ENVIRONMENTAL OFFSET STRATEGY

PROJECT	Carmichael Coal Mine and Rail Project
PREPARED FOR	Adani Mining Pty Ltd
PREPARED BY	Biodiversity and Carbon
DATE	07 November 2012

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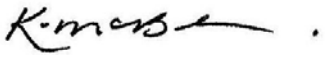
Signature:		Signature:	
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EXECUTIVE SUMMARY

Adani Mining Pty Ltd (Adani) is proposing to develop the Carmichael Coal Mine and Rail Project (the project) in the north Galilee Basin, north-west of the town of Clermont in Central Queensland. The project comprises mine and rail components. The mine component of the project straddles the boundary of the Desert Uplands and Brigalow Belt Bioregions, however, is predominantly located in the Desert Uplands Bioregion. The rail component of the project is located wholly within the Brigalow Belt Bioregion.

The project has been declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* and a 'controlled action' by the Australian Government. As a condition of project approval, offsets will be required to be delivered in accordance with Queensland and Australian Government legislation where unavoidable impacts to identified ecological values cannot be reasonably avoided or mitigated. Ecofund has prepared an Environmental Offset Strategy (the strategy) to address the offset requirements of the project. The strategy has been prepared to:

- identify the impacts of the project requiring offsets
- summarise the offset requirements of the project under relevant Queensland and Australian Government offset policies
- present the results of a preliminary assessment of the Adani owned property, Moray Downs, and describe its ability to fulfil the offset requirements of the project
- outline the results of data analysis and mapping to demonstrate the availability of compliant offset options within the Brigalow Belt and Desert Uplands Bioregions
- demonstrate that, for those biodiversity values that cannot be avoided, it is possible to provide offsets compliant with the various applicable policy requirements
- provide an overview of potential offset delivery options and a proposed method for offset delivery.

In determining the impacts of the project that are likely to trigger offset requirements, Ecofund has considered impacts associated with the proposed direct clearing of vegetation within the indicative mine onsite and offsite construction and operation footprints[1], underground mining areas and impacts associated with the construction of the project's rail component. Impacts of the mine and rail components on matters of national environmental significance (MNES) and on environmental values protected by Queensland Government legislation have been assessed. In addition, impacts on Category A areas that are subject to a compliance notice have been considered.

The impacts of the mine and rail components of the project likely to require offsets are outlined below in **Table ES1**.

[1] Including all staged vegetation clearing proposed to occur over the life of the project.

Table ES1: Impacts of the project requiring offsets

JURISDICTION	VALUE IMPACTED - MINE	VALUE IMPACTED - RAIL
Australian Government	Brigalow threatened ecological community	Brigalow threatened ecological community
	Five fauna species	Four fauna species
	One flora species	
Queensland Government	Three endangered regional ecosystems (REs)	Three endangered REs
	Five of concern REs	Five of concern REs
	9 ha of high value regrowth (HVR) containing endangered REs	One threshold regional ecosystem
	11 fauna species	9 ha of HVR containing endangered REs
	One flora species	7 ha of HVR containing of concern REs
	Watercourse vegetation	Eight fauna species
	One wetland RE and protected wetlands or trigger areas of high ecological significance	One flora species
	Connectivity	Watercourse vegetation
		Connectivity

The Queensland and Australian Government offset policies and applicability of each to the project components are:

- EPBC Act Environmental Offsets Policy, 2012 (EOP)
  - » applies to the mine and rail components of the project.
- Queensland Government Environmental Offset Policy, 2008 (QGEOP)
  - » offsets for the mine and rail components of the project will be delivered in accordance with QGEOP which sets out seven principles that must be followed when delivering offsets.
- Policy for Vegetation Management Offsets Version 3, 2011 (PVMO)
  - » applies to the rail component of the project only as clearing native vegetation for a mining activity carried out on a mining lease is exempt under the *Vegetation Management Act 1999* (VM Act) and therefore exempt from offset requirements under the PVMO.
- Queensland Biodiversity Offset Policy Version 1, 2011 (QBOP)
  - » while QBOP does not expressly apply to development that is a significant project, the Coordinator-General may use discretionary powers to require compliance with the policy as part of an approval for a significant project. The policy is expected to be applied to the mine and rail components of the project.

- Marine fish habitat offset policy (2012)
  - » applies to the mine and rail component of the project, however, assessment of available information suggests that there are no impacts on the protected values covered by this policy.

An area of 79,935 ha on Moray Downs (i.e. areas not designated for mine and rail infrastructure development) was assessed to determine its potential to partially fulfil the offset requirements of the project under the relevant offset policies. Results of this assessment indicate that Moray Downs contains significant potential to support environmental offsets.

Under the EOP, areas on Moray Downs may be suitable to provide environmental offsets for impacts of the project on:

- Brigalow threatened ecological community listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with 981 ha of potential offset area available
- all five threatened fauna species listed under the EPBC Act. Potential compliant offset areas include:
  - » 43,978 ha of potential squatter pigeon (southern) habitat
  - » 37,839 ha of potential black throated finch (southern) habitat
  - » 9,631 ha of potential ornamental snake habitat
  - » 13,634 ha of potential koala habitat
  - » 46,940 ha of potential yakka skink habitat
  - » the EPBC Act listed *Livistona lanuginosa*, with 458 ha of potential offset area available.

Under PVMO or QBOP, areas on Moray Downs may be suitable to provide environmental offsets for impacts of the project on:

- seven threatened REs listed under the VM Act. Potential compliant offset areas include:
  - » 204 ha of RE 11.3.1
  - » 67 ha of RE 11.4.8
  - » 53 ha of RE 11.4.9
  - » 634 ha of RE 11.3.3
  - » 1,228 ha of RE 11.4.5
  - » 342 ha of RE 11.4.6
  - » 2,013 ha of RE 11.4.11
- one threshold RE listed under the VM Act, with the potentially compliant offset area including 620 ha of RE 11.3.5
- HVR listed under the VM Act. Potential compliant offset areas include:
  - » 324 ha of endangered BVG 25a
  - » 2,546 ha of of concern BVGs 30b, 26a and 16c

- 12 threatened fauna species listed under the *Nature Conservation Act 1992* (NC Act). Potential compliant offset areas include:
  - 4,222 ha of potential squatter pigeon (southern) habitat
  - 3,343 ha of potential black throated finch (southern) habitat
  - 3,797 ha of potential black-necked stork habitat
  - 3,797 ha of potential cotton pygmy-goose habitat
  - 5,051 ha of potential little pied bat habitat
  - 30,784 ha of potential echidna habitat
  - 4,151 ha of potential ornamental snake habitat
  - 5,393 ha of potential yakka skink habitat
  - 4,276 ha of potential square-tailed kite habitat
  - 4,276 ha of potential black-chinned honeyeater habitat
  - 2,808 ha of potential grey falcon habitat
  - 1,382 ha of potential koala habitat
- the NC Act listed *Livistona lanuginosa*, with 31 ha of potential offset area available
- 3,397 ha of watercourse vegetation
- 1,160 ha of wetland REs and wetland protection areas
- 12,511 ha of recognised corridor vegetation.

The suitability of offset areas on Moray Downs is dependent on the results of ecological equivalence assessments and the application of offset ratios by the Australian Government. Under Queensland Government offset policies the ecological equivalence methodology is required to be applied to determine the suitability of offset areas. Under this methodology impact areas are scored and then offset areas with the same or higher score must be secured. Ecological equivalence assessments are yet to be undertaken to determine the suitability of offset areas on the Moray Downs property.

Ecofund has also assessed the availability of potential offsets in the broader landscape to determine the ability to acquit the offset requirements of the mine and rail components of the project. This assessment involved a desktop review of all compliant offset areas within the Brigalow Belt and Desert Uplands Bioregions.

For mine related impacts, there is sufficient availability of potential offset areas to fulfil Australian Government offset requirements. There is also sufficient availability of potential offset areas to fulfil the Queensland Government offset requirements for the majority of environmental values relating to the mine. For RE 10.7.4, listed as of concern under the VM Act, there are only 41 ha of potential offset areas mapped within the Desert Uplands Bioregion. Given the impact on this RE is estimated to be 88 ha, field surveys will be undertaken to identify additional offset availability in the landscape. For eight values impacted by the mine it is likely that direct offset

delivery will require the securing of offsets across multiple lots to fulfil Queensland Government offset requirements.

For rail-related impact values, there is sufficient area available to provide compliant direct offsets for all impact values i.e. for all values there is hundreds of times the area impacted available. In addition, for all values impacted there are at least 50 lots that contain compliant offset areas that are equal to or greater than the corresponding impact of the rail on that value. Therefore, for all rail-related impacts there is sufficient potential to provide offsets within the Brigalow Belt Bioregion.

On approval of this strategy, an Environmental Offset Package (the package) will be developed to present the proposed solutions to fulfilling the offset requirements of the project based on Queensland and Australian Government legislation and offset policies in place at the time that the package is prepared. The package is likely to include a combination of direct and indirect offsets (or compensatory measures), offset payments and offset transfers and is anticipated to be completed in early 2013.

As a priority Adani will utilise direct offset options available on Moray Downs. For additional direct offsets, Adani will assess areas recognised as possessing 'high conservation value' within the Galilee Basin Offset Strategy prepared by the Queensland Government. Priority areas will be assessed for their ability to acquit the offset requirements of the project for both Queensland and Australian Government requirements.

To supplement direct offsets, indirect offsets in the form of research activities and/or the implementation of financial contributions towards research and education programs will be explored. This will be particularly pertinent where such initiatives can compliment other environmental management initiatives, such as species specific management plans proposed for the project. Offset payments and offset transfers will be considered as potential options to form part of the offset package where direct and indirect offsets are not achievable/preferable.

Once approved, the package will be implemented. It is proposed that the offsets for the project will be delivered in three stages to reflect the construction and operational cycles of the rail and mine and to align with the incremental nature of the project. The indicative stages of offset delivery are:

- Stage 1 – 2013 – 2027
- Stage 2 – 2028 – 2047
- Stage 3 – 2048 - 2110

It is expected that offsets for the project will be delivered in accordance with the tasks and timeframes set out in **Table ES2**. However, these tasks and estimated timeframes are subject to change due to a number of variables, including but not limited to, regulatory approval, regulatory requirements, landholder negotiation, unforeseen weather and other unexpected delays.

Table ES2: Staged offset delivery

STAGE	TASK	ESTIMATED TIMEFRAME
Pre-delivery	Submission of the Environmental Offset Strategy	Q4 2012
	In principle support of the Environmental Offset Strategy received from regulators	Q4 2012
	Submission of the Environmental Offset Package	Q2 2013
	In principle support of the Environmental Offset Package received from regulators	Q3 2013
1	If applicable, the provision of offset payments to the Balance the Earth Trust and the provision of indirect offsets.	Q4 2013
	If applicable, the establishment of offset transfer arrangements for initial stage of offsets.	Q4 2013
	If required, landholder engagement and negotiation with the owners of the identified properties	Q2 to Q4 2013
	Ecological equivalence assessments of the offset sites required for the initial stage of offsets to verify that the values identified through desktop assessments are present, and that they are ecologically equivalent to the impact sites	Q2 to Q4 2013
	Development of Offset Area Management Plans for the initial stage of offsets in accordance with the requirements of the relevant offset policies	Q3 to Q4 2013
	Application of a legally binding mechanism to secure the environmental values of the offset area in perpetuity	Q4 2013
	Implementation of the Offset Area Management Plan including ongoing monitoring and reporting.	Q4 2013 ongoing
2	Submission of a Revised Environmental Offset Package to regulators for approval	2027
	Implementation of the Environmental Offset Package for Stage 2 offset requirements	2028 - ongoing
3	Submission of a Revised Environmental Offset Package to regulators for approval	2047
	Implementation of the Environmental Offset Package for Stage 3 offset requirements	2048 – ongoing

ABBREVIATIONS AND ACRONYMS

DEHP	Department of Environment and Heritage Protection (Qld)
DERM	Former Department of Environment and Resource Management (Qld)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
E	endangered
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EOP	EPBC Act Environmental Offsets Policy Consultation Draft (2011) (Cwlth)
FHOP	Marine fish habitat offset policy (2012) (Qld)
FPC	Foliage Projective Cover
GBR	Great Barrier Reef
HES	high ecological significance
HVR	high value regrowth
LC	least concern
MIA	Mine Infrastructure Area
MNES	Matters of National Environmental Significance
NC Act	*Nature Conservation Act 1992* (Qld)
NT	near threatened
The project	Carmichael Coal Mine and Rail Project
PR	performance requirement
PVMO	Policy for Vegetation Management Offset Version 3 (2011) (Qld)
QBOP	Queensland Biodiversity Offset Policy Version 1(2011) (Qld)
QGEOP	Queensland Government Environmental Offset Policy 2008

OC	of concern
RE	regional ecosystem
SEIS	Supplementary Environmental Impact Statement
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)
SLC	special least concern
TEC	threatened ecological community
TOR	Term of Reference
V	vulnerable
VM Act	*Vegetation Management Act 1999* (Qld)
WPA	Wetland Protection Areas

1 INTRODUCTION

1.1 Carmichael Coal Mine and Rail Project

Adani Mining Pty Ltd (Adani) is proposing to develop the Carmichael Coal Mine and Rail Project (the project) in the north Galilee Basin, north-west of the town of Clermont in Central Queensland. The project is located at the boundary of the Brigalow Belt and Desert Uplands Bioregions. The majority of the project is located within the Brigalow Belt Bioregion (**Figure 1**).

The project comprises two major components as outlined below.

1) Mine: the proposed mine footprint area consists of a greenfield thermal coal mine over EPC1690 and part of EPC1080, which includes approximately 44,700 ha of open cut and underground mining, onsite infrastructure and associated mine processing facilities and 1,448 ha of associated offsite infrastructure (namely an airstrip, industrial area and workers accommodation village).
2) Rail: the proposed rail footprint area consists of a 95 m wide greenfield rail and associated rail-related infrastructure corridor of approximately 189 km, additional temporary infrastructure areas (i.e. laydown areas), and construction camp areas that will be exposed to temporary disturbance during the rail construction phase.

The mine is proposed to be developed in two phases:

- Mine construction, involving development of the Mine Infrastructure Area (MIA), and off-site infrastructure.
- Mine operation, involving development of open cut areas and underground mining areas; and over burden disposal areas (out of pit waste dumping) and water management dams. It is proposed that the mine development will be staged over a 90 year period.

1.2 Approval process

On 26 November 2010 the project was declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). As such, an Environmental Impact Statement (EIS) is required pursuant to section 26(1)(a) of the SDPWO Act. The project was declared a 'controlled action' on 6 January 2011 by the then Australian Government Minister for the Environment, Water, Heritage and the Arts, due to likely potential impacts on Matters of National Environmental Significance (MNES). The project therefore requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the controlling provisions are:

- sections 12 and 15A (World Heritage properties)
- sections 15B and 15C (National Heritage places)
- sections 16 and 17 B (Wetlands – Ramsar)
- sections 18 and 18A (listed threatened species and communities)

- sections 20 and 20A (listed migratory species)
- Great Barrier Reef (GBR) Marine Park (sections 24B and 24C).

The project is currently being assessed under a bilateral agreement between the Queensland and Australian Government.

1.3 Environmental offsets

As a condition of project approval, offsets will be required to be delivered in accordance with Queensland and Australian Government offset policies where unavoidable impacts to identified ecological values cannot be reasonably avoided or mitigated. Ecofund has prepared an Environmental Offset Strategy (the strategy) to address the offset requirements of the project. The strategy has been prepared to:

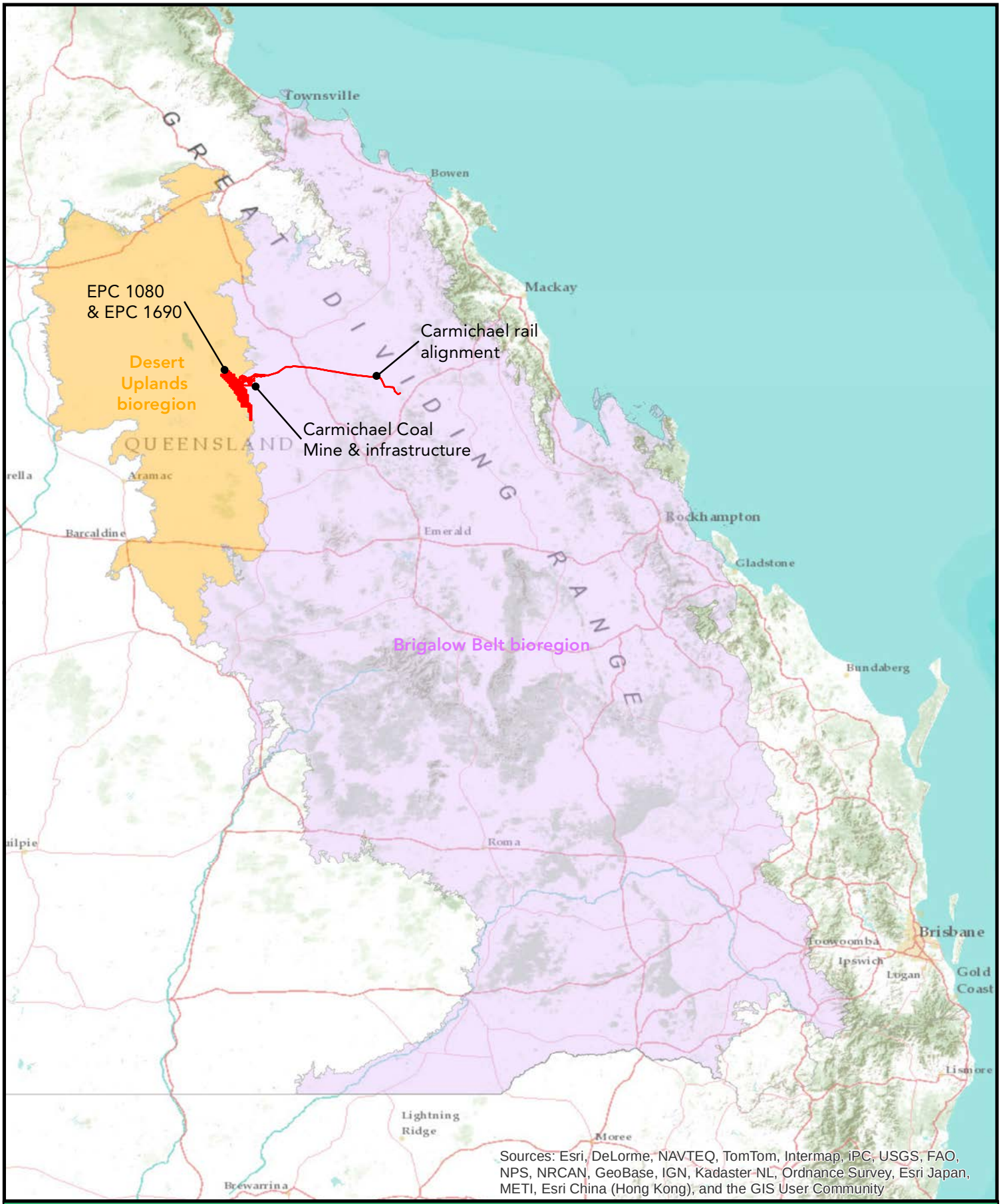
- identify the impacts of the project requiring offsets
- summarise the offset requirements of the project under relevant Queensland and Australian Government offset policies
- present the results of a preliminary assessment of the Adani owned property, Moray Downs, and describe its ability to fulfil the offset requirements of the project
- outline the results of data analysis and mapping undertaken to demonstrate the availability of compliant offset options within the Brigalow Belt and Desert Uplands Bioregions
- demonstrate that, for those biodiversity values that cannot be avoided, it is possible to provide offsets compliant with the various applicable policy requirements
- provide an overview of potential offset delivery options and a proposed method for offset delivery.

On approval of this strategy, an Environmental Offset Package (the package) will be prepared to outline the proposed solutions to fulfilling the offset requirements of the project based on legislation and offset policies in place at the time that the package is developed. The package is likely to include a combination of direct and indirect offsets (or compensatory measures), offset payments and offset transfers and is anticipated to be completed in early 2013.

As a priority Adani proposes to utilise direct offset options available on Moray Downs. For additional direct offsets, Adani will assess areas recognised as possessing 'high conservation value' within the Galilee Basin Offset Strategy prepared by the Queensland Government. To supplement direct offsets, indirect offsets in the form of research activities and/or the implementation of financial contributions towards research and education programs will be explored. Offset payments and offset transfers may be considered as potential options to form part of the offset package where applicable.

Once the package is endorsed by the Queensland and Australian Governments, the package is proposed to be implemented in a staged[2] approach to correspond with the sequential development of coal extraction over the life of the mine. The first stage of offset delivery is expected to commence in mid 2013. Stage 2 and Stage 3 offset implementation is expected to commence in 2028 and 2048 respectively. The details of offset delivery including the delivery method and an overview of the Environmental Offset Package are provided in **Section 7** of this strategy.

[2] For detailed activities of each stage please refer to Section 7.2.



Adani Mining Pty Ltd - Carmichael Coal Mine and Rail Project

LOCATION DIAGRAM

Figure 1: Carmichael Coal Mine Context

- Mine and rail infrastructure exclusion areas
- Brigalow Belt
- Desert Uplands

DATA SOURCE:

Biogeogeographic Regions - Queensland (2010) © State of Qld (Department of Environment and Resource Management) 2012
Exclusion areas provided by Adani Mining Pty Ltd 07/08/2012
- 20120806_LUMP_Infrastructure_Buffer_200m_region,
- 20120626_Rail_revision_centreline_polyline_50m_buffer,
- EPC1080_20120130_GDA94_MGAz55,
- epc1690_GDA94_MGAz55

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2 METHODS

2.1 Environmental impacts

In determining the environmental impacts of the project requiring offsets, Ecofund has considered impacts from the construction and operation phases of the project's mine and rail components, including all staged vegetation clearing and underground mining proposed to occur within the indicative mining (operation) footprint[3] over the life of the project. The impact data included in this report[4] has been sourced from the draft EIS prepared for the project by GHD (2012) or from data received by Ecofund from GHD following a request for information. The EIS used a combination of desktop assessments and field studies, which were conducted over the mine and rail study areas to obtain ecological information relevant to the project and to ground truth results from desktop assessments. EIS chapters utilised to obtain impact data include:

- Volume 1, Section 11, Matters of National Environmental Significance which investigated both the mine and rail study areas.
- Volume 2, Section 5, Nature Conservation which investigates the mine construction impacts within the MIA, airport and mine village areas; and mine operation impacts associated with open cut and underground mining areas, over burden disposal areas and water management dams.
- Volume 3, Section 5, Nature Conservation which investigates the impacts associated with development of a 95 m wide rail infrastructure corridor connecting the mine to the existing Goonyella rail system and additional temporary infrastructure (i.e. laydown) and construction camp areas.

In assessing potential impacts on threatened species, Ecofund only considered those species that were confirmed during field surveys or deemed 'likely to occur' (species that have been previously recorded in the region and have suitable habitat present within the study area) by GHD's likelihood of occurrence assessment. Ecofund did not consider species identified as 'may occur'[5] and species identified as 'unlikely to occur'[6].

2.2 Offset requirements

Ecofund has estimated the offset requirements of the project based on a review of the following polices and their applicability to the mine and rail components of the project:

- EPBC Act Environmental Offsets Policy, 2012 (EOP)
- Policy for Vegetation Management Offsets Version 3, 2011 (PVMO)
- Queensland Biodiversity Offset Policy Version 1, 2011 (QBOP)

[3] Based upon digitization of the preliminary mine plan (as at December 2011).
[4] With the exception of watercourse stream order impacts, which were provided by GHD.
[5] Species not recorded in the region (desktop searches) although species' distribution incorporates study area and potentially suitable habitat occurs at the study area.
[6] Species not recorded in the region (no records from desktop searches) and/or current known distribution does not encompass study area and/or suitable habitat is generally lacking from the study area.

- Marine fish habitat offset policy, 2012 (FHOP)

Ecofund has also considered the principles of the Queensland Government Environmental Offsets Policy 2008 (QGEOP) in the development of the strategy.

2.3 Study areas

Ecofund's offset availability analysis considered the potential for the Adani owned Moray Downs property to provide offsets. This assessment excluded the entire EPC1690 and eastern portion of EPC1080 and all off-site infrastructure footprints, as provided by Adani.

A broader offset availability analysis was also undertaken based on two study areas as the project is located across two different bioregions (as defined by the Bioregional Map of Queensland Version 3). For rail-related impact values, Ecofund assessed the potential offset availability within the Brigalow Belt Bioregion. For mine-related impact values, Ecofund assessed the potential offset availability within the Desert Uplands and Brigalow Belt Bioregions.

2.4 Direct offset availability

Ecofund has estimated the potential offset areas available for each offset requirement based on a desktop assessment. Offset requirements for each impact value were determined based on the relevant criteria outlined in the EOP, PVMO and QBOP. The results of the assessment are presented in terms of hectares of 'potential offset areas with Foliage Projective Cover 2010 (FPC; DERM 2012) ≥6%' that are available within the study areas. Statistics summarising the total number of lots that contain potential offset areas and the number of lots that contain potential offset areas ≥ the impact area [7] are also provided.

Potential offset areas have been identified where all of the following apply:

- Lot size is greater than 2 ha[8].
- Lot tenure is lands lease, leasehold or freehold – using the Queensland Digital Cadastral Database; DERM, updated 25 September 2011.
- Potential offset areas under Queensland Government offset policies are mapped as non-remnant, compliant high value regrowth vegetation (HVR)[9] or category X on a property map of assessable vegetation.
- Potential offset areas under Australian Government offset policies consist of remnant, HVR and/or non-remnant vegetation.
- Mapped with FPC ≥6% (note this data was not applied to grassland regional ecosystems (REs)).

[7] Note that the offset requirement may be larger than the impact area, however this can only be determined by on-ground ecological equivalence assessments and/or approval conditions.
[8] Note that the statistics provided are based on lot on plans (rather than properties which may consist of more than one lot).
[9] Potential offset areas exclude non-compliant HVR, i.e. HVR that is an endangered RE on freehold or indigenous land, an endangered or of concern RE on leasehold land (agriculture and grazing), essential regrowth habitat or wetland protection areas.

- Contain suitable mapped environmental values as per the relevant policy criteria (see below).

Potential offset areas exclude:

- lots mapped as Queensland Estate and other lands including protected areas of Queensland (DERM 2012) and strategic cropping trigger areas (DERM 2011)
- parts of lots that contain mining leases (Department of Employment, Economic Development and Innovation, current as of August 2012)
- parts of lots declared as nature refuges (DERM 2012)
- lots which contain potential offset areas (for a given environmental value) smaller than 1 ha.

2.4.1 Threatened fauna and flora

Potential offsets for impacts to threatened fauna and flora have been estimated using REs listed in the relevant essential habitat database record (version 3.1, DEHP 2011) in the relevant bioregion or based on habitat information from species descriptions.

2.4.2 Threatened ecological communities

Potential offset availability for impacts to threatened ecological communities were estimated using the REs referred to in the Commonwealth listing advice.

2.4.3 Threatened regional ecosystems and high value regrowth

For impacts to endangered and of concern HVR, non-remnant and compliant HVR REs with the same broad vegetation group (BVG) and *Vegetation Management Act 1999* (VM Act) class (or higher) as the impacted RE were used for estimating potential offsets.

For impacts to endangered and of concern REs the impacted regional ecosystem was used to estimate potential offsets.

2.4.4 Wetlands and wetland protection areas

Potential offset areas for impacts to wetlands have been estimated based on REs in the relevant bioregion which are listed as associated with a wetland in the regional ecosystem description database.

Potential offset areas for impacts to wetland protection areas (WPA) have been estimated based on the area of high ecological significance (HES) wetlands in the relevant bioregion. Note that on-ground verification is required to assess risk from degrading processes and ability to improve wetland function through management.

2.4.5 Watercourse vegetation and connectivity

The potential offset availability for watercourse vegetation was determined by identifying REs on landzone 3 (Quaternary alluvial systems) as these REs are by definition associated with river and creek flats.

The potential offset availability for connectivity was determined by calculating potential offset areas within the Biodiversity Planning Assessment State and Regional corridor mapping within the study area.

2.5 Limitations

2.5.1 Impacts and offset requirements

As Ecofund was reliant on project impact data presented in the EIS, this report inherits the EIS data limitations. All calculations presented in the EIS are approximate and indicative only. The rail impacts presented in this report consider the development of a 95 m wide rail infrastructure corridor connecting the mine to existing rail infrastructure near Moranbah.

A precautionary approach was applied to attribute species likelihood of occurrence and therefore, for some species, a larger area may have been estimated than is likely present on the ground. Further field work will be required to confirm the occurrence or not of individual species and suitability of potential habitat. The results of the flora and vegetation surveys indicated some inaccuracies in the mapped REs. However, due to field survey limitations, a full comprehensive assessment of RE mapping inaccuracies was not obtainable.

Ecofund has recommended an approach to offset delivery based on the offset requirements identified in this report. Further refinement of project impacts will change the project's offset requirements and potentially alter the recommended approach to offset delivery.

2.5.2 Offset availability assessment

The following limitations apply to the potential offset areas identified in this report:

- This is a desktop assessment only. The offset potential of the identified areas is subject to on-ground verification of environmental values.

- Landowners who own or lease lots containing the identified potential offset areas may not be interested in using parts of their land as an environmental offset.

- Potential offset areas may include areas which have conflicting land uses, such as agriculture, mining interests not on mining lease title, local government recreational parks or conservation areas, large urban blocks, state owned freehold land which is not a protected area and lots covered by existing development application approvals.

- Some areas may include non-compliant HVR vegetation which is on a slope greater than 12% (non-compliant for requirements under PVMO only) or within a stream protection zone.

- Some areas may not meet the PVMO and QBOP requirement to be greater than 10 ha or connected to existing remnant vegetation that is in total greater than 10 ha.

- Some areas may be cleared and therefore may not meet the PVMO and QBOP requirement of containing functional REs. Other areas may be partially cleared and require extensive revegetation. However, this has been minimised by integrating the FPC ≥6% criterion.

- For Queensland Government requirements, ecological equivalence assessments will need to be undertaken to determine the suitability of the offset and the size of the offset required for each impact.

3 IMPACTS OF THE MINE REQUIRING OFFSETS

3.1 Matters of National Environmental Significance

The following section outlines all MNES (as recognised by the EPBC Act) that are expected to be impacted by construction and operation of the project's mine component, including impacts from both direct clearing and subsidence. The EIS (GHD 2012: Volume 1, Section 11.2.3) states that the mine is not expected to have significant impacts on:

- World Heritage properties
- National Heritage places
- wetlands of international importance (Ramsar wetlands)
- the Commonwealth marine environment
- the Great Barrier Reef (GBR) Marine Park
- listed migratory species.

Three EPBC Act listed migratory birds were confirmed present during field surveys in the mine footprint area and an additional 11 are considered likely to occur (GHD 2012: Volume 1, Section 11.6.1.2). However, these species are common and widespread, and therefore the mine project area is not considered to support 'important habitat', as defined in the Significant Impact Guidelines (DEWHA 2009), for any migratory species (GHD 2012: Volume 4, Section 3.2.6). As such, mine related impacts on EPBC Act listed migratory birds have not been considered.

3.1.1 Threatened ecological communities

Field surveys confirmed the presence of one threatened ecological community (TEC) within the mine construction and operation footprint (GHD 2012: Volume 1, Section 11.4.1.3) (**Table 1**).

Table 1: Mine impacts on EPBC Act listed threatened ecological communities-

VEGETATION TYPE	EPBC ACT STATUS	PRESENCE	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
Brigalow (*Acacia harpophylla* dominant and co-dominant)[10]	E[11]	Confirmed	195	0	1

[10] Of the REs listed as forming part of the Brigalow TEC, only the REs 11.3.1, 11.4.8 and 11.4.9 occur (GHD 2012: Volume 1, Section 11.4.1.3).
[11] Endangered

3.1.2 Threatened fauna

Three EPBC Act listed threatened fauna species were confirmed present during field surveys and an additional two are considered likely to occur (GHD 2012: Volume 2, section 5.2.2.1) (**Table 2**).

Table 2: Mine impacts on EPBC Act threatened fauna species

SPECIES	EPBC ACT STATUS	PRESENCE	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
Geophaps scripta scripta (squatter pigeon (southern))	V[12]	Confirmed	12,414	6,929	6
Poephila cincta cincta (black throated finch (southern))	E	Confirmed	11,443	6,700	6
Phascolarctos cinereus (koala)	V	Confirmed	10,633	4,723	6
Denisonia maculata (ornamental snake)	V	Likely	1,368	159	27
Egernia rugosa (yakka skink)	V	Likely	12,306	6,126	33

3.1.3 Threatened flora

While the desktop assessment and project terms of reference (TOR) identified 11 EPBC Act listed threatened flora species as having the potential to occur within the mine footprint area, only one was confirmed present during field surveys and none are considered likely to occur (GHD 2012: Volume 2, Section 5.4.3.3) (**Table 3**).

Table 3: Mine impacts on EPBC Act threatened flora species

SPECIES	EPBC ACT STATUS	PRESENCE	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
Livistona lanuginosa	V	Confirmed	17	2	-

[12] Vulnerable

3.2 Queensland Government values

The following section outlines the residual impacts on all State values that are expected as a result of the construction and operation of the project's mine component and are required to be offset. This includes impacts from both direct clearing and subsidence.

In addition to the values listed below, the following 11 migratory birds are considered likely to occur in the mine study area (GHD 2012: Section 11.6.1.2) and are listed as special least concern (SLC) species under the *Nature Conservation Act 1992* (NC Act): common sandpiper (*Actitis hypoleucos*), fork-tailed swift (*Apus pacificus*), curlew sandpiper (*Calidris ferruginea*), latham's snipe (*Gallinago hardwickii*), white-bellied sea eagle (*Haliaeetus leucogaster*), white-throated needletail (*Hirundapus caudacutus*), caspian tern (*Hydroprogne caspia*), black-tailed godwit (*Limosa limosa*), glossy ibis (*Plegadis falcinellus*), common greenshank (*Tringa nebularia*) and marsh sandpiper (*Tringa stagnatilis*). Offsets for impacts on these species will not be considered until further ground truthing confirms their presence and habitat extent. As such, mine related impacts on these NC Act listed migratory birds are not discussed further.

3.2.1 Endangered and of concern regional ecosystems

The majority of the land to be affected during the mine construction phase consists of non-remnant vegetation (GHD 2012: Volume 1, Section and 11.5.1.4 Section 5.3.2.2). The proposed mining operation footprint will require the direct clearing[13] of non-remnant and remnant vegetation (GHD 2012: Volume 2, section 5.4.3.3). Underground mining activities are also likely to affect the structure and condition of remnant vegetation over time. The majority of the remnant vegetation proposed to be disturbed during the mine operation phase is mapped as least concern REs (GHD 2012: Volume 2, section 5.4.3.2). **Table 4** provides a summary of impacts on endangered and of concern REs associated with proposed mine construction and operation phases.

3.2.2 Category A areas

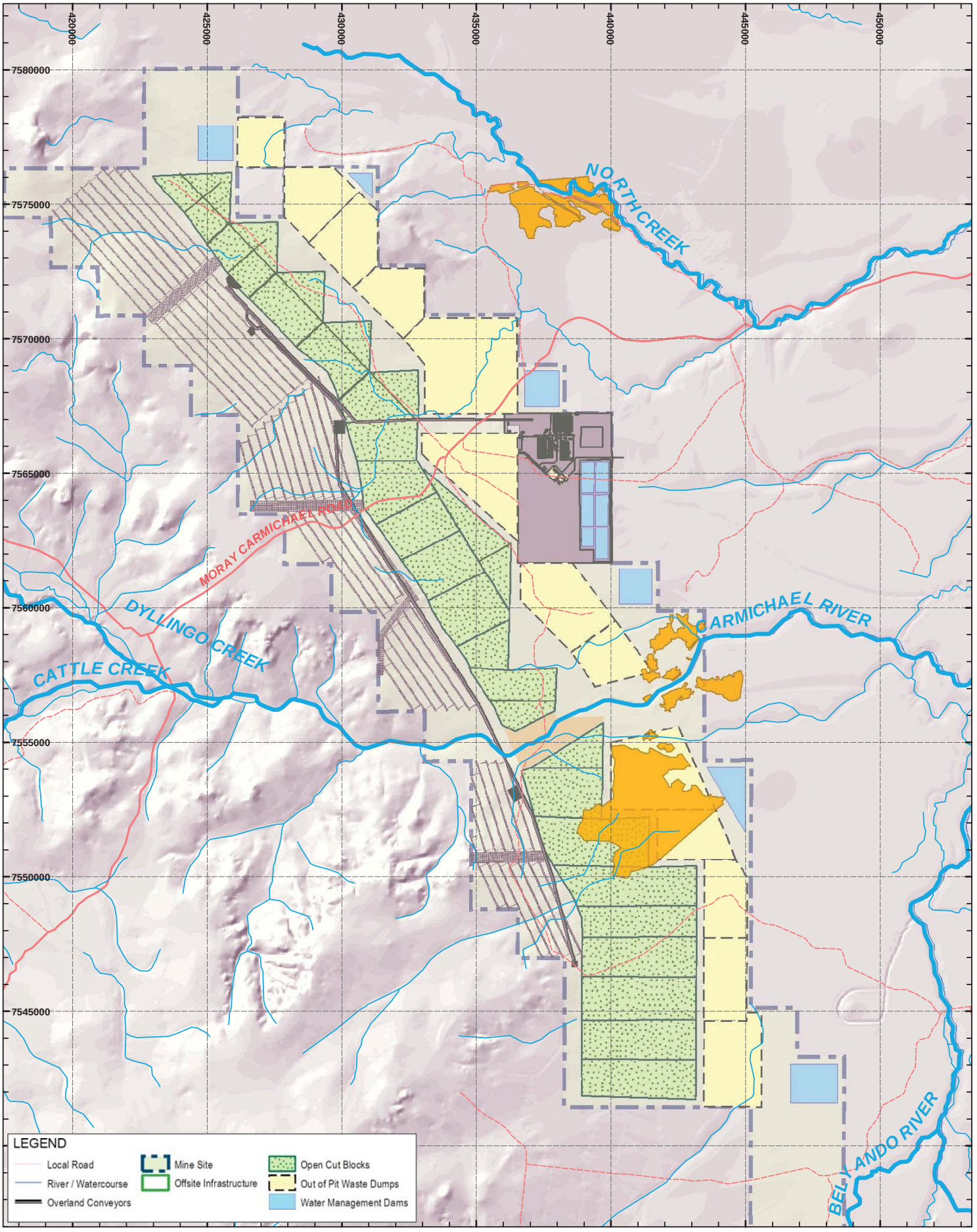
As a result of illegal land clearing by the previous landholders there are Category A areas mapped within the mine construction and operation footprint (**Figure 2**). These areas are subject to a compliance notice. In accordance with the compliance notice, vegetation within the Category A areas is to be restored until it achieves remnant status or until 2044. To compensate for impacts on Category A areas Adani proposes to offset the endangered and of concern vegetation that existed within these areas prior to the illegal clearing event. Ecofund has determined impact extents in Category A areas based on an assessment of pre-clear RE mapping. These impacts are outlined in **Table 4**. As an alternative to offsetting the Category A areas, the compliance notice could be applied to another location within the mining lease, outside of the mine construction and operation footprint.

[13] Including clearing within the Bygana West Nature Refuge.

Table 4: Mine impacts on endangered and of concern REs

RE	DESCRIPTION	VM ACT CLASS	BVG[14]	ONSITE CLEARING AREA (HA)	CATEGORY A AREAS (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)	SUB-TOTAL (HA)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	E	25a	46	21	-	1	68
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	E	25a	1	18	-	-	19
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	E	25a	149	-	-	1	150
10.7.4	*Eucalyptus decorticans* and/or *Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius* on lateritic duricrust	OC[15]	12a	21	-	67	-	88
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	OC	16c	14	34	-	-	48
11.4.5	*Acacia argyrodendron woodland on Cainozoic clay plains*	OC	26a	-	13	-	6	19
11.4.6	*Acacia cambagei* woodland on Cainozoic clay plains	OC	26a	134	218	-	-	352
11.4.11	*Dichanthium sericeum, Astrebla spp. and patchy Acacia harpophylla, Eucalyptus coolabah on Cainozoic clay plains*	OC	30b	-	-	-	53	53
TOTAL				**365**	**304**	**67**	**61**	**797**

[14] Broad vegetation group
[15] Of concern



Carmichael Mine Development

Figure 2: Category A areas (Restoration Areas)

0 1 2 3 4 5

Kilometers

N W E S

Legend

Category A Restoration Areas

adani

Mine Plan Restoration Areas (Illustrative)

Drawn By: Chris Schlebusch

Checked by:

Date: 2012-11-06

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Path: G:\Plans\Project Specific\Carmichael\2012\ESRI\2012-11-06\EPC1690 Carmichael Coal Mine Project Mine Plan with Restoration Area A3.mxd

3.2.3 High value regrowth

A total of approximately 9 ha of regulated HVR vegetation is predicted to be impacted during mine construction and operation (GHD 2012). Most impacts are on of concern HVR occurring in the offsite clearing area (**Table 5**).

Table 5: Mine impacts on endangered and of concern HVR

RE	BVG	VM ACT CLASS	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
11.3.1 11.4.8 11.4.9	25a	E	-	-	1
11.4.11	30b	OC	-	-	3
11.4.5 11.4.6	26a	OC	-	-	3
11.3.3	16c	OC	-	-	2
Total			**-**	**-**	**9**

3.2.4 Threatened fauna

Seven NC Act listed threatened fauna species were confirmed present within the mine footprint area (GHD 2012: Volume 2, Section 5.2.4.2). An additional four threatened fauna species are considered likely to occur (GHD 2012: Volume 2, Section 5.2.2.2) (**Table 6**).

Table 6: Mine impacts on NC Act threatened fauna species

SPECIES	NC ACT STATUS	PRESENCE	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
Squatter pigeon (southern)	V	Confirmed	12,414	6,929	6
Black throated finch (southern)	E	Confirmed	11,443	6,700	6
Ephippiorhynchus asiaticus (black-necked stork)	NT[16]	Confirmed	51	-	-
Nettapus coromandelianus (cotton pygmy-goose)	NT	Confirmed	51	-	-
Chalinolobus picatus (little pied bat)	NT	Confirmed	12,586	7,164	33
Tachyglossus aculeatus (echidna)	SLC[17]	Confirmed	12,610	7,164	33
Koala	SLC	Confirmed	10,633	4,723	6
Ornamental snake	V	Likely	1,368	159	27
Yakka skink	V	Likely	12,306	6,126	33
Lophoictinia isura (square-tailed kite)	NT	Likely	10,633	4,723	6
Melithreptus gularis (black-chinned honeyeater)	NT	Likely	10,633	4,723	6

[16] Near threatened
[17] Special least concern

3.2.5 Threatened flora

Of the 11 NC Act listed threatened flora species considered as having potential to occur within the mine footprint area, only 1 was confirmed present during field surveys and none are considered likely to occur (GHD 2012: Volume 2, section 5.2.2.1) (**Table 7**).

Table 7: Mine impacts on NC Act threatened flora species

SPECIES	NC ACT STATUS	PRESENCE	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
Livistona lanuginose	V	Confirmed	17	2	-

3.2.6 Essential habitat

No essential habitat is mapped within the mine footprint area (GHD 2012: Volume 2, Section 5.2.2.2).

3.2.7 Watercourses

It is estimated that the construction and operation of the mine will impact on approximately 658 ha of remnant watercourse vegetation (**Table 8**). The majority of impacts are associated with stream order 1 and 2 watercourses. A full breakdown of impacts on REs is provided in **Appendix A**. All watercourse vegetation associated with watercourses with a stream order of 5 or greater will be retained and will not be impacted by clearing.

Table 8: Mine impacts on remnant watercourse vegetation

STREAM ORDER	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
1 and 2	254	324	1
3 and 4	79	-	-
5 or greater	-	-	-
Total	**333**	**324**	**1**

3.2.8 Wetlands

There are approximately 33 ha of RE 11.3.27 within the mine footprint area. RE 11.3.27 is classified as a 'Wetland Regional Ecosystem' under the VM Act, therefore the area of land occupied by this RE is classified as a wetland under the VM Act. Approximately 18 ha of RE 11.3.27 will be impacted by vegetation clearing during the mine operation phase.

Three GBR WPA are mapped in the mine footprint area, totalling approximately 23 ha. However, ground truthing of the vegetation communities in the three WPAs did not confirm the presence of RE 11.3.27 (a necessary ecosystem feature) and in some cases no remnant vegetation was detected (GHD 2012: Volume 2, Section 5.2.2.2). Based on ground truthing, mine construction is expected to impact on no GBR WPA and 5 ha of non-remnant WPA trigger areas. Mine operation is expected to impact on approximately 8 ha of non-remnant GBR WPA and 146 ha of non-remnant WPA trigger areas.

Table 9 summarises wetland impacts associated with the proposed mine construction and operation. No significant wetlands are expected to be impacted.

Table 9: Mine impacts on wetlands

WETLAND TYPE	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
Wetland RE recognised under the VM Act (RE 11.3.27)	18	-	-
Wetland Protection Areas[18]	159[19]	-	-
Significant wetlands	-	-	-

3.2.9 Connectivity

The project EIS indicates that mine operations may reduce the ability for fauna to disperse across the landscape. It has been determined that clearing of 12,367 ha of vegetation will impact on connectivity (**Table 10**).

Table 10: Mine impacts on connectivity

VALUE	ONSITE CLEARING AREA (HA)	SUBSIDENCE AREA (HA)	OFFSITE CLEARING AREA (HA)
Connectivity	8,937	3,421	9

[18]Protected wetlands of high ecological significance in GBR catchments.
[19] Including 151 ha of impacts of non-remnant WPA trigger areas.

4 IMPACTS OF THE RAIL REQUIRING OFFSETS

4.1 Matters of National Environmental Significance

The following section outlines all MNES (as recognised by the EPBC Act) that are predicted to be impacted by construction of the project's rail component. The EIS (GHD 2012: Volume 1, Section 11.2.3) states that the rail is not expected to have significant impacts on:

- World Heritage properties
- National Heritage places
- wetlands of international importance (Ramsar wetlands)
- the Commonwealth marine environment
- the GBR Marine Park
- listed migratory species.

Two EPBC Act listed migratory birds were confirmed present during field surveys in the rail footprint area and an additional two are considered likely to occur (GHD 2012: Volume 1, Section 11.6.2.2). However, these species are common and widespread, and therefore the project rail footprint is not considered to support 'important habitat', as defined in the Significant Impact Guidelines (DEWHA 2009), for any migratory species (GHD 2012: Volume 1, Section 11.6.1.2). As such, rail related impacts on EPBC Act listed migratory birds have not been considered.

4.1.1 Threatened ecological communities

One TEC listed under the EPBC Act was identified during field surveys in the rail footprint area (GHD 2012: Volume 3, Section 5.2.2.1 and Section 5.3.1.2) (**Table 11**).

An additional two TECs, Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin and Semi-evergreen Vine Thickets of the Brigalow Belt (North and South) and Nandewar Bioregions, have been identified from the proposed quarry and borrow areas footprint. However areas of impact have not yet been determined (GHD 2012). As such, potential offset obligations regarding these values are not discussed further.

Table 11: Rail impacts on EPBC Act listed threatened ecological communities

VEGETATION TYPE	EPBC ACT STATUS	PRESENCE	IMPACT AREA (HA)
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	Confirmed	38

4.1.2 Threatened fauna

One EPBC Act listed threatened fauna species was confirmed present during field surveys in the rail footprint area and an additional three are considered likely to occur (GHD 2012: Volume 3, Section 5.2.2.1) (**Table 12**).

Table 12: Rail impacts on EPBC Act threatened fauna species

SPECIES	EPBC ACT STATUS	PRESENCE	IMPACT AREA (HA)
Squatter pigeon (southern)	V	Confirmed	146
Ornamental snake	V	Likely	230
Black-throated finch (southern)	E	Likely	65
Koala	V	Likely	143

4.1.3 Threatened flora

While the desktop assessment and project TOR identified eight EPBC Act listed threatened flora species as having the potential to occur within the rail footprint area, none were confirmed present during field surveys and none are considered likely to occur (GHD 2012: Volume 3, Section 5.2.2.1and Section 5.2.3.5).

4.2 Queensland Government values

The following section outlines the residual impacts on all State values that are expected to occur as a result of the construction and operation of the project's rail component and are required to be offset.

In addition to the values listed below, there is one EPBC Act listed migratory bird, the white-bellied sea eagle (*Haliaeetus leucogaster*), that is considered likely to occur in the rail study area (GHD 2012: Section 11.6.1.2) and is listed as SLC under the NC Act. Offsets for impacts on this species will not be considered until further ground truthing confirms the species' presence and habitat extent. As such, rail related impacts on this NC Act listed migratory bird are not discussed further.

4.2.1 Endangered and of concern regional ecosystems

As the proposed project rail corridor passes through a predominantly cleared, pastoral landscape, the majority of the land likely to be affected during the rail construction phase is non-remnant. However, the proposed project rail corridor also passes through remnant vegetation. **Table 13** provides a summary of impacts on endangered and of concern REs associated with the proposed project rail.

Table 13: Rail impacts on endangered and of concern REs

RE	DESCRIPTION	VM ACT CLASS	BVG	IMPACT AREA (HA)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	E	25a	11
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	E	25a	3
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	E	25a	24
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	OC	16c	47
11.4.5	*Acacia argyrodendron* woodland on Cainozoic clay plains	OC	26a	4
11.4.6	*Acacia cambagei* woodland on Cainozoic clay plains	OC	26a	21
11.4.11	*Dichanthium sericeum, Astrebla spp.* and patchy *Acacia harpophylla, Eucalyptus coolabah* on Cainozoic clay plains	OC	30b	128
11.9.10	*Acacia harpophylla, Eucalyptus populnea* open forest on fine-grained sedimentary rocks	OC	25a	1
Total				**239**

4.2.2 Threshold regional ecosystems

Table 14 provides a summary of impacts on threshold REs associated with the proposed rail footprint.

Table 14: Rail impacts on threshold REs

RE	DESCRIPTION	VM ACT CLASS	BVG	IMPACT AREA (HA)
11.3.5	*Acacia cambagei* woodland on alluvial plains	Least concern	26a	20

4.2.3 High value regrowth

A total of approximately 16 ha of regulated HVR vegetation is proposed to be cleared during the rail construction phase of the project (GHD 2012: Volume 3, Section 5.3.1.2) (**Table 15**).

Table 15: Rail impacts on endangered and of concern HVR

RE	BVG	VM ACT CLASS	IMPACT AREA (HA)
11.3.1 11.4.8 11.4.9	25a	E	9
11.3.3	16c	OC	2
11.4.6	26a	OC	4
11.4.11	30b	OC	1
Total			**16**

4.2.4 Threatened fauna

Two NC Act listed threatened fauna species were confirmed present during field surveys in the rail footprint area and an additional five are considered likely to occur (GHD 2012: Volume 3, Section 5.3.1.3) (**Table 16**).

Table 16: Rail impacts on NC Act threatened fauna species

SPECIES	NC ACT STATUS	PRESENCE	IMPACT AREA (HA)
Squatter pigeon (southern)	V	Confirmed	146
Little pied bat	NT	Confirmed	147
Ornamental snake	V	Likely	230
Black throated finch (southern)	E	Likely	65
Black-necked stork	NT	Likely	66
Falco hypoleucos (grey falcon)	NT	Likely	147
Cotton pygmy-goose	NT	Likely	66
Koala	Special LC	Likely	143

4.2.5 Threatened flora

Of the nine NC Act listed threatened flora species predicted to occur within the rail footprint area, none were confirmed present during field surveys (GHD 2012: Volume 3, Section 5.2.2.1). *Solanum adenophorum* is the only threatened flora species considered likely to occur within the rail footprint area (**Table 17**).

Table 17: Rail impacts on NC Act threatened flora species

SPECIES	NC ACT STATUS	PRESENCE	IMPACT AREA (HA)
Solanum adenophorum	E	Likely	82

4.2.6 Essential habitat

No essential habitat is mapped within the rail footprint area (GHD 2012: Volume 3, Section 5.2.2).

4.2.7 Watercourse vegetation

Impacted remnant vegetation along the rail corridor typically occurs in association with watercourses. The rail alignment will traverse 12 major waterways (of note – Belyando River, Mistake Creek, Logan Creek and Diamond Creek) and 76 minor waterways and overland flow paths (GHD 2012: Volume 3, Section 5.3.2.3). The rail alignment is expected to impact on 26 ha of watercourse vegetation (**Table 18**). A full breakdown of impacts on REs is provided in **Appendix A**.

Table 18: Rail impacts on remnant watercourse vegetation

STREAM ORDER	IMPACT AREA (HA)
1 and 2	12
3 and 4	1
5 or greater	13
Total	**26**

4.2.8 Wetlands

No WPAs, significant wetlands or wetlands recognised by the VM Act were recorded in the rail footprint area.

4.2.9 Connectivity

While the rail corridor passes through fragmented patches of vegetation in a predominantly cleared landscape, the project EIS recognises that important wildlife corridors exist throughout this area (GHD 2012: Volume 3, Section 5.4.1.1). As such, fragmentation of state significant bioregional wildlife corridors will occur as a result of vegetation clearing during the rail construction phase and the corridor will create a permanent linear barrier across the landscape for fauna movement (GHD 2012: Volume 3, Section 5.3.1.5). It has been determined that clearing of 278 ha of vegetation will impact on connectivity.

5 OFFSET REQUIREMENTS

5.1 Avoidance and mitigation

Offsets will be required to be delivered under Queensland and Australian Government legislation where unavoidable impacts to identified ecological values cannot be reasonably avoided or mitigated. In accordance with Principle 2[20] of QGEOP, offsets are required when a project has demonstrated to the regulator that all practical and reasonable efforts have been taken to avoid and minimise impacts on identified ecological values but a residual impact remains. Similarly, the Australian Government's EOP states that offsets can compensate for any residual impacts only after all reasonable avoidance and mitigation measures have been identified.

The project EIS indicates that the mine's operational requirements have been specifically designed to minimise the loss of vegetation as much as practical, particularly through the retention of remnant and non-remnant vegetation on the western half of the mine project area. However, it is recognised that in spite of the proposed avoidance and mitigation measures, ecological values will be unavoidably degraded (GHD 2012: Volume 2, Section 5.4.3.3).

The total extent of vegetation clearing, and in particular remnant vegetation, required for construction of the rail corridor has been minimised in the concept design phase of the rail project through avoidance. The project EIS states that "the Project (Rail) alignment has as far as is practicable (and in consideration of other environmental, social and technical constraints) been located in areas that have been previously cleared or degraded by both past and current land use practices" (GHD 2012: Volume 3, Section 5.3.1.1: 5-134). Despite this, unavoidable loss of ecological values will occur.

5.2 Applicable offset policies

5.2.1 Overview

The projects TOR specifies that the following specific issue offset policies should be considered by the project's EIS:

- Policy for Vegetation Management Offsets Version 2.4 (2009)
- Policy for Biodiversity Offsets Consultation Draft (2008)
- Fish Habitat Management Operational Policy 005 (2002), Mitigation and Compensation for Works or Activities Causing Marine Fish Habitat Loss.

The projects TOR also specify that 'any offset package should include offsets for the ecological values that will be lost as a result of the mine development and should be consistent with the principles of the Queensland Government Environmental Offset Policy 2008' (Coordinator-General 2011). Offsets must also be discussed with regard to impacts on MNES and reference should be

[20] Environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact.

made to the principles of the Draft Policy Statement: Use of environmental offsets under the *Environment Protection and Biodiversity Conservation Act 1999.*

Since the release of the TOR a number of Queensland and Australian Government offset policies have been superseded. The Queensland and Australian Government offset policies that may apply to the project are:

- 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 (2012)

Table 19 provides a summary of the applicability of each of the relevant offset polices to the mine and rail components of the project.

Table 19: Offset policy applicability to each project component

POLICY	APPLICABLE TO MINE	APPLICABLE TO RAIL
EOP	Yes	Yes
QGEOP	Yes	Yes
PVMO	No	Yes
QBOP	Yes	Yes
FHOP	Yes No impacts on protected matters	Yes No impacts on protected matters

5.2.2 EPBC Act Environmental Offsets Policy Consultation Draft

The EOP applies to the project due to expected impacts on MNES, namely TEC and habitat for threatened and migratory species. This action carries offset obligations to deliver an overall conservation outcome that improves or maintains the health, diversity and productivity of the environment as it relates to these matters (DSEWPaC 2011). Under the EOP a suitable offset must:

- deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action
- be built around direct offsets but may include other compensatory measures
- be in proportion to the level of statutory protection that applies to the protected matter
- be of a size and scale proportionate to the impacts on the protected matter

- effectively account for and manage the risks of the offset not succeeding
- be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude state or territory offsets)
- be efficient, effective, timely, transparent, scientifically robust and reasonable
- have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

5.2.3 Queensland Government Environmental Offset Policy 2008

Offsets for the project will be delivered in accordance with the QGEOP which sets out seven principles that must be followed when delivering offsets. These principles are:

- 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.
- Environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact.
- Offsets must achieve an equivalent or better environmental outcome
- Offsets must provide environmental values as similar as possible to those being lost
- Offset provision should minimise the time-lag between the impact and delivery of the offset
- Offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values
- Offsets must be legally secured for the duration of the offset requirement.

5.2.4 Policy for Vegetation Management Offsets Version 3

Clearing native vegetation for a mining activity carried out on a mining lease is exempt under the VM Act and therefore exempt from offset requirements under the PVMO. However, clearing remnant vegetation outside of mining leases is subject to the provisions of the VM Act and therefore clearing associated with the project rail component is subject to PVMO offset requirements.

Under the PVMO, the values that may be offset and are applicable to the rail component are determined by assessment of the project against the Performance Requirements (PR) in Part S of the Regional Vegetation Management Code for the Brigalow Belt and New England Tableland Bioregion (version 2) (the Code). The Code offers an acceptable solution for each of the PRs and where these acceptable solutions cannot be met, offsetting can be offered as an alternative solution for meeting the PRs (**Appendix B**).

The rail component meets the mandatory PR S1: Limits to Clearing of the Codes in so far as clearing is limited to the extent that is necessary for the project. However, there are nine PRs (PR S2 – PR S10) which the rail component is required to satisfy. Offsets are likely to be required in order to meet some of these criteria (**Table 20**).

Table 20: Requirements of the Vegetation Management Code and PVMO

PERFORMANCE REQUIREMENT	APPLICABLE	ACCEPTABLE SOLUTION MET[21]	OFFSET PROPOSED
PR S.2: Wetlands	No	NA	NA
PR S.3: Watercourses	Yes	No	Yes
PR S.4: Connectivity	Yes	No	Yes
PR S.5: Soil erosion	No	NA	NA
PR S.6: Salinity	No	NA	NA
PR S.7: Conserving remnant endangered and of concern regional ecosystems	Yes	No	Yes
PR S.8: Essential Habitat	No	NA	NA
PR S.9: Conservation status thresholds	Yes	No	Yes
PR S.10: Acid sulfate soils	No	NA	NA

5.2.5 Queensland Biodiversity Offset Policy Version 1

While QBOP does not expressly apply to development that is a significant project declared under section 26(1)(a) of the SDPWO Act, the Coordinator-General may use discretionary powers to require compliance with the policy as part of an approval for a significant project. The policy is expected to be applied to the project.

5.2.6 Marine fish habitat offset policy 2012

Assessment of available information suggests that there are no impacts on the protected values covered by this policy. As such, the policy does not apply and is not discussed further.

[21] NA not applicable.

5.3 Summary of offset requirements

Tables 21 and **22** outline the offset requirements for the mine and rail components of the project respectively. These tables present the proposed clearing area for each environmental value. The offset requirements for each value, in terms of the areas required to be secured, will vary depending on the Australian Government requirements and the results of ecological equivalence assessments. Therefore, offset requirements have not been presented in terms of areas to be secured. The offset requirements presented include impacts of the mine on mapped Category A areas as discussed in Section 3.2.2.

The Australian Government stipulates offset ratios as part of the conditions of project approval. However, when determining the suitability of direct offsets for threatened species and ecological communities, Adani will refer to the recently released Offsets Assessment Guide. Under Queensland Government offset policies offset ratios are not used and instead the ecological equivalence methodology applies. Under this methodology impact areas are scored and then offset areas with the same or higher score must be secured.

It is important to note that offset requirements as presented below are not cumulative as some environmental values occur within the same area. The QGEOP and EOP support the development of offset packages that meet the combined requirements of the Queensland Government offset policies and the Australian Government EOP. In delivering offsets for the project, offset values that occur within the same area will be collocated where possible. The potential for collocation for each of the offset values is indicated in **Tables 21** and **22** below. In considering this potential it is important to note that the PVMO and QBOP do not permit remnant vegetation as environmental offsets, while the EOP allows for the delivery of offsets consisting of remnant vegetation.

Table 21: Summary of offset requirements for the project mine component

ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	STATUS	PROPOSED IMPACT AREA[22] (HA)	RELEVANT OFFSET POLICY	POTENTIAL FOR OFFSET COLLOCATION
Australian Government offset requirements					
Threatened Ecological Communities listed under the EPBC Act	Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	196	EOP	Threatened species habitat, RE 11.3.1, RE11.4.9 and connectivity.
Threatened fauna listed under the EPBC Act	Squatter pigeon (southern)	V	19,349	EOP	State offsets requirements for this species, RE 11.3.1, RE 11.4.8, RE 11.3.3., RE 11.4.5, watercourses and connectivity.
	Black throated finch (southern)	E	18,149	EOP	State offsets requirements for this species, RE 11.3.1, RE 11.3.3, RE 11.4.5, RE 11.4.8, RE 11.4.5, RE 11.3.5, RE 11.9.10 and connectivity.
	Koala	V	15,362	EOP	RE 11.3.3, watercourses and connectivity.
	Ornamental snake	V	1,554	EOP	State offsets requirements for this species, RE 11.3.1, RE 11.4.8, RE 11.4.9, RE 11.3.3 and connectivity.
	Yakka skink	V	18,465	EOP	State offsets requirements for this species, RE 10.7.4 and connectivity.
Threatened flora listed under the EPBC Act	*Livistona lanuginosa*	V	19	EOP	State offsets requirements for this species, watercourse vegetation, connectivity squatter pigeon, little pied bat, ornamental snake, black-throated finch, black-necked stork, grey falcon and cotton pygmy-goose.
Queensland Government offset requirements					
Threatened regional ecosystems listed under the VM Act	11.3.1(BVG 25a)	E	68	QBOP	Watercourses, connectivity, squatter pigeon, little pied bat, ornamental snake, black-throated finch, black-necked stork, grey falcon and cotton pygmy-goose.
	11.4.8 (BVG 25a)	E	19	QBOP	Connectivity, squatter pigeon, little pied bat, ornamental snake, black-throated finch and grey falcon.
	11.4.9 (BVG 25a)	E	150	QBOP	Connectivity, little pied bat and ornamental snake.
	10.7.4 (BVG 12a)	OC	88	QBOP	Black-throated finch, little pied bat and yakka skink.

[22] Include onsite and offsite areas, subsidence, and Category A endangered and of concern pre-clear regional ecosystems.

ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	STATUS	PROPOSED IMPACT AREA[22] (HA)	RELEVANT OFFSET POLICY	POTENTIAL FOR OFFSET COLLOCATION
	11.3.3 (BVG 16c)	OC	48	QBOP	Watercourses, connectivity, squatter pigeon, little pied bat, ornamental snake, black-throated finch, black-necked stork, cotton pygmy-goose and grey falcon.
	11.4.5 (BVG26a)	OC	19	QBOP	Connectivity, squatter pigeon, little pied bat, ornamental snake, black-throated finch and grey falcon.
	11.4.6 (BVG 26a)	OC	352	QBOP	Connectivity
	11.4.11 (BVG 30b)	OC	53	QBOP	Connectivity
HVR containing endangered REs	BVG 25a	E	1	QBOP	Threatened species habitat and connectivity.
HVR containing of concern REs	BVG 30b	OC	3	QBOP	Threatened species habitat and connectivity.
	BVG 26a	OC	3	QBOP	Threatened species habitat and connectivity.
	BVG 16c	OC	2	QBOP	Threatened species habitat and connectivity.
Threatened fauna listed under the NC Act	Squatter pigeon (southern)	V	19,349	QBOP	RE 11.3.1, RE 11.4.8, RE 11.3.3., RE 11.4.5, watercourses and connectivity.
	Black throated finch (southern)	E	18,149	QBOP	RE 11.3.1, RE 11.4.8, RE 11.4.9, RE 11.3.3 and connectivity.
	Black-necked stork	NT	51	QBOP	RE 11.3.1, RE 11.3.3 and connectivity.
	Cotton pygmy-goose	NT	51	QBOP	RE 11.3.1, RE 11.3.3, RE 11.3.5 and connectivity.
	Little pied bat	NT	19,783	QBOP	RE 11.3.1, RE 11.4.8, RE 11.4.9, RE 11.3.3, RE 11.3.5, RE 11.9.10 and connectivity.
	Echidna	SLC	19,807	QBOP	All offset requirements.
	Koala	SLC	15,362	QBOP	Connectivity
	Ornamental snake	V	1,554	QBOP	RE 11.3.1, RE 11.4.8, RE 11.4.9, RE 11.3.3 and connectivity.
	Yakka skink	V	18,465	QBOP	RE 10.7.4 and connectivity.
	Square-tailed kite	NT	15,362	QBOP	Connectivity
	Black-chinned honeyeater	NT	15,362	QBOP	Connectivity

ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	STATUS	PROPOSED IMPACT AREA[22] (HA)	RELEVANT OFFSET POLICY	POTENTIAL FOR OFFSET COLLOCATION
Threatened flora listed under the EPBC Act	*Livistona lanuginosa*	V	19	QBOP	Watercourse vegetation, connectivity squatter pigeon, little pied bat, ornamental snake, black-throated finch, black-necked stork, grey falcon and cotton pygmy-goose.
Watercourse vegetation	Stream orders 1 and 2 watercourses	NA	579	QBOP	RE 11.3.1, RE 11.3.3 and connectivity.
	Stream orders 3 and 4 watercourses	NA	79	QBOP	RE 11.3.1, RE 11.3.3 and connectivity.
Wetlands	Wetland RE recognised under VM Act 1999 (RE 11.3.27)	NA	18	QBOP	Watercourse vegetation and connectivity.
	Wetland Protection Areas	NA	159[23]	QBOP	Watercourse vegetation and connectivity.
Connectivity	Not applicable	NA	12,367	QBOP	All offset requirements.

[23] Including 151 ha of impacts of non-remnant WPA trigger areas.

Table 22: Summary of offset requirements for the project rail component

ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	STATUS	PROPOSED IMPACT AREA (HA)	RELEVANT OFFSET POLICY	POTENTIAL FOR COLLOCATION
Australian Government offset requirements					
Threatened Ecological Communities listed under the EPBC Act	Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	38	EOP	Threatened species habitat, RE 11.3.1, RE 11.4.9 and connectivity.
Threatened fauna listed under the EPBC Act	Squatter pigeon (southern)	V	146	EOP	State offsets requirements for this species and connectivity.
	Ornamental snake	V	230	EOP	State offsets requirements for this species and connectivity.
	Black throated finch (southern)	E	65	EOP	State offsets requirements for this species and connectivity.
	Koala	V	143	EOP	RE 11.3.3, watercourses and connectivity.
Queensland Government offset requirements					
Threatened regional ecosystems listed under the VM Act	11.3.1(BVG 25a)	E	11	PVMO	Squatter pigeon, little pied bat, ornamental snake, black-throated finch, black-necked stork, grey falcon, cotton pygmy-goose, watercourses and connectivity.
	11.4.8 (BVG 25a)	E	3	PVMO	Squatter pigeon, little pied bat, ornamental snake, black-throated finch, grey falcon and connectivity.
	11.4.9 (BVG 25a)	E	24	PVMO	Little pied bat, ornamental snake and connectivity.
	11.3.3 (BVG 16c)	OC	47	PVMO	Squatter pigeon, little pied bat, ornamental snake, black-throated finch, black-necked stork, cotton pygmy-goose, grey falcon, watercourses and connectivity.
	11.4.5 (BVG 26a)	OC	4	PVMO	Squatter pigeon, little pied bat, ornamental snake, black-throated finch, grey falcon and connectivity.

ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	STATUS	PROPOSED IMPACT AREA (HA)	RELEVANT OFFSET POLICY	POTENTIAL FOR COLLOCATION
	11.4.6 (BVG 26a)	OC	21	PVMO	Connectivity
	11.4.11 (BVG 30b)	OC	128	PVMO	Connectivity
	11.9.10 (BVG 25a)	OC	1	PVMO	Little pied bat, ornamental snake and connectivity.
Threshold regional ecosystems	11.3.5 (BVG 26a)	LC	20	QBOP	Little pied bat, ornamental snake, black-necked stork, cotton pygmy-goose, watercourses and connectivity.
HVR containing endangered REs	BVG 25a	E	9	QBOP	Threatened species habitat and connectivity.
HVR containing of concern REs	BVG 16c	OC	2	QBOP	Threatened species habitat and connectivity.
	BVG 26a	OC	4	QBOP	Threatened species habitat and connectivity.
	BVG 30b	OC	1	QBOP	Threatened species habitat and connectivity.
Threatened fauna listed under the NC Act	Squatter pigeon (southern)	V	146	QBOP	RE 11.3.1, RE 11.4.8, RE 11.3.3., RE 11.4.5, watercourses and connectivity.
	Little pied bat	NT	147	QBOP	RE 11.3.1, RE 11.4.8, RE 11.4.9, RE 11.3.3, RE 11.3.5, RE 11.9.10 and connectivity.
	Black throated finch (southern)	E	65	QBOP	RE 11.3.1, RE 11.3.3, RE 11.4.5, RE 11.4.8, RE 11.4.5, RE 11.3.5, RE 11.9.10 and connectivity.
	Ornamental snake	V	230	QBOP	RE 11.3.1, RE 11.4.8, RE 11.4.9, RE 11.3.3 and connectivity.
	Black-necked stork	NT	66	QBOP	RE 11.3.1, RE 11.3.3 and connectivity.
	Grey Falcon	NT	147	QBOP	RE 11.3.1, RE 11.3.3, RE 11.4.5, RE 11.4.8 and connectivity.
	Cotton pygmy-goose	NT	66	QBOP	RE 11.3.1, RE 11.3.3, RE 11.3.5 and connectivity.
	Koala	SCL	143	QBOP	Connectivity
Threatened flora listed under the NC Act	*Solanum adenophorum*	E	82	QBOP	Unknown

ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	STATUS	PROPOSED IMPACT AREA (HA)	RELEVANT OFFSET POLICY	POTENTIAL FOR COLLOCATION
Watercourse vegetation	Stream orders 1 and 2 watercourses	NA	12	QBOP	RE 11.3.1, RE 11.3.3, RE 11.3.5 and connectivity.
	Stream orders 3 and 4 watercourses	NA	1	QBOP	RE 11.3.1, RE 11.3.3, RE 11.3.5 and connectivity.
	Stream orders 5 or greater	NA	13	QBOP	RE 11.3.1, RE 11.3.3, RE 11.3.5 and connectivity.
Connectivity	Not applicable	NA	278	PVMO	All offset requirements.

6 POTENTIAL DIRECT OFFSET AVAILABILITY

6.1 Moray Downs

6.1.1 Overview of property

Moray Downs is located near the locality of Belyando, which is approximately 140 km north-west of Moranbah in central Queensland (**Figure 3**). The Moray Downs property leasehold was purchased by Adani in November 2011 for the purpose of housing the majority of the off-lease mine infrastructure associated with the project. The proposed mining area also overlays much of the property.

The property is approximately 116,528 ha in size, and consists predominantly of non-remnant (or previously cleared) areas located throughout the eastern half of the property, and remnant areas located throughout the western half of the property. The tenure of the property is leasehold (**Table 23**).

Table 23: Moray Downs property details

PROPERTY	LOT ON PLANS	TENURE	PROPERTY AREA (HA)	AREA ASSESSED (HA)
Moray Downs	662 PH1491	Leasehold	116,528	79,935

Ecofund assessed a 79,935 ha area of interest on Moray Downs including all areas that are not currently designated for mine or rail infrastructure development, or infrastructure buffers (**Figure 3**). This area contains:

- 46,875 ha of mapped remnant vegetation
- 30,784 ha mapped non-remnant
- 546 ha of mapped HVR.

Ecofund also identified a 1,732 ha Category A area mapped on the Moray Downs property. Under the VM Act a Category A area is vegetation subject to compliance notices, offsets, or voluntary declarations. As such, these areas are unsuitable for use as environmental offsets and Ecofund has excluded this area from the analysis of the offset potential of Moray Downs.

Within the area of interest assessed by Ecofund, the dominant vegetation types include:

- Eucalyptus melanophloia, Callitris glaucophylla +/- E. populnea woodland (RE 10.5.5a)
- *Eucalyptus similis* and/or *Corymbia brachycarpa* and/or *Corymbia setosa* low open woodland to open woodland on sand plains (RE 10.5.1)
- *Acacia argyrodendron* woodland on Cainozoic clay plains (RE 11.4.5)
- *Eucalyptus melanophloia* woodland on alluvial plains (RE 10.3.6a)

- Dichanthium sericeum, Astrebla spp. and patchy Acacia harpophylla, Eucalyptus coolabah on Cainozoic clay plains (RE 11.4.11)
- *Acacia cambagei* woodland on alluvial plains (RE 11.3.5)
- *Eucalyptus melanophloia* or *E. crebra* open woodland on sandy alluvial fans (RE 10.3.28)
- *Acacia cambagei* low woodland on Cainozoic lake beds (RE 10.4.5)
- *Acacia cambagei* woodland on Cainozoic clay plains (RE 11.4.6)
- *Eucalyptus brownii* woodland on alluvial plains (RE 11.3.10).

6.1.2 Offset potential

Ecofund's analysis of Moray Downs indicates that areas outside proposed infrastructure development may contain significant potential to support environmental offsets compliant with both Queensland and Australian and Government policies (**Table 24; Figures 4 to 6**). It is important to note that no Queensland Government offset policies permit remnant vegetation as environmental offsets. The EPBC Act however allows for offsets consisting of remnant vegetation as the Australian Government acknowledges that areas mapped as remnant can be in poor ecological condition and benefit from management actions.

Under Australian Government legislation areas on Moray Downs may be suitable to provide environmental offsets for project impacts on Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC, five threatened fauna species and one threatened flora species listed under the EPBC Act expected to be impacted by the project. Identified areas could provide environmental offsets compliant with the EBPC Act, however, further ground-truthing will be required to confirm this.

The maximum offset multiplier (**Table 24**) shows the ratio of impact to potential offset area, indicating the extent to which the property may acquit specific offset requirements of the project. The multiplier indicates that areas of the Brigalow TEC, and potential habitat for the squatter pigeon (southern), black throated finch (southern), ornamental snake and yakka skink may be large enough to satisfy a significant proportion of the offset requirements for mine and/or rail related impacts.

Under current Queensland Government offset policies, areas of non-remnant vegetation on Moray Downs outside of those areas designated for infrastructure development may be suitable to provide environmental offsets for project impacts on:

- seven threatened REs listed under the VM Act
- one threshold RE listed under the VM Act
- HVR listed under the VM Act
- 12 threatened fauna species listed under the NC Act
- one threatened flora species listed under the NC Act
- watercourse vegetation

- wetland or wetland trigger area vegetation
- connectivity (recognised corridor vegetation).

Identified areas could provide environmental offsets compliant with PVMO or QBOP, however, further ground-truthing of species habitat factors and assessment of ecological equivalence will be required to confirm this.

Using the maximum offset multiplier as a guide, areas on Moray Downs may be large enough to satisfy a significant proportion of the offset requirements for mine and/or rail related impacts on:

- RE 11.3.3, RE 11.4.5, RE 11.4.11
- threshold RE 11.3.5
- HVR containing endangered REs within BVG 25a
- HVR containing of concern REs within BVG 30b, BVG 26a and BVG 16
- potential habitat for the black-necked stork, cotton pygmy-goose and grey falcon.

Multiplier results based on broad searches for watercourse and wetland RE offset areas within Moray Downs indicate that there may also be a large enough area to satisfy offset requirements for mine and/or rail related impacts on these values.

Table 24: Summary of environmental offset potential on Moray Downs

IMPACTED ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	PROJECT COMPONENT	TOTAL IMPACT AREA (HA)	POTENTIAL COMPLIANT OFFSET AREA (HA)	MAXIMUM OFFSET MULTIPLIER[24]
Potential Australian Government offsets					
TEC listed under the EPBC Act	Brigalow (*Acacia harpophylla* dominant and co-dominant)	Mine and rail	234	981	4.19
Threatened fauna listed under the EPBC Act	Squatter pigeon (sth)	Mine and rail	19,495	43,978	2.26
	Black throated finch (sth)	Mine and rail	18,214	37,839	2.08
	Koala	Mine and rail	15,505	13,634	0.88
	Ornamental snake	Mine and rail	1,784	9,631	5.40
	Yakka skink	Mine	18,465	46,940	2.54
Threatened flora listed under the EPBC Act	*Livistona lanuginosa*	Mine	19	458	24.11
Potential Queensland Government offsets					
Threatened regional ecosystems listed under the VM Act	11.3.1(BVG 25a)	Mine and rail	79	204	2.58
	11.4.8 (BVG 25a)	Mine and rail	22	67	3.05
	11.4.9 (BVG 25a)	Mine and rail	174	53	0.30
	10.7.4 (BVG 12a)	Mine	88	-	-

[24] This value is the maximum offset ratio (offset: impact) that the Moray Downs property could accommodate.

IMPACTED ENVIRONMENTAL VALUE	SPECIES/COMMUNITY	PROJECT COMPONENT	TOTAL IMPACT AREA (HA)	POTENTIAL COMPLIANT OFFSET AREA (HA)	MAXIMUM OFFSET MULTIPLIER[24]
	11.3.3 (BVG 16c)	Mine and rail	95	634	6.67
	11.4.5 (BVG 26a)	Mine and rail	23	1,228	53.39
	11.4.6 (BVG 26a)	Mine and rail	373	342	0.92
	11.4.11 (BVG 30b)	Mine and rail	181	2,013	11.12
	11.9.10 (BVG 25a)	Rail	1	-	-
Threshold regional ecosystems	11.3.5 (BVG 26a)	Rail	20	620	31.00
HVR containing endangered REs	BVG 25a	Mine and rail	10	324	32.40
HVR containing of concern REs	BVG 30b	Mine and rail	4	342	85.50
	BVG 26a	Mine and rail	7	1,570	224.29
	BVG 16c	Mine and rail	4	634	158.50
Threatened fauna listed under the NC Act	Squatter pigeon (sth)	Mine and rail	19,495	4,222	0.22
	Black throated finch (sth)	Mine and rail	18,214	3,343	0.18
	Black-necked stork	Mine and rail	117	3,797[25]	32.45
	Cotton pygmy-goose	Mine and rail	117	3,797[20]	32.45
	Little pied bat	Mine and rail	19,930	5,051	0.25
	Echidna	Mine	19,807	30,784	1.55
	Koala	Mine and rail	15,505	1,382	0.10
	Ornamental snake	Mine and rail	1,784	4,151	2.33
	Yakka skink	Mine	18,465	5,393	0.29
	Square-tailed kite	Mine	15,362	4,276	0.28
	Black-chinned honeyeater	Mine	15,362	4,276	0.28
	Grey falcon	Rail	147	2,808	19.10
Threatened flora listed under the NC Act	*Livistona lanuginosa*	Mine	19	31	1.63
	Solanum adenophorum	Rail	82	To be confirmed	-
Watercourse vegetation	Landzone 3 REs	Mine and rail	684	3,797[20]	5.55
Wetlands	Wetland RE recognised under the VM Act 1999	Mine	18	1,119	62.17
	Wetland Protection Areas	Mine	159	41	0.26
Connectivity	Not applicable	Mine and rail	12,645	12,511[26]	0.99

[25] All Landzone 3 REs.
[26] Area of Queensland Government recognised corridors, within the Brigalow Belt bioregion only (as all recognised corridors within the Desert Uplands bioregion are remnant vegetation).

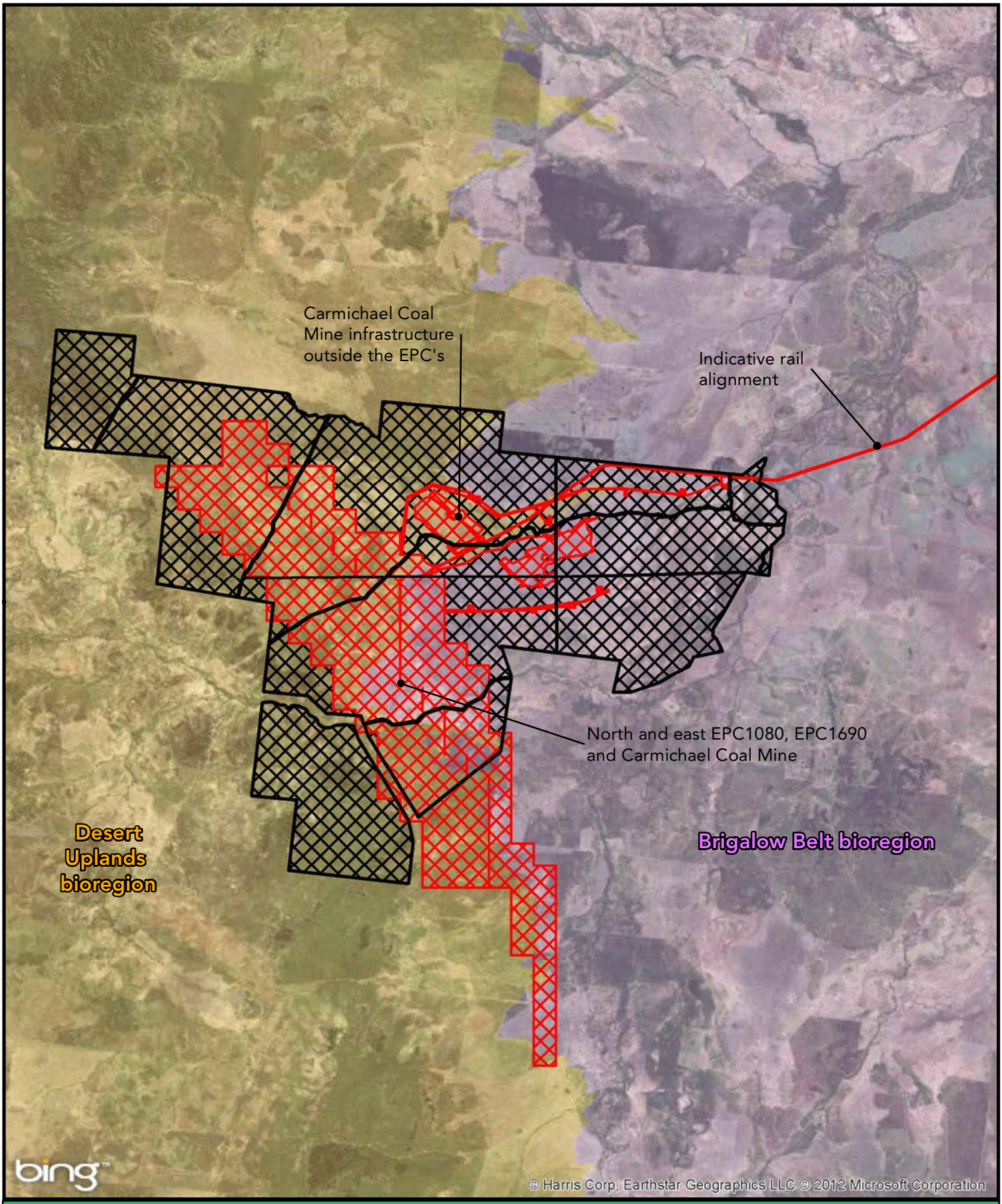

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Figure 3: Moray Downs Assessment Area

DATA SOURCE:

Biogeogeographic Regions - Queensland (2010) © State of Qld (Department of Environment and Resource Management) 2012
Exclusion areas provided by Adani Mining Pty Ltd 07/08/2012
- 20120806_LUMP_Infrastructure_Buffer_200m_region,
- 20120626_Rail_revision_centreline_polyline_50m_buffer,
- EPC1080_20120130_GDA94_MGAz55,
- epc1690_GDA94_MGAz55

- Moray Downs property boundary
- Moray Downs assessment area
- Mine infrastructure exclusion areas
- Brigalow Belt
- Desert Uplands

DATE	AUTHOR	REQUESTED BY
03/09/2012	RF	KS

N

ecofund queensland

0 5 10
Kilometres

1:420,000

(A4) GCS GDA 1994

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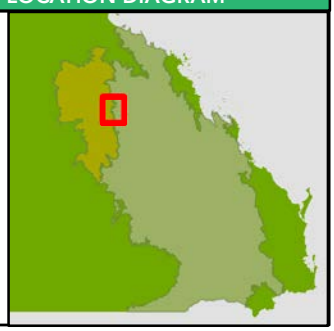
ABN: 92142 542 774

LOCATION DIAGRAM



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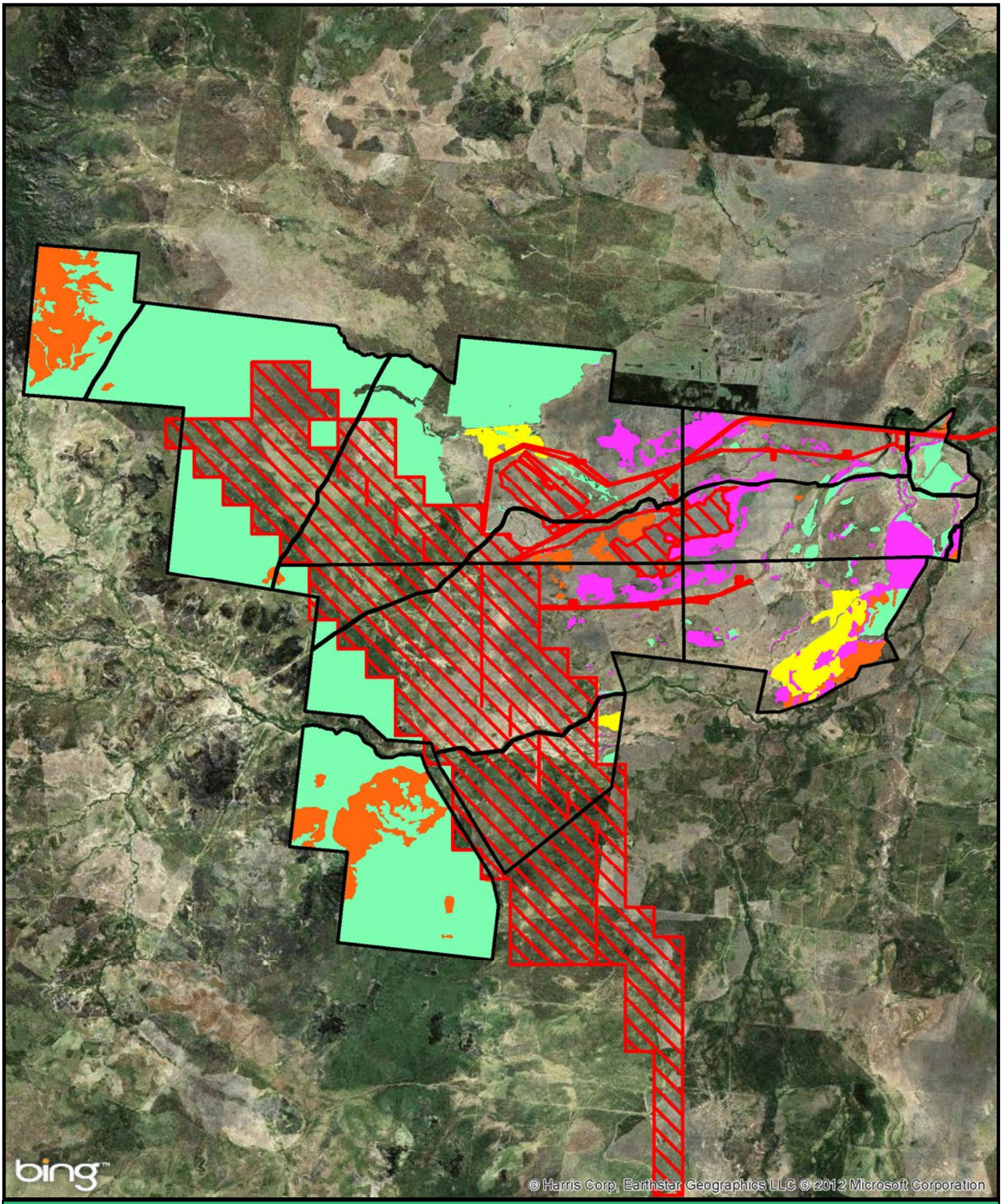

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Figure 4: Moray Downs Regional Ecosystems Mapping

The following datasets are © State of Qld (Department of Environment and Resource Management) 2012:
- Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)
- Vegetation Management Act Regional Ecosystems V6.1 (2011)
- Vegetation Management Act High Value Regrowth Vegetation Version 2.1 (2011)
- Foliage Projective Cover 2010 (2012)

Exclusion areas provided by Adani Mining Pty Ltd 07/08/2012
- 20120806_LUMP_Infrastructure_Buffer_200m_region,
- 20120626_Rail_revision_centreline_polyline_50m_buffer,
- EPC1080_20120130_GDA94_MGAz55,
- epc1690_GDA94_MGAz55

Moray Downs boundary
Offset exclusion area
PMAV Category A
Containing Endangered regional ecosystems
Containing Of Concern regional ecosystems
Is a Least Concern regional ecosystem

DATE	AUTHOR	REQUESTED BY
03/09/2012	RF	KS

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ecofund queensland

0 4 8
Kilometres

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(A4) GCS GDA 1994

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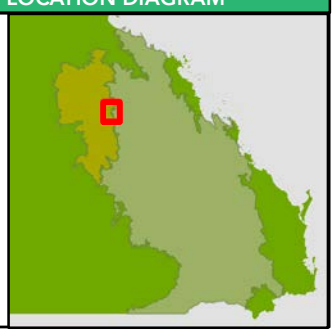
ABN: 92142 542 774

LOCATION DIAGRAM



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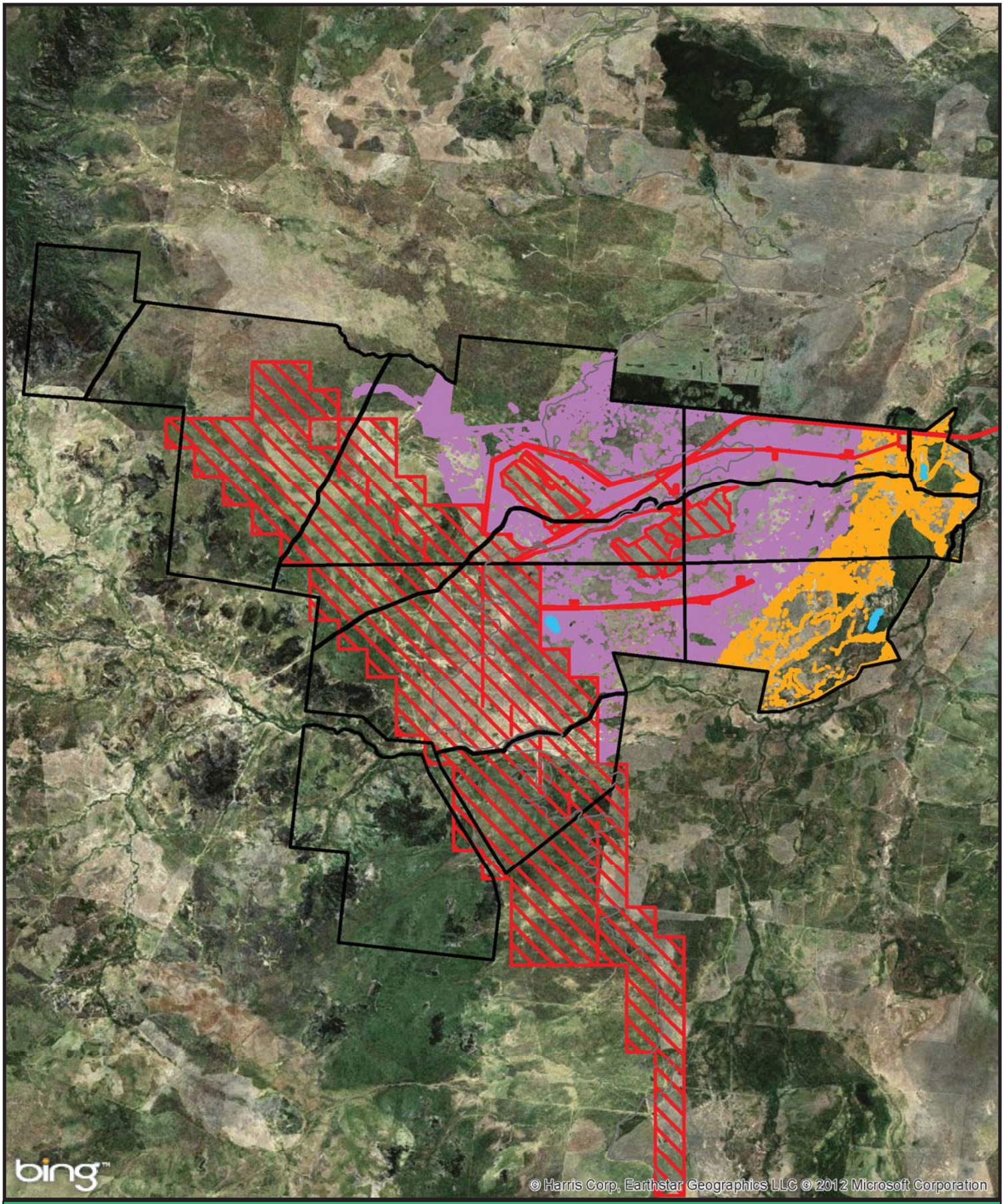

Adani Mining Pty Ltd - Carmichael Coal Mine and Rail Project

LOCATION DIAGRAM

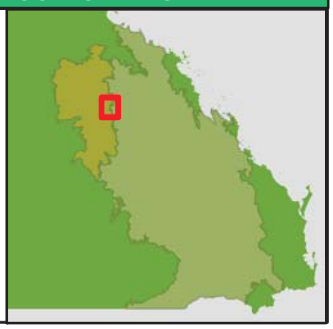

Figure 5: Moray Downs Potential Offset Areas: State

- Moray Downs boundary
- Offset exclusion area
- Offsetable areas (state) within mapped corridors
- Offsetable areas (state)
- HES wetland areas

The State offsetable areas are vegetation that has a Foliage Projective Cover >6% and are non-remnant and HVR that is not endangered and not Essential Regrowth Habitat.

DATE	AUTHOR	REQUESTED BY
03/09/2012	RF	KS

N

ecofund queensland

0 4 8

Kilometres

1:325,000

(A4) GCS GDA 1994

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ABN: 92142 542 774

The following datasets are © State of Qld (Department of Environment and Resource Management) 2012:
- Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)
- Vegetation Management Act Regional Ecosystems V6.1 (2011)
- Vegetation Management Act High Value Regrowth Vegetation Version 2.1 (2011)
- Queensland Biodiversity and Vegetation Offsets Special Features (2011)
- Wetland Protection Area trigger area (2011)
- Foliage Projective Cover 2010 (2012)

Exclusion areas provided by Adani Mining Pty Ltd 07/08/2012

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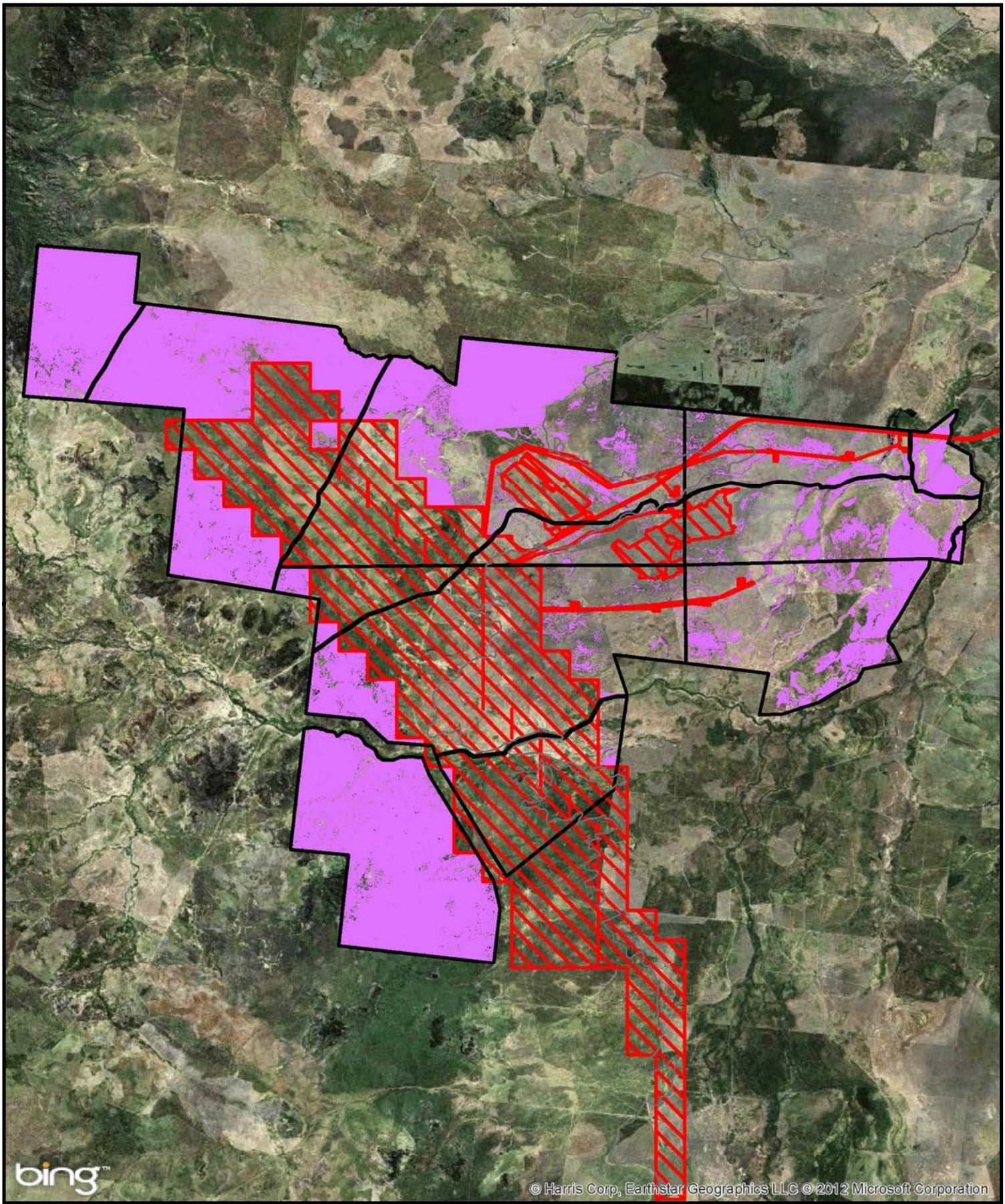

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Figure 6: Moray Downs Potential Offset Areas: Commonwealth

The following datasets are © State of Qld (Department of Environment and Resource Management) 2012:
- Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)
- Vegetation Management Act Regional Ecosystems V6.1 (2011)
- Vegetation Management Act High Value Regrowth Vegetation Version 2.1 (2011)
- Foliage Projective Cover 2010 (2012)
Exclusion areas provided by Adani Mining Pty Ltd 07/08/2012

- Moray Downs boundary
- Offset exclusion area
- Offsetable areas (Commonwealth)

The Commonwealth offsetable areas are remnant, HVR and non-remnant vegetation that has a Foliage Projective Cover of >6% and are not PMAV Category A.

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03/09/2012	RF	KS

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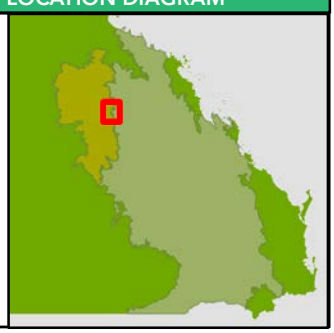
LOCATION DIAGRAM



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6.2 Potential offset availability

6.2.1 Offset availability for mine impacts

For mine-related impacts, Ecofund assessed the potential offset availability within the Brigalow Belt and Desert Uplands Bioregions (**Table 25**). Potential offset areas are described in areas (hectares) of policy compliant land in terms of 'potential offset areas with FPC ≥ 6%.' The total number of lots that contain potential offset areas and the total number of lots that contain potential offset areas ≥ the impact area is provided.

For offsets required under Australian Government policies there is sufficient availability of potential offset areas to fulfil the offset requirements for all environmental values relating to the mine, as described in **Table 25**.

Under Queensland Government policies, offsets for impacts on state significant biodiversity values must be located in the same bioregion as where the impacts occur. However, Ecofund sees merit in providing offsets for values impacted in the Desert Uplands Bioregion on properties located in the Brigalow Belt Bioregion as:

- the mine is located on the border of the Brigalow Belt Bioregion and Desert Uplands Bioregion and the majority of the environmental values impacted by the project occur in both bioregions.
- the values impacted by the mine footprint are similar to those impacted by the rail which extends into the northern half of the Brigalow Belt Bioregion

Adani seeks approval from the Department of Environment and Heritage Protection to locate offsets in either bioregion as long as the offset is located within areas containing suitable habitat requirements or environmental values.

Based on an assessment of offset availability in the Brigalow Belt and Desert Uplands Bioregions there is sufficient availability of potential offset areas to fulfil the Queensland Government offset requirements for the majority of environmental values relating to the mine, as described in **Table 25**. For RE 10.7.4, listed as of concern under the VM Act, there are only 41 ha of potential offset areas available within the Desert Uplands Bioregion. Given the impact on this RE is estimated to be 88 ha, field surveys will be undertaken to identify additional offset availability in the landscape.

For the following values it is likely that the delivery of direct offsets will require the securing of offsets across multiple lots to fulfil Queensland Government offset requirements:

- Squatter pigeon (southern)
- Black throated finch (southern)
- Little pied bat
- Koala
- Yakka skink

- Square-tailed kite
- Black-chinned honey eater
- Connectivity.

Table 25: Offset potential for impacts associated with the mine – Desert Uplands and Brigalow Belt Bioregions

IMPACTED VALUE	SPECIES/ COMMUNITY	STATUS	IMPACT AREA (HA)	DESERT UPLANDS BIOREGION			BRIGALOW BELT BIOREGION		
				POTENTIAL OFFSET AREA FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA	POTENTIAL OFFSET AREAS FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA
Australian Government offsets (mine)									
TEC listed under the EPBC Act	Brigalow (*Acacia harpophylla* dominant and co-dominant)[27]	E	196	NA			1,086,757	12,444	1,199
Threatened fauna listed under the EPBC Act	Squatter pigeon (southern)	V	19,349	305,579	577	-	9,583,370	44,487	29
	Black throated finch (southern)	E	18,149	312,383	616	-	9,738,377	44,127	40
	Koala	V	15,362	123,661	174	-	7,534,650	39,623	39
	Ornamental snake	V	1,554	44,287	162	7	11,420,578	46,831	1,389
	Yakka skink	V	18,465	360,620	676	-	11,501,183	47,095	53
Threatened flora listed under the EPBC Act	*Livistona lanuginosa*	V	19	NA			297,433	10,334	2,539
Queensland Government offsets (mine)									
Threatened regional ecosystems listed under the VM Act	RE 11.3.1(BVG 25a)	E	68	NA			89,529	2,468	327
	RE 11.4.8 (BVG 25a)	E	19	NA			110,606	1,303	729
	RE 11.4.9 (BVG 25a)	E	150	NA			97,569	1,110	174
	RE 10.7.4 (BVG 12a)	OC	88	41	8	-	NA		
	RE 11.3.3 (BVG 16c)	OC	48	NA			80,841	2,296	385

[27] Including REs 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14 and11.12.21

IMPACTED VALUE	SPECIES/ COMMUNITY	STATUS	IMPACT AREA (HA)	DESERT UPLANDS BIOREGION			BRIGALOW BELT BIOREGION		
				POTENTIAL OFFSET AREA FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA	POTENTIAL OFFSET AREAS FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA
	11.4.5 (BVG 26a)	OC	19	NA			12,100	70	47
	11.4.6 (BVG 26a)	OC	352	NA			37,054	168	30
	11.4.11 (BVG 30b)	OC	53	NA			50,159	91	61
HVR containing endangered REs	BVG 25a	E	1	NA			605,493[28]	9,439	9,439
HVR containing of concern REs	BVG 30b	OC	3	NA			21,068[21]	973	746
	BVG 26a	OC	3	NA			26,780[21]	159	147
	BVG 16c	OC	2	NA			155,507[21]	6,481	5,165
Threatened fauna listed under the NC Act	Squatter pigeon (southern)	V	19,349	39,165	379	-	2,785,294	34,288	-
	Black throated finch (southern)	E	18,149	45,760	425	-	2,790,958	34,021	-
	Black-necked stork	NT	51	18,509	145	35	839,950	21,402	3,007
	Cotton pygmy-goose	NT	51	18,509	145	35	839,950	21,402	3,007
	Little pied bat	NT	19,783	47,358	438	-	3,376,539	36,410	-
	Echidna	SLC	19,807	TBC	TBC	TBC	TBC	TBC	TBC
	Koala	SLC	15,362	16,304	82	-	2,121,767	30,657	-
	Ornamental snake	V	1,554	7,730	123	-	3,414,275	36,713	330
	Yakka skink	V	18,465	47,358	438	-	3,473,287	36,875	-

[28] Areas that are the desired dominant BVG only i.e. no sub-dominant areas are included.

IMPACTED VALUE	SPECIES/ COMMUNITY	STATUS	IMPACT AREA (HA)	DESERT UPLANDS BIOREGION			BRIGALOW BELT BIOREGION		
				POTENTIAL OFFSET AREA FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA	POTENTIAL OFFSET AREAS FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA
	Square-tailed kite	NT	15,362	39,190	379	-	3,400,965	36,849	-
	Black-chinned honeyeater	NT	15,362	39,253	381	-	3,397,684	36,540	-
Threatened flora listed under the NC Act	*Livistona lanuginosa*	V	19	NA			78,930	6,585	1,002
Watercourse vegetation	Vegetation with stream order buffers	NA	658	18,509[29]	145	7	839,950[30]	21,402	183
Wetlands	Wetland RE recognised under VM Act 1999	NA	18	3,429[31]	35	22	640,819	19,523	5,808
	Wetland protection areas	NA	159	1,972[32]	40	2	9,921[27]	544	12
Connectivity	Not applicable	NA	12,367	35,379[33]	291	-	949,541[28]	12,168	-

[29] Including Landzone 3 REs in bioregion 10
[30] Including Landzone 3 REs in bioregion 11
[31] Including REs in bioregion 10 associated with a wetland: RE 10.10.6, RE 10.3.13, RE 10.3.14, RE 10.3.15, RE 10.3.16, RE 10.3.17, RE 10.3.22, RE 10.3.23, RE 10.3.24, RE 10.3.30, RE 10.3.31, RE 10.3.4, RE 10.3.5, RE 10.4.5, RE 10.4.7
[32] Including HES wetlands with same habitat type (RE)
[33] Areas recognised within a biodiversity corridor

6.2.2 Offset availability for rail impacts

For rail-related impact values, Ecofund assessed the potential offset availability within the Brigalow Belt Bioregion (**Table 26**). Potential offset areas are described in areas (hectares) of policy compliant land in terms of 'potential offset areas with FPC ≥ 6%.' The total number of lots that contain potential offset areas and the total number of lots that contain potential offset areas ≥ the impact area is provided.

This analysis shows that that within the Brigalow Belt Bioregion there is sufficient area available to provide compliant direct offsets for all impact values i.e. for all values there is hundreds of times the area impacted available. In addition, for all values impacted there are at least 50 lots that contain complaint offset areas that are equal to or greater than the corresponding impact of the rail on that value. Therefore, for all rail-related impacts there is sufficient potential to provide offsets within the Brigalow Belt Bioregion.

Table 26: Offset potential for impacts associated with the rail - Brigalow Belt Bioregion

IMPACTED VALUE	SPECIES/ COMMUNITY	STATUS	IMPACT AREA (HA)	POTENTIAL OFFSET	POTENTIAL OFFSET AREA FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA
Australian Government offsets (rail)							
Threatened Ecological Communities listed under the EPBC Act	Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	38	11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14, 11.12.21	1,086,757	12,444	3,843
Threatened fauna listed under the EPBC Act	Squatter pigeon (southern)	V	146	Suitable REs in bioregion 11	9,583,370	44,487	7,422
	Ornamental snake	V	230	Suitable REs in bioregion 11	11,420,578	46,831	1,693
	Black throated finch (southern)	E	65	Suitable REs in bioregion 11	9,738,377	44,127	11,232
	Koala	V	143	Suitable REs in bioregion 11	7,534,650	39,623	5,965
Queensland Government offsets (rail)							
Threatened regional ecosystems listed under the VM Act	11.3.1(BVG 25a)	E	11	11.3.1	89,529	2,468	1,123
	11.4.8 (BVG 25a)	E	3	11.4.8	110,606	1,303	1,127
	11.4.9 (BVG 25a)	E	24	11.4.9	97,569	1,110	480
	11.3.3 (BVG 16c)	OC	47	11.3.3	80,841	2,296	389
	11.4.5 (BVG 26a)	OC	4	11.4.5	12,100	70	64
	11.4.6 (BVG 26a)	OC	21	11.4.6	37,054	168	127
	11.4.11 (BVG 30b)	OC	128	11.4.11	50,159	91	52
	11.9.10 (BVG 25a)	OC	1	11.9.10	57,222	1,834	1,676

IMPACTED VALUE	SPECIES/ COMMUNITY	STATUS	IMPACT AREA (HA)	POTENTIAL OFFSET	POTENTIAL OFFSET AREA FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA
Threshold regional ecosystems	11.3.5 (BVG 26a)	LC	20	11.3.5	18,222	155	87
HVR containing endangered REs	BVG 25a	E	9	Endangered BVG 25a in bioregion 11	605,493[34]	9,439	5,005
HVR containing of concern REs	BVG 16c	OC	2	Endangered and of concern BVG 16c in bioregion 11	155,507[22]	6,481	5,213
	BVG 26a	OC	4	Endangered and of concern BVG 26a in bioregion 11	26,780[22]	159	146
	BVG 30b	OC	1	Endangered and of concern BVG 30b in bioregion 11	21,068[22]	973	957
Threatened fauna listed under the NC Act	Squatter pigeon (southern)	V	146	Suitable REs in bioregion 11	2,785,294	34,288	3,889
	Little pied bat	NT	147	Suitable REs in bioregion 11	3,376,539	36,410	4,349
	Black throated finch (southern)	E	65	Suitable REs in bioregion 11	2,790,958	34,021	6,688
	Ornamental snake	V	230	Suitable REs in bioregion 11	3,414,275	36,713	3,171
	Black-necked stork	NT	66	Suitable REs in bioregion 11	839,950	21,402	2,491
	Grey falcon	NT	147	Suitable REs in bioregion 11	2,774,003	33,973	3,849
	Cotton pygmy-goose	NT	66	Suitable REs in bioregion 11	839,950	21,402	2,491

[34] Areas that are the desired dominant BVG only i.e. no sub-dominant areas are included.

IMPACTED VALUE	SPECIES/ COMMUNITY	STATUS	IMPACT AREA (HA)	POTENTIAL OFFSET	POTENTIAL OFFSET AREA FPC ≥ 6% (HA)	TOTAL # LOTS	TOTAL # LOTS WITH POTENTIAL OFFSET AREA ≥ IMPACT AREA
	Koala	SLC	143	Suitable REs in bioregion 11	2,121,767	30,657	3,058
Threatened flora listed under the NC Act	*Solanum adenophorum*	E	82	TBC	TBC	TBC	TBC
Watercourse vegetation	Not applicable	NA	26	Landzone 3 REs in bioregion 11	839,950	21,402	4,918
Connectivity	Not applicable	NA	278	Biodiversity corridor in bioregion 11	949,541	12,168	3,931

7 OFFSET DELIVERY

7.1 Offset delivery options

Current Queensland and Australian government offset policies allow the delivery of offset packages involving direct or indirect offsets (or compensatory measures), or a combination of the two. Under the current Queensland Government PVMO and QBOP there are also options to deliver offsets through offset transfers and offset payments.

7.1.1 Direct offsets

Direct offsets involve the identification and securing of land to be managed for conservation purposes. Subject land must have similar values, function and habitat to those values being impacted. Direct offsets are recognised by EOP as generally providing a more certain, lower risk conservation outcome then indirect offsets, and are therefore considered an essential part of an offset package. Under EOP direct offsets may involve:

- the acquisition of good or better quality land for enduring protection through inclusion in the conservation estate (including covenanting arrangement on private land)
- maintenance or improvement of land targeted toward the impacted value, including rehabilitation of existing vegetation in poor condition or revegetation of environmentally degraded land.

Under QBOP and PVMO, direct offsets are usually an area of land with its biodiversity values managed (via an approved management plan), improved (if necessary) and permanently protected (via a legally binding mechanism). Such direct offsets include:

- the acquisition of compliant land to be included in the protected area estate
- the rehabilitation and protection of regrowth vegetation.

7.1.2 Indirect offsets

Indirect offsets can be land-based, where land areas that have similar environmental values to impact areas (but do not fully comply with direct offset requirements) are protected. Land-based approaches are typically used in combination with other indirect offset options including financial contributions, improved management and research funding aimed at promoting benefits for those values being impacted.

Under EOP, the delivery of indirect offsets (or compensatory measures) that establish positive social and economic co-benefits is encouraged. Indirect offsets can be a range of measures that improve knowledge, understanding and management of environmental values leading to improved conservation outcomes for the impacted protected matter, including:

- 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.

Under QBOP and PVMO, indirect offsets may form part of an offset package, in combination with a direct offset in situations where the offset area provided substantially achieves ecological equivalence with the area to be cleared, however, fails to meet the required ecological equivalence scores. The indirect offset must be:

- an activity that will result in, or improve the spatial capture of vegetation and wildlife information, including:
- habitat mapping/modelling for priority species
- development of RE BioCondition benchmarks
- finer scale RE mapping
- fauna surveys in identified strategic areas
- approved 'on-ground' and 'research and monitoring' actions derived from the Back on Track species prioritisation framework Action Plans.
- an action addressing a threatening process for a species or ecosystem (within the same bioregion) identified in a State or Commonwealth approved conservation or recovery plan.

7.1.3 Offset payments

QBOP and PVMO allow eligible applicants to make financial offset payments to an approved trust[35] established for land management or nature conservation purposes. If an applicant is eligible to make an offset payment, the offset obligation is transferred to the approved trust.

Under QBOP, the payment may be used to either purchase land containing State significant biodiversity values to add to the protected area estate or to purchase or secure suitable areas with State significant biodiversity values or areas located within a mapped strategic area or recognised corridor. Under PVMO, the trustee must locate an offset area within a strategic biodiversity corridor that meets the offset requirements consistent with the policy.

[35] QBOP specifies that payments be made to the Balance the Earth Trust.

7.1.4 Offset transfers

Under QBOP and PVMO an applicant may enter into a contractual agreement with an offset broker for the provision of an offset area as a means of meeting their regulatory requirements. For an offset transfer to be considered, it must be reasonably evident that an offset, that meets the requirements of the policy, is available at the time of the development approval being issued and the offset can be legally secured with 12 months. It is important to note that while the applicant can undertake an offset transfer to an offset broker as a means of securing the applicant's offset requirements, the offset obligation still remains with the applicant (personal communication Department of Environment and Resource Management, 29 March 2012).

7.2 Proposed approach to offset delivery

7.2.1 Delivery method

The offset requirements of the project consider impacts from the construction and operation phases of the project's mine and rail components. However, vegetation clearing will not occur across the entire mining footprint in a single event, but rather is to be staged to correspond with the sequential development of coal extraction over the 90 year life of the mine (GHD 2012: Volume 2, section 5.4.3.1). This will maintain the environmental values within some areas of the mining operation footprint until the scheduled time of mining for that area. Progressive rehabilitation will also occur as areas become available.

As such, Adani proposes to stage offset implementation to align with the incremental nature of the project. It is proposed that the offsets for the project will be delivered in three stages to reflect the construction and operational cycles of the rail and mine (GHD 2012 Volume 3, section 2.7; GHD 2012 Volume 2, section 2.5). The three stages of offset delivery are:

- Stage 1 – 2013 – 2027
- Stage 2 – 2028 – 2047
- Stage 3 – 2048 - 2110

On approval of this Environmental Offset Strategy, an Environmental Offset Package (the package) will be developed to document the proposed solutions to fulfilling the offset requirements of the project based on legislation and offset policies in place at the time that the package is prepared. If, at any time, it is decided that the package will be modified to reflect new legislative requirements pertaining to offsets, this will be negotiated with the relevant regulatory agencies. Any project updates, such as rail infrastructure, will be reflected in the package.

The Environmental Offset Package is likely to include a combination of direct and indirect offsets (or compensatory measures), offset payments and offset transfers and is anticipated to be completed in early 2013. Specific details of the content of the package are outlined below in **Section 7.2.2**. Once approved, it is proposed that the package will be implemented in a staged approach.

It is expected that offsets for the project will be delivered in accordance with the tasks and timeframes set out in **Table 27**. However, these tasks and estimated timeframes are subject to change due to a number of variables, including but not limited to, regulatory approval, regulatory requirements, landholder negotiation, unforeseen weather and other unexpected delays.

Table 27: Tasks and associated timeframes for offset delivery

STAGE	TASK	ESTIMATED TIMEFRAME
Pre-delivery	Submission of the Environmental Offset Strategy	Q4 2012
	In principle support of the Environmental Offset Strategy received from regulators	Q4 2012
	Submission of the Environmental Offset Package	Q2 2013
	In principle support of the Environmental Offset Package received from regulators	Q3 2013
1	If applicable, the provision of offset payments to the Balance the Earth Trust and the provision of indirect offsets.	Q4 2013
	If applicable, the establishment of offset transfer arrangements for initial stage of offsets.	Q4 2013
	If required, landholder engagement and negotiation with the owners of the identified properties	Q2 to Q4 2013
	Ecological equivalence assessments of the offset sites required for the initial stage of offsets to verify that the values identified through desktop assessments are present, and that they are ecologically equivalent to the impact sites	Q2 to Q4 2013
	Development of Offset Area Management Plans for the initial stage of offsets in accordance with the requirements of the relevant offset policies	Q3 to Q4 2013
	Application of a legally binding mechanism to secure the environmental values of the offset area in perpetuity	Q4 2013
	Implementation of the Offset Area Management Plan including ongoing monitoring and reporting.	Q4 2013 ongoing
2	Submission of a Revised Environmental Offset Package to regulators for approval	2027
	Implementation of the Environmental Offset Package for Stage 2 offset requirements	2028 - ongoing

STAGE	TASK	ESTIMATED TIMEFRAME
3	Submission of a Revised Environmental Offset Package to regulators for approval	2047
	Implementation of the Environmental Offset Package for Stage 3 offset requirements	2048 – ongoing

7.2.2 Environmental Offset Package

The Environmental Offset Package will be developed to address the requirements of both Queensland and Australian Government offset policies in place at the time of preparation and will include:

- an update of the offset requirements of the project based on refined impact data and the criteria of current Queensland and Australian Government offset policies
- the anticipated offset requirements of the project corresponding to each of the three stages of offset delivery
- if required, the results of ecological equivalence assessments of impact sites
- solutions for acquitting the offset requirements including details of proposed direct offsets, indirect offsets (or compensatory measures), offset payments and offset transfers (as applicable)
- for direct offsets, data on the values and extent of each offset value on each property, including maps and results of field assessments and ecological equivalence assessments (where relevant and possible)
- the compliance of the proposed offset solutions with the criteria of the relevant offset policies
- details of the proposed offset delivery approach for each stage of offset delivery including:
- how offsets will be delivered for each stage
- proposed legally binding mechanisms for direct offsets
- a schedule of future tasks and timeframes to secure offsets
- the framework for the development specific offset area management plans, including monitoring and reporting requirements.

As a priority Adani will utilise direct offset options available on Moray Downs. For additional direct offsets, Adani will assess areas recognised as possessing 'high conservation value' within the Galilee Basin Offset Strategy recently released by the Queensland Government. Priority areas will be assessed for their ability to acquit the offset requirements of the project for both Queensland and Australian Government requirements.

To supplement direct offsets, indirect offsets in the form of research activities and/or the implementation of financial contributions towards research and education programs will be explored. This will be particularly pertinent where such initiatives can complement other environmental management initiatives, such as species specific management plans proposed for the project. Offset payments and offset transfers will be considered as potential options to form part of the offset package where direct and indirect offsets are not achievable/preferable. `

7.2.3 Coordination with environmental management objectives

A key task in the development of the Environmental Offset Package will be identifying the complimentary aims and objectives between the project's environmental management framework and the project's offset strategy. Clarification of the potential synergies between the two would help ensure that the identification of land-based sites are appropriate to meet offset obligations, meet the project's broader biodiversity conservation and enhancement goals and provide opportunities for research to inform management throughout the operational life of the project.

Where possible, on-ground initiatives should be implemented to compliment other environmental impact mitigation initiatives proposed for the project as well as progressive rehabilitation. Such initiatives are in line with direct offset options under the EOP, QBOP and PVMO. However, offset options that nominate a complementary approach will need to be negotiated with DSEWPaC and DEHP so that these options satisfy the requirements all relevant policies.

7.2.4 Activities to be offset in each stage

Details of the activities proposed to be offset, including timing of activities is outlined below.

Stage 1

Stage 1 offset delivery will involve the delivery of offsets for activities scheduled to occur between 2013 and 2027. These activities and their associated timeframes are outlined in **Table 28**.

Table 28: Activities to be offset in Stage 1

YEAR/S	ACTIVITIES TO BE OFFSET
2013	• Project rail construction • Prepare works for Mine onsite and offsite infrastructure • Undertake redevelopment of Moray Carmichael Road from Gregory Development Road to Mine site • Commence construction of infrastructure for mine camp, open cut, northern underground and central underground including overland conveyors and central run of mine (ROM) facilities • Commence construction of power, water supply and other external services • Commence excavation of G Pit and J Pit box-cut

YEAR/S	ACTIVITIES TO BE OFFSET
2014	• Project rail construction • Complete on mine infrastructure and associated infrastructure • Produce first coal from northern underground and open cut • Complete G Pit box-cut
2015	• Produce first coal from central underground • Commence E Pit (west) and E Pit highwall diversion drain
2016	• Complete G Pit • Commence C Pit (west) • Commence Dragline 1 in G Pit
2017	• Construct Northern ROM and overland conveyor • Commence A Pit (west) and A Pit dump diversion drain • Complete J Pit tailings void (130 Mm^3)
2018 – 2027	• Complete wash plant and commence coal washing: utilise tailings cells until J • Pit inventory is mined out • Mine out I Pit and commence rehabilitation • Dragline 2 commences in both C and E Pits • Commence H Pit and construct G Pit and H Pit highwall diversion drains • Dragline 3 commences in A Pit

Stage 2

Stage 2 offset delivery will involve the delivery of offsets for activities proposed to occur between 2028 and 2047. These activities and their associated timeframes are outlined in **Table 29**.

Table 29: Activities to be offset in Stage 2

YEAR/S	ACTIVITIES TO BE OFFSET
2028 – 2037	• Commence B Pit (west) • Commence D Pit (west) • Construct low low-level crossing of Carmichael River • Commence M Pit • Commence A Pit (east) • Rehabilitate A Pit (west) and profile spoil dump and west void • Rehabilitate C Pit (west) and spoil dump • Commence N Pit • Commence Southern Underground construction • Construct permanent G Pit and H Pit highwall diversion drains
2038 – 2047	• Construct Carmichael River southern flood protection levee • Construct southern ROM • Commence production southern underground mine • Commence G Pit rehabilitation • Commence A Pit (west) rehabilitation • Commence C Pit (east) production • Dragline introduced into M Pit

	• Commence L Pit • Complete N Pit box-cut

Stage 3

Stage 3 offset delivery will involve the delivery of offsets for activities proposed to occur between 2048 and 2110. These activities and their associated timeframes are outlined in **Table 30**.

Table 30: Activities to be offset in Stage 3

YEAR/S	ACTIVITIES TO BE OFFSET
2048 – 2057	• No new pits commenced
2058 - 2067	• Duplicate southern ROM capacity • Commence P Pit • J Pit rejects dam full. Move to G Pit and rehabilitate J Pit • Completion of northern and central underground mines • Rehabilitate northern and central underground Infrastructure and overland conveyor routes • Completion of southern underground mine • Rehabilitate southern underground infrastructure and overland conveyor route • Construct Carmichael River northern flood protection levee • Commence K Pit and O Pit
2068 - 2077	• Commence B Pit (east) • Decommission Northern ROM
2077 - 2087	• Complete north pit area (A Pit to E Pit) and commence final rehabilitation • Complete mining north of Carmichael River and commence final rehabilitation of active pits (mine infrastructure and haul road remain)
2088 - 2110	• Complete mining in M Pit, N Pit and O Pits, to toes of out-of-pit spoil dumps. • Rehabilitate mine site

8 CONCLUSION

Ecofund has identified that the project is likely to require offsets under Australian and Queensland Government offset policies (**Table 31**).

Table 31: Summary of policies relevant to the project and their applicability

POLICY	MINE	RAIL
EPBC Act Environmental Offsets Policy	Yes	Yes
Queensland Government Environmental Offset Policy	Yes	Yes
Policy for Vegetation Management Offsets	No	Yes
Queensland Biodiversity Offset Policy	Yes	Yes

Ecofund's analysis of Moray Downs indicates that areas outside proposed infrastructure development are likely to contain significant potential to support environmental offsets compliant with both Australian and Queensland Government policies. The suitability of offset areas on Moray Downs is dependent on the results of ecological equivalence assessments and the application of offset ratios by the Australian Government.

Ecofund has also assessed the availability of potential offsets in the wider landscape to acquit the offset requirements of the project. This assessment involved a desktop review of all compliant offset areas within the Brigalow Belt and Desert Uplands Bioregions.

For mine related impacts, there is sufficient availability of potential offset areas to fulfil Australian Government offset requirements. There is also sufficient availability of potential offset areas to fulfil the Queensland Government offset requirements for the majority of environmental values relating to the mine. For RE 10.7.4, listed as of concern under the VM Act, there are only 41 ha of potential offset areas available within the Desert Uplands Bioregion. Given the impact on this RE is estimated to be 88 ha, field surveys will be undertaken to identify additional offset availability in the landscape. For eight values impacted by the mine it is likely that the delivery of direct offsets will require the securing of offsets across multiple lots to fulfil Queensland Government offset requirements.

For rail-related impact values, there is sufficient area available to provide compliant direct offsets for all impact values i.e. for all values there is hundreds of times the area impacted available. In addition, for all values impacted there are at least 50 lots that contain complaint offset areas that are equal to or greater than the corresponding impact of the rail on that value. Therefore, for all rail-related impacts there is sufficient potential to provide offsets within the Brigalow Belt Bioregion.

On approval of this strategy, an Environmental Offset Package will be developed to present the proposed solutions to fulfil the offset requirements of the project based on Queensland and Australian Government legislation and offset policies in place at the time that the package is prepared. The package is likely to include a combination of direct and indirect offsets, offset payments and offset transfers and is anticipated to be completed in Q2 2013.

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APPENDIX A: WATERCOURSE VEGETATION MPACTS BY RE TYPE

RE CODE	IMPACT AREA (HA)
Mine	
Stream orders 1 and 2 - watercourse vegetation	
10.3.14a	11.41
10.3.14d	8.21
10.3.25	4.77
10.3.28a	144.42
10.3.3b	0.28
10.3.4b	3.51
10.3.6a	126.32
10.4.3a	1.82
10.4.5	17.46
10.5.1a	6.29
10.5.1c	12.73
10.5.1d	11.07
10.5.4a	0.09
10.5.5a	169.12
10.5.8a	11.76
10.7.10b	0.31
10.7.2a	18.38
10.7.3a	0.65
10.7.3b	1.62
10.7.4	1.20
10.7.5	0.04
11.3.1	2.40
11.3.10	10.27
11.3.3	1.69
11.3.5	8.44
11.4.6	4.25
Stream order 3 and 4 – watercourse vegetation	
10.3.28a	41.95
10.3.6a	13.91
10.4.3a	1.92
10.4.5	15.37
10.5.5a	5.99
Stream order 5 or greater – watercourse vegetation	
-	0
Rail	
Stream orders 1 and 2 - watercourse vegetation	
11.3.1	0.42
11.3.10	0.34
11.3.25	2.63
11.3.3	3.71
11.3.37	0.52
11.3.5	0.31
11.4.6	0.40
11.4.9	0.05
11.5.3	1.44
11.5.9c	2.03
Stream order 3 and 4 – watercourse vegetation	
11.3.1	1.37

RE CODE	IMPACT AREA (HA)
Stream order 5 or greater – watercourse vegetation	
11.3.1	0.23
11.3.10	0.77
11.3.25	4.90
11.3.3	4.56
11.3.37	0.85
11.3.5	1.23

APPENDIX B: VEGETATION MANAGEMENT CODE PERFORMANCE REQUIREMENTS AND ACCEPTABLE SOLUTIONS (DERM 2009)

PERFORMANCE REQUIREMENT	ACCEPTABLE SOLUTION
PR S.2: Wetlands To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes—maintain the current extent of assessable vegetation associated with any natural significant wetland and/or natural wetland is protected to maintain— a) water quality by filtering sediments, nutrients and other pollutants; b) aquatic habitat; and c) terrestrial habitat.	**AS S.2** **S.2.1** Clearing does not occur— a) in any natural wetland; and b) within 100 m from any natural wetland; and c) in any natural significant wetland; and d) within 200 m from any natural significant wetland.
PR S.3: Watercourses To regulate the clearing of vegetation in a way that does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes—maintain the current extent of assessable vegetation associated with any watercourse to provide— a) bank stability by protecting against bank erosion; b) water quality by filtering sediments, nutrients and other pollutants; c) aquatic habitat; and d) terrestrial habitat.	**AS S.3** **S.3.1** Clearing does not occur— a) in any watercourse; and b) within 50 m of each high bank of each watercourse with a stream order of 1 or 2; or c) within 100 m of each high bank of each watercourse with a stream order of 3 or 4; or d) within 200 m of each high bank of each watercourse with a stream order of 5 or greater

PERFORMANCE REQUIREMENT	ACCEPTABLE SOLUTION
PR S.4: Connectivity To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes—areas of remnant vegetation are retained that are— a) of sufficient size and configured in a way to maintain ecosystem functioning; b) of sufficient size and configured in a way to remain in the landscape in spite of any threatening processes; and c) located on the lot(s) that are the subject of the application to maintain connectivity to remnant vegetation on adjacent properties.	**AS S.4** **S.4.1** Where clearing is less than— a) 25 m wide; or b) is less than 5 ha; clearing does not— - reduce the width of remnant vegetation to less than 200 m; and - occur where the width of remnant vegetation is less than 200 m; OR **S.4.2** Clearing does not— a) reduce areas of contiguous remnant vegetation to less than 50 ha; and b) occur in areas of contiguous remnant vegetation that are less than 50 ha; and c) reduce the width of remnant vegetation to less than 200 m; d) occur where the width of remnant vegetation is less than 200 m; and e) reduce the total extent of remnant vegetation to less than 30%; and f) occur where the total extent of remnant vegetation is less than 30%.
PR S.5: Soil erosion	**AS S.5**

PERFORMANCE REQUIREMENT	ACCEPTABLE SOLUTION
To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—the effect of clearing does not result in— a) mass movement, gully erosion, rill erosion, sheet erosion, tunnel erosion, stream bank erosion, wind erosion, or scalding; and b) any associated loss of chemical, physical or biological fertility — including, but not limited to water holding capacity, soil structure, organic matter, soil biology, and nutrients, within and/or outside the lot(s) that are the subject of the application.	**S.5.1** Mechanical clearing only occurs on— a) very stable soils on a slope less than 15%; and b) stable soils on a slope less than 12%; c) unstable soils on a slope less than 8%; and d) very unstable soils on a slope less than 5%.
PR S.6: Salinity To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes – clearing does not contribute to – a) waterlogging; or b) the salinisation of groundwater, surface water or soil.	**AS S.6** **S.6.1** Where clearing is less than— a) 2 ha; or b) 10 m wide; Clearing does not occur in any discharge area. OR **S.6.2** Where clearing is less than— a) 5 ha; or b) 50 m wide clearing does not occur—

PERFORMANCE REQUIREMENT	ACCEPTABLE SOLUTION
	i) in any discharge area; and ii) within 200 m of any discharge area.
PR S.7: Conserving remnant Endangered regional ecosystems and Of Concern regional ecosystems To regulate the clearing of vegetation in a way that conserves remnant Endangered regional ecosystems and remnant Of Concern regional ecosystems— maintain the current extent of Endangered regional ecosystems and Of Concern regional ecosystems.	**AS S.7** **S.7.1** Clearing only occurs in Endangered regional ecosystems or Of Concern regional ecosystems that are not listed in Table 4 and where the clearing within those regional ecosystems is less than— a) 10 m wide; or b) 0.5 ha
PR S.8: Essential Habitat To regulate the clearing of vegetation in a way that prevents the loss of biodiversity— maintain the current extent of Essential Habitat.	**AS S.8** **S.8.1** Clearing does not occur in an area shown as Essential Habitat on the Essential Habitat map.
PR S.9: Conservation status thresholds To regulate the clearing of vegetation in a way that conserves remnant regional ecosystems and prevents the loss of biodiversity—maintain the current extent of regional ecosystems listed in Table 5.	**AS S.9** **S.9.1** Clearing in a regional ecosystem listed in Table 5, does not occur unless the clearing is less than— a) 10 m wide; or b) 2 ha.

PERFORMANCE REQUIREMENT	ACCEPTABLE SOLUTION
PR S.10: Acid sulfate soils To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes in the coastal subregions of the Brigalow Belt Region, and the Marlborough Plains subregions (11.14) – clearing activities do not result in disturbance of acid sulfate soils or changes to the hydrology of the location that will either – a) aerate horizons containing iron sulfides; or b)mobilise acid and/or metals.	**AS S.10** **S.10.1** In the coastal subregions of the Brigalow Belt Region, and the Marlborough Plains subregions (11.14), clearing in land zone 1, land zone 2 or land zone 3 in areas below 5 m Australian Height Datum— a) is carried out in accordance with an acid sulfate soils environmental management plan as outlined in the State Planning Policy 2/02 Guideline: Planning and Managing Development involving Acid Sulfate Soils; and b) follows management principles in accordance with the Soil Management Guidelines in the Queensland Acid Sulfate Soil Technical Manual.

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