES 2020a) - a toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy, Version 1.10 (DES 2021).
- Identify potentially suitable land-based offset areas through desktop assessment.
- Identify further actions and commitments to progress investigation and detailed assessment of potential offset sites.
- Outline the priority or staging of potentially suitable offsets sites, preparation of an Offset Area Management Plan (OAMP) and engagement / negotiation process with landholders to facilitate offsets.
- Identify the preferred mechanism to legally secure the offset.
- Demonstrate how the offset delivery approach is in accordance with the Commonwealth Offsets Policy and the EIS Terms of Reference (ToR).



1.3. Assumptions

Key assumptions that form the basis of this BOMS include the following:

- Only MNES and MSES for which significant residual impacts are likely to occur as determined by the updated terrestrial ecology assessment as outlined in Volume 4, EIS Supplement, Attachment E of the SEIS.
- DES has advised the landholder of the Ballara Nature Refuge, that an offset area to replace the land required to facilitate the transmission line easement will require an offset.
- Environmental offset requirements are based on current offset policies and supporting guidelines and desk top mapping layers (Regional Ecosystem Description Database (REDD) Mapping version 12) in effect as of July 2021.



2. Regulatory Framework

2.1. Environment Protection and Biodiversity Conservation Act 1999 – Commonwealth

The Environment *Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth Government’s principal piece of environmental legislation and is administered by the DAWE. The EPBC Act is designed to protect MNES, which include threatened species of flora and fauna, threatened ecological communities (TECs), migratory species as well as other protected matters. The Act includes EPBC categories of threat for threatened flora and fauna, identifies key threatening processes to their survival and provides for the preparation of recovery plans for threatened flora and fauna.

Approval is required under the EPBC Act for any action (development) that has the potential to significantly impact MNES. Proponents of projects that are likely to have a significant impact refer the project to the DAWE for a determination on whether the proposed activity requires assessment under the EPBC Act via a controlled action, and if so, the level of assessment required. For controlled actions, five different levels of assessment are possible and include assessment based on information provided in the referral, assessment by preliminary documentation, assessment by an Environmental Impact Statement (EIS), assessment by a Public Environment Report (PER) and assessment by public enquiry.

The Project was referred to on 31 March 2019 (EPBC Act Referral 2019/8416). The referral decision made on 14 May 2019 was that the Project is a ‘controlled action’. The controlling provisions determined to be of relevance to the Project are:

- Listed threatened species and communities (sections 18 and 18A).
- Listed migratory species (sections 20 and 20A).

2.1.1. EIS bilateral agreement

The Commonwealth and Queensland governments have committed to working cooperatively across shared responsibilities to strengthen intergovernmental cooperation on the environment. As such, both governments have established a bilateral environmental approvals process under the EPBC Act that removes duplication of assessment and approval processes.

Assessment of this Project will be undertaken under the assessment bilateral agreement between the Queensland and Commonwealth Governments and Commonwealth matters have been included in the Projects Terms of Reference. The ToR components that are relevant to this offset strategy, how they have been addressed and where they can be found are located in Table 2-1.

Table 2-1 Project Terms of Reference offset requirements

Project Terms of Reference Requirements	Project Offsets
12.27 Identify whether the Project will result in a significant residual impact on MSES, requiring an offset with reference to the Queensland Environmental Offsets Policy and Significant Residual Impact Guideline 2014 (see Appendix 1) and the Queensland Environmental Offsets framework.	Refer to Section 2.3, Section 3.6, Section 3.6.6 and 4.2.
12.148 The MNES chapter must include an assessment of the likelihood of residual significant impacts occurring on listed threatened species and communities, and listed migratory species after avoidance, mitigation and management measures relating to the Project have been applied. If it is determined that a residual significant impact is likely, include a draft Offset Management Strategy (as an appendix to the EIS) that provides, at a minimum:	<p>The Biodiversity Offsets Management Strategy is this document.</p> <p>Refer to Section 3.6, Section 3.6.6 and Section 4.1 for impacts.</p>



Project Terms of Reference Requirements	Project Offsets
(a) details of the environmental offset/s (in hectares) for residual significant impacts of the proposed action on relevant MNES, and/or their habitat;	
(b) details of how the environmental offset/s meets the requirements of the Department's EPBC Act Environmental Offsets Policy (2012) (EPBC Act Offset Policy), including the Offsets Assessments Guide, available at: www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy ;	Refer to Section 2.2.
(c) details of a strategy for the staging of environmental offset/s for each Project stage (if proposed);	Refer to Section 4.3.
(d) details of appropriate offset area/s (including a map) to compensate for the residual significant impact on relevant MNES, and/or their habitat;	Refer to Section 5.
(e) information about the proposed offset area/s provides connectivity with other relevant habitats and biodiversity corridors which meet the ecological requirements of the protected matter;	Refer to Section 5 and Figure 5-1.
(f) details of the mechanism to legally secure the environmental offset/s (under Queensland legislation or equivalent) to provide protection for the offset area/s against development incompatible with conservation.	Refer to Section 7.

2.2. Environmental Offsets Policy – Commonwealth

Under the EPBC Act *Environmental Offsets Policy 2012* (EPBC Act Environmental Offsets Policy), environmental offsets are actions taken to counterbalance significant residual impacts on MNES. Offsets are used as a last resort and only considered after all management actions have been considered and where significant residual impacts remains.

The EPBC Act Environmental Offsets Policy provides guidance on the role of offsets in environmental impact assessments and how DAWE considers the suitability of a proposed offset package (SEWPaC, 2012).

The EPBC Act Environmental Offsets Policy, has five key aims that involve:

- Ensuring the use of offsets are efficient, effective, timely, transparent and scientifically robust.
- Providing all stakeholders with greater certainty on how offsets are determined and provided.
- Delivering improved environmental outcomes.
- Outlining the appropriate nature and scale of offsets.
- Providing guidance on acceptable offsets and their delivery.

The Policy also provides eight key principles that are applied in determining the suitability of offsets as follows. An overview of how the potential offset areas, outlined in Sections 5.1 to 5.6, would align with the requirements of the EPBC Act Environmental Offsets Policy is provided in Table 2-2.

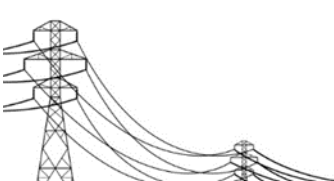
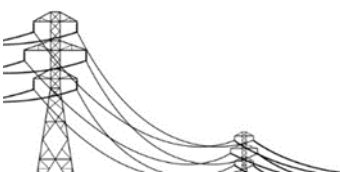


Table 2-2 EPBC Act environmental offsets policy requirements

Policy Requirements	Project Offsets
Deliver an overall conservation outcome that improves or maintains the viability of the MNES in question	The offset investigation areas were selected so that they could acquit potential offset requirements for impacts to the MNES and MSES based on desktop vegetation and habitat mapping. Once the offset obligations for MNES and MSES are known, relevant offset areas will be field verified to confirm the presence of the required habitat values. The potential offset area would be managed in such a way to improve habitat condition and the viability of all three MNES in accordance with EPBC Act offset obligations and offsets assessment guide. It is expected an offset area would be managed and monitored as outlined in the final OAMP which could be in the order of 20 years or for the life approval following approval of the OAMP.
Be primarily built around direct offsets but may also include other compensatory measures	The offset investigation areas have the potential to fully acquit any potential offset requirements. Yet to be undertaken field verifications to ground-truth the vegetation will determine the on-ground presence of the vegetation communities and fauna habitat. If alternate offset locations are required, the primary selection criteria would be that the area can fully acquit the required offset obligations. Therefore, it is expected that no other compensatory requirements are necessary.
Be in proportion to the level of statutory protection that applies to the MNES	The threat status of the MNES is considered by the EPBC Offset Assessment Guide calculator in determining the area of the offset to be provided.
Be of a size and scale proportionate to the residual impacts on the protected matter	The quantum of potential offsets is not yet known. However, the potential quantum of offsets that have the potential to be required was estimated using experience and recent EPBC Offsets Calculator outputs (i.e. multipliers) from other projects. As such, a preliminary and nominal multiplier of four was used. It is noted that Project specific inputs will be required for determining the final quantum of offsets, if required. These inputs, including justification for the inputs will be based on the results of detailed field assessments and habitat quality data that will be undertaken in due course.
Account for and manage the risks of the offset not succeeding	The suitability of a final offsets area will be calculated in accordance with EPBC Act Environmental Offsets Policy and the EPBC Offset Assessment Guide Calculator which takes into consideration several metrics including confidence in the offset succeeding. Final inputs and justifications will be outlined in a OAMP as will a risk assessment of proposed management actions.
Be additional to what is already required	The offset investigation areas are zoned rural and have been historically used for cattle grazing with improvements including sheds, water storages, fencing and dirt roads. Landowners are currently obliged to appropriately manage pest animals and invasive weed species to protect environmental values (amongst other values) under state government general biosecurity obligations
Be efficient, effective, timely, transparent, scientifically robust and reasonable	<p>The suitability of the offset investigation areas (and any alternate offset area) will be assessed using standard practices approved by both Commonwealth and State Governments and will be undertaken by suitably qualified ecologists using an evidence-based and scientifically robust approach. CuString will commit to legally securing the offset area within the timeframe required by the final approval conditions.</p> <p>The required OAMP is expected to include a transparent and scientifically robust ongoing monitoring program that can be readily audited to assess its effectiveness of assessing the success of the offset area in achieving the required performance criteria and satisfy the Projects offset obligations.</p>



Policy Requirements	Project Offsets
Have transparent governance arrangements including management actions, monitoring and auditing	The final approved OAMP will outline a clear governance framework and delivery pathway to legally secure the offset area and a transparent and scientifically robust monitoring and reporting program. The OAMP would also provide an auditing framework that allows for continual improvement to ensure the offset area achieves the required offset obligations.

2.3. Environmental Offsets Policy – Queensland

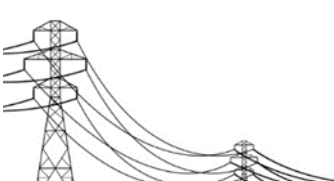
The Queensland *Environmental Offset Act 2014* (EO Act), *Environmental Offsets Regulation 2014* (EO Regulation) and Queensland Environmental Offsets Policy, Version 1.10 (QEOP) (DES 2021) comprise the Queensland Environmental Offsets Framework. Under this framework, it is necessary to provide offsets for any significant residual impacts on MSES.

Under the EO Act, offsets are required for activities likely to cause a significant residual impact on MSES, as defined in Schedule 2 of the EO Regulation. The Queensland Environmental Offsets Policy Significant Residual Impact Guideline (SRI Guideline) (EHP 2014) has been prepared to assist proponents in assessing the potential for significant residual impacts to occur. DES has also produced the General guide for the Queensland Environmental Offsets Framework Version 1.03 (DES 2021b), which provides guidance interpreting and implementing the Queensland Environmental Offsets Framework.

Offsets can be delivered as a financial settlement, land-based offsets and/or delivery of actions in Direct Benefit Management Plan, or a combination of these approaches. For land-based offsets, the Queensland Government has developed a number of tools to assist proponents in determining habitat quality of both the impact and offset site. This data is then used to decide the relevant offset ratio.

However, in the case of matters that are prescribed as being both MNES and MSES, offsets are not required under the EO Act if impacts to the same (or substantially the same) prescribed matter have been assessed by DAWE under the EPBC Act (i.e. for projects that have been deemed a controlled action). It is the responsibility of the Commonwealth Government to assess and condition offsets for MNES. For impacts to residual MSES (i.e. those species or communities that are not dual listed), offsets will be provided under the EO Act as required.

Under the Queensland Environmental Offsets Policy, offsets can also be delivered in stages. In such cases, the potential impacts and potential offset obligations for the project as a whole, should be identified along with the measures undertaken to avoid and mitigate those impacts. Although the final quantum of impacts and potential offsets are yet to be finalised, the intent of CuString is to stage offset in-line with the staged construction program (refer to Section 4.3 for further detail).

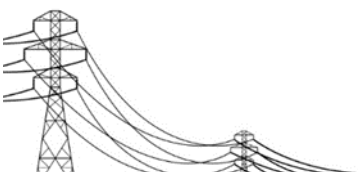


3. Biodiversity values requiring offsets

The Project was subject to extensive ecological investigations as part of the original 2010 EIS and 2011 SEIS assessments and reporting undertaken between 2010 and 2011 (CopperString 1.0 EIS). To maximise efficiencies and build upon the information obtained through those previous surveys and assessments, the current investigation has used an integrated approach. This combined a comprehensive review/gap analysis of previous studies with corridor realignment to avoid areas of ecological significance where possible, with renewed desktop assessments and targeted field surveys to ground-truth current conditions.

The following steps were used in the ecological assessment with the aim of integrating data, identifying gaps and streamlining the approach for targeted surveys of high value areas:

- A comprehensive review of the CopperString 1.0 EIS reports and mapping data was undertaken to identify key findings, ecological constraints and potential gaps imposed by logistical and land access constraints.
- A revised desktop assessment of government databases and mapping layers was undertaken to provide current information on conservation significant species, vegetation communities, aquatic and terrestrial habitats, and other ecological constraints.
- Preliminary constraints mapping was undertaken to identify and map the distribution of key ecological constraints including EPBC Act Threatened Ecological Communities (TEC), endangered or of concern Regional Ecosystems (RE) mapped and regulated under the VM Act, essential habitat for species listed under the NC Act, Wetland Protection Areas, predicted habitat for conservation significant species confirmed present or considered likely to occur. A preliminary corridor selection workshop was undertaken to identify area of high ecological value and protection that could be avoided by the Project through a process of realignment of localised sections of the transmission line and corridor selection. The constraints mapping was also used to inform the site selection for targeted field survey efforts.
- Targeted field surveys were undertaken in 2010 and 2011 across the study area over five survey events for CopperString 1.0. These provided representative ecological information under pre-wet and post-wet season weather conditions. Surveys undertaken by GHD in 2019 for this Project targeted those areas not assessed in the CopperString 1.0 EIS including areas of high potential ecological value, and areas representative of the local environment in different geographic sections of the study area (able to be accessed at the time). In addition, further surveys for this Project were by GHD and BASE Consulting in 2020 and 2021 (refer to Volume 4, EIS Supplement, Attachment E and Attachment F). These surveys were completed across several sections of the alignment to further refine results and compliments previous survey data.
- A likelihood of occurrence assessment was undertaken for all conservation significant species identified in desktop searches and likelihood of occurrence updated and determined based on the results of additional field surveys, Commonwealth and State environmental agency input and desktop assessments.
- Revised ecological constraints mapping was undertaken to provide updated predictive habitat mapping for species of conservation significance and mapping of key constraints to inform the impact assessment process.
- Assessment of the proposed activities during construction and operation of the Project has been undertaken to identify potential impacts on the ecological values of the receiving environments. Recommended avoidance and mitigation measures have been proposed and significance of impact assessments conducted for conservation significant species.



3.1. Study area

The study area refers to the 5 km wide corridor which was subject to the field and desktop assessments (up to 2.5 km either side of the corridor selection). This study area width was employed to allow for a greater assessment of the surrounding areas and to allow for identification of regional values, connected values, and potential constraints or realignment opportunities.

3.2. Review of CopperString 1.0 EIS

Extensive desktop assessment and ecological surveys were previously undertaken as part of the CopperString 1.0 EIS assessments. In order to capture the relevant ecological information from previous studies, the following documents were reviewed:

- CopperString Project EIS: specifically, the Terrestrial Ecology and Impact Assessment Report (BAAM, 2010) and the Aquatic Ecology (frc environmental, 2010), prepared for BAAM Pty Ltd, was viewed to ascertain the existing environmental values and legislative triggers identified during the initial assessment of the Project.
- CopperString Project SEIS: specifically, the Terrestrial Ecology and Impact Assessment Report (BAAM, 2011) was viewed to ascertain additional information with regards to the existing environmental values, protected species and Project impacts updated as a supplementary submission following the initial EIS assessment.

A total of six ecological field surveys were undertaken for the CopperString 1.0 EIS investigations (refer to Table 3-1). The study area for the previous desktop assessments was a 5 km wide corridor along the centreline, with a 200 m wide corridor for field assessment purposes.

Table 3-1 Summary of previous ecological surveys relevant to the Project

Survey dates	Ecologists	Duration	Method and survey effort
Targeted field surveys for MNES flora – BAAM			
July and August 2010	Not specified	Not specified	Quaternary vegetation assessments TEC verifications
Targeted field surveys for MNES reptiles - BAAM			
March-April 2011	4 fauna ecologists	10 days	Habitat suitability assessments Active searches
SEIS Terrestrial ecology surveys – BAAM, 3D Environmental			
April 2011	1 landscape ecologist 1 flora ecologist	12 days	Quaternary vegetation assessments Fauna habitat/rapid survey Trap and release surveys Regional ecosystem mapping
Targeted trapping survey for <i>Carpentarian Pseudantechinus</i> - BAAM			
May 2011	Not specified	4 x 5 days	Targeted trapping surveys Habitat suitability assessments
Targeted trapping surveys for Julia Creek Dunnart - BAAM			
May 2011	Not specified	2 x 5 days	Targeted trapping surveys Habitat suitability assessments
Targeted field surveys for MNES fauna – BAAM			
May / June 2011	4 fauna ecologists	10 days	Habitat suitability assessments Active searches



3.3. Preliminary constraints mapping and risk avoidance

Preliminary constraints mapping was undertaken to identify key constraints along the study area. The following key ecological constraints were mapped:

- Predicted habitat for conservation significant species considered known or likely to occur based on habitats confirmed in CopperString 1.0 EIS surveys and essential habitat factors listed for each species.
- Known locations of conservation significant flora and fauna species.
- Essential habitat for conservation significant species listed under the NC Act.
- Flora trigger mapping for flora species listed under the NC Act.
- Confirmed TECs mapped in the CopperString 1.0 EIS surveys.
- Wetland Protection Areas.

The preliminary corridor selection workshop was undertaken to identify area of high ecological value and protection that could be avoided by the Project through a process of realignment of localised sections of the transmission line and corridor selection, resulting in a number of mapped ecological constraints being avoided entirely.

The preliminary constraints mapping was used to inform the selection of field survey sites, targeting areas of high ecological value that had not been surveyed in the CopperString 1.0 EIS surveys and areas requiring re-assessment to validate current conditions.

3.4. CopperString 2.0 field surveys

Ecological surveys were undertaken by GHD and Base Consulting for the Project between September 2019 and May 2021.

GHD surveys were undertaken between September 2019 and November 2020 and comprised two pre-wet season surveys conducted as three separate field events:

- The first field survey assessed the western extent of the proposed corridor selection, from Mount Isa to east of Cloncurry in the Mount Isa Augmentation and the south-western sites of the Phosphate Hill.
- The second field survey assessed the remaining sections of the corridor selection, from east of Cloncurry in the west to Woodstock in the east.
- The third field survey assessed the Ballara Nature Refuge and the new alignment near Ravenswood. Additional targeted surveys for the koala, ornamental snake and black-throated finch were also conducted around Priare and Pentland.

During all survey event, rapid ecological assessments were undertaken at selected sites across the proposed alignment. The field teams for all surveys consisted of three fauna ecologists and two flora ecologists. The surveys targeted areas of high ecological value and areas that were not assessed in the original Copperstring 1.0 surveys due to land access or logistical constraints. This provided for greater investigation of areas of high ecological value and on-ground validation of current conditions at sites previously assessed in the Copperstring 1.0 project.

Base Consulting surveys were completed between September 2020 and May 2021 and comprise six separate mobilisations completed pre and post wet season. During all surveys, rapid ecological assessments were undertaken at selected sites across the proposed alignment. The field teams for all surveys consisted of either two, three or four ecologists. As with GHD surveys, Base Consulting surveys targeted areas of high ecological value and areas that were not assessed in the original Copperstring 1.0 or GHD surveys due to land access or logistical constraints. These surveys

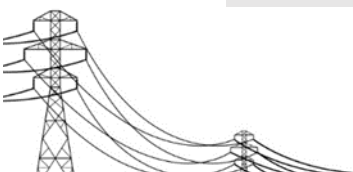


complemented previous survey effort and assist in providing refined on ground verification of vegetation, access constraints and habitat condition along the proposed alignment.

A summary of the GHD and Base Consulting field survey program is presented in Table 3-2. A description of the terrestrial flora and fauna and aquatic ecology survey techniques utilised during field surveys is presented in the following sections.

Table 3-2 Summary of field surveys

Survey dates	Field team	Duration	Survey area	Methodology and survey effort	Survey effort
GHD Pre-wet season survey 1					
September 2019	3 fauna ecologists 2 flora ecologists	7 days	Mount Isa, Cloncurry, Dajarra, Phosphate Hill and Julia Creek.	Habitat suitability assessments Active searches Quaternary assessments SAT searches Targeted searches for conservation significant species Aquatic assessments	110 flora survey sites 82 fauna survey sites 6 aquatic survey sites
GHD Pre-wet season survey 2					
December 2019	3 fauna ecologists 2 flora ecologists	7 days	Woodstock to Julia Creek	Habitat suitability assessments Active searches Quaternary assessments SAT searches Targeted searches for conservation significant species Aquatic assessments	123 flora survey sites 109 fauna survey sites 7 aquatic survey sites
GHD Pre-wet season survey 3					
October / November 2020	2 fauna ecologists 2 flora ecologists	14 days	Ballara Nature Refuge, Pentland and Ravenswood.	Habitat suitability assessments Active searches Quaternary assessments SAT searches Targeted searches for conservation significant flora species Aquatic assessments	102 fauna survey sites 284 flora survey sites
Base Consulting Pre-wet season survey 1					
September 2020	3 ecologists	10 days	Richmond, Maxwelton	Habitat suitability assessments Active searches Quaternary assessments Waterway assessments	75 flora survey sites 52 habitat survey sites 14 water assessments
Base Consulting Pre-wet season survey 2					
October 2020	4 ecologists	10 days	Ballara Nature Refuge	Habitat suitability assessments Active searches Quaternary assessments Waterway assessments	60 flora survey sites 27 habitat survey sites 18 water assessments



Survey dates	Field team	Duration	Survey area	Methodology and survey effort	Survey effort
Base Consulting Pre-wet season survey 3					
January 2021	4 ecologists	10 days	Mt Isa, Phosphate Hill, Selwyn	Habitat suitability assessments Active searches Quaternary assessments Waterway assessments	84 flora survey sites 15 habitat survey sites 19 water assessments
Base Consulting Post-wet season survey 4					
March 2021	2 ecologists	10 days	Julia Creek, Cloncurry, Mt Isa	Habitat suitability assessments Active searches Quaternary assessments Waterway assessments	46 flora survey sites 84 habitat survey sites 11 water assessments
Base Consulting Post-wet season survey 5					
May 2021	2 ecologists	10 days	Cloncurry, South of Ballara Nature Refuge, Torrens Creek, Pentland	Habitat suitability assessments Active searches Quaternary assessments Waterway assessments	32 flora survey sites 59 habitat survey sites 6 water assessments
Base Consulting Post-wet season survey 6					
May 2021	2 ecologists	10 days	Prairie Torrens Creek	Habitat suitability assessments Active searches Quaternary assessments Waterway assessments	25 flora survey sites 22 habitat survey sites 2 water assessments

At each of the 293 GHD fauna survey sites and 295 Base Consulting survey sites, habitat assessments were undertaken to document the value of habitats for birds, reptiles, mammals and amphibians. This was based on the presence of key resources and habitat features including:

- Structural complexity of vegetation at canopy, shrub and ground layers.
- Substrate type and the structural complexity of ground level microhabitats.
- Presence of refuges and resources including fallen timber, leaf litter, hollow-bearing trees and stags, rocks/boulder piles and outcrops, caves and overhangs, mistletoes, nests, termite mounds and waterbodies.
- Habitat condition based on existing land use and associated disturbance due to vegetation clearing, fragmentation, grazing, fire, weed and pest infestation.
- Presence and condition of key resources for targeted conservation significant species including:
 - Breeding habitat for the Julia Creek dunnart (i.e. areas of Mitchell grass plains with a local abundance of cracking clays)
 - Foraging habitat for the koala (i.e. areas with a high abundance and diversity of koala food trees)
 - Breeding habitat for the squatter pigeon (southern) (i.e. sandy and stony soils with tussocky grasses within close proximity to permanent waterbodies)



- Breeding habitat for the black-throated finch (southern) (i.e. woodland areas with a high abundance and diversity of native grasses within close proximity to permanent waterbodies).
- Breeding and foraging habitat for the night parrot (i.e. presence of *Triodia* grassland with very sparse shrubs and or trees).

Survey methods were undertaken in accordance with applicable Commonwealth and Queensland threatened species and communities survey guidelines including:

- Koala – Targeted searches for koala faecal pellets were undertaken at 140 sites using the Spot Assessment Technique (SAT) (Phillips and Callaghan 2011). Spotlighting was undertaken within suitable habitat.
- Black-throated finch – Waterbody watches and area searches for birds were undertaken within 600 m of permanent waterbodies at 74 sites.
- Julia Creek dunnart – Deployment of remote cameras and collection of predator scats for content analysis were undertaken at 28 sites.
- Night parrot – Opportunistic surveys were undertaken at 84 sites. Targeted habitat assessments conducted at 27 sites.
- Squatter pigeon – Driving / flushing surveys and area searches at permanent waterbodies, including in the vicinity of dams and cattle troughs, were undertaken at 74 sites.
- Plains death adder – Nocturnal driving transects and active searches were undertaken at 104 sites.

A summary of the survey effort directed towards conservation significant species is presented in Table 3-2.

3.4.1. Habitat mapping for threatened species

Predictive habitat mapping was produced for all conservation significant species confirmed present or considered likely to occur in the Copperstring 1.0 EIS. Predictive mapping was based on essential habitat factors nominated for each species by DES, updated records and RE data, as well as the known, likely and/or potential habitat mapping produced for the Copperstring 1.0 project. Predictive mapping informed the targeted selection of survey sites, as well as localised route selection changes to avoid areas of ecological significance.

Following field surveys, predictive habitat mapping was refined based on information on habitat condition obtained from field surveys and additional species observations (or lack of observations for some flora species). The refined predictive habitat mapping was used to inform the impact assessment.

Suitable habitat has been mapped in the predictive mapping, which is broadly defined as areas that meet the Queensland State government essential habitat factors (where relevant and able to be mapped), the mapped distribution for the species, and/or other key habitat characteristics from the DAWE Species Profile and Threats Database that are able to be mapped (such as watercourse stream order or waterbody type).

Predictive habitat mapping was derived from the following sources (as relevant to the species):

- Copperstring 1.0 EIS field survey records (BAAM, 2010 and BAAM, 2011).
- GHD 2019-2020 field survey records.
- Base Consulting 2020-2021 field survey records.
- Wildlife Online database records (Wildnet data).
- Queensland Museum database records.
- REDD Mapping version 12.



- ALA records (if additional to the records shown on Wildnet or Qld Museum) and/or
- Birdlife Australia database records.

For EPBC Act listed species, the potential habitat mapping has been limited spatially to the indicative distribution of the species shown on the DAWE Species Profile and Threats Database (derived from point locations, bioclimatic distribution models and/or expert knowledge), as relevant to the suitable habitat characteristics present.

The suitable habitat mapping has been considered for assessing potential impacts to each species, as relevant to their habitat requirements (e.g. non-breeding, breeding or foraging habitat), movements and lifecycle, and in relation to remaining suitable habitat available at the local and regional scales.

3.5. Impact assessment

In order to determine if an environmental offset is necessary, the impacts of a project need to be fully understood. Both Commonwealth and Queensland Governments take into consideration the offset hierarchy that is to preferentially avoid impacts, mitigate impacts that are unavoidable and provide offsets for significant residual impacts.

To determine the level of impacts to threatened species, the habitat mapping was used in conjunction with construction and operational requirements and the temporal and spatial nature of these requirements. Specifically, the project activities and impacts were classified as temporary (access tracks for construction only, break and winch pads, tower assembly and laydown areas and workers accommodation areas) or permanent activities (access tracks for operations (required along the corridor selection) and maintenance, transmission tower, CEV huts and substation footprints and clearing required for the transmission line clearance or conductor blow out) (refer to Volume 4, EIS Supplement, Attachment E Revised MNES Report, table 18.38 and Volume 4, Attachment F Vegetation Clearing Works Plans of the SEIS of further detail). The location and timing of these activities were then overlaid on the landscape type including vegetation density and structure. The potential residual impact to MNES and MSES was assessed based on the nature of the works, the spatial and temporal duration of the disturbance/impact and whether the impact could be remediated (refer to Volume 4 EIS Supplement Attachment E section 18.5.5 for more detail).

3.6. Summary of impacts

A summary of impacts to MNES and MSES that have the potential to require offsets as outlined in Volume 4, EIS Supplement, Attachment E Revised MNES Report, table 18.37 and 18.38 are collated below and Table 3-3. The quantum of significant residuals impacts to MNES and MSES have been described but are yet to be finalised and conditioned by the Co-ordinator General (in consultation with various State Government agencies) and DAWE. However, there is a potential that significant residual impacts to MNES including the koala, black-throated finch and squatter pigeon and MSES for least concern essential habitat and regulated waterway vegetation may occur that would require offsets.

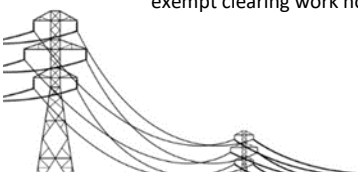
3.6.1. Direct impacts

Direct impacts involve the clearing of vegetation and/or removal of habitat for threatened fauna species as follows. Based on the available data, no significant residual impacts to endangered or of concern REs, MSES fauna, MSES plants and MNES plants are expected.

Potential significant residual impacts to MSES from clearing as a result of the project consist of¹:

- 112.30 ha of remnant least concern regional ecosystems REs that intersect waterways.

¹ Note: if the the Project is undertaken by an electricity entity under the *Electricity Act*, clearing of native vegetation for the project can occur as exempt clearing work not requiring offsets.



- 13.75 ha of remnant least concern regional ecosystems REs that are essential habitat.

There is the potential that the Project will result in a residual impact to habitat for threatened fauna species that may require offsets for the following species:

- 0.56 ha of habitat for the squatter pigeon, consisting of 0.00 ha of breeding and foraging habitat, 0.56 ha of foraging habitat.
- 82.96 ha of habitat for the koala, consisting of 15.77 ha of high-quality habitat and 61.00 ha of moderate quality habitat and 6.19 ha of low-quality habitat.
- 108.79 ha of black-throated finch habitat, consisting of 39.10 ha of seasonal breeding habitat and 25.89 ha of permanent breeding habitat and 43.80 foraging habitat.

3.6.2. Indirect impacts

Indirect impacts, associated with the project that have the potential to impact vegetation communities and fauna habitat include the introduction or spread of invasive species, habitat fragmentation, changes to riparian/floodplain ecology, erosion and sedimentation, vehicle strike, light, noise and dust.

3.6.3. Measure to avoid and mitigate impacts

The Project layout is largely dependent on geology, landscape and terrain. During the planning phase of the Project, a number of measures were considered to avoid and minimize impacts from the direct loss of vegetation/habitat. A preliminary ecological constraints assessment was undertaken to identify and avoid areas of high ecological value wherever possible.

The key constraint outcomes included:

- Avoiding areas of known TECs, natural heritage areas, endangered and of concern REs, mapped essential habitat, known occurrences of conservation significant species, where possible.
- Avoiding adjacent protected areas.
- Minimising impact to watercourses and watercourse vegetation by examining the tower positions and spans.
- Adjusting tower heights, wire heights and tower spans to avoid and/or minimise where possible, impacts to visitation and habitat.
- Utilising existing tracks and locating proposed tracks within previously disturbed areas wherever possible.
- Minimising clearing of watercourse vegetation by avoiding clearing within 10 m of the defining high bank of a watercourse, other than where it cannot be avoided.
- Locating laydown, camps and other associated infrastructure areas in previously disturbed areas wherever possible.

3.6.4. Measures to avoid and/or minimise impacts

The following measures will be implemented during construction of the Project to minimize reduce the loss of vegetation and habitats:

- Vegetation clearing will be restricted to the minimal amount necessary for the construction of the Project footprint. Micro-siting of infrastructure, such as tower footprints, brake and winch sites, and assembly areas, will be undertaken during the detailed design phase to further reduce impacts and to ensure areas of high ecological significance are avoided as a priority. Construction assembly areas and brake and winch sites are to be rehabilitated to grassland on completion of construction and it is expected that woody vegetation will return in the longer term to re-inhabit the tree canopy.

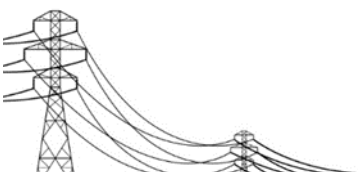


- Vegetation will only be cleared or trimmed where it is within 3.5 m of the transmission line at maximum sag. Clearing of all vegetation to ground level will be required to accommodate transmission line infrastructure including tower foundations, substations, laydown areas, etc, where it cannot be placed in cleared areas. Clearing may also be required for trees over 3.5m in height within the conductor clearance zone (includes the shadow area below wires). This vegetation height varies and in some landscapes this may require only trimming of taller trees, or only selective clearing of taller vegetation may be required while lower vegetation may remain. Where possible, any trees likely to grow taller than 3.5 m within the easement or with overhanging branches that could reach the conductor clearance zone will be trimmed and managed during operation to a reduced height so as not to be within the five-metre safety buffer.
- Areas of high terrain will allow spanning of the majority of vegetated areas, particularly in habitats of low open woodlands that feature very sparse canopy trees of very low height. In such areas, clearing is likely to be limited to that required for tower footprints and access tracks. These tower and access locations will be determined during the detailed design phase.
- Areas of grassland habitats feature very few and low trees or shrubs (frequently confined to drainage line corridors), therefore clearing of vegetation will be minimal in these areas and will span riparian corridors wherever possible. Ground disturbance will occur in these grassland habitats, which have value for ground-dwelling mammals and reptiles, however disturbance will be restricted to pre-determined areas and will be temporary apart from permanent infrastructure locations.
- Areas assessed as being of high ecological value will aim to be spanned across wherever possible using higher towers (i.e. up to 75 m height) and shorter or longer spans, as appropriate to the ecological values and depending on the terrain. This will enable vegetation below 20 m to be retained and mature trees over 20 m may be trimmed if necessary for safety and maintenance requirements.
- Waterway crossings containing riparian vegetation corridors will be spanned in most instances, and particularly where values for and occurrences of listed threatened flora and fauna species have been identified by desktop mapping or surveys. Larger waterways will have higher towers and longer spans in order to avoid the bed and banks of waterways and place towers as far back from fringing vegetation. For access tracks across ephemeral waterways, existing crossings or clearings will be used. Any clearing required within a riparian corridor will be minimised with larger habitat trees retained.
- All site offices, construction stockpiles and laydown/storage areas will be located within existing cleared or disturbed areas as a priority.

3.6.5. Measures to mitigate impacts

As part of the process of assessment of environmental impacts and detailed design, additional measures will be developed to avoid, minimise and mitigate impacts. This will include site environmental management measures such as:

- Pre-clearance surveys will be undertaken to mark and where possible avoid the locations of all potential breeding places for wildlife and the locations of any breeding places for conservation significant species. Construction activities will be prioritised to be limited to daylight hours to reduce the need for lighting and resultant light spill into adjacent habitat and to reduce noise and vibration impacts on nocturnal fauna species.
- Preparation of a high-risk Species Management Program (SMP) will be undertaken in accordance with the requirements of Section 335 of the *Nature Conservation (Animals) Regulation 2020*.
- Clearing of potential habitat for conservation significant species will include engagement of a spotter-catcher.



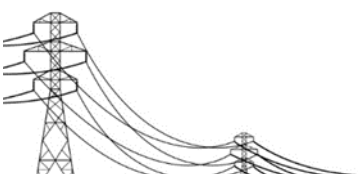
- Temporary exclusion fencing will be established around cleared areas in locations of high ecological sensitivity to prevent wildlife from returning to works areas, where deemed appropriate.
- Development of a Traffic Management Plan for the construction site with designated access routes, speed limits and sensitive ecological areas (i.e. particularly areas where squatter pigeons (southern) have the potential to occur on access roads).
- Temporary construction areas will be rehabilitated after the completion of construction works to reconnect fragmented habitats.
- Construction activities will be prioritised to be limited to daylight hours to reduce the need for lighting and resultant light spill into adjacent habitat and to reduce noise and vibration impacts on nocturnal fauna species.
- A Weed and Pest Management Plan will be prepared for the Project and included within the Construction Environment Management Plan (CEMP).
- An Erosion and Sediment Control Plan (ESCP) will be developed as part of the CEMP for the Project.
- Rehabilitation of temporary construction areas will be undertaken after completion of construction.
- Permits to disturb, authorising the boundaries of all disturbance activities and inclusive of requirements for a spotter catcher, species management, clearing methods, erosion control and topsoil management
- A Waste Management Plan will be prepared as part of the CEMP.

3.6.6. Summary of residual impacts

Volume 4 EIS Supplement, Attachment E Revised MNES Report, Section 18.5.5 includes a detailed assessment of the residual and significant impacts to MNES that have been identified within project activities (disturbance footprint). This assessment then considered the nature of the works being undertaken including the location of the works, whether the works and impacts were temporary or permanent and whether the impacts could be remediated. This iterative process determined that significant residual impacts to MNES that would require offsets is unlikely for the majority of species but may occur for the koala, squatter pigeon and black-throated finch. Potential significant residual impacts to MSES include least concern REs that are associated with watercourses and impacts to mapped essential habitat.

Although the offset requirements have yet to be conditioned by the Commonwealth and State Government agencies, a precautionary approach in identifying potentially suitable offsets sites have been applied in the preparation of this strategy. As such, habitat requirements of three species that were identified as having the highest potential to require offsets (koala, squatter pigeon and black-throated finch) were selected when assessing the suitability of potential offsets sites. The diverse habitat requirements of these species would also likely cover any potential offset required for other MNES and likely any potential MSES offset obligations. If impacts to MSES cannot be fully covered by MNES offset obligations, additional offset areas would be sort.

Table 3-3 summarises the results of the significant residual impacts assessments. Habitat requirements and species profiles of for the koala, squatter pigeon and black-throated finch are outlined below with further information available in Volume 4, Attachment E of the SEIS.



The quantum of significant residuals impacts to MNES and MSES have been described but are yet to be finalised and conditioned by the Co-ordinator General (in consultation with various State Government agencies) and DAWE. However, there is a potential that significant residual impacts to the koala, black-throated finch and squatter pigeon may occur that would require offsets.

Notwithstanding, the project will result in loss of canopy cover for line clearance and at tower locations, as well as clearing for ground level vehicle access, particularly within coastal ranges, woodland and riparian landscapes, that will result in unavoidable residual impacts. The cumulative impacts across the vast extent of the project (approximately 1,000 km), regardless of the individual dimension, size or scale of individual activities, may reduce the extent and quality of EVNT species habitat to a significant extent.

These significant impacts apply to several conservation significant species impacted by this Project and a land-based offset may be required. Therefore, this BOMS has been prepared with the expectation that offset would be required for the koala, black-throated finch and squatter pigeon.

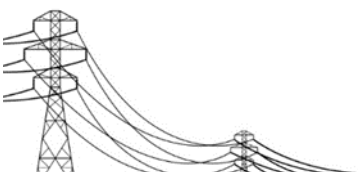


Table 3-3 Summary of impacts on MNES and MSES

Protected matter	EPBC Status	NC Act/VM Act status	Likelihood of occurrence	Total area of mapped habitat intersected by the project activities (ha)*	Residual Impact area (ha)**	Significant Residual Impact area (ha)***
MNES						
Squatter pigeon (Southern)	Vulnerable	Vulnerable	Confirmed present	187.40 (total)	0.56 (total)	0.56 (total)
				38.43 (breeding)	0.00	
				148.97 (foraging)	0.56	0.56
Koala	Vulnerable	Vulnerable	Confirmed present	1097.55 (total)	82.96 (total)	14.33(total)
				116.89 (high)	15.77	10.64 (riparian)
				313.66 (moderate)	61.00	3.69 (open forest, open woodlands)
				667.00 (low)	6.19	0
Black-throated finch	Endangered	Endangered	Confirmed present	1776.55 (total)	108.79 (total)	49.76 (total) (open forest, open woodlands)
				214.93 (seasonal breeding)	39.10	11.38 (open forest, open woodlands)
				203.42 (permanent breeding)	25.89	38.38 (open forest, open woodlands)
				1776.55 (foraging)	43.80	0
MSES						
Of Concern regulated vegetation	n/a	Of concern	n/a	42.68 (total)	8.54 (total)	8.54 (total)
Regulated vegetation within a defined distance of a watercourse	n/a	Of concern	n/a	24.76 (total)	4.95 (total)	4.95 (total)
				0.68 (Non-coastal stream order 1 or 2 – 25m)	0.14	0.14
				0.56 (Non-coastal stream order 3 or 4 – 50m)	0.11	0.11
				23.52 (Non-coastal stream order 5 or >)	4.70	4.70

Protected matter	EPBC Status	NC Act/VM Act status	Likelihood of occurrence	Total area of mapped habitat intersected by the project activities (ha)*	Residual Impact area (ha)**	Significant Residual Impact area (ha)***
	n/a	Least concern	n/a	536.74 (total)	107.35 (total)	29.74 (total)
				1.62 (Coastal Stream order 1 or 2 – 10m)	0.33	0.09
				276.35 (Non-coastal stream order 1 or 2 – 25m)	55.27	16.66
				112.58 (Non-coastal stream order 3 or 4 – 50m)	22.52	5.37
				146.17 (Non-coastal stream order 5 or > 100m)	29.23	7.71
Regulated vegetation that is essential habitat	n/a	Of concern	n/a	0.63 (total)	0.13 (total)	0.13 (total)
				0.63 (Julia Creek dunnart)	0.13	0.13
	n/a	Least concern	n/a	203.33 (total)	40.66 (total)	13.66 (total)
				109.03 (Ornamental snake, squatter pigeon, waxy cabbage palm)	21.80	8.49
				16.43 (Julia Creek dunnart)	3.29	1.26
			77.87 (Purple necked rock wallaby)	15.57	03.92	
Ballara Nature Refuge	n/a	Nature Refuge	n/a	191.52	32.61	13.60

*Footprint is equivalent to the Construction Footprint for Laydowns and CEV Huts, Easement, Land Acquisition and Adjusted Substation Footprints

** Residual impact area is equivalent to the total area of Project Activities deemed a residual impact under certain criteria relevant to MNES

*** Significant residual impact area is equivalent to classified residual impacts of Project Activities deemed significant impact under MNES and MSES

4. Proposed offset delivery strategy

The approach to delivering the potential offset obligations for the Project is through proponent driven land-based offsets with the aim to co-locate, where possible, all required offsets within one offset area, where possible. Co-locating offsets within a single area allows for efficient and ecologically driven cost-effective outcomes to the broader ecosystem to be achieved. The exception may be the co-location of offsets for the black-throated finch but potentially suitable offset areas primarily for this species have been identified as outlined in Section 5.

The following sections address the protected attribute and habitat quality components of the Offsets Assessment Guide.

For the purposes of this BOMS, 'area of habitat' is considered the most appropriate protected attribute to be assessed for all MNES species being impacted as species are likely to use habitat being impacted by the project for both foraging and/or breeding purposes. Further, quantification of specific breeding features or numbers of individuals cannot practically be achieved. The Offsets assessment guide indicates that it is not appropriate to select multiple protected attributes where there is overlap in the impacts that are being captured by each attribute. The area of habitat being impacted is therefore considered the most appropriate 'protected attribute' for assessing impacts and offset requirements for these two species.

4.1. MNES

In determining the appropriateness of a proposed offset package, DAWE will consider:

- What types of activities would be appropriate as offsets for a given impact.
- Determining the specific size and scope of an offsets package.

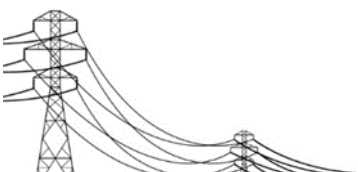
Direct offsets under the EPBC Act need to be 'like for like' and demonstrate how the MNES impacted has directly benefited as a result of the offset. The '*Offsets assessment guide*' (Assessment Guide) which accompanies the EPBC Act Environmental Offsets Policy, has been developed to assist with determining the size and scope of an offsets package.

The Assessment Guide is essentially a balance sheet approach to estimate impacts and offsets for threatened species and ecological communities. This section of the BOMS addresses the first component of the Assessment Guide that relates to quantifying the nature and extent of the impacts likely to occur at the proposed impact site. Specifically, for each protected matter being impacted, the Assessment Guide takes into account the following attributes of the impact site:

- Protected attribute: being impacted (e.g. area of habitat, nesting features, number of individuals, birth/mortality rates).
- Habitat quality: how important to the ecology of the protected matter is the attribute that is being impacted.
- Size of the impact: how much of the attribute is being impacted.

Along with direct offsets, the potential exists for 10% of a proposed offset package to be achieved through the provision of other compensatory measures (i.e. research into the species ecology, priority actions identified in a recovery plan and/or educational programs). In accordance with the EPBC Act Environmental Offsets Policy, research and education programs must:

- Endeavour to improve the viability of the impacted protected matter.
- Be targeted toward key research/education activities as identified in the relevant Commonwealth approved recovery plan, threat abatement plan, conservation advice, ecological character description, management plan or listing document.
- Be undertaken in a transparent, scientifically robust and timely manner.



- Be undertaken by a suitably qualified individual or organisation in a manner approved by the department.
- Consider best practice research approaches.

4.2. MSES

Under the Queensland environmental offsets framework, the State can only impose an offset condition for MSES if a similar impact and offset is covered by MNES offset obligations. For residual MSES that cannot be covered by MNES, offsets could be delivered through land-based offsets, financial settlement offsets, or a combination of these approaches. At this stage, it is generally proposed that environmental offsets for the significant residual impacts to MSES would be delivered through the provision of a land-based offset and collocated with MNES offset where possible. To avoid duplication, the land-based offset must be capable of delivering a conservation outcome for the impacted MSES and the Queensland Environmental Offsets Policy provides specific requirements that must be met by the offset site in order for the offset to achieve a conservation outcome.

As outlined previously, the quantum of MSES requiring offsets has been quantified based off desktop mapping layers and field verified observations (due to restricted access along the corridor selection during the EIS). It will be further verified following on ground surveys which will occur post EIS approval and during the subsequent secondary approval phase via approval under the VM Act (if required) as part of the Queensland Ministerial Infrastructure Designation. MSES offset requirements are also determined by whether works are undertaken by an electricity entity. CuString have recently been issued with a Transmission Authority. This may avoid MSES offset requirements triggered by assessable development under the VM Act on the basis that such works are exempt clearing activities under the Queensland *Electricity Act 1994*. Notwithstanding, the Co-ordinator General may impose MSES offset conditions and MNES offset recommendations to DAWE as part of the Bilateral EIS process.

The requirements relevant to the likely MSES being impacted by the Project are outlined below;

- For least concern REs associated with watercourses, the offset site must be:
 - of the same BVG as the impacted RE
 - within the same bioregion
 - associated with a watercourse or drainage feature
- For essential habitat for fauna, the offset site must:
 - contain, or be capable of containing, a self-sustaining population of that same impacted species.

The Queensland Environmental Offsets Policy also states that for land-based offsets, the size and scale of the offset is determined by conducting a habitat quality assessment at both the impact and the offset site. The proposed habitat quality methods are outlined below in Section 4.4.2.

4.3. Staging offsets

As outlined in Volume 4, Attachment B, the construction program is expected to be staged into nine construction hubs that will support transmission line construction activities and will also support substation construction activities. Construction of the Project within the required timeframes is expected to require two working fronts undertaking concurrent activities across most of the construction hubs. The relationship between the nine construction hubs and anticipated sequence of land clearing with the potential to impact species habitat and/or vegetation is outlined in Table 4-1.

Subject to approval, construction is scheduled to commence (i.e. clearing and grubbing) at the Cloncurry, Pentland and Hughenden areas in Q3 2022. To align with the construction staging, it is



CuString’s intent to stage offsets such that offsets for the initial construction stages are sought and secured first, followed by offset requirements for the subsequent construction stages.

The extent of significant residual impacts has yet to be finalised with the Government agencies. As the extent is being finalised, the offsets staging plans will also be confirmed and aligned with the final construction staging plans. Offset staging will be outlined in the OAMPs and Offset Delivery Plans as required. These will require approval prior to commencement of impacts requiring offsets.

Table 4-1 Indicative construction stages and species/vegetation impacted

Construction hubs	Proposed construction timeframes	Matters potentially requiring offsets
Cloncurry	Q3 2022	Watercourse RE Essential habitat
Pentland	Q3 2022	Watercourse RE Essential habitat Koala Black-throated finch
Hughenden	Q3 2022	Watercourse RE Essential habitat Black-throated finch
Julia Creek	Q4 2022	Watercourse RE Essential habitat
Charters towers	Q4 2022	Watercourse RE Essential habitat Koala Black-throated finch Squatter pigeon
Ayr (Woodstock)	Q1 2023	Watercourse RE Essential habitat Koala Black-throated finch
Mt Isa	Q1 2023	Watercourse RE Essential habitat
Richmond	Q2 2023	Watercourse RE
Selwyn / Woodya	Q2 2023	Watercourse RE

4.4. Habitat quality

A range of ecological surveys have been completed for the Project; however, as the locations and scale of significant residual impacts have yet to be finalised, detailed habitat quality assessments as required for inputs into the calculation of the offset areas required has yet to be undertaken. In addition, as the offset areas (properties) have yet to be finalised, the required habitat quality assessments within these areas have yet to be undertaken. These habitat quality assessments and corresponding habitat quality scores will ultimately be used as required to calculate Commonwealth and State offset obligations and included in an OAMP.

4.4.1. MNES

The Offsets Assessment Guide specifies that assessment of the quality of habitat being impacted must take into account a range of habitat indicators to measure the ecological viability and habitat values of a site and its capacity to support fauna. The process used for assessing habitat quality is



designed so that it is repeatable and relatively simple and uses a combination of field attributes associated with vegetative structure, GIS assessment of the site in reference to its location in the landscape and species-specific habitat requirements.

Each of the indicators are scored then summed to derive a final score out of 10 (refer to the Guide for calculation methodology). The key indicators for determining habitat quality of a land-based impact site or an offset site are:

- Site condition: a general condition assessment of vegetation compared to a benchmark site.
- Site context: an analysis of the site in relation to the surrounding environment.
- Species habitat index: the ability of the site to support a given species.

For the purposes of this BOMS, the following methodology for determining habitat quality scores was prepared with reference to the approach developed in consultation with the Commonwealth in relation to offsets being provided for a range of other projects (Base 2018; 2020; 2021).

Habitat quality scores for the impact and offset sites will be calculated using a combination of data collected using the Queensland DES 'Guide to Determining Terrestrial Habitat Quality, version 1.3' (DES, 2020a) (the Guide) and criteria previously determined by DAWE. From previous consultation with DAWE for other projects, habitat quality assessments use the majority of the attributes from the Guide, but these attributes are partitioned differently with the majority of the species habitat index attributes being partitioned between site condition and site context as follows.

- Site Condition (15 attributes):
 - Recruitment of woody perennial species in EDL
 - Native plant species richness - trees
 - Native plant species richness - shrubs
 - Native plant species richness - grasses
 - Native plant species richness - forbs
 - Tree canopy height
 - Tree canopy cover
 - Shrub canopy cover
 - Native perennial grass cover
 - Organic litter
 - Large trees
 - Coarse woody debris
 - Non-native plant cover
 - Quality and availability of food and foraging habitat
 - Quality and availability of shelter

The first 13 attributes listed above are generated from direct measurements taken in the field within a standardised habitat quality plot (HQP). While these attributes are not a direct or specific measurement of the habitat value for a certain species, they do provide an indication of the overall ecological condition of the community. Nonetheless, these attributes can serve as a surrogate indicator of the suitability of a community for a specific fauna species. For example, high cover of non-native species may present as a barrier to a koala moving along the ground between habitat trees. However, a similar community with a high cover of native perennial grass (i.e. that tend to form tussocks more than a dense, tall, impenetrable biomass) and high species richness of grasses and forbs, is less likely to have a similar barrier to fauna moving along the ground.



Ecological condition requirements that are specific to a species are captured by the assessment of the quality and availability of food/foraging habitat and shelter attributes in line with the Guide. As per the Guide, a species-specific scoring system for the attributes will be developed and will be based on the species-specific habitat requirements as outlined in Volume 4, Attachment E, the SPRAT profile and field-based knowledge of the target species.

- Site Context (7 attributes):
 - Size of patch
 - Connectedness
 - Context
 - Ecological Corridors
 - Threat to Species
 - Species mobility capacity.

As per the Guide, the first four attributes above are calculated using GIS spatial analysis. Site context requirements that are specific to a species are captured by the assessment of the threats to species and species mobility capacity attributes of the Guide. Ecological condition requirements that are specific to a species are captured by the assessment of species threats and mobility attributes in line with the Guide. As per the Guide, a species-specific scoring system for the attributes will be developed prior to detailed habitat quality assessments being undertaken.

- Species stocking rate (scale of 0 - 4 as categorised below)
 - 0: No evidence the species is present at the site;
 - 1: Evidence of species presence at the site during surveys conducted for the purpose of the EPBC environmental assessment;
 - 2: There is a statistically significant increase in species density relative to the species density determined for a score of 1 or species density is equal to or greater than the species density at a reference site (not required to be an important population);
 - 3: Equivalent to the species density at a reference site associated with an important population; and
 - 4: Equivalent to the maximum species density measured at a DAWE agreed number of reference sites associated with important populations.

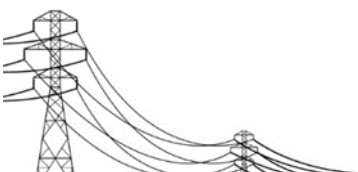
Species stocking rate has been developed by DAWE and replaces species habitat index as a measure of the presence of a species at the impact and offset site.

To achieve an overall habitat quality score out of 10, site condition and site context are multiplied by a weighting factor out of 10 based on the level of importance attributed to site condition, site context and stocking rate for the MNES. The DAWE determined the weighting factors for these MNES will be 30% for site condition, 30% for site context and 40% for species stocking rate.

4.4.2. MSES

Habitat quality scores for the MSES are calculated using the methods outlined in the Guide and in a similar manner to MNES, but with minor modifications. The key indicators for determining habitat quality of a land-based impact site or an offset site are for fauna are:

- Site condition: a general condition assessment of vegetation compared to a benchmark site.
- Site context: an analysis of the site in relation to the surrounding environment.
- Species habitat index: the ability of the site to support a given species.



A habitat quality score calculated in line with the Guide is out of 10. A maximum score of 10 represents a fully intact system, scores of 4, 5 and 6 may indicate good quality regrowth or medium value habitat, and a minimum score of 1 would indicate a totally cleared area (DES 2020).

Where MSES being significantly impacted are RE based (i.e. not habitat for a protected species), the methodology undertaken as part of this assessment focusses on the site-based and landscape-scale attributes outlined below. Species habitat indices are only required for assessing the quality of fauna based MSES.

- Site Condition (13 attributes):
 - Recruitment of woody perennial species in EDL
 - Native plant species richness - trees
 - Native plant species richness - shrubs
 - Native plant species richness - grasses
 - Native plant species richness - forbs
 - Tree canopy height
 - Tree canopy cover
 - Shrub canopy cover
 - Native perennial grass cover
 - Organic litter
 - Large trees.
- Site Context (5 attributes):
 - Size of patch
 - Connectedness
 - Context
 - Ecological Corridors
 - Distance to permanent water (intact landscapes only).

Habitat quality scores are then calculated in line with Section 1.4.4. of the Guide.

4.5. Offset area required

The final required offset areas for the Project have not yet been determined and will depend on the approved impact areas, the habitat quality scores for the impact areas and offset area(s) and the inputs into the Commonwealth EPBC offset Calculator and where and if required, the Queensland Land Based Offset Multiplier Calculator. Nevertheless, to get an indicative indication of the potential offset area that may be required for each MNES for this Project, the maximum offset multiplier of four (4) as per the Queensland Environmental Offsets Policy was used. A multiplier of four (4) is also based on experience and final offset multiplies in recently approved Offset Management Plans. It is recognized that the final offset area for MNES will be determined from the habitat quality scores and the relevant inputs into the EPBC offsets calculator. The indicative and potentially required offset areas for MNES and MSES for this Project are shown in Table 4-2.

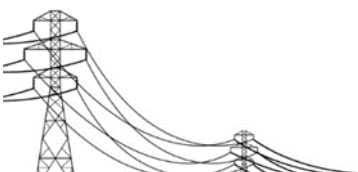


Table 4-2 Offset area estimates

Protected matter	Potential impacts requiring offsets (ha)	Indicative multiplier	Potential offset area required (ha)
MNES			
Squatter pigeon	0.56	4	2.24
Koala	88.82	4	355.28
Black-throated finch	140.07	4	560.28
MSES			
Of Concern RE	8.54	4	34.16
Watercourse RE	112.3	4	449.2
Essential habitat	40.79	4	163.16
Bellara Nature Refuge	193	5	965



5. Offset investigation areas

CopperString have commenced investigating potential offset properties (refer to Figure 5-1). in the Brigalow Belt, Einasleigh Uplands, Gulf Plains, Mitchell Grass Downs and Desert Uplands Bioregions in relation to fulfilling the potential offset requirements for the Project. As far as practicable, the intention is to co-locate offsets for all MNES (and MSES if offsets are required) within the same offset property. However, this may not be possible for the black-throated finch in particular and a potentially suitable offset area specifically for this species has also been identified. Co-location of offsets for matters, where possible, will improve the net conservation outcomes for impacted matters, as well as improving efficiencies in terms of offset area management.

Although an offset area has yet to be secured, there are eight offset areas that are various stages of being investigated in terms of their suitability and availability for providing the required offsets and consultation with landowners (refer to Figure 5-1). A general description of each potential offset area and their general location within the landscape is outlined below in Section 5.1 to Section 5.6. Lot and plans are not included in the below information but can be provided separately.

A high-level desktop assessment has been completed for all potential offset areas to determine the potential for these investigation areas to fulfill the potential offset requirements associated with the Project. The potential offset areas within each priority were assessed using the predictive habitat mapping criteria within Attachment E of the SEIS. The following parameters were considered important in terms of assessing the values of the properties.

- Co-location of environmental values and habitat requirements.
- Offset sites that are strategically located (e.g. adjoining a National Park or located within a state or regional ecological corridor) would provide greater conservation outcomes and contribution to landscape scale connectivity.
- Offset areas that are known to support the MNES are more likely to achieve the desired conservation outcomes, although properties with suitable habitat can still support these species.
- Offset areas that support a combination of remnant and regrowth vegetation will achieve a balance between the 'time to achieve ecological benefit' and 'improving the future quality' components of DAWE's Offset assessment guide.

A 20 km search area centered on a central coordinate within each property was used for the desktop assessment. with the following information, mapping layers and constraints analysed within the search area:

- Recent aerial photography.
- Digital Cadastral Database accessed 15 July 2021 (DoR 2021a).
- Mining leases and mineral development licenses Version 9.8.11 (DoR 2021b, DoR 2021c).
- Regulated Vegetation Management Map version 4.14 and Vegetation Management Supporting Map Version 11 (DoR 2021d, DoR 2021e).
- Species predicative habitat mapping as outlined In Volume 4, Attachment E of the SEIS.
- Queensland biodiversity corridors mapping Version 1.6 (DES 2020b).
- Protected areas of Queensland, Version 6.13 (DES 2021c).
- Atlas of Living Australia Database accessed on 23 July 2021 (ALA 2021a, ALA 2021b, ALA 2021c)

A summary of the potential offset values within each of the six offset investigation areas (using the predictive habitat mapping criteria within Attachment E of the SEIS) is provided in the following sections and Table 5-7 provides an overview of the values of each offset investigation area. These



potential offset areas within each property will be field verified once selection of the final suitable property or properties has been completed.

5.1. Potential offset property 1

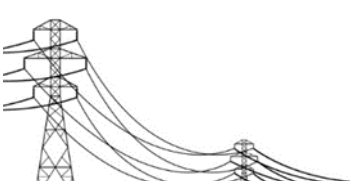
Property 1 encompasses 19,464 ha and is located in close proximity to Glenden in the Northern Bowen Basin subregion of the Brigalow Belt Bioregion (refer to Figure 5-1) for the general location). Using the predictive habitat mapping criteria within Attachment E of the SEIS, a desktop investigation undertaken as part of this BOMS indicates the property supports a range of State mapped vegetation communities and ecological values that have the potential to provide environmental offsets for a number of MNES impacted by the Project (subject to field validation of vegetation and habitat present).

This property supports a mosaic of remnant vegetation supporting endangered, of concern and least concern REs. Areas of high-value regrowth (HVR) and non-remnant vegetation are also present. Ten of the remnant and HVR REs mapped by the Queensland Government within the property are woodland /open woodland communities that have the potential to offset habitat for the koala. The majority of the remnant and HVR REs communities across the property have the potential to provide habitat for the black-throated finch. The remnant and HVR REs contain potential breeding and or foraging habitat for the squatter pigeon (southern) as they occur on land zones that typically provide the sandy, gravelly soils that can support habitat communities for the squatter pigeon (i.e. land zones 3, 5, and 9).

There are ten (10) BVGs across the property which are comprised of semi-evergreen vine thickets, open woodland to open forests dominated by *Eucalypt* and/or *Acacia sp.*, tussock grasslands and palustrine wetlands (Table 5-1).

Table 5-1 Broad vegetation groups within property 1

BVG 1:1M	Description	RE/VM status
7a	Semi-evergreen vine thickets on wide range of substrates	11.8.13/Endangered
11a	Moist to dry open forests to woodlands dominated by <i>Eucalyptus sp.</i>	11.8.5/Least concern 11.8.14/Of concern
13c	<i>Eucalyptus sp.</i> woodlands.	11.9.9/Least concern
16a	Open forests and woodlands dominated by <i>Eucalyptus sp.</i>	11.3.25/Least concern
16c	Woodlands and open woodlands dominated by <i>Eucalyptus sp.</i>	11.3.4/Of concern
17a	Woodlands dominated by <i>Eucalyptus sp.</i>	11.3.2/Of concern 11.5.3/Least concern
17b	Woodlands to open woodlands dominated by <i>Eucalyptus sp.</i>	11.9.2/Least concern
25a	Open forests to woodlands dominated by <i>Acacia.</i>	11.9.5/Endangered 11.4.9/Endangered 11.4.8/Endangered 11.3.1/Endangered
30b	Tussock grasslands.	11.8.11/Of concern
34d	Palustrine wetlands.	11.3.27/Least concern



There are two mining leases and a mining development license over the property covering a total area of 10,439ha which are primarily located within the central and southern sections of the property.

This area has been excluded from the calculations of environmental offsets for the MNES and MSES. Although these leases and license represent a potential constraint in terms of establishing an environmental offset, The leases and license does not completely exclude an area from being used to achieve biodiversity conservation outcomes. For example, there are a number of Nature Refuges that have been established under Queensland's NC Act.

The remnant and HVR vegetation within property 1 intersect with a number of 1st, 2nd, and 3rd order drainage features, as well as higher order 5 waterway of Suttor Creek. These waterways are generally associated with biodiversity corridors of state significance provide which occur in the northeastern, central and southeast portions of the property (refer to Figure 5-2). There are no protected areas on the property; however, there is HVR vegetation to the north that connects to Newlands Nature Refuge.

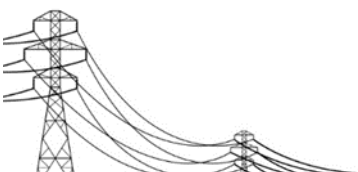


Figure 5-1 Indicative locations of the potential offset properties

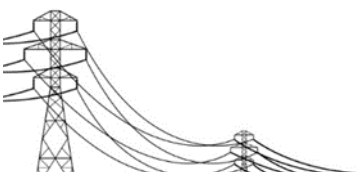


Figure 5-2 Biodiversity corridors and potential offset locations



5.2. Potential offset property 2

Property 2 encompasses 14,395 ha and is located near Glenden in the Northern Bowen Basin subregion of the Brigalow Belt Bioregion (refer to Figure 5-1) for the general location). Desktop investigations indicate the property supports a range of State mapped vegetation communities and has the potential to provide environmental offsets for a number of MNES impacted by the Project (subject to field validation of vegetation and habitat present).

This property supports a mosaic of remnant vegetation supporting endangered, of concern and least concern RE, high-value regrowth (HVR), and non-remnant vegetation. Nineteen remnant and HVR REs mapped by the Queensland Government within the property are communities that provide potential habitat for the koala. The majority of these remnant and HVR communities also provide potential habitat for the black-throated finch and the squatter pigeon. The remnant and HVR communities throughout the property occur on a range of landzones including those that are typically provide the sandy, gravelly soils that can support habitat communities for the squatter pigeon (i.e. land zones 3, 5, 7, 9 and 10).

There are eleven (11) BVGs across the property which are comprised of semi-evergreen vine thickets, open woodland to open forests dominated by *Eucalypt* and/or *Acacia* sp. (Table 5-2).

Table 5-2 Broad vegetation groups within property 2

BVG 1:1M	Description	RE/VM status
7a	Semi-evergreen vine thickets on wide range of substrates.	11.9.4/Of concern 11.5.15/Least concern
10a	Dry woodlands to open woodlands dominated by <i>Corymbia</i> .	11.10.1/Least concern
12a	Dry woodlands to open woodlands dominated by ironbarks.	11.10.4/Least concern
13c	<i>Eucalyptus</i> woodlands.	11.12.1/Least concern 11.9.9/Least concern
13d	Woodlands dominated by <i>Eucalyptus</i> sp.	11.9.13/Of concern
16a	Open forests and woodlands dominated by sp.	11.3.25/Least concern
17a	Woodlands dominated by <i>Eucalyptus</i> sp.	11.10.12/Least concern
17b	Woodlands to open woodlands dominated by <i>Eucalyptus</i> sp.	11.9.2/Least concern
18b	Woodlands dominated <i>Eucalyptus</i> sp.	11.3.26/Of concern 11.5.2/Least concern
24a	Low woodlands to tall shrublands dominated by <i>Acacia</i> sp.	11.10.3/Least concern
25a	Open forests to woodlands dominated by <i>Acacia</i> .	11.4.8/Endangered 11.9.5/Endangered 11.3.1/Endangered 11.5.16/Endangered

The remnant and HVR vegetation within the property intersect with a number of 1st to 4th order drainage features, as well as higher order 5 waterway of Suttor Creek. These drainage features are identified as contributing to local, regional and state significant biodiversity corridors throughout the property (refer to Figure 5-2).

There are no protected areas within the property or mining leases.



5.3. Potential offset property 3

Property 3 encompasses 11,592 ha and is located near Kirknie, within the Burdekin Regional Council Local Government Area and within the Brigalow Belt bioregion with the property straddling the Townsville Plains and Bogie River Hills sub-regions (refer to Figure 5-1 for the general location). Both sub-regions are currently classified as intact landscapes which reflect the minimal levels of habitat fragmentation that have occurred relative to other bioregions in Queensland. Desktop investigations indicate the property supports a diverse range of ecological values (State mapped vegetation communities) and has the potential to provide environmental offsets for a number of MNES impacted by the Project (subject to field validation of vegetation and habitat present).

This property primarily consists of a mosaic of remnant vegetation supporting of concern and least concern RE and non-remnant vegetation. Twelve remnant and HVR REs mapped by the Queensland Government within the property are communities that provide potential habitat for the koala, black-throated finch and squatter pigeon. Although the property contains potential black-throated finch habitat, previous surveys within parts of this property since 2018 for other purposes failed to identify the presence of black-throated finches.

Property 3 contains twelve (12) distinct BVGs which are comprised of semi-evergreen vine thicket, moist to dry open woodland to open forest dominated by *Eucalypt* and *Acacia sp.*, closed tussock grasslands and *Melaleuca* dominated open woodland to open forests (Table 5-3).

Table 5-3 Broad vegetation groups within property 3

BVG 1:1M	Description	RE/VM status
7a	Semi-evergreen vine thickets on wide range of substrates.	11.12.4/Least concern
9b	Moist to dry woodlands dominated by <i>Eucalyptus sp.</i> , frequently with <i>Corymbia sp.</i>	11.12.9/Least concern
9c	Open forests of <i>Corymbia sp</i> and/or <i>Eucalyptus sp.</i>	11.12.10/Of concern
9e	<i>Corymbia</i> dominated open forests, woodlands and open woodlands.	11.3.7/Least concern 11.3.9/Least concern
13c	Ironbark woodlands.	11.12.1/Least concern
16a	Open forests and woodlands dominated by <i>Eucalyptus sp.</i> fringing drainage lines.	11.3.25/Least concern
16d	River beds, open water or sand, or rock, frequently not vegetated.	11.3.25f/Least concern
18b	Woodlands dominated <i>Eucalyptus crebra</i> .	11.3.30/Least concern 11.3.29a/Least concern
21a	Low woodlands and low open woodlands dominated by <i>Melaleuca sp.</i> on depositional plains.	11.3.31/Least concern
22c	Open forests dominated by <i>Melaleuca sp.</i> fringing major and minor streams.	11.3.25b/Least concern
27a	Low open woodlands dominated by a variety of species including <i>Acacia</i> and <i>Atalaya</i> .	11.3.34/Of concern
32a	Closed tussock grasslands.	11.3.31/Least concern



State biodiversity planning assessment mapping shows the majority of property is mapped as conservation areas of either state, regional or local significance (refer to Figure 5-2). Approximately 75 % of property is classified as having state biodiversity significance and the offset area is entirely located within an area identified as a state ecological corridor in the form of a bio-regional ecological corridor which extends in a continuous band to the west and the north-east. The high degree of biodiversity corridors is largely due to the combination of high levels of remnant vegetation and numerous 1st to 4th order waterways throughout the property.

There are no protected areas within the property or mining leases.

5.4. Potential offset property 4

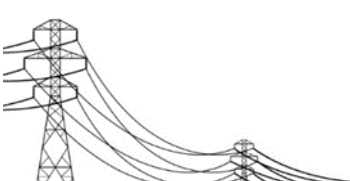
Property 4 encompasses 78,734 ha and is located approximately 150 km northwest of Clermont in the Desert Uplands Bioregion (refer to Figure 5-1) for the general location. Southern parts of this property are potentially going to be used for offsets for other projects but an approximate 9,000 ha area was investigated as part this BOMS. Using the predictive habitat mapping criteria within Attachment E of the SEIS, a desktop investigation indicates the property supports a range of MSES vegetation communities that have the potential to provide environmental offsets for MNES impacted by the Project (subject to field validation of vegetation and habitat present).

This property includes least concern remnant vegetation with small sections of non-remnant vegetation also present. Thirteen single or mixed polygons of the remnant REs mapped by the Queensland Government within the property are vegetation communities that have the potential to provide offsets to the koala, black-throated finch and squatter pigeon. This property was particularly chosen due to the presence of the black-throated finish which was determined from previous ecological surveys undertaken by others as part of a potential offset site (reference and location withheld due to commercial in confidence). The offset area also supports a range of landzones associated with waterways that typically provide the sandy, gravelly soils that can support a range of diverse habitat communities (i.e. land zones 3, 5, and 7).

Property 4 contains twelve (12) distinct BVGs which are comprised of open woodland to open forests dominated by *Eucalyptus sp.*, *Acacia sp.* and/or *Melaleuca sp.*, hummock grasslands and palustrine wetlands (Table 5-4).

Table 5-4 Broad vegetation groups within property 4

BVG 1:1M	Description	RE/VM status
12a	Dry woodlands to open woodlands dominated by ironbarks.	10.7.3c/Least concern 10.7.5/Least concern
16a	Open forests and woodlands dominated by <i>Eucalyptus sp.</i> fringing drainage lines.	10.3.13a/Least concern 10.3.14d/Least concern 10.3.14a/least concern
17a	Woodlands dominated by <i>Eucalyptus sp.</i>	10.3.6a/Least concern
17b	Woodlands to open woodlands dominated by ironbarks.	10.3.28a/Least concern 10.5.5a/Least concern 10.5.11b/Least concern
17c	<i>Eucalyptus</i> woodlands to open woodlands on sand sheets.	10.5.1a/Least concern 10.5.1c/Least concern
19d	Low open woodlands dominated by <i>Eucalyptus sp.</i> with <i>Triodia sp.</i> dominated ground layer.	10.5.1c/Least concern 10.7.2a/Least concern 10.7.4/Least concern



BVG 1:1M	Description	RE/VM status
21b	Low open woodlands and tall shrublands of <i>Melaleuca sp.</i>	10.7.7a/Least concern 10.7.7b/Least concern
24a	Low woodlands to tall shrublands dominated by <i>Acacia sp.</i>	10.7.3a/Least concern 10.7.3b/Least concern
25a	Open forests to woodlands dominated by <i>Acacia</i> .	10.3.3a/Least concern
26a	Open forests to tall shrublands dominated by <i>Acacia</i> .	10.3.4b/Least concern
27c	Low open woodlands dominated by a variety of species including <i>Grevillea sp.</i> , <i>Acacia sp.</i> , <i>Terminalia sp.</i> or <i>Cochlospermum sp.</i>	10.3.25/Least concern
33b	Hummock grasslands dominated by <i>Triodia</i> .	10.3.16a/Least concern
34b	Palustrine wetlands.	10.3.16d/Least concern

The remnant and HVR vegetation within the property intersect with a number of 1st to 4th order drainage features, as well as higher order 6 waterway (Dyllingo Creek) that bisects through the property in a northwest and southwest trajectory. These drainage features are identified as contributing to primarily regional and state significant biodiversity corridors and a state corridor buffer intersects the potential offset area in the northeast corner (refer to Figure 5-2). The property is near the Doongambulla Mound Springs Nature refuges. Further, adjacent to the north and eastern boundary of the potential offset area are protected areas of category A vegetation which is currently used a biodiversity offsets.

No mining leases occur within the potential offset property area.

5.5. Potential offset property 5

Property 5 covers approximately 91,350 ha and is located approximately 50 km north of Hughenden and straddles the Desert Uplands and Einasleigh Uplands Bioregions (refer to Figure 5-1 for the general location). Southern parts of this property are potentially going to be used for a range of other activities but an approximate 20,000 ha area in the northern portion was investigated as part this BOMS. Using the predictive habitat mapping criteria within Attachment E of the SEIS, a desktop investigation indicates the property supports a range of MSES vegetation communities and ecological values that have the potential to provide environmental offsets for a number of MNES impacted by the Project (subject to field validation of vegetation and habitat present).

This property includes a mix of single and mixed vegetation polygons that comprise of concern and least concern remnant RE, high-value regrowth (HVR), and non-remnant vegetation. Approximately 14 remnant and HVR REs are within the norther offset investigation area and these vegetation communities could provide potential habitat for the koala. Approximately 13 of these remnant and HVR communities also provide potential habitat for the black-throated finch and the pigeon. The remnant and HVR communities throughout the property occur on a range of landzones including those that are typically provide the sandy, gravelly soils that can support a range of habitat communities including those for the for the black-throated finch and the pigeon (i.e. land zones 3, 5, 8 and 10).

Property 5 contains sixteen (16) different BVGs which are comprised of semi-evergreen vine thickets, moist to dry open forests to low open woodlands dominated by *Eucalyptus sp.*, *Acacia sp.* and/or *Melaleuca sp.*, tussock grasslands and palustrine wetlands (Table 5-5).



Table 5-5 Broad vegetation groups within property 5

BVG 1:1M	Description	RE/VM status
7a	Semi-ever green vine thicket on a variety of substrates.	2.10.2x2/Least concern
11a	Moist to dry open forests to woodlands dominated by <i>Eucalyptus sp.</i>	9.8.9/Least concern
11b	Moist to dry open forests to woodlands dominated by <i>Eucalyptus sp.</i>	9.8.1a/Least concern
12a	Dry woodlands to open woodlands dominated by ironbarks.	2.10.2x10c/Least concern 2.10.2x5c/Least concern
12b	Woodlands and open woodlands dominated by <i>Eucalyptus sp.</i> with <i>Corymbia sp.</i>	2.10.4x3/Least concern 2.10.3/Of concern
13c	Ironbark woodlands.	9.12.13c/Least concern 2.11.1a/Least concern
16a	Open forests and woodlands dominated by <i>Eucalyptus sp.</i> fringing drainage lines.	2.3.26b/Least concern
16c	Woodlands and open woodlands dominated by <i>Eucalyptus sp.</i>	9.3.22a/Least concern
17a	Woodlands dominated by <i>Eucalyptus sp.</i>	9.3.5/Least concern
18a	Dry <i>Eucalypt</i> woodlands to open woodlands.	2.5.24a/Least concern
18b	Woodlands dominated <i>Eucalyptus sp.</i> frequently with <i>Corymbia sp.</i> or <i>Callitris sp.</i>	9.5.3/Least concern
20a	Woodlands to open forests dominated by <i>Callitris sp.</i>	2.5.4/Of concern
21b	Low open woodlands and tall shrublands of <i>Melaleuca sp.</i>	9.3.10a/Least concern
24a	Low woodlands to tall shrublands dominated by <i>Acacia sp.</i>	2.10.5a/Least concern 2.10.2x5a/Least concern 2.7.2x10/Least concern 2.10.6x2/Of concern
30b	Tussock grasslands dominated by <i>Astrelba sp.</i> (Mitchell grass) or <i>Dichanthium sp.</i>	9.8.5a/Least concern 9.8.13/Least concern 9.3.27a/Least concern
34d	Palustrine wetlands.	9.3.11a/Least concern

The remnant and HVR vegetation within the property intersect with a number of 1st and 2nd order drainage features with higher order drainage features in the western portion of the property and adjacent to the offset investigation area. Within the offset investigation area, the drainage features are associated with areas of local and regional significant biodiversity corridors and a state corridor buffer intersects the potential offset area in the northeast corner (refer to Figure 5-2).

There are no protected areas within the property or mining leases.

5.6. Potential offset property 6

Property 6 encompasses >225,000 ha and is located within the Einasleigh Uplands Bioregion near Einasleigh (refer to Figure 5-1 for the general location). Predictive habitat mapping criteria as outlined in Attachment E of the SEIS, was used to assess the potential offset areas within this property. A desktop investigation was undertaken using the mapping criteria with the results indicating the property supports a significant diversity of State mapped vegetation communities and



ecological values that have the potential to provide environmental offsets for a the required MNES that are impacted by the Project (subject to field validation of vegetation and habitat present).

This property supports a mosaic of remnant vegetation comprising of concern and least concern REs with significant areas of high-value regrowth (HVR) and non-remnant vegetation also present. Greater than 20 remnant and HVR REs mapped by the Queensland Government within the property are woodland /open woodland communities that have the potential to offset habitat for the koala. The majority of these remnant and HVR REs communities within the property also have the potential to provide habitat for the black-throated finch. The remnant and HVR REs contain potential breeding and or foraging habitat for the squatter pigeon and significant areas within the property contain land zones that typically provide the sandy, gravelly soils that can support habitat communities for the squatter pigeon (i.e. land zones 3, 5, 7, 8, and 10).

Property 6 contains twenty-two (22) different BVGs which are comprised of semi-evergreen vine thickets, moist to dry open forests to low open woodlands dominated by *Eucalyptus sp.*, *Acacia sp.*, *Corymbia sp.*, *Callitris sp.*, and/or *Melaleuca sp.*, tussock grasslands, open shrubland to open heaths and palustrine wetlands (Table 5-6).

Table 5-6 Broad vegetation groups within property 6

BVG 1:1M	Description	RE/VM status
7a	Semi-evergreen vine thickets on wide range of substrates.	9.11.9/Of concern 9.5.2/Of concern 9.8.7/Least concern
11a	Moist to dry open forests to woodlands dominated by <i>Eucalyptus sp.</i>	9.8.9/Least concern
11b	Moist to dry open forests to woodlands dominated by <i>Eucalyptus sp.</i>	9.8.11/Least concern 9.8.1/Least concern
11c	Moist woodlands dominated by <i>Eucalyptus sp.</i>	9.3.10/Least concern 9.8.13/Least concern
13a	Woodlands and open woodlands dominated by ironbarks.	9.11.3/Least concern 9.12.27/Least concern 9.12.7/Least concern 9.5.8/least concern
13b	Woodlands to open woodlands dominated by <i>Eucalyptus sp.</i>	9.11.23/Least concern
13c	Ironbark woodlands.	9.11.15/Least concern 9.12.12/Least concern
14b	Woodlands dominated by <i>Eucalyptus sp.</i>	9.5.16/Least concern
14d	Woodlands dominated by <i>Corymbia sp.</i> and <i>Eucalyptus sp.</i>	9.7.6/Of concern 9.12.3/Least concern
16b	Woodlands dominated by <i>Eucalyptus</i> and associated with <i>Corymbia sp.</i>	9.3.3/Least concern
16c	Woodlands and open woodlands dominated by <i>Eucalyptus sp.</i>	9.3.6/Least concern 9.3.19/Of concern
16d	River beds, open water or sand, or rock, frequently not vegetated	9.3.12/Least concern



BVG 1:1M	Description	RE/VM status
18d	Woodlands to low open woodlands dominated by <i>Eucalyptus sp.</i>	9.3.20/Least concern 9.5.10/Least concern
20a	Woodlands to open forests dominated by <i>Callitris sp.</i>	-
21b	Low open woodlands and tall shrublands of <i>Melaleuca sp.</i>	9.12.6/Least concern 9.11.23/Least concern 9.3.10/Least concern 9.5.13/Least concern
22c	Open forests dominated by <i>Melaleuca sp.</i> fringing major and minor streams.	9.3.13/Least concern
24a	Low woodlands to tall shrublands dominated by <i>Acacia sp.</i>	9.12.38/Least concern 9.7.2/Least concern 9.10.3/Least concern
27a	Low open woodlands dominated by a variety of species including <i>Acacia sp.</i> and <i>Atalaya sp.</i>	9.3.23/Of concern 9.8.12/Of concern
27c	Low open woodlands dominated by a variety of species including <i>Grevillea sp.</i> , <i>Acacia sp.</i> , <i>Terminalia sp.</i> or <i>Cochlospermum sp.</i>	9.12.36/Least concern
29b	Open shrublands to open heaths on elevated rocky substrates.	9.12.1/Least concern
30b	Tussock grasslands.	9.3.25/Least concern 9.8.13/Least concern
34d	Palustrine wetlands.	9.3.11/Least concern

A mosaic 1st to 4th order waterways traverse the property as well as higher order 5 and 6 waterways such as Elizabeth Creek, Twelve Mile Creek, Black Spring Creek, Junction Creek and Cassidy Creek bisects the northern portion of the property in a east-west and east to southeast direction, respectively. The 5th order waterway connects to a state significant ecological corridor that covers a portion of the northern section of the property (refer to Figure 5-2). The remainder of the property is identified as contributing to a regionally significant biodiversity corridor.

Although there are no protected areas within the property, the property is in close proximity to the Undara Volcanic National Park to the east and the Canyon Resources Reserve to the west. In addition, the Talaroo Nature Refuge is approximately 5 km to the west and is bordered by the 6th order waterway that traverses the property and connects from the Undara Volcanic National Park. Both the Undara Volcanic National Park, Canyon Resources Reserve and Talaroo Nature Refuge, substantial areas of remnant vegetation and fauna habitat within the surrounding area.



Table 5-7 Available offsets within the offset Investigation areas

Impacted Matter	Offset Investigation Area					
	Property 1	Property 2	Property 3	Property 4	Property 5	Property 6
Matters of National Environmental Significance						
<p>Squatter pigeon (Southern) <i>Geophaps scripta scripta</i></p> <p>Potential habitat occurs in remnant and regrowth open forest and woodland dominated by <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Acacia</i> and <i>Callitris</i> species with tussock grassy understorey within 3 km of water sources.</p>	<ul style="list-style-type: none"> ALA database – 7 records between 10 km and 20 km. 2,878.5 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 11 records between 5 km and 20 km. 6,576.0 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 2 records within 50 km. 10,232.6 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within 50 km. 8,089.2 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 2 records within 5 km, 3 additional records between 10 km and 20 km. 18,214.4 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within 100 km. 193,582 ha of potential offset area is available.
<p>Black-throated finch (Southern) <i>Poephila cincta cincta</i></p> <p>Potential habitat occurs in scattered locations in northern Queensland, in areas of dry grassy open woodland and forest environments in proximity to water and with an abundance of seeding grasses. Potential breeding habitat occurs in non-remnant grassy woodlands and forest vegetation.</p>	<ul style="list-style-type: none"> ALA database – 3 records within 150 km. 2,878.5 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 4 records within 150 km. 6,576.0 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 2 records within 25 km. 10,232.6 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within 200 km. 8,186.6 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within 60 km. 18,266.1 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within 50 km. 200,557 ha of potential offset area is available.

Impacted Matter	Offset Investigation Area					
	Property 1	Property 2	Property 3	Property 4	Property 5	Property 6
<p>Koala <i>Phascolarctos cinereus</i></p> <p>The Koala is widely distributed along the east coast, from Cairns in the north, to the Qld border in the south, to Killarney in the west, and feeds on the leaves of various <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Lophostemon</i>, <i>Angophora</i> and <i>Melaleuca</i> species. Additional habitat can occur in Eucalypt woodlands located predominately along watercourses and in open woodland areas on alluvial soils.</p>	<ul style="list-style-type: none"> ALA database – 4 records within 50 km. 3,210.4 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 11 records within 50 km. 7,507.8 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within 5 km. 10,232.6 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within property and 7 additional records occur within 50 km 8,078.4 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 2 records within 5 km. 19,673.5 ha of potential offset area is available. 	<ul style="list-style-type: none"> ALA database – 1 record within property and 4 additional records occur within 50 km 223631 ha of potential offset area is available.

6. Preparation of an offset area management plan

Following verification of the impact and offset areas and verification field surveys, an OAMP to address MNES and MSES will be prepared to describe how the proposed offset will provide a conservation outcome. The OAMP will in general:

- Describe the ecological characteristics of final offset site including the habitat quality of the offset site.
- Outline the approach to legally secure the offset site.
- State the appropriateness of the size and scale of the offset for the impact, including co-location of the required offsets.
- Include the EPBC and State Offset Calculator inputs and outputs and justification for each.
- Include detailed management objectives and management actions.
- Include competition criteria and interim performance targets.
- Include monitoring plans to ensure the proposed management actions are achieving the stated competition criteria and interim performance targets.
- Propose corrective actions should the monitoring show the management actions are not adequate to achieve the competition criteria and/or interim performance targets.

Typical and indicative inclusions in an OAMP are outlined in the below sections.

6.1.1. Consultation and negotiation with landholders

Consultation with landholders of properties identified as containing suitable offset sites will be approached in a manner consistent with the protocols outlined in the Project land access strategy provided in Volume 3 Appendix E. This will include the allocation of a dedicated land agent to maintain dialogue with the landholder, capturing information about landholder property and infrastructure, capturing and managing data including records of dealings, communicating entry requirements, establishing contact registers essential in any negotiation process.

6.1.2. Offset area protection mechanism

It is expected the final offset will be secured by a Voluntary Declaration under section 19E and 19F of Queensland's VM Act as an area of high nature conservation value (refer to Section 7 for further details). The Voluntary Declaration will be registered on the property's title and will be binding on current and future landholders. Once the declaration has been registered on the property title, the offset area will be mapped as a Category A area on the Property Map of Assessable Vegetation (PMAV) which is shown as red and described as an "Area subject to compliance notices, offsets and voluntary declarations". Category A areas have a similar level of protection as endangered REs.

6.1.3. Management objectives

The environmental outcomes sought by an OAMP are to improve the condition and ecological values of the vegetation communities for the MNES and MSES requiring offsets within the final offset area. Environmental outcomes should be realised by achieving indicative completion criteria for each matter.

Implementation of the OAMP should manage risks to the MNES and MSES and implement adaptive management actions to continually refine, revise and update the management actions as additional data on the success of the offset area is collected. Typical management objectives of OAMP are to:

- Strategically graze cattle to reduce and manage understorey fuel loads and, native and non-native flora densities.



- Reduce the risk of unplanned fire causing adverse impacts to MNES through strategic fire management.
- Minimise habitat degradation caused by pest animals, to reduce impacts on habitat variables for MNES and MSES including tree species recruitment and understorey vegetation composition.
- Restrict unauthorised access and prevent alternate land-use.
- Control invasive weed species to reduce impacts on MNES and MSES from an overdominance of non-native floristic abundance in the understorey.
- Minimise predation risk to MNES by pest animals.

Although typical and indicative management objectives and the corresponding management actions are outlined below, the final agreed and approved objectives and actions will be specific to the final offset area. The final actions will be developed by considering identified threats and recovery actions specific to each species and as relevant to the offset area as outlined in the Commonwealth listing and conservation advice, recovery plans and other relevant documents.

6.1.4. Typical completion criteria and interim performance targets

Completion criteria for each of the MNES and MSES will be developed as a measure to assess and ensure that the final approved and agreed habitat quality scores are achieved. The completion criteria and assumed increase in habitat quality scores should be reached by implementing the management actions outlined in Table 6-1 and monitoring the success of those actions. Interim performance targets should also be included in the approved OAMP as the intent of such targets are to assess, revise and if required, amend the approved OAMP such that the completion criteria can be attained within the proposed time frame.

6.1.5. Typical management actions included in an OAMP

An OAMP should be based on the principles of adaptive management and include management objectives and actions that have been identified and developed from site-specific field surveys. The ongoing suitability of management actions should be informed by the results of ongoing monitoring activities within the final offset area. The OAMP should be adapted and updated annually, if required as determined by the corrective actions outlined in the OAMP.

This section outlines typical management actions aimed at abating offset site-specific threats to the MNES and MSES (as informed from detailed field surveys) and to protect and enhance the habitat values of the offset area. Management actions focus on the key threatening processes to the MNES requiring offsets as described in the relevant DAWE SPRAT species profiles and relevant National Recovery Plans.

Typical management actions for offset areas are outlined in Table 6-1 and briefly discussed in the following sections. Most ongoing and routine -management actions are expected to be undertaken by the registered landowner (e.g. grazing management, fire management, feral animal and weed management) under agreement with the proponent. However, ongoing ecological monitoring is expected to be undertaken by suitably qualified ecologists also under agreement with the proponent.

If and/or when the results of ongoing monitoring identify that the relevant management action(s) have been unsuccessful, corrective action(s) should be undertaken and the management actions reviewed and updated accordingly as shown in Table 6-1.



Table 6-1 Typical management actions, triggers for further action and corrective actions

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
Strategic cattle grazing to reduce and manage understorey fuel loads and, native and non-native flora densities.	<ul style="list-style-type: none"> Stock will be managed in accordance with actions set out in the approved OAMP. If/where new fencing is required to demarcate the offset area, ensure fencing is permanent and prohibit unintended grazing by cattle. Grazing will be restricted during the peak breeding and egg laying periods (e.g for squatter pigeons) in the early to mid-dry season. 	<ul style="list-style-type: none"> Livestock located in the offset areas outside of strategic grazing events. Damaged fencing is observed Habitat quality assessments indicate native grass groundcover is outside of pre-determined limits. 	<ul style="list-style-type: none"> Regular inspections of the offset area will be undertaken during normal land management and farming practices to examine fence lines when stock are grazing in the offset area and/or adjacent to the offset area. Regular inspections will be undertaken to assess signs of overgrazing and pugging. 	<ul style="list-style-type: none"> Amend livestock management practices including amendment of stocking rates, and/or timing, and/or duration and/or frequency of strategic grazing events until native grass cover is within pre-determined limits. Repair offset area boundary fencing if damaged within one week of detection. Construct additional fencing if required. Additional fencing will not clear areas of MNES habitat. Should monitoring activities identify triggers for further action, the approved OAMP will be reviewed by a suitably qualified person within one month and update if required. Any corrective action identified will be implemented within 1 month of the OAMP being updated.
Reduce the risk of unplanned fire causing adverse impacts to MNES and MSES by through strategic fire management ² .	<ul style="list-style-type: none"> Controlled burns will be undertaken in accordance with the recommended fire management guidelines for Regional Ecosystems. Fire is to be excluded from the offset area except for planned and strategic burns as required to reduce understorey fuel loads 	<ul style="list-style-type: none"> Unplanned fire within the offset area. Planned fires become out of control or the required burning regime is not achieved. Habitat quality assessments indicate native grass 	<ul style="list-style-type: none"> Fire breaks are to be inspected annually in September Visual inspection of signs of fire during routine land management and during the habitat quality assessments. Fuel loads will be monitored through monitoring of ground 	<ul style="list-style-type: none"> Occurrences of fire are to be recorded during visual inspections undertaken routine land management. If an uncontrolled bushfire has impacted the offset area (including if controlled burning becomes out of control), review the grazing management and fire management strategies and adherence to these strategies and exclude cattle for three months. All fire breaks will be

² <https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/fire-management>

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
	<p>having a detrimental impact on canopy tree recruitment and establishment and to maintain existing fire breaks.</p> <ul style="list-style-type: none"> • Firebreaks are to be co-located, where possible, with roads, fence lines and vehicle access tracks. No areas of MNES or MSES will be cleared unless necessary or safety management. 	<p>groundcover is outside of pre-determined limits.</p>	<p>cover and to inform fire management strategies.</p>	<p>inspected, maintained and repaired if required.</p> <ul style="list-style-type: none"> • To ensure compliance, with performance criteria, undertake remedial action including: <ul style="list-style-type: none"> ○ Alteration to stocking rates, and/or duration and frequency of strategic grazing events; and/or ○ Amendments to fire management practices as required including fire safety and containment management. • Suitably qualified ecologist to review OAMP within one month and update if required.
<p>Minimise habitat degradation caused by pest animals</p>	<ul style="list-style-type: none"> • Pest animal management will be undertaken in accordance with agreed management measures. • Pest management will include a range of best management practice actions including shooting, trapping, fencing and baiting, and will be undertaken in accordance with Queensland's Department of Agriculture and Fisheries (DAF) guidelines³ and the 	<ul style="list-style-type: none"> • Observed increase in sightings/signs and/or the relative abundance of pest animals above baseline levels and/or previous monitoring event (whichever is lower). • Observation, or signs of, a feral animal not identified as occurring within the Project area during the baseline surveys. 	<ul style="list-style-type: none"> • Feral animal presence will be monitored as a minimum through visual signs recorded during monitoring and direct observations. Remote cameras will also be used to assess the presence of feral animals undertaken during habitat quality assessments. 	<ul style="list-style-type: none"> • Review adherence to the agreed pest animal management. • Investigate potential sources or reasons for an increase in pest animal numbers and rectify. • Increase the frequency or revise the type of invasive pest animal control efforts in accordance with DAF guidelines, and in conjunction with neighbouring landowners. • Suitably qualified ecologist to review OAMP within one month and update if required.

³ <https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals>

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
	requirements of the <i>Biosecurity Act 2014</i> .			
Control invasive weed species to reduce impacts on MNES from an overdominance of non-native floristic abundance in the understorey.	<ul style="list-style-type: none"> Weed management and weed hygiene restrictions will be implemented across the offset site to reduce the extent of existing weeds and to control the potential introduction of other exotic weed species. Weed hygiene and management will be undertaken in accordance with agreed management actions. 	<ul style="list-style-type: none"> An increase in the average percent (%) cover score of weed species from baseline and/or previous monitoring events. Outbreak of infestations of weed species not previously recorded in the Project area during baseline and/or previous monitoring events. An increase in the presence of weeds (relative abundance and/or area of occurrence) as determined from photo monitoring results. 	<ul style="list-style-type: none"> Monitoring of weeds and non-native plants will be undertaken during the habitat quality assessment surveys using the same methodology used to the baseline habitat quality as outlined in the Guide, as well as incidental observations as part of routine management. Photo monitoring will be undertaken in accordance with agreed procedures. 	<ul style="list-style-type: none"> Any increase in the relative abundance of invasive or other weed populations from those recorded during the baseline survey, or subsequent monitoring events will trigger the following corrective actions: <ul style="list-style-type: none"> Review adherence to weed hygiene procedures to ensure compliance and to update restrictions. Review timing and frequency of weed management measures and implement alternative weed management timeframes. Investigate alternative weed management control actions (e.g. spot spraying and/or injection of herbicides) and implement. Suitably qualified ecologist to review OAMP within one month and update if required.
<ul style="list-style-type: none"> Minimise predation risk on MNES and MSES fauna by pest animals. 	<ul style="list-style-type: none"> Feral animal management will be undertaken in accordance with the agreed management measures. Feral animal management will include a range of best management practice actions including shooting, trapping, fencing and baiting, and will be 	<ul style="list-style-type: none"> An observed increase in the abundance or signs of predator Feral animal species in the offset area above baseline levels and/or previous monitoring event (whichever is lower). 	<ul style="list-style-type: none"> Feral animal presence will be monitored as a minimum through visual signs recorded during monitoring and direct observations. Where practical, remote cameras will also be used to assess the presence of feral animals undertaken during the habitat quality assessments. 	<ul style="list-style-type: none"> Review adherence to the agreed pest animal management actions. Investigate potential sources or reasons for an increase in pest animal numbers and rectify. Increase the frequency and/or revise the type of invasive pest animal control efforts in accordance with DAF guidelines,

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
	undertaken in accordance DAF guidelines and the requirements of the <i>Biosecurity Act 2014</i> .			and in conjunction with neighbouring landowners. <ul style="list-style-type: none"> • Suitably qualified ecologist to review OAMP within one month and update if required.

6.1.6. Access and fencing

Access to an offset area should be restricted to authorised personnel including the landowner and persons authorised by the landowner and the proponent, and for undertaking monitoring programs and maintenance. Existing and new fences (if required) are expected to be used to restrict access into offset areas. Signs should be erected in prominent locations (i.e. at access points into the offset site) which recognize that the area is protected for conservation purposes and that access into these areas is restricted to authorised personnel only.

6.1.7. Vehicles

Vehicle access should be restricted to vehicles approved by the landowner/offset area manager and the proponent. Vehicle movement should be limited to designated access tracks and vehicles should travel to track conditions to minimise the risk of injury to MNES and MSES fauna.

Persons entering the offset area are expected to ensure all vehicles and equipment are weed free. Authorised personnel (e.g. contractors) entering the offset area would be required to hold a current weed hygiene certificate and be approved to access the area by the landowner/offset area manager.

6.1.8. Vegetation clearing

Vegetation clearing should not be permitted within the offset area, with the exception of clearing that is exempt under Queensland's VM Act and is required for:

- Maintenance of any established access tracks and/or fire breaks.
- As directed by emergency management response personnel in the event of uncontrolled bushfire or other emergency procedures.

6.1.9. Grazing management

Offset areas are typically used to graze cattle. Grazing is generally permitted throughout offset areas under strict controls to reduce fuel loads, to control exotic flora and to increase native species richness of the ground layer.

To minimise potential erosion and subsequent impacts on water quality that may in turn impact on MNES and MSES fauna habitat (e.g. squatter pigeons and/or black-throated finch) and/or affect attainment of interim performance targets and/or completion criteria, grazing should be excluded when rainfall causes inundated or waterlogged soils. Grazing is also generally restricted/excluded during the peak breeding and egg laying seasons for the ground dwelling fauna (e.g. squatter pigeons). The location and extent of any grazing exclusion areas should be reviewed regularly based on the results of management and monitoring events.

6.1.10. Fire management

Fuel loads are generally controlled through a combination of strategic grazing, weed control measures and fuel reduction burns to minimise the risk and impacts of unplanned fires and to improve habitat quality through controlling weeds and increased recruitment and establishment of native plants. Regular maintenance (e.g. grading and vegetation spraying) of firebreaks, roads and tracks should be an integral part of fire management to mitigate the risks associated with unplanned fire. Ground cover monitoring should be undertaken annually as part of fire management activities to assess fuel loads, determine the risk of unplanned fires to the offset area and inform fire management strategies.

Fire management should be consistent with the recommend fire management regime for REs that occur within the offset area as per the recommendations in the Fire Management Guidelines produced by the Queensland Herbarium.



6.1.11. Pest animal management

Assessments of pest animals should be undertaken as part of a comprehensive baseline habitat quality assessment. Results of these assessments should form part of the ongoing monitoring program to assess the presence, and extent of, pest animals within the final offset area and to also assess impacts to fauna habitat values and vegetation condition. Results from these assessments should inform the most appropriate species-specific control measures and management activities. It is expected that pest animal controls will be undertaken in accordance with the *Biosecurity Act 2014*, DAF guidelines and in conjunction with neighbouring landowners.

6.1.12. Weed management

Weeds and invasive plants generally pose considerable threats to habitat quality within offset areas due to the increase in groundcover biomass and the risk of uncontrolled fires. The highest distribution of weeds and invasive plants are generally confined to areas of prior disturbance, riparian corridors, waterway and drainage lines and along existing access tracks.

Comprehensive baseline surveys of weeds within the final offset site should be undertaken as part of a comprehensive baseline habitat quality assessment to determine the distribution and abundance of weeds species. Results from comprehensive surveys should inform the most appropriate species-specific weed control measures.

General visual inspections should also be undertaken to monitor the distribution and abundance of weed species and invasive plants within the final offset area. Weed infestations should be controlled and managed in accordance with the *Biosecurity Act 2014* and Queensland's DAF recommended control measures.

6.1.13. Typical monitoring required for OAMPs

Monitoring programs are implemented to assess the effectiveness of proposed management measures and to make timely decisions on corrective actions to ensure performance criteria and/or interim performance targets are being met.

Typical monitoring methods are:

- Specific to the interim performance targets and competition criteria being assessed and will determine whether the performance criteria have been achieved or whether corrective actions are needed.
- Quantitative and repeatable such that the monitoring assessments can be compared to each other which provides for changes between sampling events to be detected.

The overarching objectives of monitoring programs are to:

- Evaluate performance of the OAMP against interim performance targets and competition criteria.
- Ensure management triggers are defined and can be detected.
- Develop and implement corrective actions when management triggers are detected.
- Inform subsequent reviews and amendments to the OAMP and associated management plans.

6.1.14. General site and visual inspections

Offset area inspection visits are generally conducted at least once or twice per year by the land manager/offset area manager to inspect the offset area to generally assess the following matters:

- Fencing and signage condition.
- Evidence of excessive pugging or areas of overgrazing while stock are in the offset area.
- Condition of firebreaks.
- Fuel loads.



- Damage and/or degradation resulting from pest animal activity within the offset area.
- New weed outbreaks.
- Signs of land degradation, erosion, pugging and over-grazing.
- Signs of unplanned fires.
- Incidental fauna observations and any additional risks to offset values (i.e. evidence of predation of MNES and MSES).

6.1.15. Habitat quality monitoring sites

Permanent habitat monitoring sites should be established and should be based on the initial habitat quality assessment sites. The number of monitoring sites provided in Table 1 of the Guide are aimed at having sufficient sample sites to assess any variation in condition across the offset area and effectively assess key habitat features for each offset matter.

For efficiencies, all habitat monitoring sites should be used to assess habitat quality for each MNES and MSES as relevant habitat may overlap where offsets are co-located. Each monitoring site should include a 100 m transect, with the start and central points to be marked with permanent markers (i.e. star picket) and the GPS location recorded. Photo monitoring should also be undertaken with photographs taken from north, south, east and west directions and all subsequent monitoring events should be undertaken at the same locations.

The permanent habitat quality monitoring sites should be used for the following expected monitoring activities:

- Habitat quality assessments undertaken in accordance with the Guide and the methods outlined in Section 4.4.1 and 4.4.2.
- Fauna assessments including bird surveys, spotlighting and other specific assessment methods (e.g. Koala Spot Assessment Technique (SAT) surveys)
- Photo monitoring, undertaken at the ends of each of the habitat monitoring site transects.
- Presence of pest animals.
- Presence of weeds and invasive plants.
- Signs of fire.

6.1.16. Typical habitat quality and fauna monitoring

Initial baseline habitat quality assessments should be undertaken to provide inputs into the EPBC Offsets Calculator to determine the quantum of offsets required for each MNES and MSES. Following the initial assessments, a comprehensive habitat quality and fauna assessment should be undertaken at regular intervals as agreed with DAWE and State Government Agencies where relevant, through to the end of the approval to assess habitat improvement against interim performance targets and completion criteria. Habitat quality monitoring be undertaken at the initial habitat quality surveys sites and the Guide should be used to assess habitat quality for each MNES.

Habitat quality assessments should include targeted surveys the relevant MNES and MSES and should generally be undertaken in accordance with relevant Survey Guidelines. Fauna surveys as well as the habitat quality assessments should be undertaken by suitably qualified ecologists. The habitat quality assessments should also include assessments of weed abundance and distribution and an assessment on the presence of pest animals.

Where the habitat quality assessments do not show improvements in each of the habitat attributes, and the overall habitat quality for the offset area, an adaptive management framework will allow for



a review of management actions and suitable corrective actions to be implemented to determine if additional management measures or corrective actions are required.

A period of 20 years is typically chosen as the time period over which the final habitat quality, and hence, increased habitat values of the MNES will be reached. This period is generally chosen as it provides the maximum to ecological benefit in the EPBC Offset Calculations and is generally the time required for large canopy trees to become established.

6.1.17. Photo point monitoring

Photo monitoring should be undertaken at each monitoring location during the habitat quality assessments to allow habitat changes to be visually assessed over time.

6.1.18. Weeds

The offset area should be monitored for weeds and invasive plants and should include a comprehensive baseline weed survey to map the distribution and density of weed infestations. The final mapping methodology should be determined by a suitably qualified ecologist prior to and during the comprehensive baseline survey. Ongoing seasonal weed monitoring surveys should be undertaken in conjunction with the habitat quality monitoring surveys.

In addition to the permanent weed monitoring sites, incidental observations should be recorded from the offset area during general observations during routine land management.

6.1.19. Pest animals

The offset area should be monitored for pest animals and should include a comprehensive baseline survey which map the presence of pest animals. Ongoing pest feral animal monitoring surveys should be undertaken in conjunction with the habitat quality monitoring surveys.

Pest animals should also be opportunistically surveyed throughout the year outside of monitoring times, including observations for potential new pest animal species that have not been previously recorded.

6.1.20. Fuel loads

Fuel load monitoring for fire management should be undertaken annually in the early dry season when biomass (i.e. ground cover) is at its greatest, to determine the risk of fire to the offset site and to inform fire management strategies.



7. Recommendations for securing offsets

As discussed in Section 5, several properties are being investigated in terms of their suitability to satisfy offset requirements for the Project. Field surveys of the potential offset sites are required to determine the quality of habitat present and to complete the offset component of DAWE's 'Offset assessment guide' and DES' Land-based Offsets Multiplier Calculator.

The EPBC Act Offset Policy requires offsets to be legally secured for at least the same duration as the impact on the protected matter(s) arising from the action, not necessarily the action itself. The Policy requires that offsets on private lands:

- Should be legally secured for conservation purposes for at least the duration of the impact.
- The securing scheme should actively monitor for compliance, with covenant requirements enforced.
- any change in legal status should require Ministerial or statutory approval.

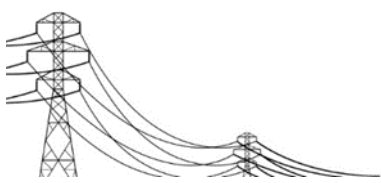
The EPBC Act Offsets Policy mentions the best legal mechanisms for securing an offset are those that are intended to be permanent (lasting forever) and are secure (that is, they are difficult to change or alter). Potential legal mechanisms that satisfy these requirements include:

- A conservation agreement between the Minister and a third party for the conservation of a protected matter under Part 14 of the EPBC Act an environmental offset protection area under the EO Act.
- A voluntary declaration under the VM Act.
- A protected area (including a nature refuge) under the NC Act.

Mechanisms of establishing legal security over an offset area provided in the Queensland Environmental Offset Policy that are relevant to terrestrial MSES include:

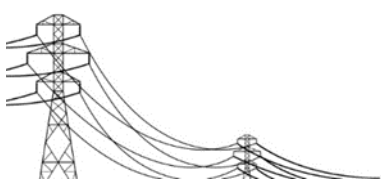
- An environmental offset protection area under section 30 of the *Environmental Offsets Act 2014*
- An area declared as an area of high nature conservation value under section 19F of the VM Act, where it is secured for the purposes of an offset.
- Declared as a nature refuge under section 46 of the NC Act, where it is secured for the purposes of an offset.
- Declared as a protected area under section 29(1) of the NC Act, where it is secured for the purposes of an offset.
- Declared as a special wildlife reserve under section 43D of the NC Act, where it is secured for the purposes of an offset secured as a statutory covenant for environmental purposes under the *Land Act 1994* or *Land Title Act 1994*.

Once an offset area has been identified as supporting the necessary values to satisfy the requirements of the EPBC Act Offsets Policy and/or the Queensland Environmental Policy, preparation of an OAMP is required. The purpose of the OAMP is to provide the framework for management of the offset area for conservation outcomes.



8. References

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