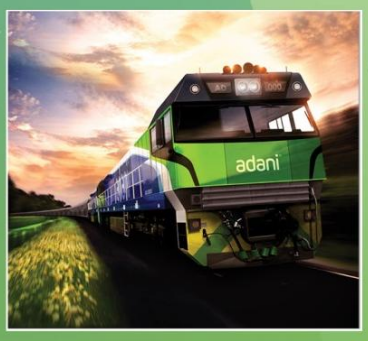

Adani Mining Pty Ltd

NORTH GALILEE BASIN RAIL PROJECT

Environmental Impact Statement

Appendix O Offsets

November 2013

This North Galilee Basin Rail Project offsets strategy report ("the Report") has been prepared by GHD Pty Ltd ("GHD") on behalf of and for Adani Mining Pty Ltd ("Adani") in accordance with an agreement between GHD and Adani.

The Report may only be used and relied on by Adani for the purpose of informing environmental assessments and planning approvals for the North Galilee Basin Rail Project ("the Purpose") and may not be used by, or relied on by any person other than Adani.

The services undertaken by GHD in connection with preparing the Report were limited to those specifically detailed in section 2.10 of the Report.

The Report is based on conditions encountered and information reviewed, including assumptions made by GHD, at the time of preparing the Report. Assumptions made by GHD are contained through the Report, including (but not limited to) concept design and operations information provided by Adani.

To the maximum extent permitted by law GHD expressly disclaims responsibility for or liability arising from:

- *any error in, or omission in connection with assumptions, or*
- *reliance on the Report by a third party, or use of the Report other than for the Purpose.*

Executive Summary

Adani Mining Pty Ltd (Adani) is proposing to develop the North Galilee Basin Rail Project (NGBR Project), an approximately 300 kilometre standard gauge rail line in central Queensland that will connect the northern Galilee Basin to the Port of Abbot Point. For the purposes of this Offset Strategy, the NGBR Project footprint includes a nominal 100 m wide final rail corridor, plus ancillary infrastructure footprints (both temporary and permanent) located adjacent to the final rail corridor.

The NGBR Project will involve unavoidable removal of vegetation and loss of species' habitat. As such, delivery of environmental offsets will be required in accordance with State and Commonwealth policies, where residual impacts to identified ecological values cannot be avoided or mitigated. Accordingly, this Offset Strategy has been prepared to:

- Identify the anticipated impacts of the NGBR Project
- Review offset requirements under relevant State and Commonwealth policies
- Identify options for availability of potential offsets
- Propose an approach for offset delivery

Offset policies that were considered include the following:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) *Environmental Offsets Policy* (2012)
- *Queensland Government Environmental Offset Policy* (2008)
  - *Policy for Vegetation Management Offsets Version 3* (2011)
  - *Queensland Biodiversity Offset Policy Version 1* (2011)
  - *Marine Fish Habitat Offset Policy* (FHMOP005.2) (2012).

Existing mapping layers produced by the Queensland Department of Environment and Heritage Protection were used to quantify the impacts of the NGBR Project that are likely to require offsets. These data included:

- Remnant Vegetation Cover Version 6.1
- High Value Regrowth Vegetation Version 2.1
- Pre-clearing Vegetation Communities and Regional Ecosystems Version 6.1
- Essential Habitat Version 3.1
- Essential Regrowth Habitat Version 3.1
- Great Barrier Reef Wetland High Ecological Significance Wetlands.

Technical data from ecological studies undertaken for the NGBR Project to date have been incorporated where possible. It is intended that this Offset Strategy will be updated as more detailed field-verified mapping becomes available.

The impacts of the NGBR Project that are likely to require offsets are summarised as follows:

- Commonwealth
  - Three threatened ecological communities
  - One threatened flora species

  - Five threatened fauna species
- Queensland
  - 24 remnant regional ecosystems that are endangered or of concern
  - Two threshold regional ecosystems
  - Nine high value regrowth regional ecosystems that are endangered or of concern
  - Two flora species
  - 16 fauna species
  - Watercourse vegetation
  - Wetland vegetation and wetland protection areas
  - Connectivity
  - One marine fish habitat type.

Subsequent to impact quantification, a desktop-based offset availability analysis was undertaken to determine how to achieve direct offset requirements triggered by the NGBR Project. In this regard, the Galilee Basin Offset Strategy (2012) has been developed by the Queensland Government to identify conservation priority areas that can potentially be used for delivery of offsets for projects supporting the development of coal reserves within this basin. These priority areas formed the study area for the offset availability analysis, together with an area encompassing a 10 km buffer surrounding the centreline of the final rail corridor.

Results of the offset availability analysis indicated that there is significant potential to locate suitable offsets for the environmental values that will be impacted by the NGBR Project, specifically:

- Sufficient potentially compliant offset areas were identified within the area of the Galilee Basin Offset Strategy for all environmental values pursuant to the EPBC Act *Environmental Offsets Policy.*
- Sufficient potentially compliant offset areas were identified for marine fish habitat values pursuant to the *Marine Fish Habitat Offset Policy* predominantly within 10 km from the centreline of the final rail corridor as well as some areas of the Galilee Basin Offset Strategy.
- Sufficient potentially compliant offset areas were identified within the area of the Galilee Basin Offset Strategy for all but four environmental values pursuant to the *Policy for Vegetation Management Offsets* and the *Queensland Biodiversity Offsets Policy.* Sufficient potentially compliant offset areas for three of these four values were identified in the area encompassing a 10 km buffer surrounding the centreline of the final rail corridor.
- The one remaining value for which potential offsets could not be located within the study area is a regional ecosystem that has a highly limited geographical distribution within the bioregion as a result of habitat requirements specific to coastal ranges. As such, it may be difficult to provide a direct offset for this regional ecosystem, with alternative offset options such as payments and/or indirect offsets preferable for this value.

Field surveys in accordance with the Queensland Government's BioCondition method will be required to assess the suitability of the identified potential offset sites. Furthermore, BioCondition surveys of the offset site, as well as areas of impact, will serve to inform the size of offsets required under the EPBC Act *Environmental Offsets Policy,* the *Queensland Biodiversity Offset Policy* and the *Policy for Vegetation Management Offsets,* and to ensure 'like for like'

offsets are obtainable. Preliminary simulations using the EPBC Act Offsets Calculator were undertaken, and revealed that the size of direct offsets potentially required will be adequately met by the offset sites identified by the offset availability analysis.

Following preparation and approval of this Offset Strategy, an offsets package will be developed to finalise the approach to offset delivery for the NGBR Project and to address the requirements of Commonwealth and State offset policies. The offsets package is likely to include a combination of direct and indirect offsets, with options for offset payments and offset transfers also investigated.

In conclusion, the results of this assessment indicate that it will be possible for the NGBR Project to achieve 'no net loss' of ecological values, in accordance with the ambitions of the various offset policies, with this broadly achievable within the study area.

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Terms and abbreviations

Terms and abbreviations	Definition
Adani	Adani Mining Pty Ltd
BPA	Biodiversity Planning Assessment
BVG	Board vegetation group
DEHP	Department of Environment and Heritage Protection
DEWHA	Department of Water, Heritage and the Arts
EIS	Environmental Impact Statement
EOP	Environmental Offsets Policy
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
FHMOP005.2	Marine Fish Habitat Offset Policy
Final NGBR Project footprint	The final NGBR Project footprint will accommodate all rail infrastructure required for construction and operation, scalable to accommodate 100 mtpa product coal transport, including passing loops, a maintenance road, rolling stock maintenance (provisioning, fuel storage and refuelling, maintenance, etc.), water supply and pipeline, track and signalling maintenance facilities, staff crib, accommodation and training facilities and other necessary infrastructure associated with the operational functions of the NGBR Project. Temporary construction facilities are expected to include laydown areas, construction depots (warehousing, fuel storage, vehicle storage, administration facilities, etc.), sleeper manufacturing yards, construction accommodation camps, quarries and borrow pits, access tracks into the corridor and other necessary infrastructure associated with the construction functions of the NGBR Project.
Final rail corridor	The final rail corridor is a nominal 100 m wide corridor
FPC	Foliage projective cover
ha	Hectare
HVR	High value regrowth
MNES	Matters of National Environmental Significance
Mtpa	Million tonnes per annum
NGBR Project	North Galilee Basin Rail Project
Preliminary investigation corridor	The preliminary investigation corridor is a nominal 1,000 m wide corridor
PVMO	Policy for Vegetation Management Offsets
QBOP	Queensland Biodiversity Offsets Policy
QGEOP	Queensland Government Environmental Offsets Policy

Terms and abbreviations	Definition
RE	Regional Ecosystem
SEVT	Semi-evergreen vine thicket
TEC	Threatened Ecological Community
TOR	Terms of Reference
VM Act	*Vegetation Management Act 1999*
WPA	Wetland protection areas

1. Introduction

1.1 Project overview

Adani Mining Pty Ltd (Adani) proposes the construction and operation of the North Galilee Basin Rail Project (NGBR Project), a multiuser, standard gauge, greenfield rail line that will transport coal from mines in the northern Galilee Basin to the Port of Abbot Point. The NGBR Project is approximately 300 km in length and connects the proposed Carmichael Coal Mine and Rail Project's east-west rail corridor, approximately 70 km east of the Carmichael Mine in the vicinity of Mistake Creek, with supporting infrastructure at the Port of Abbot Point (refer Figure 1-1). The NGBR Project will have an operational capacity of up to 100 million tonnes per annum (mtpa) of coal product expected to be sourced from both Adani and third-party mines in the northern Galilee Basin. Key features of the NGBR Project include:

- Approximately 300 km of standard gauge, bi-directional rail track located within a nominal 100 m wide rail corridor (the final rail corridor)
- A rail maintenance access road running parallel to the rail track for approximately 300 km and wholly within the final rail corridor
- Seven passing loops, each 4.3 km in length
- Signalling infrastructure
- Approximately 4.5 km of fill greater than 15 m in depth (11 locations) and approximately 3.4 km of cut greater than 15 m in depth (nine locations)
- At-grade and grade separated road, rail, stock and occupational crossings
- Bridge and culvert structures at major waterways and drainage lines, and various other longitudinal and cross drainage structures
- A rolling stock maintenance facility near the Port of Abbot Point including provisioning line, train maintenance line, wagon and locomotive service sheds, wash bay and queuing line
- Five temporary accommodation camps for construction workers
- A temporary construction depot at the southern end of NGBR Project
- Temporary construction yards, concrete batching plants, bridge and tack laydown areas and heavy vehicle turning circles.

During construction, quarries and borrow pits within acceptable haulage distances will be required to provide a cost effective source of fill, gravel, aggregate and ballast. The number and location of borrow pits and quarries will be investigated further during detailed design and each may require screening and crushing plants to process material.

1.2 Environmental offsets

The term 'environmental offsets' refers to measures that are intended to compensate for the residual adverse impacts of an action on the environment. Offsets provide environmental benefits to counterbalance the impacts that remain after avoidance and mitigation measures have been implemented. These remaining, unavoidable impacts are termed 'residual impacts'.

The NGBR Project will involve the removal of vegetation and the loss of species' habitat, which will be partially mitigated through the sensitive design, construction and operation of the NGBR Project. Nevertheless, there may be unavoidable residual impacts that cannot be fully mitigated in this way, which will then require the provision and implementation of environmental offsets.

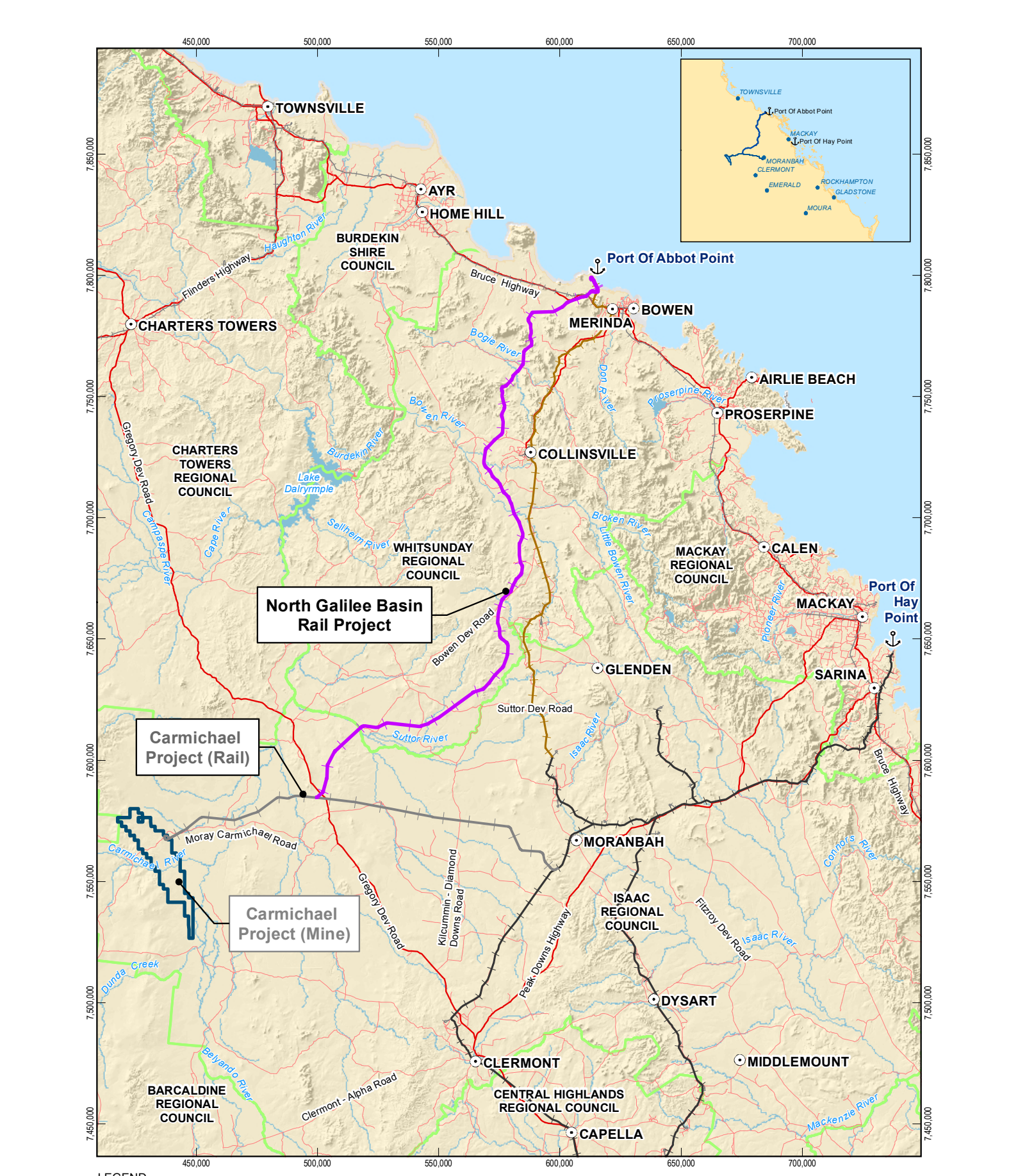
1.3 Scope of report

The overarching objectives of the strategy are to:

- Identify the anticipated impacts of the NGBR Project
- Review offset requirements under relevant State and Commonwealth policies
- Identify options for availability of potential offsets
- Propose an approach for offset delivery.

The specific aim of this Offset Strategy is to determine whether 'no net loss' of ecological values can be delivered, in line with the requirements of the various offset policies. This report was prepared in accordance with the Terms of Reference (TOR) for the NGBR Project issued by the Queensland Coordinator-General as well as the Final Guidelines for an Environmental Impact Statement for the North Galilee Basin Rail Project (EIS Guidelines) issued by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC). A table that cross-references the contents of this report and the TOR is included as Volume 2 Appendix A TOR cross-reference.

This report is provided as supporting documentation to the Environmental Impact Statement (EIS) for the NGBR Project and will be further refined as details of the NGBR Project evolve.



LEGEND

- Town
- Major Port
- Other Rail Network
- Goonyella System
- Newlands System
- Major Road
- Local Road
- Watercourse
- Local Government Area
- Carmichael Project (Rail)
- North Galilee Basin Rail
- Carmichael Project (Mine)

1:2,000,000 (at A4)

0 10 20 30 40 50

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

Adani Mining Pty Ltd

North Galilee Basin Rail Project

Project location

Job Number 41-26457
Revision B
Date 29 Aug 2013

Figure 1-1

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Level 9, 145 Ann St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses (2007); DNRM: LGA, (2011), Hillshade (2009); DMR: State Roads (2008); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012), NGBR: Alignment Opt6 Rev 2 (2013).

2. Methodology

2.1 Study area

For the purposes of this Offset Strategy the study area for the availability analysis was limited to the identified conservation priority areas within the Galilee Basin Offsets Strategy and lands within a 10 km buffer surrounding the centreline of the final rail corridor.

The availability analysis was limited to these areas as the NGBR Project supports the development of coal reserves within the Galilee Basin and to identify potential compliant offset areas within close proximity to the impact area.

2.2 Data sources

For the full list of desktop searches used in the production of this Offset Strategy, as well as their search extent, limitations and type of analysis used, refer to Volume 2 Appendix F Nature conservation, Table 2-1. Data sources directly used in the production of this offsets strategy are outlined below:

- Remnant Vegetation Cover Version 6.1
- High Value Regrowth Vegetation Version 2.1
- Survey and Mapping of Pre-clearing Vegetation Communities and Regional Ecosystems Version 6.1
- Essential Habitat Version 3.1
- Essential Regrowth Habitat Version 3.1
- Great Barrier Reef Wetland High Ecological Significance Wetland
- Protected Areas of Queensland
- Queensland Digital Cadastral Database
- Galilee Basin Offset Strategy.

2.3 Legislation and guidelines

A review of offset policies and guidelines has been carried out to confirm those that are relevant and applicable to the NGBR Project. Policies and guidelines that have been considered comprise the following:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) *Environmental Offsets Policy* (EOP) (2012) and the associated Environmental Offsets Assessment Guide
- *Queensland Government Environmental Offset Policy* (QGEOP) (2008)
  - *Policy for Vegetation Management Offsets Version 3* (PVMO) (2011)
  - *Queensland Biodiversity Offset Policy Version 1* (QBOP) (2011)
  - *Marine Fish Habitat Offset Policy* (FHMOP005.2) (2012)

Each of these is considered below.

2.4 EPBC Act Environmental Offsets Policy

The EPBC Act is the Australian Government's principal piece of environmental legislation. It is designed to protect national environmental interests, known as Matters of National Environmental Significance (MNES), and other protected matters.

The EPBC Act *Environmental Offsets Policy* came into effect 2 October 2012 and outlines the Australian Government's approach to the use of environmental offsets and provides transparency around how the suitability of offsets is determined. This policy relates to offsetting impacts to the following types of protected matters:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- The environment, where nuclear actions are involved
- The environment, where actions proposed are on, or will affect Commonwealth land and the environment
- The environment, where Commonwealth agencies are proposing to take an action.

The EOP has a list of eight 'offset principles' that must be considered when determining suitable offsets for MNES. The offset principles specify that suitable offsets must:

1. Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed development
2. Be built around direct offsets but may include indirect offsets or other compensatory measures
3. Be in proportion to the level of statutory protection that applies to the affected species or community
4. Be of a size and scale proportionate to the residual impacts being offset
5. Effectively manage the risks of the offset not succeeding
6. Be additional to what is already required or agreed to
7. Be efficient, effective, transparent, proportionate, scientifically robust and reasonable

Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced

For assessments under the EPBC Act, offsets under the EOP are only required if residual impacts are significant. In order to determine whether an impact is significant or not, an assessment is required to be undertaken against the criteria set out within the relevant sections of the Significant Impact Guidelines 1.1: Matters of National Environmental Significance (DEWHA, 2009).

Implications for the NGBR Project

The EOP will apply to the NGBR Project, as residual impacts to MNES have the potential to constitute significant impacts. The NGBR Project requires the clearance of regional ecosystems (REs) listed as components of threatened ecological communities (TECs) and habitat for threatened species listed under the EPBC Act. The NGBR Project may also involve the clearance of habitat for EPBC Act listed migratory birds.

For further information on the magnitude of impacts to MNES, refer to Volume 1 Chapter 7 Matters of National Environmental Significance.

2.5 Queensland Government Environmental Offsets Policy

The QGEOP came into effect 1 July 2008 to provide a framework for the use of environmental offsets in Queensland. This policy acts as a broad over-arching policy instrument, under which specific-issue offset policies provide detailed direction for the application of environmental offsets. The QGEOP identifies seven principles for offsetting that specific-issue offsets policies must comply with. The seven principles are as follows:

- Principle 1: offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy
- Principle 2: environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact
- Principle 3: offsets must achieve an equivalent or better environmental outcome
- Principle 4: offsets must provide environmental values as similar as possible to those being lost
- Principle 5: offset provision should minimise the time-lag between the impact and delivery of the offset
- Principle 6: offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values
- Principle 7: offsets must be legally secured for the duration of the offset requirement.

Four specific-issue offset policies currently exist beneath the QGEOP, of which three may be relevant to the NGBR Project:

- PVMO
- QBOP
- *Marine Fish Habitat Offset Policy.*

The fourth specific-issue policy, namely the *Offsets for Net Gain of Koala Habitat in South East Queensland Policy*, is not of relevance as the NGBR Project is not located within the geographical area covered by the policy.

2.5.1 Policy for Vegetation Management Offsets

Vegetation clearing in Queensland is regulated through the *Vegetation Management Act 1999* (VM Act), which identifies regulations and requirements for vegetation clearing, and describes how such activities must be undertaken in order to comply with the requirements of the law.

The PVMO sets the requirements for an offset package, providing guidance on the sourcing and provision of offsets for matters protected under the VM Act. Regional vegetation management codes under the VM Act set out performance requirements that development applications involving the clearing of native vegetation must meet in order to comply with the PVMO.

In line with the QGEOP offset principles, where an applicant has demonstrated reasonable effort to first avoid and then mitigate impacts related to the development, offsets may be proposed by the applicant as a solution to meeting specific performance requirements. The policy also identifies seven criteria that vegetation offsets must meet, including ecological equivalence requirements, performance requirements and legal procurement of offset areas.

Implications for the NGBR Project

As the NGBR Project will require the removal of vegetation which is protected under the VM Act, the PVMO applies to the NGBR Project. An assessment of the impacts of the NGBR Project is required against each performance requirement of the policy.

2.5.2 Queensland Biodiversity Offset Policy

The QBOP establishes the offset requirements for impacts to State significant biodiversity values which cannot be avoided. The policy aims to ensure that there is no net loss of biodiversity. As outlined in the QGEOP, applicants are only permitted to provide an offset if they have first demonstrated that all practical and reasonable efforts have been taken to avoid and minimise impacts to State significant biodiversity values.

State significant biodiversity values are defined within the policy, spanning numerous environmental features, including REs, essential habitat, wetlands, watercourses, areas significant to connectivity, protected animals, legally secured offset areas, protected plants and wetland protection areas.

Offsets under this policy may come in the form of direct offsets or indirect offsets where it has been demonstrated that a direct offset substantially meets but does not fully meet offset requirements.

Implications for the NGBR Project

The Queensland Government Environmental Offsets Policy (QGEOP) provides an overarching framework that sets the principles and requirements for delivery of State offsets. Within this framework, specific-issue policies exist for managing offsets in relation to native vegetation clearance, loss of biodiversity, koala impacts and fish habitat impacts.

However, the QGEOP does not bind the Coordinator-General in assessing coordinated projects or activities under the SDPWO Act. The Coordinator-General has the discretion to consider the need for and decide on all types of offset conditions (and conditions in general).

The Coordinator-General has the powers necessary to decide on offsets as part of his broad conditioning powers under the SDPWO Act.

The Coordinator-General can take advice from relevant state agencies on offsets and will consider existing State offset polices but is the sole decision-maker on coordinated projects and will determine and approve any State offset conditions that are considered necessary over and above Commonwealth requirements.

The Coordinator-General will work with the Commonwealth to aim to agree on their offset requirements. Any additional requirements for offsetting non-MNES impacts over and above the

Commonwealth's offsets and conditions will be considered by the Coordinator-General on a case-by-case basis, after the Commonwealth Minister's decision.

2.5.3 Marine Fish Habitat Offset Policy

The *Marine Fish Habitat Offset Policy* sets the requirements for offsets to counterbalance permanent or temporary impacts or loss on fisheries resources or fish habitat relevant to fisheries development approval decisions under the *Fisheries Act 1994* and *Sustainable Planning Act 2009*.

Offsets under this policy may be either direct or indirect offsets. Direct offsets involve spatial areas of fish habitat as a surrogate for loss or gain of fisheries productivity. Direct offsets must comply with the following principles:

- Equivalent or better environmental outcomes
- Similar environmental values
- Additional protection and management.

Where the above principles cannot be achieved using direct offsets, indirect offsets may be considered as compensation based on loss of function and services values of fish habitat.

Implications for the NGBR Project

As the NGBR Project will impact marine fish habitat, the NGBR Project has been assessed against the requirements of the *Marine Fish Habitat Offset Policy*.

2.6 Desktop assessment

A desktop assessment has been undertaken to determine offset requirements that are triggered by State and national environmental values potentially impacted by the NGBR Project. The results of this assessment are described in Section 3.2 of this Offset Strategy.

The desktop assessment involved a review of publicly-available information, including spatial data and species databases maintained by the State and Australian Governments.

The desktop assessment has considered environmental values within a two kilometre buffer of the final rail corridor, this may be subsequently refined if the final rail corridor is refined as a result of detailed engineering design.

The desktop assessment has also been informed by preliminary results from the NGBR Project ecological assessment (refer Volume 2 Appendix F Nature conservation). Overall, these results allow a greater understanding of values likely to be impacted as a result of the NGBR Project and provide an opportunity for refining impacts to specific environmental receptors.

2.7 Geospatial analysis

For each of the residual impacts identified and quantified by the desktop assessment, an analysis of suitable locations for offsetting was undertaken in order to determine the potential availability of offset sites across the region. The results of this analysis are presented in Section 3.2 of this Offset Strategy.

Offset priority areas identified by the Galilee Basin Offset Strategy formed the basis of the offset availability analysis. For values that could not be offset within this study area due to their natural distribution not encompassing the Galilee Basin, further analysis was undertaken within a

broader study area, encompassing lands within 10 km from the centreline of the final rail corridor.

The suitability of areas for use as potential offset sites for the NGBR Project was assessed in accordance with the following criteria:

- Lot size greater than two hectares
- Lot tenure is lands lease or freehold (using the Queensland Digital Cadastral Database)
- Areas mapped as non-remnant, compliant high value regrowth (HVR) vegetation or category X on a property map of assessable vegetation in line with Queensland Government offset policies
- Areas mapped as remnant, HVR and/or non-remnant in line with the Australian Government offset policy
- Areas mapped with foliage projective cover (FPC) greater than or equal to six per cent (where applicable)
- Areas containing suitable mapped environmental values as per the relevant policy criteria.

To determine suitability in terms of environmental values, the geospatial analysis used aerial imagery together with relevant mapping layers such as vegetation, geology, topography, essential habitat, flora and fauna species records.

Potential offset areas excluded from the analysis were:

- Lots mapped as Queensland estate and other lands including protected areas and strategic cropping trigger areas
- Parts of lots containing mining leases
- Parts of lots declared as nature refuges
- Lots which contain potential offset areas (for a given environmental value) smaller than one hectare.

2.7.1 Threatened flora and fauna

Potential impacts and subsequent offset requirements relating to threatened flora and fauna were calculated using a combination of resources including REs listed in the relevant essential habitat database record (version 3.1) and species information gathered from literature and previous experience within the region. This is the same approach that was employed for threatened species habitat mapping as presented in Volume 2 Appendix F Nature conservation.

2.7.2 Threatened ecological communities

Potential impacts and subsequent offset requirements relating to TECs were calculated based on REs listed in Commonwealth Government listing advice and Queensland Government RE mapping version 6.1.

2.7.3 Threatened regional ecosystems and high value regrowth

Potential impacts and subsequent offset requirements relating to endangered and of concern REs were calculated based on the impacted REs. Non-remnant and compliant high value regrowth REs within the same broad vegetation group (BVG) and the same VM Act status (or

higher) as the impacted RE were used to calculate potential offsets for impacts to endangered and of concern high value regrowth.

2.7.4 Wetlands and wetland protection areas

Potential impacts to wetlands have been calculated based on REs listed as associated with a wetland in the RE description database. Potential impacts to wetland protection areas (WPAs) have been calculated based on the area of high ecological significance wetlands in the relevant bioregion.

2.7.5 Watercourse vegetation and connectivity

Potential offset availability for watercourse vegetation was determined by selecting REs within specified distances from a watercourse identified within the *Regional Vegetation Management code for the Brigalow Belt and New England Tablelands Bioregion*. Potential offset availability for connectivity was determined through the use of Biodiversity Planning Assessment (BPA) mapping of State and regional corridors.

2.8 EPBC Act offsets assessment guide

The EPBC Act offsets assessment guide was used to provide indicative offset requirements under the EPBC Act EOP to meet minimum direct offset requirements (90 per cent of the offset requirement). This exercise was undertaken to provide an estimate as to future offset obligations for MNES requiring offsets under the EOP. Many of the values used in this process were rough estimates and do not represent 'on ground' conditions or finalised inputs. This exercise will be revised at a later date following the refinement of data relating to future field investigations within the NGBR Project footprint.

2.9 Consultation

Consultation involving key regulators and relevant stakeholders will be undertaken during later stages of the EIS process to confirm the approach of this offsets strategy and the type and quantum of offsets being proposed.

2.10 Limitations

Whilst it has been possible to incorporate some technical data from recent ecological field surveys of the preliminary investigation corridor, the desktop assessment and geospatial analysis have been largely reliant upon mapped vegetation layers. These mapped layers have not yet been ground-truthed, and as such, a field-verified RE map is not available at this stage of the NGBR Project. Nevertheless, once this information does become available, this Offset Strategy can be revisited and the quantification of offset requirements updated accordingly. Furthermore, should the NGBR Project footprint change, residual impact calculations will need to be refined.

3. Offset strategy

3.1 Potential residual impacts and offset requirements

Through the planning and early design stages of the NGBR Project, efforts have been made to avoid, minimise and mitigate potential impacts to sensitive ecological receptors. These have been focused on directly reducing the scale and intensity of any potential impacts. Nevertheless, residual impacts to such receptors are predicted in places and will require offsetting. These offsets do not reduce the likely impacts of the NGBR Project, but instead compensate for any significant residual impacts incurred. Offsetting requirements for the NGBR Project are discussed as follows.

3.1.1 EPBC Act Environmental Offsets Policy

The EIS (refer Volume 1 Chapter 7 Matters of National Environmental Significance) states that the NGBR Project is not expected to have significant residual impacts on the following MNES:

- World Heritage properties
- National Heritage places
- Listed threatened species and communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park.

With regards to the above, it is relevant to note the following:

- The lack of hydrological connectivity between the NGBR Project and any World Heritage properties, National Heritage places, Commonwealth marine areas and the Great Barrier Reef Marine Park has led to the conclusion of no NGBR Project related significant impacts to these features, as prescribed in the Significant Impact Guidelines (DEWHA, 2009).
- A total of 27 migratory species were considered relevant to the NGBR Project. These species are generally common and widespread across the region as a whole, and the lack of large-scale habitat features of potential value within the NGBR Project footprint means that it is not considered to support key assemblages of, or important habitat for, these species, as defined in the Significant Impact Guidelines (DEWHA, 2009).

Further information on these assessments is provided in the EIS (Volume 1 Chapter 7 Matters of National Environmental Significance).

The following sections identify potential residual impacts to MNES that are likely to trigger offset requirements under the EPBC Act EOP. It is anticipated that significant residual impacts to TECs and threatened species will trigger such offset requirements and these are described in further detail below.

Threatened ecological communities

Field surveys conducted as part of the EIS process confirmed the presence or potential presence of three TECs within the preliminary investigation corridor (refer Volume 2 Appendix F

Nature conservation). Potential impacts to these TECs within the NGBR Project footprint are presented in Table 3-1.

Table 3-1 Potential NGBR Project impacts on threatened ecological communities

TEC	EPBC Act status	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
Brigalow (*Acacia harpophylla*) dominant and co-dominant	Endangered	94.3	6.0	100.3
Natural grasslands of the Queensland central highlands and the northern Fitzroy Basin	Endangered	100.4	16.7	117.1
Semi-evergreen vine thickets (SEVT) of the Brigalow Belt (north and south) and Nandewar regions	Endangered	35.8	0	35.8

Threatened species

Two EPBC Act listed threatened species were confirmed present during field surveys throughout the preliminary investigation corridor, these being black ironbox (*Eucalyptus raveretiana*) and squatter pigeon (southern) (*Geophaps scripta scripta*) (refer Volume 2 Appendix F Nature conservation). An additional four EPBC Act listed threatened species were considered likely to occur within the preliminary investigation corridor (refer Volume 2 Appendix F Nature conservation). Potential impacts to EPBC Act listed threatened species' habitat within the NGBR Project footprint are provided in Table 3-2.

Table 3-2 Potential NGBR Project impacts on EPBC Act listed threatened species habitat

Threatened species	EPBC status	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
Flora				
Black ironbox *Eucalyptus raveretiana*	Vulnerable	64.2	0.4	64.6
Fauna				
Australian painted snipe *Rostratula australis*	Endangered	39.9	5.7	45.6

Threatened species	EPBC status	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
Black-throated finch (southern) *Poephila cincta cincta*	Endangered	1,793.7	349.7	2,143.4
Koala *Phascolarctos cinereus*	Vulnerable	1,913.2	476.9	2,390.1
Ornamental snake *Denisonia maculata*	Vulnerable	212.3	34.3	246.6
Squatter pigeon (southern) *Geophaps scripta scripta*	Vulnerable	1,412.1	375.9	1,788

3.1.2 Queensland Government Environmental Offsets Policy

The following section identifies the residual impacts on all state values that are predicted to occur as a result of the NGBR Project. Critically limited RE is excluded as this state value was not identified in the NGBR Project final rail corridor.

Endangered and of concern regional ecosystems

A total of 24 endangered and of concern REs are predicted to be directly impacted as a result of the NGBR Project. These impacts have been calculated on existing vegetation mapping that has not been ground-truthed (refer Section 2.8). Predicted clearing extents for each RE are presented in Table 3-3.

Table 3-3 Potential NGBR Project impacts on endangered and of concern regional ecosystems

RE	Description	VM Act class	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
11.12.10	*Corymbia clarksoniana* woodland on igneous rocks	Of concern	1.6	1.2	2.8
11.12.14	*Lophostemon* spp. woodland on igneous rocks. Coastal hills	Of concern	1.2	0	1.2
11.12.15	*Allocasuarina torulosa*, *Livistona drudei* woodland on igneous rocks. Coastal hills	Of concern	1.7	0	1.7
11.12.16	*Acacia* spp. low woodland on igneous rocks. Coastal hills	Of concern	1.7	0	1.7
11.12.18	Montane shrubland on igneous rocks. Mountain tops	Of concern	0.4	0	0.4
11.12.21	*Acacia harpophylla* open forest on igneous rocks. Colluvial lower slopes	Endangered	13.0	0	13.0
11.11.13	*Acacia harpophylla* or *A. argyrodendron*, *Terminalia oblongata* low open forest on deformed and metamorphosed sediments and interbedded volcanics	Of concern	4.6	0	4.6
11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	Endangered	2.0	0	2.0
11.9.1	*Acacia harpophylla-Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks	Endangered	0.1	0	0.1
11.9.10	*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks	Of concern	20.9	4.6	25.5
11.9.12	*Dichanthium sericeum* grassland with clumps of *Acacia harpophylla* on fine-grained sedimentary rocks	Endangered	36.0	6.9	42.9
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains	Of concern	1.8	0	1.8

RE	Description	VM Act class	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
11.4.5	*Acacia argyrodendron* woodland on Cainozoic clay plains	Of concern	0.4	0	0.4
11.4.6	*Acacia cambagei* woodland on Cainozoic clay plains	Of concern	0.1	0	0.1
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	Endangered	17.9	2.7	20.6
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	45.1	3.3	48.4
11.4.11	*Dichanthium sericeum*, *Astrebla* spp. and patchy *Acacia harpophylla*, *Eucalyptus coolabah* on Cainozoic clay plains	Of concern	8.2	0	8.2
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Endangered	18.2	0	18.2
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of concern	33.7	31.6	65.3
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	Of concern	16.7	1.0	17.7
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland on alluvial plains	Of concern	30.9	2.3	33.2
11.3.33	*Eremophila mitchellii* open woodland on alluvial plains	Of concern	3.9	6.0	9.9
11.3.34	*Acacia tephrina* woodland on alluvial plains	Of concern	1.0	0.7	1.7
11.2.3	Microphyll vine forest (beach scrub) on sandy beach ridges	Of concern	33.8	0	33.8

Threshold regional ecosystems

A summary of predicted impacts to threshold regional ecosystems is provided in Table 3-4.

Table 3-4 Potential NGBR Project impacts on threshold regional ecosystems

RE	Description	VM Act status	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
11.4.11	*Dichanthium sericeum*, *Astrebla* spp. and patchy *Acacia harpophylla*, *Eucalyptus coolabah* on Cainozoic clay plains	Of concern	8.2	0	8.2
11.3.5	*Acacia cambagei* woodland on alluvial plains	Least concern	30.5	0	30.5

High value regrowth

A total of 13.3 ha of endangered and of concern HVR vegetation is predicted to be cleared as a result of the NGBR Project. A summary of predicted impacts to endangered and of concern HVR vegetation is provided in Table 3-5.

Table 3-5 Potential NGBR Project impacts to endangered and of concern HVR vegetation

RE	VM Act class	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
11.12.21	Endangered	2.3	0	2.3
11.4.8	Endangered	1.6	0.2	1.8
11.4.9	Endangered	5.1	0	5.1
11.12.14	Of concern	0.7	0	0.7
11.12.15	Of concern	1.0	0	1.0
11.12.18	Of concern	0.2	0	0.2
11.2.3	Of concern	0.5	0	0.5
11.3.4	Of concern	0.8	0.1	0.9
11.4.5	Of concern	0.8	0	0.8

Threatened species

A total of six NC Act listed threatened species (one flora species, five fauna species) were confirmed present through field surveys of the preliminary investigation corridor. A further 12 species (one flora species, 11 fauna species) are considered likely to occur (refer Volume 2 Appendix F Nature conservation). Some of these species are also classified as threatened

under the EPBC Act (refer Section 3.2.1). A summary of predicted impacts to NC Act listed threatened species is provided in Table 3-6.

Table 3-6 Potential NGBR Project impacts to NC Act listed threatened species

Threatened Species	NC Act status	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
Flora				
Bonamia dietrichiana	Near threatened	682.8	150.1	832.9
Black ironbox *Eucalyptus raveretiana*	Vulnerable	64.2	0.4	64.6
Fauna				
Squatter pigeon (southern) *Geophaps scripta scripta*	Vulnerable	1412.1	375.9	1788.1
Black-necked stork *Ephippiorhynchus asiaticus*	Near threatened	325.9	91.8	417.7
Cotton pygmy-goose *Nettapus coromandelianus*	Near threatened	54.4	8.9	63.3
Freckled duck *Stictonetta naevosa*	Near threatened	54.4	8.9	63.3
Little pied bat *Chalinolobus picatus*	Near threatened	2,005.0	489.7	2,494.7
Black-throated finch (southern) *Poephila cincta cincta*	Endangered	1,793.7	349.7	2,143.4
Australian painted snipe *Rostratula australis*	Endangered	39.9	5.7	45.6
Little tern *Sternula albifrons*	Endangered	39.9	5.7	45.6
Black-chinned honeyeater *Melithreptus gularis*	Near threatened	1,788.5	322.3	2,110.8
Square-tailed kite *Lophoictinia isura*	Near threatened	1,937.0	323.4	2,260.4
Ornamental snake *Denisonia maculata*	Vulnerable	212.3	34.3	246.6
Estuarine crocodile *Crocodylus porosus*	Vulnerable	62.4	0.4	62.8

Threatened Species	NC Act status	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
Brigalow scaly-foot *Paradelma orientalis*	Vulnerable	1,579.4	282.5	1,861.9
Common death adder *Acanthophis antarcticus*	Near threatened	2,005.0	489.7	2,494.7
Eastern curlew *Numenius madagascariensis*	Near threatened	39.9	5.7	45.6
Koala *Phascolarctos cinereus*	Special least concern	1,913.2	476.9	2,390.1

Essential habitat

No Department of Environment and Heritage Protection (DEHP) essential habitat is mapped within the final rail corridor or ancillary infrastructure areas. The NGBR Project is therefore not expected to impact any DEHP essential habitat.

Watercourse vegetation

The NGBR Project traverses 16 major waterways and approximately 120 minor waterways, impacting watercourse vegetation associated with these crossings. The final rail corridor and ancillary infrastructure areas are expected to impact approximately 225.7 ha of watercourse vegetation. A summary of anticipated impact to watercourse vegetation is provided in Table 3-7.

Table 3-7 Potential NGBR Project impacts to watercourse vegetation

Description	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
Stream order 1	105.0	10.5	115.5
Stream order 2	29.6	4.5	34.1
Stream order 3	31.2	0.0	31.3
Stream order 4	14.2	0.1	14.3
Stream order 5	13.7	1.5	15.2
Stream order 6	13.4	1.9	15.3

Wetlands

The NGBR Project is expected to impact approximately 240.8 ha of vegetation that is classified as 'wetland regional ecosystem' under the VM Act. Additionally, one wetland protection area is present within the northernmost extent of the final rail corridor. A summary of anticipated impacts to wetlands is provided in Table 3-8.

Table 3-8 Potential NGBR Project impacts to wetlands

Wetland type	Clearing area (ha) – final rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
Wetland protection area	9.3	8.4	17.7
Wetland protection area (trigger area)	125.6	8.0	133.6
Wetland RE	189.3	51.5	240.8

Connectivity

The NGBR Project passes through several significant wildlife corridors, as identified in Volume 2 Appendix F Nature conservation. With respect to BPA mapping of connectivity, the rail corridor will involve the clearing of approximately 2,925.9 ha of vegetation that will impact connectivity. The construction of temporary laydown areas will involve the clearing of approximately 665.6 ha of vegetation that will impact on connectivity.

Marine fish habitat

The NGBR Project does not traverse any declared fish habitat areas; it does however impact tidal fish habitat areas, which require offsetting under the *Marine Fish Habitat Offset Policy*. These fish habitat areas are a saltmarsh RE, noting that any areas of marine fish habitat within the Caley Valley Wetland have not been included in this calculation as no impacts to Caley Valley Wetland are to occur. A summary of anticipated impacts to marine fish habitat is provided in Table 3-9.

Table 3-9 Potential NGBR Project impacts to marine fish habitat

RE	Description	VM Act class	Clearing area (ha) – rail corridor	Clearing area (ha) – ancillary infrastructure	Total (ha)
11.1.2	Samphire forbland or bare mud-flats on Quaternary estuarine deposits	Least concern	4.3	7.5	11.8

3.1.3 Summary of offset requirements

A summary of offset requirements for the NGBR Project is provided in Table 3-10. In delivering offsets for the NGBR Project, offset values that occur within the same area will be co-located where possible. For example, where an RE type has been identified as habitat for a threatened species, the offset for this RE can potentially also be used as an offset for this threatened species. The potential for collocation for each of the offset values is indicated in in Table 3-10.

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Table 3-10 Summary of potential impacts

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
EPBC Act Environmental Offsets Policy				
Threatened Ecological Communities	Brigalow (*Acacia harpophylla*) dominant and co-dominant	100.3	EOP	RE 11.12.21, RE 11.9.1, RE 11.4.8, RE 11.4.9, RE 11.3.1
	Natural grasslands of the Queensland central highlands and the northern Fitzroy Basin	117.1	EOP	RE 11.9.12, RE 11.4.11, RE 11.4.4, RE 11.9.3
	Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar regions	35.8	EOP	RE 11.11.18, RE 11.2.3
Threatened species listed under the EPBC Act	*Eucalyptus raveretiana*	64.6	EOP	State offset requirement for this species, RE 11.3.25, RE 11.3.37
	Australian painted snipe	45.6	EOP	State offset requirement for this species, wetland protection areas
	Black-throated finch (southern)	2,143.4	EOP	State offset requirement for this species, RE 11.3.2, RE 11.3.3, RE 11.3.4, RE 11.3.33, RE 11.4.2, RE 11.4.8, RE 11.4.11, RE 11.9.1, RE 11.12.10, RE 11.12.14, wetland RE
	Koala	2,390.1	EOP	State offset requirement for this species, RE 11.3.2, RE 11.3.3, RE 11.3.4, RE 11.3.33, RE 11.3.34, RE 11.4.2, RE 11.9.1, RE 11.9.10, RE 11.12.10, RE 11.12.14, wetland RE
	Ornamental snake	246.6	EOP	State offset requirement for this species, RE 11.3.3, RE 11.4.6, RE 11.4.8, RE 11.4.9, RE 11.4.11, RE 11.9.1, RE 11.9.12

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
	Squatter pigeon (southern)	1,788.1	EOP	State offset requirement for this species, RE 11.3.1, RE 11.3.2, RE 11.3.3, RE 11.3.4, RE 11.3.34, RE 11.4.2, RE 11.4.5, RE 11.4.6, RE 11.4.8, RE 11.4.9, wetland RE
Queensland Government Offsets Policy				
Endangered and of concern regional ecosystems	RE 11.12.10	2.8	PVMO, QBOP*	Black-throated finch, koala, common death adder
	RE 11.12.14	1.2	PVMO, QBOP*	Black-throated finch, koala, little pied bat, common death adder
	RE 11.12.15	1.7	PVMO, QBOP*	Little pied bat
	RE 11.12.16	1.7	PVMO, QBOP*	Little pied bat, common death adder
	RE 11.12.18	0.4	PVMO, QBOP*	Little pied bat, common death adder
	RE 11.12.21	13.0	PVMO, QBOP*	Brigalow TEC, little pied bat, common death adder
	RE 11.11.13	4.6	PVMO, QBOP*	Little pied bat, common death adder
	RE 11.11.18	2.0	PVMO, QBOP*	n/a
	RE 11.9.1	0.1	PVMO, QBOP*	Brigalow TEC, black-throated finch, koala, ornamental snake, little pied bat, brigalow scaly-foot, common death adder
	RE 11.9.10	25.5	PVMO, QBOP*	Koala, little pied bat, black-chinned honeyeater, square-tailed kite, brigalow scaly-foot, common death adder

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
	RE 11.9.12	42.9	PVMO, QBOP*	Natural grasslands TEC, ornamental snake
	RE 11.4.2	1.8	PVMO, QBOP*	Black-throated finch, koala, squatter pigeon, little pied bat, black-chinned honeyeater, square-tailed kite, brigalow scaly-foot, common death adder
	RE 11.4.5	0.4	PVMO, QBOP*	Squatter pigeon, little pied bat, square-tailed kite, brigalow scaly-foot, common death adder
	RE 11.4.6	0.1	PVMO, QBOP*	Ornamental snake, squatter pigeon
	RE 11.4.8	20.6	PVMO, QBOP*	Brigalow TEC, black-throated finch, ornamental snake, squatter pigeon, little pied bat, brigalow scaly-foot, common death adder
	RE 11.4.9	48.4	PVMO, QBOP*	Brigalow TEC, ornamental snake, squatter pigeon, little pied bat, brigalow scaly-foot, common death adder
	RE 11.4.11	8.2	PVMO, QBOP*	Natural grasslands TEC, threshold RE, black-throated finch, ornamental snake
	RE 11.3.1	18.2	PVMO, QBOP*	Brigalow TEC, squatter pigeon, little pied bat, brigalow scaly-foot, common death adder
	RE 11.3.2	65.3	PVMO, QBOP*	Black-throated finch, koala, squatter pigeon, black-necked stork, little pied bat, black-chinned honeyeater, square-tailed kite, brigalow scaly-foot, common death adder, wetland RE

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
	RE 11.3.3	17.7	PVMO, QBOP*	Black-throated finch, koala, ornamental snake, squatter pigeon, black-necked stork, little pied bat, black-chinned honeyeater, square-tailed kite, brigalow scaly-foot, common death adder, wetland RE
	RE 11.3.4	33.2	PVMO, QBOP*	Black-throated finch, koala, squatter pigeon, black-necked stork, little pied bat, black-chinned honeyeater, square-tailed kite, brigalow scaly-foot, common death adder, wetland RE
	RE 11.3.33	9.9	PVMO, QBOP*	Black-throated finch, koala, little pied bat, square-tailed kite, brigalow scaly-foot, common death adder
	RE 11.3.34	1.7	PVMO, QBOP*	Koala, squatter pigeon, little pied bat, square-tailed kite, brigalow scaly-foot, common death adder
	RE 11.2.3	33.8	PVMO, QBOP*	SEVT TEC
Threshold regional ecosystems	RE 11.4.11	8.2	PVMO, QBOP*	Natural grasslands TEC, RE, black-throated finch, ornamental snake
	RE 11.3.5	30.5	PVMO, QBOP*	Squatter pigeon, brigalow scaly-foot, common death adder, little pied bat,
Endangered and of concern high value regrowth	RE 11.12.21	2.3	PVMO, QBOP*	Brigalow TEC, little pied bat, common death adder
	RE 11.4.8	1.8	PVMO, QBOP*	Brigalow TEC, black-throated finch, ornamental snake, squatter pigeon, little pied bat, brigalow scaly-foot, common death adder

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
	RE 11.4.9	5.1	PVMO, QBOP*	Brigalow TEC, ornamental snake, squatter pigeon, little pied bat, brigalow scaly-foot, common death adder
	RE 11.12.14	0.7	PVMO, QBOP*	Black-throated finch, koala, little pied bat, common death adder
	RE 11.12.15	1.0	PVMO, QBOP*	Little pied bat
	RE 11.12.18	0.2	PVMO, QBOP*	Little pied bat, common death adder
	RE 11.2.3	0.5	PVMO, QBOP*	SEVT TEC
	RE 11.3.4	0.9	PVMO, QBOP*	Black-throated finch, koala, squatter pigeon, black-necked stork, little pied bat, black-chinned honeyeater, square-tailed kite, brigalow scaly-foot, common death adder, wetland RE
	RE 11.4.5	0.8	PVMO, QBOP*	Squatter pigeon, little pied bat, square-tailed kite, brigalow scaly-foot, common death adder
Listed species under the NC Act	*Bonamia dietrichiana*	832.9	PVMO, QBOP*	n/a
	Eucalyptus raveretiana	64.6	PVMO, QBOP*	EPBC Act offset requirement for this species, 11.3.25, 11.3.37
	Squatter pigeon (southern)	1,788.1	PVMO, QBOP*	EPBC Act offset requirement for this species, RE 11.3.1, RE 11.3.2, RE 11.3.3, RE 11.3.4, RE 11.3.34, RE 11.4.2, RE 11.4.5, RE 11.4.6, RE 11.4.8, 11.4.9, wetland RE
	Black-necked stork	417.7	PVMO, QBOP*	RE 11.3.2, RE 11.3.3, RE 11.3.4, wetland RE

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
	Cotton pygmy-goose	63.3	PVMO, QBOP*	n/a
	Freckled duck	63.3	PVMO, QBOP*	n/a
	Little pied bat	2,494.7	PVMO, QBOP*	RE 11.3.34, RE 11.3.33, RE 11.3.4, RE 11.3.3, RE 11.3.2, RE 11.3.1, RE 11.4.9, RE 11.4.8, RE 11.4.5, RE 11.4.2, RE 11.9.10, RE 11.9.1, RE 11.11.13, RE 11.12.21, RE 11.12.18, RE 11.12.16, RE 11.12.15, RE 11.12.14, RE 11.12.10, wetland RE
	Black-throated finch (southern)	2,143.4	PVMO, QBOP*	EPBC Act offset requirement for this species, RE 11.3.2, 11.3.3, RE 11.3.4, RE 11.3.33, RE 11.4.2, RE 11.4.8, RE 11.4.11, RE 11.9.1, RE 11.12.10, RE 11.12.14, wetland RE
	Australian painted snipe	45.6	PVMO, QBOP*	EPBC Act offset requirement for this species, wetland protection areas
	Little tern	45.6	PVMO, QBOP*	Wetland protection areas
	Black-chinned honeyeater	2,110.8	PVMO, QBOP*	RE 11.3.2, RE 11.3.3, RE 11.3.4, RE 11.4.2, RE 11.9.10, wetland RE
	Square-tailed kite	2,260.4	PVMO, QBOP*	RE 11.3.2, RE 11.3.3, RE 11.3.4, RE 11.3.33, RE 11.3.34, RE 11.4.2, RE 11.4.5, RE 11.9.10, wetland RE
	Ornamental snake	246.6	PVMO, QBOP*	EPBC Act offset requirement for this species, RE 11.3.3, RE 11.4.6, RE 11.4.8, RE 11.4.9, RE 11.4.11, RE 11.9.1, RE 11.9.12
	Estuarine crocodile	62.8	PVMO, QBOP*	n/a

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
	Brigalow scaly-foot	1,861.9	PVMO, QBOP*	RE 11.3.34, RE 11.3.33, RE 11.3.4, RE 11.3.3, RE 11.3.2, RE 11.3.1, RE 11.4.2, RE 11.4.5, RE 11.4.8, RE 11.4.9, RE 11.9.10, RE 11.9.1, wetland RE
	Common death adder	2,494.7	PVMO, QBOP*	RE 11.3.34, RE 11.3.33, RE 11.3.4, RE 11.3.3, RE 11.3.2, RE 11.3.1, RE 11.4.9, RE 11.4.8, RE 11.4.5, RE 11.4.2, RE 11.9.10, RE 11.9.1, RE 11.11.13, RE 11.12.21, RE 11.12.18, RE 11.12.18, RE 11.12.16, RE 11.12.14, RE 11.12.10, wetland RE
	Eastern curlew	45.6	PVMO, QBOP*	Wetland protection areas
	Koala	2,390.1	PVMO, QBOP*	EPBC Act offset requirement for this species, 11.3.2, 11.3.3, 11.3.4, 11.3.33, 11.3.34, 11.4.2, 11.9.1, 11.9.10, 11.12.10, 11.12.14
Watercourse vegetation	Stream order 1	115.5	PVMO, QBOP*	Relevant regional ecosystems
	Stream order 2	34.1	PVMO, QBOP*	Relevant regional ecosystems
	Stream order 3	31.3	PVMO, QBOP*	Relevant regional ecosystems
	Stream order 4	14.3	PVMO, QBOP*	Relevant regional ecosystems
	Stream order 5	15.2	PVMO, QBOP*	Relevant regional ecosystems
	Stream order 6	15.3	PVMO, QBOP*	Relevant regional ecosystems

Environmental value	Species/community	Proposed impact area (ha)	Relevant offset policy	Potential for offset co-location
Wetlands	Wetland protection area	17.7	PVMO, QBOP*	n/a
	Wetland protection area (trigger area)	133.6	PVMO, QBOP*	n/a
	Wetland RE	240.8	PVMO, QBOP*	RE 11.3.2, RE 11.3.3, RE 11.3.4, black-throated finch, koala, squatter pigeon, black-necked stork, little pied bat, black-chinned honeyeater, square-tailed kite, brigalow scaly-foot, common death adder
Connectivity	Not applicable	3,591.5	PVMO, QBOP*	n/a
Marine fish habitat	11.1.2	11.8	FHMOP005.2	n/a

*Note that the applicability of the QBOP to the NGBR Project has not yet been determined (refer to Section 2.3.2 herein)

3.2 Offset availability

3.2.1 Offset availability in the Galilee Basin

The Galilee Basin Offset Strategy was developed to provide spatial resources that guide proponents to locate offset sites in strategic conservation hubs and corridors and assist decision makers in the assessment of development activities in the Galilee Basin.

The Galilee Basin Offset Strategy identifies a strategic footprint within the Brigalow Belt and Desert Uplands bioregions that determines where to locate land based offsets for the best biodiversity conservation outcomes. The strategic footprint identifies two types of priority areas, these being:

- Priority 1 areas: identification of conservations hubs that are areas of high conservation value and where there are limited mining interests
- Priority 2 areas: key north-south and east-west corridors that link to adjacent bioregions

Sufficient potential offset areas were identified within priority 1 and 2 of the Galilee Basin Offset Strategy for the vast majority of values requiring offsetting in association with the NGBR Project (refer Table 3-11), specifically:

- A large amount of potential offsets are available for all EPBC Act listed TECs, and sufficient potential offsets exist within the study area for all EPBC Act listed threatened species
- Large quantities of potential offset areas are available to meet the offset requirements for threshold REs, high value regrowth, listed species under the NC Act, watercourse vegetation, wetland and connectivity
- Suitable offset areas were available for all but four of the endangered and of concern REs requiring offsets (REs: 11.12.16, 11.11.18, 11.9.12 and 11.2.3)
- Areas of potential offsets for marine fish habitat were located; however, the potential offset area was less than the area of impact

3.2.2 Offset availability within 10 km from the centreline of the final rail corridor

Offset availability within 10 km from the centreline of the final rail corridor was analysed for environmental values that do not naturally occur within the Galilee Basin, specifically, four RE types (REs 11.12.16, 11.11.18, 11.9.12, 11.2.3) and marine fish habitat. It was found that a large amount of potential offsets are available for marine fish habitat, together with sufficient potentially compliant offsets for three of the four REs (refer Table 3-12).

3.2.3 Offset availability within the bioregion

The availability of pre-clear and remnant RE 11.12.16 within the Brigalow Belt Bioregion was assessed to ascertain an understanding of potential offset availability for this RE, given the unavailability of potential offsets for this RE within the Galilee Basin and the 10 km area from the centreline of the final rail corridor. This RE has a highly restricted geographical distribution, and is primarily found on islands and coastal ranges. It was calculated that a potential offset area of up to 38.7 ha is potentially available in the bioregion. Further analysis was not undertaken in accordance with the offset criteria identified in Section 2.7 as it was not considered desirable to provide an offset which was significantly spatially separated from other

offset areas. As such it may be more appropriate to offset RE 11.12.16 through means other than a direct offset, such as offset payments and/or indirect offsets (refer Section 3.3.1).

3.2.4 Offset availability elsewhere

Although large areas of potentially compliant offset areas were found for environmental values likely to be impacted by the NGBR Project, it is recognised that a number of environmental values have a low potential compliant offset area ratio or maximum offset multiplier (refer Table 3-12). Specifically, 11 of the potentially impacted values have offset multipliers of less than 50. Low offset multipliers are indicative of the relatively scarce availability of offsets for these values within the search area, such that there may potentially be difficulties in securing sufficient appropriate offset sites. Nevertheless, it is relevant to acknowledge that the offset availability analysis presented herein was restricted analysis to the areas within the Galilee Basin Offsets Strategy and lands within 10 km from the centreline of the final rail corridor. Where the potential compliant offset area may be limited, additional analysis will be undertaken within 10 km from the centreline of the final rail corridor (for values not included in the initial search) or elsewhere within the wider Brigalow Belt Bioregion.

Table 3-11 Summary of offset potential within priority areas identified by the Galilee Basin Offset Strategy

Environmental value	Species/community	Total impact area (ha)	Potential compliant offset area (ha)	Maximum offset multiplier
EPBC Act Environmental Offsets Policy				
Threatened Ecological Communities	Brigalow (*Acacia harpophylla*) dominant and co-dominant	100.3	31,260.8	311.7
	Natural grasslands of the Queensland central highlands and the northern Fitzroy Basin	117.1	2,824.1	24.1
	Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar regions	35.8	520.0	14.5
Threatened species	*Eucalyptus raveretiana*	64.6	40,590.5	628.3
	Australian painted snipe	45.6	226,580.8	4,968.9
	Black-throated finch (southern)	2,143.4	545,476.8	254.5
	Koala	2,390.1	558,704.7	233.8
	Ornamental snake	246.6	63,484.5	257.4
	Squatter pigeon (southern)	1,788.1	444,547.7	248.6
Queensland Government Offsets Policy				
Endangered and of concern regional ecosystems	RE 11.12.10	2.8	2,225.9	795.0
	RE 11.12.14	1.2	1,218.8	1,015.7
	RE 11.12.15	1.7	120.8	71.1
	RE 11.12.16	1.7	0	n/a
	RE 11.12.18	0.4	36.1	90.2

Environmental value	Species/community	Total impact area (ha)	Potential compliant offset area (ha)	Maximum offset multiplier
	RE 11.12.21	13.0	62.5	4.8
	RE 11.11.13	4.6	4881.8	1,061.3
	RE 11.11.18	2.0	0	n/a
	RE 11.9.1	0.1	439.5	4,395.0
	RE 11.9.10	25.5	1,887.3	74.0
	RE 11.9.12	42.9	0	n/a
	RE 11.4.2	1.8	714.3	396.8
	RE 11.4.5	0.4	1,790.8	4,477.0
	RE 11.4.6	0.1	7,617.2	76,172.0
	RE 11.4.8	20.6	14,500.3	703.9
	RE 11.4.9	48.4	11,087.8	229.1
	RE 11.4.11	8.2	279.8	34.1
	RE 11.3.1	18.2	4,784.6	262.9
	RE 11.3.2	65.3	19,311.1	295.7
	RE 11.3.3	17.7	13,914.2	786.1
	RE 11.3.4	33.2	4,202.6	126.6
	RE 11.3.33	9.9	212.2	21.4
	RE 11.3.34	1.7	521.8	306.9
	RE 11.2.3	33.8	8.4	n/a

Environmental value	Species/community	Total impact area (ha)	Potential compliant offset area (ha)	Maximum offset multiplier
Threshold regional ecosystems	RE 11.4.11	8.2	279.8	34.1
	RE 11.3.5	30.5	8,750.6	286.9
Endangered and of concern high value regrowth	RE 11.12.21	2.3	62.5	27.2
	RE 11.4.8	1.8	14,500.3	8,055.7
	RE 11.4.9	5.1	11,087.8	2,173.9
	RE 11.12.14	0.7	1,218.8	1,741.1
	RE 11.12.15	1.0	120.8	120.8
	RE 11.12.18	0.2	36.1	180.5
	RE 11.2.3	0.5	8.4	16.8
	RE 11.3.4	0.9	4,202.6	4,669.6
	RE 11.4.5	0.8	1,790.8	2,238.5
Listed species under the NC Act	*Bonamia dietrichiana*	832.9	119,292.3	143.2
	Eucalyptus raveretiana	64.6	40,590.5	628.3
	Squatter pigeon (southern)	1,788.1	444,547.7	248.6
	Black-necked stork	417.7	157,012	375.9
	Cotton pygmy-goose	63.3	599.3	9.5
	Freckled duck	63.3	599.3	9.5
	Little pied bat	2,494.7	593,093.7	237.7
	Black-throated finch (southern)	2,143.4	545,476.8	254.5
	Australian painted snipe	45.6	226,580.8	4,968.9

Environmental value	Species/community	Total impact area (ha)	Potential compliant offset area (ha)	Maximum offset multiplier
	Little tern	45.6	226,580.8	4,968.9
	Black-chinned honeyeater	2,110.8	468,657.3	222.0
	Square-tailed kite	2,260.4	465,708.0	206.0
	Ornamental snake	246.6	63,484.5	257.4
	Estuarine crocodile	62.8	40,373.9	642.9
	Brigalow scaly-foot	1,861.9	460,416.8	247.3
	Common death adder	2,494.7	591,962.5	237.3
	Eastern curlew	45.6	226,580.8	4,968.9
	Koala	2,390.1	558,704.7	233.8
Watercourse vegetation	Stream order 1	115.5	40,343.0	349.3
	Stream order 2	34.1	14,687.9	430.7
	Stream order 3	31.3	12,745.7	407.2
	Stream order 4	14.3	8,710.8	637.6
	Stream order 5	15.2	6,125.6	403.0
	Stream order 6	15.3	2,057.4	134.5
Wetlands	Wetland protection area	17.7	18,545.0	1047.7
	Wetland protection area (trigger area)	133.6	85,678.0	641.3
	Wetland RE	240.8	60,378.0	250.7
Connectivity	Not applicable	3,591.5	19,736.8	5.5
Marine fish habitat	RE 11.1.2	11.8	4.6	n/a

Table 3-12 Summary of potential offset values within 10 km from the centreline of the final rail corridor

Environmental value	Species/Community	Total impact area (ha)	Potential compliant offset area (ha)	Maximum offset multiplier
Endangered and of concern regional ecosystems	RE 11.12.16	1.7	0	n/a
	RE 11.11.18	2.0	92.2	46.1
	RE 11.9.12	42.9	2,382.2	55.5
	RE 11.2.3*	33.8	158.5	4.7
Marine fish habitat	RE 11.1.2	11.8	1,129.7	95.7

*Note that RE 11.2.3 constitutes the SEVT of the Brigalow Belt (north and south) and Nandewar regions TEC

3.3 Offset delivery

3.3.1 Offset delivery options

Potential residual impacts associated with the NGBR Project have been assessed against Commonwealth and State offsets policies to determine offset requirements. Due to the extent of the potential residual impacts and the provisions of the relevant policies and legislation, offsets are required for the NGBR Project.

Where residual impacts associated with the NGBR Project are anticipated, offsets will be provided as a means of reducing NGBR Project impacts on the environment and complying with approval conditions under the relevant legislation.

Offset packages typically require the delivery of either direct or indirect offsets, or a combination of the two.

Direct offsets

Direct or 'in-kind' offsets aim to provide similar values, function, habitat and other attributes to those being lost or impacted by the adverse activity. Current policies no longer identify specific ratios for calculating direct offset areas. Ratios (also referred to as 'mitigation ratios') establish how much every unit lost (e.g. ha of an endangered RE) at a specific site must be offset with gains elsewhere (e.g. 1 unit of loss: 3 units of compensation). Under the EOP, direct offsets should form a minimum 90 per cent of the offset requirement.

The offset ratio required under the EOP, the QBOP and the PVMO is generally determined by the results of an ecological field assessment that considers the ecological condition of the impact site as well as the offset site. Therefore, BioCondition surveys for the NGBR Project will subsequently be undertaken in accordance with DEHP's method with the aim of determining the size of offsets required to offset the residual impacts of the NGBR Project, as well as to further determine the suitability of potential offset sites.

Indirect offsets

Indirect offset options should be considered to supplement direct offset delivery. Indirect or 'out of kind' offsets refer to offsetting activities that come in the form of either management, research, or financial contributions and are aimed at promoting gains for those values lost as a result of the impacting activity. Under the EOP, indirect offsets (or 'compensatory measures') may satisfy up to a maximum of 10 per cent of the total offset requirement. Indirect offsets under the EOP may include the following:

- Implementing priority actions outlined in relevant recovery plans
- Enhancing habitat quality or reducing threats to the protected matter on a site that is not part of a direct offset
- Contributing to relevant research or education programs.

Indirect offsets under the QBOP and the PVMO may form part of an offsets package, in combination with direct offsets, where an applicant has provided an offset area which substantially achieves ecological equivalence with the impact area, but fails to meet the required ecological equivalence scores.

Acceptable indirect offsets under the QBOP and PVMO may include the following:

- Habitat mapping/modelling for listed threatened species under the NC Act using a methodology approved by DEHP
- Development of RE BioCondition benchmarks consistent with DEHP methodologies
- Finer scale RE mapping consistent with DEHP methodologies
- DEHP-approved 'on-ground' and 'research and monitoring' actions derived from the Back on Track species prioritisation framework Action Plans
- Fauna surveys of DEHP-identified strategic areas
- Addressing a threatening process outlined in a Commonwealth or State approved conservation or recovery plan.

Offset transfer

Under the QBOP and PVMO, an applicant may enter into an agreement with an offset broker for the provision of an offset area as a means of meeting their regulatory requirements. For offset transfers to be considered, it must be evident that offsets meet the requirements of the offset policies, are available at the time of development approval submission, and can be legally secured within 12 months of the issuing of the applicant's development permit.

Offset payment

Offset payments under the QBOP and PVMO allow eligible applicants to make offset payments to an approved trust (QBOP specifies 'Balance the Earth Trust'). Offset payments may then be used to secure suitable areas with State significant biodiversity values, either to add to the protected area estate or strategic areas and corridors identified by DEHP.

3.3.2 Proposed approach to offset delivery

Based on the desktop analysis undertaken for this Offset Strategy, it is anticipated that a combination of both direct and indirect methods of offset delivery will be selected for the NGBR Project, with possibilities for offset transfer and offset payment also potentially considered.

While the NGBR Project's preference is to offset impacts using direct offsets, it is possible that suitable impacts for certain values may not be readily identified or secured, such as RE 11.12.16. As part of the final offsets package, landholder engagement and ecological surveys to confirm the suitability of the preferred package option will be conducted. A property map of assessable vegetation will be prepared and certified by the Queensland Herbarium, to confirm potential impact areas. Biocondition assessment of potential impact areas and offsite sites will be undertaken to determine their ecological equivalence. Following this, the offsets package will be refined and confirmed. This may include the use of indirect offsets, which are likely to be in the form of contributions to species-specific management plans and targeted recovery actions.

The final offsets package will be developed to finalise the proposed approach to offset delivery and to address the requirements of Commonwealth and State offset policies. It should be noted that Queensland offset policies are currently under review by DEHP, and that the likely outcomes of this review are not yet known. The final offsets package should reflect any changes in these policies as a result of the DEHP review. The final offsets package will include:

- Updated offset requirements, based on Commonwealth and State offset requirements at the time of preparation

- Refined impact data, including a property map of assessable vegetation certified by the Queensland Herbarium
- The results of ecological equivalence assessments to determine 'quality' or BioCondition scores at impact and potential offset sites
- Final details regarding the delivery approach of direct and indirect offsets or offset payments and transfers within the offsets package
- Detail regarding the compliance of the offsets package with the relevant offset policies
- Proposed legally binding mechanisms to secure direct offsets
- A schedule of future tasks and timeframes to secure offsets
- A framework for the management of offset areas.

EPBC Act offsets assessment

An indicative use of the EPBC Act offsets assessments guide was undertaken to estimate future offset requirements under the EOP using this guide, noting that limited field verified data was available for input. A summary of the values used in this assessment are provided below in Table 3-13 and Appendix A.

The indicative potential impact areas proposed in Table 3-13 should be able to be met within the study area, based on the potential offset availability calculations provided in Section 3.2. The values presented in Table 3-13 do not represent final values or proposed offsets. This exercise will be refined at a later stage in the offsets process using refined information, including a property map of assessable vegetation certified by the Queensland Herbarium.

Table 3-13 Indicative use of the EPBC Act offsets assessment guide

MNES	Quality*	Quantum of impact (ha)**	Proposed offset (ha)	Risk related time horizon (years)	Time until ecological benefit (years)	Start quality	Risk of loss	Future quality without offset	Future quality with offset	Confidence	Percentage of impact offset	Minimum (90%) of direct offset requirement met?	Potential compliant offset area (ha)
Brigalow (*Acacia harpophylla*) dominant and co-dominant	6	60	200	10	10	1	50	3	8	75	90.09%	Yes	31,260.8
Natural grasslands of the Queensland central highlands and the northern Fitzroy Basin	2	23.4	80	10	10	1	50	3	8	75	91.03%	Yes	2,824.1
Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar regions	7	25.2	86	10	10	1	50	3	8	75	90.87%	Yes	678.5
Eucalyptus raveretiana	5	32.5	100	10	10	1	50	3	8	75	90.48%	Yes	40,590.5
Australian painted snipe	3	13.7	47	10	10	1	50	3	8	75	91.48%	Yes	226,580.8
Black-throated finch	7	1500.4	5075	10	10	1	50	3	8	75	90.06%	Yes	545,476.8
Koala	7	1673.1	5125	10	10	1	50	3	8	75	90.08%	Yes	558,704.7
Ornamental snake	6	148.0	453	10	10	1	50	3	8	75	90.03%	Yes	63,484.5
Squatter pigeon	8	1430.5	4380	10	10	1	50	3	8	75	90.04%	Yes	444,547.7

*Habitat quality scores were estimated based on discussions with the field survey team, noting that habitat quality has not yet been formally assessed.

Quantum of impact = (Proposed impact area **X Quality)/10

3.3.3 Outstanding and ongoing actions

A number of remaining tasks are required to be undertaken to advance the offsets process for the NGBR Project. In summary, such tasks include:

- Identification of large-scale strategic offset sites to focus further investigations and offset site selection
- Field assessment of potential impact sites to gain 'quality' or BioCondition scores for impacted values
- Field assessment of potential offset sites to verify that the values identified through desktop assessments are present and that they are ecologically equivalent to the impact sites.

Further refinement of threatened species habitat mapping is recommended to produce a more accurate indication of potential impacts to threatened species habitat. The mapping process used to determine the potential impact to MNES does not take into account localised features, previous disturbance (other than remnant vegetation current extent), relationships with introduced species, local habitat condition or current land use. It takes key habitat features at a regional scale that can be spatially represented to describe potential habitat. For this reason, the mapping outputs of potential habitat do not reflect current distribution or predict occurrence of a species and indeed provides an overestimate of where species actually occur, and therefore an overestimate of unavoidable impact to MNES. Further field investigations and threatened species habitat modelling could produce more accurate threatened species habitat mapping and therefore minimise overestimation of these values.

3.3.4 Consultation

Adani will undertake consultation with government agencies to discuss this offsets strategy. This consultation will provide an indication of further actions that need to be undertaken and additional offset areas that will be required to satisfy offset obligations.

Offsets brokers may also be engaged to assist with securing offsets, as they have established relationships with landholders and have knowledge of those interested in being involved in securing offsets for major projects in the region.

4. Conclusions

The NGBR Project will require delivery of environmental offsets under National and State offset policies. The analysis of conservation priority areas identified by the Galilee Basin Offset Strategy indicates substantial availability of potentially suitable offset sites for most of the environmental values that will be impacted by the NGBR Project, and large areas of potentially compliant offset areas for three REs together with marine fish habitat are present within 10 km surrounding the centreline of the final rail corridor. The one RE with insufficient offset availability has a highly restricted geographical distribution, such that it will be difficult to find a practical direct offset for this RE.

In finalising the offset approach for the NGBR Project, subsequent actions that will be undertaken will include the following:

- Preparation of field-verified ecological mapping (currently underway) and corresponding refinement of impact quantification
- Field assessment of impact sites to gain BioCondition scores and quantification of the size of offset requirements
- Identification of strategic offset sites to focus offset site selection, including BioCondition assessments to confirm suitability of potential offset sites
- Consultation with government agencies to confirm offset requirements and the approach to offset delivery
- Preparation of an offsets package to finalise the proposed approach to offset delivery and to address the requirements of National and State offset policies

In conclusion, the results of this assessment indicate that it will be possible for the NGBR Project to achieve 'no net loss' of ecological values through a combination of direct and indirect offsets, in accordance with the ambitions of the various offset policies and the NGBR Project's TOR and the EIS Guidelines. Delivery of direct offsets will be broadly achievable within the study area.

5. References

Department of Environment, Water, Heritage and the Arts (DEWHA) 2009, Matters of National Environmental Significance – Significant Impact Guidelines, retrieved July 12, 2013, from http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf

Appendices

Appendix A – EPBC Act offsets assessment guide results

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Brigalow TEC
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Brigalow TEC	**Area**	100	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	60.00	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	60.00	Adjusted hectares	200	**Risk-related time horizon (max. 20 years)**	10	**Start area (hectares)**	203	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	101.50	75%	76.13	67.57	54.05	90.09%	Yes		
									Future area without offset (adjusted hectares)	101.5	**Future area with offset (adjusted hectares)**	203.0									
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	60	54.05	90.09%	**Yes**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Natural grasslands of the Queensland
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Natural Grasslands TEC	**Area**	117	Hectares	
			Quality	**2**	Scale 0-10	
			Total quantum of impact	23.40	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	23.40	Adjusted hectares	80	**Risk-related time horizon (max. 20 years)**	10	**Start area (hectares)**	80	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	40.00	75%	30.00	26.63	21.30	91.03%	Yes		
									Future area without offset (adjusted hectares)	40.0	**Future area with offset (adjusted hectares)**	80.0									
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	23.4	21.30	91.03%	**Yes**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	SEVT TEC
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Semi-evergreen vine thicket TEC	**Area**	36	Hectares	
			Quality	**7**	Scale 0-10	
			Total quantum of impact	25.20	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	25.20	Adjusted hectares	86	**Risk-related time horizon (max. 20 years)**	10	**Start area (hectares)**	86	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	43.00	75%	32.25	28.62	22.90	90.87%	Yes		
									Future area without offset (adjusted hectares)	43.0	**Future area with offset (adjusted hectares)**	86.0									
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	25.2	22.90	90.87%	**Yes**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Australian Painted Snipe
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Australian Painted Snipe	**Area**	45.6	Hectares	
			Quality	**3**	Scale 0-10	
			Total quantum of impact	13.68	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	13.68	Adjusted hectares	47	**Time over which loss is averted (max. 20 years)**	10	**Start area (hectares)**	47	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	23.50	75%	17.63	15.64	12.51	91.48%	Yes	
									Future area without offset (adjusted hectares)	23.5	**Future area with offset (adjusted hectares)**	47.0								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	13.68	12.51	91.48%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Black-throated finch
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Black-throated finch	**Area**	2143	Hectares	
			Quality	**7**	Scale 0-10	
			Total quantum of impact	#####	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	1500.38	Adjusted hectares	5075	**Time over which loss is averted (max. 20 years)**	10	**Start area (hectares)**	5075	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	2537.50	75%	1903.13	1689.13	1351.30	90.06%	Yes	
									Future area without offset (adjusted hectares)	2537.5	**Future area with offset (adjusted hectares)**	5075.0								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	1500.38	1351.30	90.06%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Koala	**Area**	2390	Hectares	
			Quality	**7**	Scale 0-10	
			Total quantum of impact	#####	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	1673.07	Adjusted hectares	5125	**Time over which loss is averted (max. 20 years)**	10	**Start area (hectares)**	5125	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	2562.50	75%	1921.88	1883.86	1507.09	90.08%	Yes	
									Future area without offset (adjusted hectares)	2562.5	**Future area with offset (adjusted hectares)**	5125.0								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	1673.07	1507.09	90.08%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Ornamental snake
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Ornamental snake	**Area**	246.6	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	147.96	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	147.96	Adjusted hectares	453	**Time over which loss is averted (max. 20 years)**	10	**Start area (hectares)**	453	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	226.50	75%	169.88	166.51	133.21	90.03%	Yes	
									Future area without offset (adjusted hectares)	226.5	**Future area with offset (adjusted hectares)**	453.0								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	147.96	133.21	90.03%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Squatter pigeon
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Squatter pigeon	**Area**	1788	Hectares	
			Quality	**8**	Scale 0-10	
			Total quantum of impact	#####	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	1430.48	Adjusted hectares	4380	**Time over which loss is averted (max. 20 years)**	10	**Start area (hectares)**	4380	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	0%	2190.00	75%	1642.50	1610.01	1288.01	90.04%	Yes	
									Future area without offset (adjusted hectares)	2190.0	**Future area with offset (adjusted hectares)**	4380.0								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**8**	5.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	1430.48	1288.01	90.04%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	R. Coulson	N. Harwood	N. Harwood	P. Bradley	Phil Bradley	22/08/13

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