Adani Mining Pty Ltd

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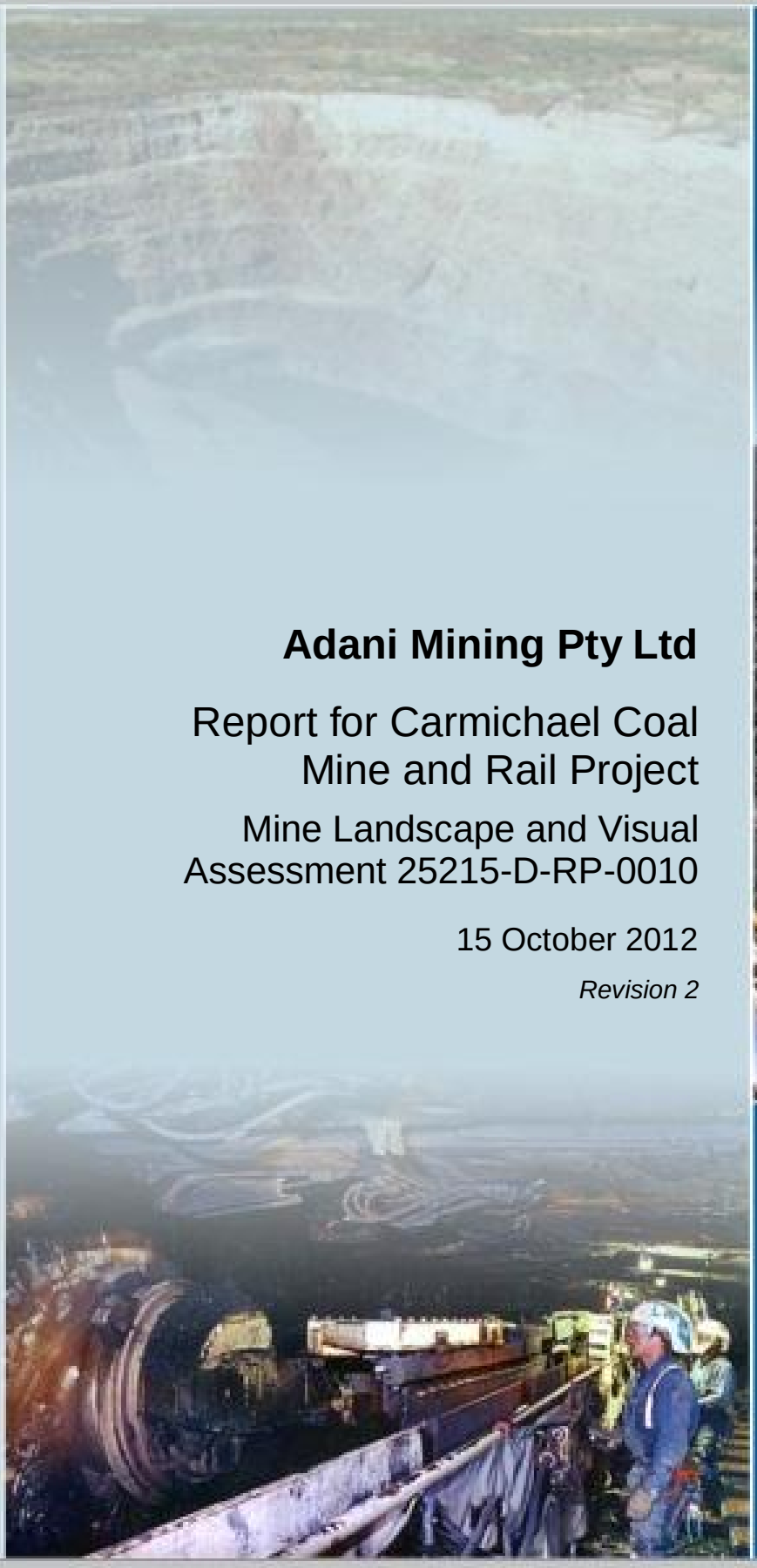

Adani Mining Pty Ltd

Report for Carmichael Coal Mine and Rail Project

Mine Landscape and Visual Assessment 25215-D-RP-0010

15 October 2012

Revision 2

GHD

This Carmichael Coal Mine and Rail Project: Mine Landscape and Visual Assessment ("the Report") has been prepared by GHD Pty Ltd ("GHD") on behalf of and for Adani Mining Pty Ltd ("Adani") in accordance with an agreement between GHD and Adani.

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

The services undertaken by GHD in connection with preparing the Report were limited to those specifically detailed in Section 1 of the Report.

The Report is based on conditions encountered and information reviewed, including assumptions made by GHD, at the time of preparing the Report. Assumptions made by GHD are listed within Section 1.4 of the Report and contained through the Report.

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- *reliance on the Report by a third party, or use of this Report other than for the Purpose*

Contents

Table Index

Figure Index

Plate Index

Appendices

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Abbreviations and Glossary

Project Specific Terminology	
Abbreviation	**Term**
the EIS	Carmichael Coal Mine and Rail Project Environmental Impact Statement – refers to the particular document that GHD is preparing to facilitate approval of the Project
The Proponent	Adani Mining Pty Ltd
The Project (Mine)	Carmichael Coal Mine and Rail Project: Mine Component
The Project (Rail)	Carmichael Coal Mine and Rail Project: Rail Component

Generic Terminology	
Abbreviation	**Term**
Background view	6 km – 16 km - Textures are no longer visible, but mountain and valley forms, skylines and ridgelines are important (Forest Practice Board Tasmania, 2006).
Cut	An excavation for constructing below the natural ground level.
Cut batters	The side slopes of cuttings.
Ecology	A branch of biology dealing with the relations and interactions between organisms and their environment, including other organisms.
the EIS	Carmichael Coal Mine and Rail Project Environmental Impact Statement- refers to the particular document that GHD is preparing to facilitate approval of the Project
Fill	Earth used to construct an embankment.
Foreground	0 -1 km – Is the visual zone where colour contrast and textural detail are most clearly perceived (Forest Practice Board Tasmania, 2006).
Landscape feature	A component, part or feature of the landscape that is prominent or eye-catching, e.g. hills, buildings, vegetation.
Landscape quality	Largely subjective judgement based on particular characteristics that influence the way in which the environment is experienced, including special interests such as cultural associations or heritage interests, the presence and/or type of elements and condition.
Landscape sensitivity	The extent to which landscape can accept a change of a particular type and scale without unacceptable adverse impacts on its character.

Generic Terminology	
Abbreviation	**Term**
Landscape value	Areas of formally designated landscape that through national or local consensus, reflect the value placed by society on particular environments and/or their features.
Middleground view	1 km-6 km – different elements in the landscape are visually apparent (Forest Practice Board Tasmania, 2006).
Mitigation	Limit the intensity of impacts or prevent impacts.
National Environmental Significance (NES)	Matters of NES as listed under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*, which include World/National Heritage properties, Ramsar Wetlands, Nationally Threatened Species and Ecological Communities, Migratory Species, Commonwealth Marine Areas, Nuclear Actions and National Heritage Places.
Sensitive visual receptor	Person and/or viewer group that would experience an impact.
Viewing locations	Viewing locations are used in this report to typify the views experienced by sensitive visual receptors throughout the visual catchment of the proposal. Viewing locations in this report often represent a viewing area, rather than one exact point.
Visual amenity	The value of a particular area or view in terms of what is seen.
Visual impact	Changes in the appearance of the landscape or in the composition of available views as a result of development, to people's responses to these changes, and to the overall impacts in regard to visual amenity. This can be positive (i.e. beneficial or an improvement) or negative (i.e. adverse or a detraction).
Visual catchment	Extent of potential visibility to or from a specific area, feature or proposal.
Abbreviations	
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
DERM	Former Queensland Department of Environment and Resource Management
GIS	Geographic Information Systems
NC Act	*Nature Conservation Act 1992*
SP Act	*Sustainable Planning Act 2009*
IPA	*Integrated Planning Act 1997*
IRC	Isaac Regional Council
LGA	Local Government Area

ToR	Terms of Reference
VM Act	*Vegetation Management Act 1999*

Executive Summary

This landscape and visual impact assessment was undertaken by GHD on behalf of Adani Mining Pty Ltd (Adani), as part of the Environmental Impact Statement (EIS) for the Carmichael Coal Mine and Rail Project (the Project) and specifically for the Mine component of the Project. This report has been prepared to assess the existing landscape and visual amenity of the study area, impacts of the Project, and to develop mitigation measures to minimise impacts of the Project.

Adani is proposing to develop a 60 million tonne per annum (Mtpa) thermal coal mine in the Galilee Basin approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland.

The study area for the Landscape and Visual Impact Assessment encompasses the indicative visual catchment of the proposed works and general region surrounding the Project.

The Landscape and Visual Impact survey and assessment included the following:

- Literature review of existing studies for the site and locality, where available
- Review of the legislative framework within the context of this assessment
- Desktop analysis utilising available GIS data
- Site assessment including photography in June 2011
- Analysis of landscape and visual significance of effects
- GIS based view-shed analysis

Based on the findings of this report, views to the Project (Mine) are restricted and would only be visible to potential sensitive receptors on Moray Carmichael Boundary Road. These impacts would be moderate in the immediate vicinity of the Project reducing in severity with distance for road users. The remaining receptors either are at a reasonable distance from or have a prominent ridgeline screening the view.

The Project (Mine) will result in a large change to existing land use over a Project operating life of approximately 90 years. Project elements that would adversely affect the landscape character of the site and/or the visual amenity of receptors include the change in land use from low intensity cattle grazing land use to a mining land use. This will include the development of the support infrastructure such as a workers accommodation village and airstrip. The proposed mine will operate 24 hours per day and the impacts from lighting will be caused by: static floodlights associated with mine operations, lighting around the mine infrastructure area, workshops, ancillary buildings, workers accommodation village and airstrip, as well as vehicle lights moving around the site. The clearing of vegetation as part of the construction and operation of the Project (Mine) will have an ancillary impact of removing some of the vegetated buffers, which currently limit the views to the Study Area.

Mitigation measures recommended in this report to minimise these impacts include: avoiding losses of vegetation wherever possible, revegetation of land along the Carmichael Moray Boundary Road and a sensitive lighting design. The mitigation will be achieved through the planned progressive rehabilitation of the Project (Mine) and final rehabilitation and decommissioning of the site.

1. Introduction

1.1 Project Overview

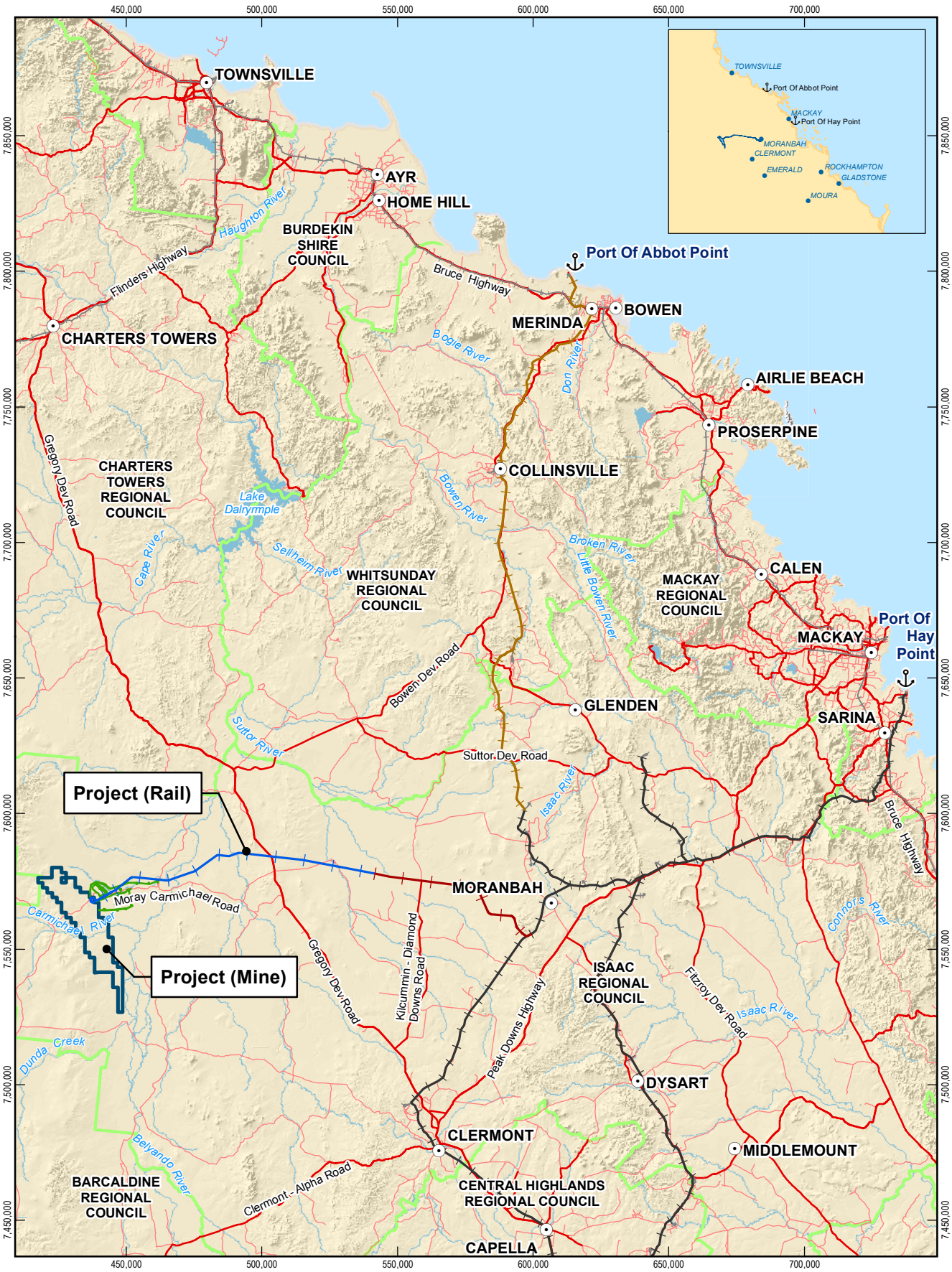
Adani Mining Pty Ltd (Adani) is proposing to develop a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the north Galilee Basin approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland. All coal will be railed via a privately owned rail line connecting to the existing QR National rail infrastructure to coal terminal facilities at the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion), where it will be loaded onto export vessels. The Carmichael Coal Mine and Rail Project (the Project) will have an operating life of approximately 90 years.

The Project comprises of two major components:

- The Project (Mine): a greenfield coal mine over EPC1690 and the eastern portion of EPC1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including:
  - A workers accommodation village and associated facilities
  - A permanent airport site
  - Water supply infrastructure
- The Project (Rail): a greenfield rail line connecting the Mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively; including:
  - Rail (west): a 120 km dual gauge portion from the Mine site running west to east to Diamond Creek
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah

The Project has been declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) for which an Environmental Impact Statement (EIS) is required. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project EIS has been developed with the objective of avoiding or mitigating all potential adverse impacts to environmental, social and economic values and enhancing positive impacts. Detailed descriptions of the Project are provided in Volume 2 Section 2 Project Description (Mine) and Volume 3 Section 2 Project Description (Rail). Figure 1-1 presents the Project location.



LEGEND

- Town
- Major Port
- Other Rail Network
- Goonyella System
- Newlands System
- State Road
- Local Road
- Watercourse
- Local Government Area
- Project (Rail)
- Rail (West)
- Rail (East)
- Project (Mine)
- Mine (Offsite)

1:2,000,000 (at A4)

0 10 20 30 40 50

Kilometres

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

N

Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision L
Date 28-08-2012

Project Location

Figure: 1-1

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Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses (2007); DERM: LGA, (2011), Hillshade (2009); DMR: State Roads (2008); Gassman/Hyder: Mine (Offsite) (2012); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012). Created by: BW, JVC

1.2 Purpose of this Report

The purpose of this report is to provide a landscape and visual impact assessment of the Project (Mine) and present strategies to mitigate its potential impacts. In doing so, this assessment describes the existing landscape character within the visual catchment of the Project (Mine), identifies and assesses the significance of the visual impacts and provides management to address those potential impacts, as appropriate. This report addresses the terms of reference (ToR) for the Project EIS outlined in Section 3.2.1, relating to the Project (Mine) only. Table 1-1 below provides a cross reference between sections of this report and the ToR.

The central purpose of the landscape and visual impact assessment is to identify potential significant adverse impacts at the planning stage of the Project (Mine) and to propose measures to mitigate or ameliorate such impacts.

Table 1-1 Terms of Reference Cross Reference

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.1 Scenic Amenity and Lighting	
Description of environmental values	
Describe the existing character of the landscape and the general impression that would be obtained while travelling through and around it.	Section 3
Outline existing landscape features, panoramas and views that have, or could be expected to have, value to the community	Section 3.5
Provide information in the form of maps and photographs demonstrating:	
◗ major views, view sheds, outlooks and features contributing to the amenity of the area, including assessment from private residences	Section 3.5, Figure 3-1, Figure 3-2
◗ focal points, landmarks, waterways (e.g. rivers, streams, creeks other bodies of water and wetlands) and other features contributing to the visual quality of the area and the project site(s)	Section 3.4
◗ character of the local and surrounding areas including vegetation and land use	Sections 3.2 and 3.3
Describe the relevant geomorphology supported by illustrative mapping.	Section 3.2, Section 3.4, Figure 3-2 and EIS Volume 4 Appendix L
Potential impacts and mitigation measures	
Describe the potential beneficial and adverse impacts of the project on landscape character and visual qualities of the site and the surrounding area. Detail appropriate mitigation measures to avoid such impacts.	Section 1

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.1 Scenic Amenity and Lighting	
Lighting	
Assess and describe impacts of the project's lighting, during all stages, with particular reference to objectives to be achieved and management methods to be implemented to mitigate or avoid.	Section 4.4

1.3 Aim and Objectives

Consistent with the ToR, the aim of the landscape and visual assessment is to describe, in general terms, the existing character of the landscape and the general impression that would be obtained while travelling through and around it. Existing landscape features, panoramas and views that have, or could be expected to have, value to the community are outlined. Information in the form of maps and photographs, particularly where addressing the issues below, is provided:

- Major views, view sheds, outlooks and features contributing to the amenity of the area, including assessment from private residences
- Focal points, landmarks, waterways (e.g. rivers, streams, creeks other bodies of water and wetlands) and other features contributing to the visual quality of the area and the project site(s)
- Character of the local and surrounding areas including vegetation and land use

At a level of detail appropriate to the scale of the project, describe the relevant geomorphology supported by illustrative mapping highlighting any significant features and associated environmental values.

1.4 Assumptions and Limitations

Some selected sensitive visual receptor viewing locations were inaccessible at the time of site survey, as the property owner had not granted permission to access the land. The assessment for these locations was therefore undertaken based on the desktop study and an assessment from the nearest publically accessible area.

The assessment process aims to be objective and describe any changes factually. Potential changes to the landscape as a result of the Project (Mine) have been defined, however the significance of these changes requires qualitative (subjective) judgements to be made. The conclusions to this assessment therefore combine objective measurement and professional interpretation. This assessment has attempted to be objective, however it is recognised that visual assessment can be highly subjective and individuals are likely to associate different visual experiences with the study area.

A number of assumptions have been made for this assessment, as outlined below.

- The assessment is based on the information available for the Project (Mine) at the time of writing.
- Baseline conditions were assessed in the field during the site survey in June 2011.
- For the purpose of this report, general assumptions have been made in order to appraise the impact of the construction works upon landscape resources and visual amenity based upon similar Projects and specialist advice.

- The workers accommodation village is not considered to be a sensitive receptors as it is an integral part of the overall Project.

1.5 Study Area

For the purposes of this report, the Study Area is the visual catchment. The visual catchment is defined as the area from within which the Project (Mine), at its maximum development, may be seen. The area of maximum development is based on footprint of the Conceptual Mine Plan (see Volume 1 Section 4 Project Description).

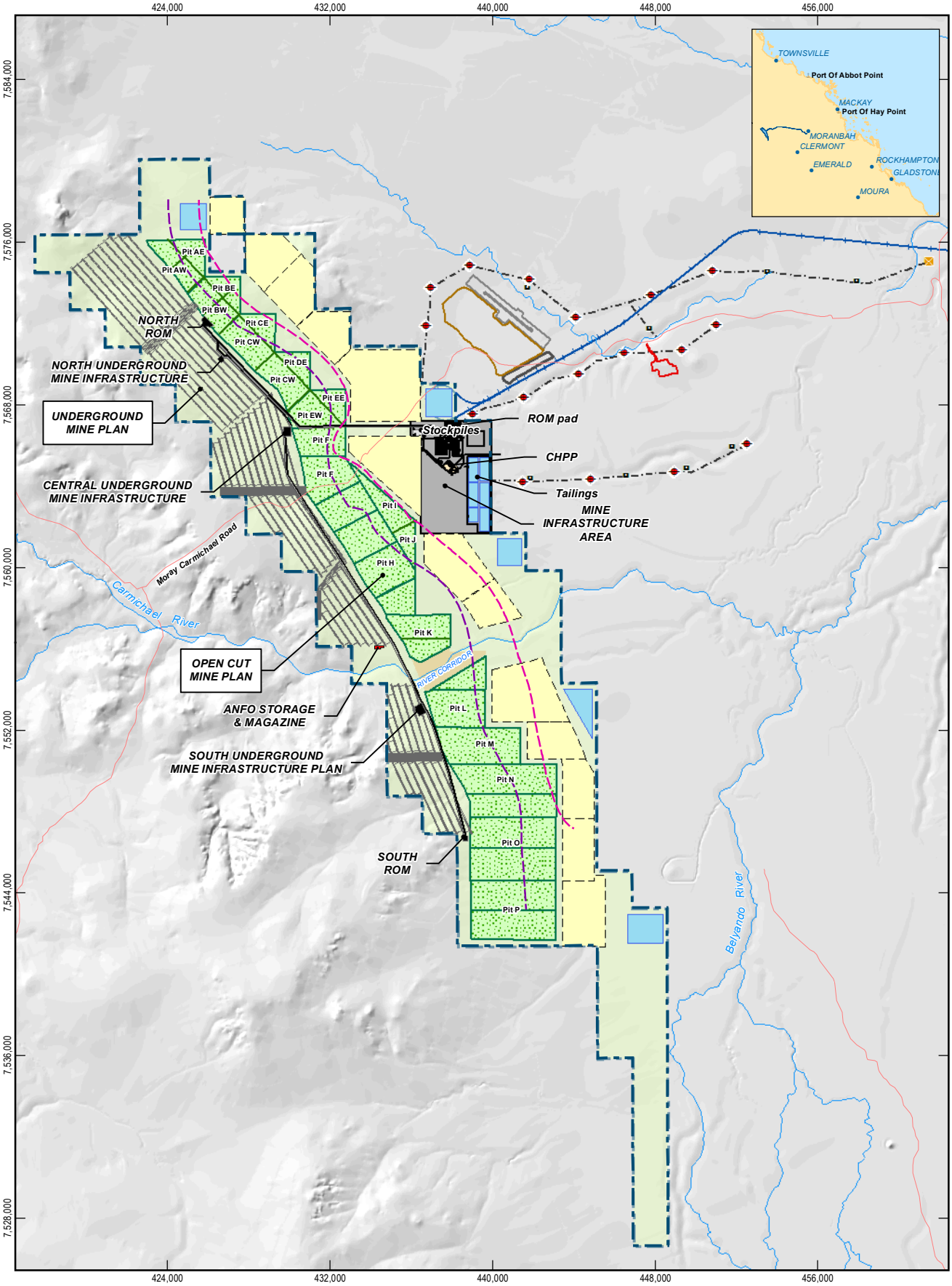
The Study Area includes both onsite and offsite infrastructure components of the Project (Mine). Onsite infrastructure components include that required for the successful construction and operation of the mine. A full list of the onsite infrastructure is provided in Volume 2 Section 2 Project Description. Offsite infrastructure project components include all those components that are located outside EPC1690 and part EPC1080, including the workers accommodation village and airstrip.

1.6 Location

The Study Area is located approximately 160 km north-west of the town of Clermont, Central Queensland. The nearest regional centre is Moranbah, 200 km east of the Study Area. The Study Area is located in the area known as the Galilee Basin. The Galilee Basin is a significant coalfield consisting of up to four principal coal seams suitable for thermal coal, with the potential for liquefaction and gasification.

The workers accommodation village is located approximately 8.4 km east of the mine site on the southern side of the Moray Carmichael Road. The airstrip, industrial development area and rail siding are located approximately 3.4 km east of the mine site on the northern side of Moray Carmichael Road.

Current access to the Project (Mine) area is via the unsealed Moray Carmichael Road from the Gregory Developmental Road, located approximately 70 km to the east of the site. Figure 1-2 shows the location of the Project (Mine) components.



LEGEND

- Local Road
- River / Watercourse
- AB1 Cropline
- D1 Cropline
- Overland Conveyors
- Rail (West)
- Mine (Onsite)
- Open Cut Blocks
- Out of Pit Waste Dumps
- Water Management Dams
- Mine (Offsite)
- Borehole
- Storage Site (Instream)
- Storage Facility (Offstream)
- Pipeline Network
- Airport Location
- Rail Siding
- Industrial Area
- Workers Accommodation Village

1:270,000 (at A4)

0 2 4 6 8

Kilometres

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

N

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Mine) Onsite and Offsite Infrastructure

Job Number	41-25215
Revision	A
Date	29-08-2012

Figure 1-2

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data Source: GA: Road, River / Watercourse (2007); DME:EPC1690 (2010), EPC1080 (2011); Adani: Mine Layout / Infrastructure (2012); Gassman Hyder: Mine (Offsite) (2012);. Created by: CA

2. Methodology

2.1 Introduction

For the purpose of this report, the term 'landscape' includes:

- Landscape character
- Landscape context
- Views and prospects
- Historical landscapes
- Anthropogenic landscapes

The landscape and visual impact assessment is a combination of two separate but closely related aspects. The first is impact upon the landscape character, that is, responses that sensitive visual receptors experience because of the effects of the new development. The second is visual impact, that is, the extent to which new developments are visible within the visual catchment.

2.2 Standards and Guidance

The methodology for the landscape and visual impact assessment responds to particular project requirements and constraints including the scale and nature of the Project (Mine). There are no guidelines on the assessment of landscape and visual impacts specific to Australia. However, the industry typically refers to guidance offered by the British Institute of Landscape Architects. This assessment has therefore been conducted in accordance with the Guidance for Landscape and Visual Impact Assessment (2002) published jointly by the Landscape Institute and the Institute for Environmental Management and Assessment (UK).

Terminology and assessment methods have also been derived from the Visual Landscape Planning in Western Australia, produced by the Western Australian Planning Commission (2007) and the Forest Practice Board of Tasmania's, A Manual for Forest Landscape Management (2006).

2.3 Baseline Landscape Characterisation

2.3.1 Desktop Study

The desktop study included a review of the relevant published documents in relation to visual impact and landscapes at a national, regional and local level for the study Area. The desktop study also included a review of the legislative framework (further described in Section 2.6).

Potential sensitivity receptors, defined as a person or viewer group that would experience a potential impact were identified through the use of geographical information. Consultation with Isaac Regional Council (IRC) also assisted in identifying key planning considerations relevant to this assessment.

The following data sets were reviewed:

- Aerial photography
- Topographic maps with contours at 10 m

- Hillshade (SRTM Shaded Relief)
- Road networks (GA 2007)
- Existing rail networks (GA 2007)
- Proposed rail alignments (Missing Link, Alpha Coal Project and Waratah)
- Homestead locations (Homesteads GA 2007)
- Cadastre (DERM 2011)
- Water courses (GA 2007)
- Protected areas as defined under *Nature Conservation Act 1992* (DCDB DERM 2011)
- Nature refuges as defined under *Nature Conservation Act 1992* (DCDB DERM 2010)
- Local Government Area(LGA) boundaries
- Interim Biogeographic Regionalisation for Australia Version 6.1 (regions and subregions (DEH 2005)
- Survey maps

2.3.2 Site Survey

A site survey was undertaken to verify the desktop study to:

- Allow characterisation of the landscape
- Identify sensitive receptors
- Observe and document how the landscape may be viewed from sensitive receptors

Two qualified Landscape Architects conducted the site survey in June 2011, during conditions of good visibility. During the site survey, the Landscape Architects traversed the study area and viewed the proposed mine site from publicly accessible viewpoints. Photographs were taken at each location with the bearing and GPS location recorded along with field notes and sketches. The site survey assisted in building consensus, thereby limiting subjectivity.

Representative viewpoints were selected, recorded and photographed. Viewpoints were chosen to represent a range of typical views possible from that locality, to the Project (Mine). In addition, the viewpoints were selected to:

- Represent views of particular landscape and /or visual features of importance
- Represent views from key visual receptors (residents and road users) where a potentially significant change in view may occur as a result of the Project (Mine)

2.3.3 Defining the Landscape Character Areas

Landscape character areas are considered common landscape types (defined by typical features and characteristics) and highlight any principal landscape features. A description of the landscape character combines subjective assessments and objective description and is provided from both within the Study Area, and from the wider landscape.

The potential impact on the landscape character is measured by the responses that are felt by sensitive visual receptors towards the combined effects of the new development. The categorising of the landscape character areas include:

- Landform
- Vegetation
- Intensity
- Character of land

The categories are informed through a review of the information during the desktop study described in Section 2.3.1 and the site survey described in Section 2.3.2. Particular attention was paid to the relevant regions/subregions selected from the Interim Biogeographic Regionalisation for Australia regions and subregions (DEH 2005). This national data set which classifies the land surface of Australia, is derived from specialist ecological knowledge and the assessment of climate, geomorphology, landform, lithology, and characteristic flora and fauna (DEH 2005). These attributes provide additional information to inform landscape character.

2.3.4 Defining the Visual Catchment

The visual catchment is defined as the area from within which the Project (Mine) may be seen, which in turn is defined as the Study Area. The Study Area was determined through a desktop study of aerial photographs and topographic maps where landform and land cover (screening) were considered in parallel. The area of maximum development is based on footprint of the Conceptual Mine Plan.

2.3.5 Description of Existing Conditions

A description of the existing conditions of the landscape and visual environment forms the baseline against which the Project (Mine) was assessed. The description of the existing conditions is based upon outcomes of the desktop study and the site survey. The principal documents and data sources used include:

- Survey mapping and GIS data sets
- Aerial photography
- Information from local planning authorities, including land use planning. Refer to Section 2.6.2
- Site survey outcomes including a photographic record of landscape features, key views and sensitive receptors
- Observations of the way elements of the public realm, such as the roads, are used

The assessment takes into account

- The landscape character defined for the Study Area
- Representative viewing locations
- Sensitive visual receptors

As outlined in Section 1.4, some selected sensitive visual receptor viewing locations were inaccessible at the time of site survey. The assessment for these locations was therefore undertaken based on the desktop study and an assessment from the nearest publicly accessible area.

2.4 Assessment of Impacts

2.4.1 Introduction

Impacts are defined as the relative capacity of the landscape to accommodate changes to the physical landscape of the type and scale proposed that would occur as a direct result of the Project (Mine).The level of the impact is evaluated considering:

- Visual modification
- Visual sensitivity

Both are defined in Section 2.4.3 and Section 2.4.4 respectively, and their use in identifying severity of the impacts outlined.

Assessment of landscape and visual impacts is necessarily qualitative as both the values of a particular landscape and the extent to which change to landscape character are acceptable are subjective.

2.4.2 Zone of Theoretical Visibility

A zone of theoretical visibility is the theoretic assessment of visibility to or from a designated point in the landscape using elevation data such as a Digital Elevation Model (DEM) to calculate the extent of visibility of that point from anywhere in the Study Area. This mapping does not take account of buildings or vegetation screening and hence reflects a lunar landscape, which for the visual impact assessment process represents the "worst case scenario". The zone of theoretical visibility generated for this assessment is based on 10 m contour intervals and an observer eye height of 1.7 m.

2.4.3 Visual Modification

Visual modification refers to the extent of change to the landscape, and therefore impact upon visual amenity, that would occur as a direct result of the Project from a given viewpoint. Landscape is defined as features (such as vegetation, built elements, topography, etc.) either within the Project (Mine) site or on land adjacent. The features of the landscape are considered as an integral part of the landscape and visual context of the route and important contributors to the overall character of the environment.

Assessment of changes to the landscape includes:

- The nature of the change that is the degree of contrast, or integration of, any new features with existing features
- Context and quality of the views including the extent to which the Project (Mine) will be visible in the wider landscape (with consideration of the presence of intervening vegetation or features)
- The scale or degree of change i.e. obvious / imperceptible with respect to loss or addition of features
- The nature of the impact (adverse or beneficial)

For the purposes of this assessment, the definitions in Table 2-1 have been used to describe visual modification.

Table 2-1 Visual Modification Definitions

Level of Modification	Definition
Large reduction or improvement	A substantial / obvious change to the landscape due to total loss of, or change to, elements, features or characteristics of the landscape. Would cause a landscape to be permanently changed and its quality diminished.
Moderate reduction or improvement	Discernible changes in the landscape due to partial loss of, or change to the elements, features or characteristics of the landscape. May be partly mitigated. The change would be out of scale with the landscape, and at odds with the local pattern and landform and will leave an adverse impact on the landscape.
Small reduction or improvement	Minor loss or alteration to one or more key landscape elements, features, or characteristics, or the introduction of elements that may be visible but may not be uncharacteristic within the existing landscape.
No perceivable reduction or improvement	Almost imperceptible or no change in the view as there is little or no loss of / or change to the elements, features or characteristics of the landscape.

Source:

Landscape Institute and Institute for Environmental Management and Assessment (2002)

2.4.4 Visual Sensitivity

Visual sensitivity refers to visual receptors and their sensitivity to their visual environment. Visual sensitivity is defined as the perception of viewers. Visual impacts relate to the changes that arise in composition of available views as a result of changes to the existing landscape, people's responses to these changes, and the overall impacts with respect to visual amenity.

For the purposes of this assessment, key visual receptors comprise residents, users of transport routes (road and rail) as well as users of public recreation and all have differing sensitivities to their visual environment. Generally, sensitivity is derived from a combination of factors including:

- Receptors interest in the visual environment i.e. high, medium or low interest in their everyday visual environment, and the duration of the effect
- Receptors duration and viewing opportunity i.e. prolonged, regular viewing opportunities
- Number of viewers and their distance / angle of view from the source of the effect, extent of screening/filtering of the view, where relevant
- Magnitude of change in the view (i.e. loss/addition of features that change the view's composition) and integration of changes within the existing view (form, mass, height, colour and texture)
- Effectiveness of proposed mitigation

For the purposes of this assessment, the terminology set out in Table 2-2 has been used to describe visual sensitivity.

Table 2-2 Visual Sensitivity Definitions

Sensitivity	Definition
High	Occupiers of residential properties with long viewing periods, within close proximity to the proposed development. Communities that place value upon the landscape and enjoyment of views of their landscape setting.
Medium	Outdoor workers who have a key focus on their work who may also have intermittent views of the Project (Mine) area. Viewers at outdoor recreation areas located within close proximity but where viewing periods are limited. Occupiers of residential properties with long viewing periods, at a distance from or screened / filtered views of the Project (Mine) area.
Low	Road users in motor vehicles, trains or on transport routes that are passing through or adjacent to the study area and have short term / transient views. Viewers indoor at their place of work, or similar.
Neutral	Viewers from locations where there is screening by vegetation or structures where only occasional views are available and viewing times are short.

2.4.5 Duration of Impact

Duration of impact has been defined for the purposes of this assessment as outlined in Table.

Table 2-3 Duration of Impacts

Duration	Definition
Temporary	Impacts lasting one year or less.
Short Term	Impacts lasting one to seven years.
Medium Term	Impacts lasting seven to fifteen years.
Long Term	Impacts lasting fifteen to sixty years.
Permanent	Impacts lasting over sixty years.

Source:

Landscape Institute and Institute for Environmental Management and Assessment (2002)

2.4.6 Impact Type

The definition of impact type as used in this assessment has been outlined in Table 2-4.

Table 2-4 Quality of the Impact

Impact	Definition
Neutral	A neutral impact will neither enhance nor detract from the landscape character or view.
Positive	A positive impact will improve or enhance the landscape character or view.
Negative	A negative impact will reduce or have an adverse effect on the existing landscape character or view.

2.4.7 Significance of Impact

The significance (or severity) of impacts has been assessed in accordance with the impact significance criteria applied across this EIS (described Table 2-1 in and Table 2-2 with respect to landscape visual impacts).

Only impacts of major or high significance in the context of this assessment have been considered. These impacts will require further refinement through mitigation or scheme design.

Table 2-5 Significance of impact

		Landscape Impact			
		Large	Moderate	Small	Negligible
Visual sensitivity	High	Major significance	High significance	Moderate significance	Minor significance
	Medium	High significance	Moderate significance	Minor significance	Not significant
	Low	Moderate significance	Minor significance	Not significant	Not significant
	Negligible	Minor significance	Not significant	Not significant	Not significant

2.5 Mitigation

Preliminary evaluation of site works and facilities have been guided by the need to avoid or reduce potential adverse effects on landscape character and visual receptors. Environmental constraints and opportunities have been taken into consideration at each stage of the Project (Mine) design. This iterative approach assists to avoid or minimise potential negative impacts of the Project (Mine) while helping to identify opportunities for landscape enhancement.

Where impacts have been deemed adversely significant, site specific mitigation measures have been proposed in order to lessen the impact on the landscape character and visual amenity.

The hierarchy of strategies for impact mitigation include:

- **Avoidance**– Avoid developments in sensitive or prominent landscapes, and avoid insensitive or visually intrusive designs. Prevention of adverse effects at source.
- **Reduction** – Reduction of adverse effects that cannot be eliminated by avoidance. The significance of adverse impacts is lessened. Seeks to limit the exposure of the sensitive visual receptor. Reduce the visual intrusiveness of the design and reduce the visibility of the Project (Mine) (e.g. by installing barriers between the location(s) of likely receptors and the source of the impact).
- **Remedy** – Remedy serves to improve adverse conditions by carrying out further works which seek to restore the environment e.g. increased planting of trees/shrubs to offset unavoidable loss of vegetation.
- **Offsetting** – The provision of alternative or compensatory measures where appropriate and feasible (e.g. offset planting).

If it is not possible or practical to mitigate an impact (e.g. felling mature trees) this is described as a Residual Impact.

2.6 Legislative Framework

2.6.1 Commonwealth Legislative Framework

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act ensures the protection of the environment, especially those aspects of the environment that are of national environmental significance and heritage value. The protection of the environment includes the qualities and characteristics of locations, places and areas; and heritage values of places that inform the considerations in this report.

Native Title Act 1993

The Project (Mine) intersects native title claims for the Wangan and Jagalingou People and Jangga Peoples current under the *Native Title Act 1993*. Landscapes may have particular cultural significance for Aboriginal people.

2.6.2 State Legislative Framework

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) protects native vegetation in Queensland. The VM Act regulates the clearing of vegetation for a variety of reasons, including to protect amenity. However, vegetation management codes established under the VM Act do not specifically require any consideration of visual impact when assessing compliance with codes.

Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) is established to conserve nature. The NC Act protects areas of conservation significance including National Parks, Nature Refuges and other conservation areas, as well as individual plants and animals. The NC Act recognises that biological diversity is important at a landscape scale. Bygana West Nature Refuge, Doongmabulla Mound Springs Nature Refuge and Wilandspey Conservation Park are either within or close to the Project (Mine) site and are all therefore protected under the NC Act. This legislation is applicable to both mine onsite and offsite development.

Aboriginal Cultural Heritage Act 2003

The main purpose of the *Aboriginal Cultural Heritage Act 2003* is to provide effective recognition, protection and conservation of Aboriginal cultural heritage. Landscapes can play an important part in Aboriginal cultural heritage. However, a separate cultural heritage assessment process will be undertaken as part of the Project EIS and is therefore not discussed further in this report.

Sustainable Planning Act 2009

The *Sustainable Planning Act 2009* (SP Act) provides the framework for planning and assessment of the elements of development, other than on mining leases. The SP Act does apply to all other elements of the Project (Mine). The framework for assessment has been utilised as a tool for assessing impacts. The SP Act includes aesthetic and amenity values as matters that should be considered in planning. In relation to assessment of aesthetic or visual aspects of development, local governments may recommend that applications be refused when relevant to their jurisdiction, where:

- "the building or structure, when built, will have an extremely adverse effect on the amenity or likely amenity of its neighbourhood; or
- the aesthetics of the building or structure, when built, will be in extreme conflict with the character of its neighbourhood" (SP Act section 288(2))

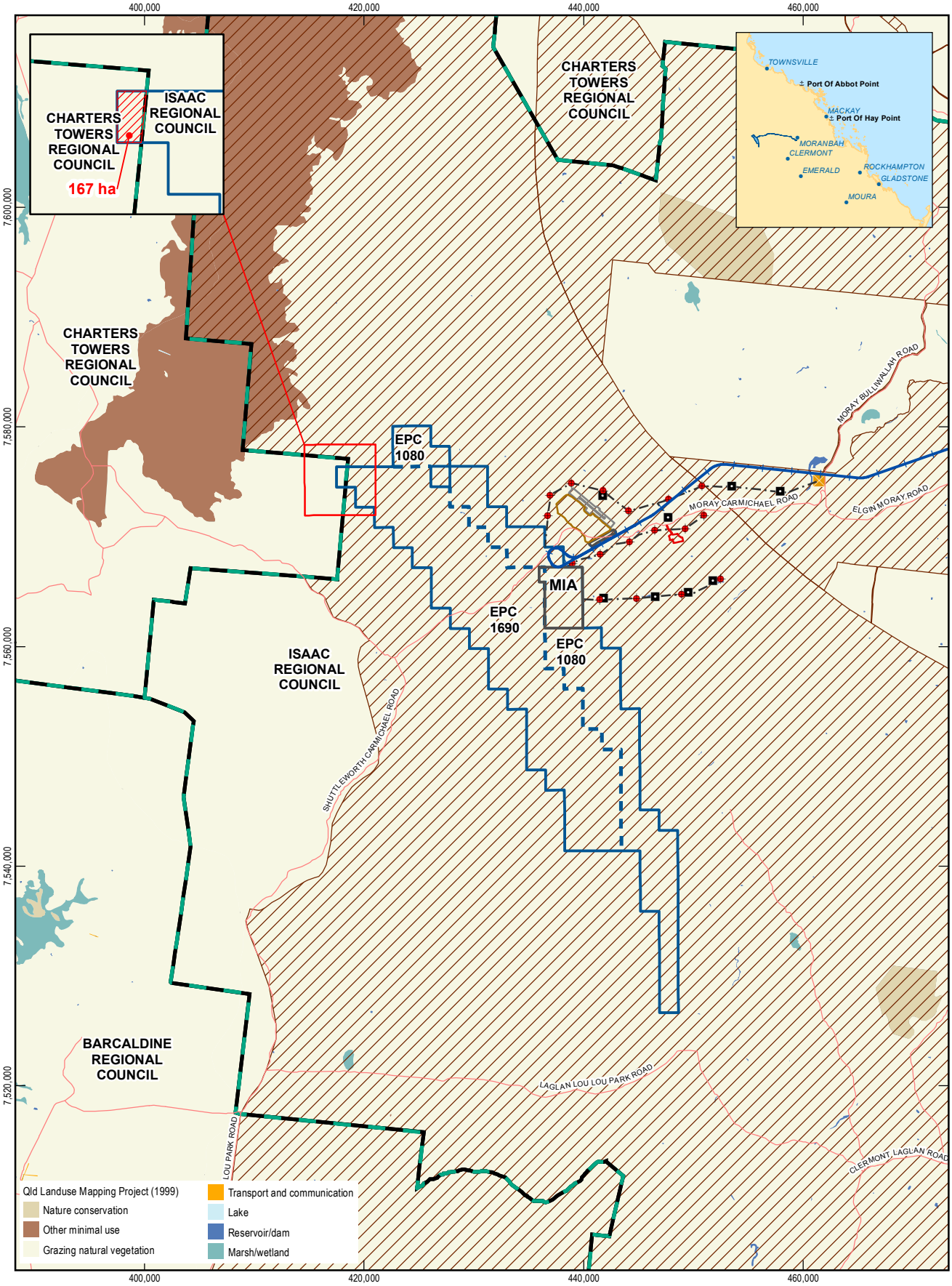
2.6.3 Local Planning Framework

The Study Area is principally located within part of the IRC LGA which was formerly the Belyando Shire (see Figure 1-1). The IRC was formed on 15 March 2008, following the amalgamation of the shires of Belyando, Broadsound and Nebo Shires. The former Shire Planning Schemes are still in effect, until a new Regional Council Planning Scheme comes into effect.

Development of land within the former Belyando Shire is regulated through the *Planning Scheme for Belyando Shire 2009.* This Planning Scheme was formed under the former *Integrated Planning Act 1997* (IPA) (now superseded by the SP Act) for the purposes of managing development in a way that advances the purposes of the IPA.

The north-western tip of the Study Area is located within the Charters Towers Regional Council, more specifically within the former Dalrymple Shire Council. Development within the former Dalrymple Shire is regulated through the *Planning Scheme for Dalrymple Shire 2006.*

The local planning framework does not apply to development within the mining lease but does apply to all of the offsite infrastructure.



LEGEND

- Town
- State Road
- Local Road
- Local Government Area
- Native Title Register
- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area
- Mine (Offsite)
- Borehole
- Storage Site (Instream)
- Storage Facility (Offstream)
- Pipeline Network
- Airport Location
- Rail Siding
- Industrial Area
- Workers Accommodation Village

1:500,000 (at A4)

0 5 10 15 20

Kilometres

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

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Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision A
Date 24-09-2012

Local Government Area and Land Use Figure 2-1

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Data Source: GA: Roads (2007); DME: EPC 1690 (2010)/EPC 1080 (2011); DERM: Cadastre, LGA (2010), Landuse (1999), Adani: Alignment Opt9 Rev3 (2012); Gassman/Hyder: Mine (Offsite) (2012) . Created by: BW,MS

Isaac Regional Council (IRC): Belyando Shire

The policies relating to scenic amenity in the former Belyando Shire include:

1. Desired Environmental Outcome

In Belyando Shire, ecological systems, the natural environment (including natural features and unique habitats such as Peak Range National Park, Mazeppa National Park, Narrien Range National Park, Epping Forest National Park, Wilandspey Conservation Park, Doongmabulla Springs Important Wetland and the declared catchment), and items and places of cultural and heritage significance are protected such that biodiversity, cultural heritage values and existing or intended landscape character are maintained.

2. Strategies

(a) Development is regulated to minimise any adverse impacts on air and water quality, to prevent land degradation, loss of unique habitat and biodiversity and to maintain the integrity of riparian areas, ridgelines and escarpments.

(b) Development is regulated to be compatible with the environmental, habitat, biodiversity and landscape values and historic significance of protected areas (including Peak Range National Park, Mazeppa National Park, Narrien Range National Park, Epping Forest National Park, Wilandspey Conservation Park, Doongmabulla Springs Important Wetland and the declared catchment) and areas, local items and places of cultural significance (including areas along water courses).

The policies relating to the Rural Zone states that development:

- *is located, designed and operated in a manner that protects and enhances the predominant rural scale, intensity, form and character;*
- *does not adversely impact on areas and sites of conservation importance, including cultural and high landscape values.*

These specifically include:

Non-Rural Activities - Locational Criteria 9 (PC1)

Non-"rural activities" are located in the Rural "Zone" only where those activities:

(a) do not unduly impact on the character and amenity of the locality;

(b) are directly and primarily associated with rural activities, a natural resource related industry or natural or cultural resources;

(c) cannot reasonably be located in another more appropriate zone;

(d) do not prejudice the existing or future productive capacity of rural land or other natural resources; and

(e) do not adversely affect the landscape values and scenic qualities of the locality.

Setbacks and Boundary Clearances (PC7)

"Buildings" and "structures" are located to ensure the rural amenity is maintained by:

– *"Buildings" and "structures" have a setback of not less than 20 metres from any road frontage other than a State Controlled Road.*

– *"Buildings" and "structures" have side and rear boundary clearances of not less than 15 metres from property boundaries (except where establishing in an existing "building" and no "building works" are being undertaken for that existing "building").*

Building and Structure Design (PC9)

"Buildings" and "structures" are designed such that the amenity of the locality is protected and maintained. No acceptable solution is prescribed.

Ridgelines and Escarpments (PC10)

Ridgelines and escarpments are maintained in a natural state to protect rural character, landscape values, and visual amenity.

Landscaping and External Activity Areas (PC11)

Landscaping and external activity areas are provided onsite to:

(a) contribute to a pleasant and functional rural built form;

(b) provide positive sun and breeze control;

(c) make provision for recreation areas; and

(d) contribute to the positive visual qualities of the Locality

Dalrymple Shire: Planning Scheme for Dalrymple Shire 2006

The policies relating to scenic amenity in the Dalrymple Shire include:

Desired Environmental Outcome

Character

DEO 1

The rural character and amenity of the Shire including settlements is maintained to ensure the health and safety of people is maximised.

Shire Strategies

DEO 1 is intended to be achieved by –

a) *Facilitating development that incorporates sound land management practices, specifically intended to preserve those biological and physical resources which make up the rural land bank on which rural activities are dependent.*

b) *Ensuring places, areas or sites identified as being susceptible to land degradation or natural hazard (including contamination, erosion, salinity and landslip flood area areas) are protected and further degradation is minimised.*

DEO 2

The values of significant natural features are not compromised and the value of significant cultural features are conserved and protected as much as practicable.

Shire Strategies

DEO 2 is intended to be achieved by –

a) Appropriate designation of development and identification of sound management practices that minimise, mitigate and contain the impacts on the land, water and biological resources within these areas.

b) Dissuade development in the Natural Resources Areas that have the potential to adversely affect the environmental values of the Shires natural features.

These specifically include the following performance criteria prescribed for development within the rural planning area within the Dalrymple Shire:

Built form and building envelope

P3 Buildings are appropriate in scale and form, ensuring the visual privacy of residents.

P4 Residential and other noise and emission sensitive developments are designed to protect future residents and users from the impact of traffic noise, dust and vehicle emissions and be provided with an acceptable visual amenity. The site design incorporates appropriate amenity buffering to protect future residents from the impact of traffic noise, dust and vehicle emissions from traffic on and adjoining or adjacent State-controlled road.

Amenity

P5 The storage of equipment and/or machinery does not cause a visual blight.

P6 The size and location of advertising devices associated with non-residential uses does not adversely affect the visual amenity of a locality.

3. Baseline Environment – Landscape Characterisation

3.1 Overview

The following section provides a description of the existing land use, landform, vegetation and viewpoints in the vicinity of the Project (Mine) site (Figure 3-1). Site wide land use, topography and landscape typologies are largely similar and contribute directly to landscape character and visual amenity.

3.2 Land Use and Land Form

The landscape use and character of the Project (Mine) area is predominantly rural, used for agricultural broad acre grazing. This is supported by the rural landscape character of expansive paddocks and scattered native vegetation (see Plate 3-1). The topography of the Project (Mine) site is generally flat with some slight undulations particularly in the centre and north-east corner. The highest regions of landform occur outside the Project (Mine) site approximately 3 km west with a ridge line rising from 250 m (within the site) to 396 m at its highest point (Figure 3-2).

3.3 Vegetation

The presence of vegetation within the Project (Mine) site contributes to its rural landscape character. The landscape commonly displays scattered eucalypt woodlands with shrubby understoreys (predominantly acacias) and rough native grasslands. Modification to the landscape for grazing is evident from areas of open, expansive paddocks (see Plate 3-1).

3.4 Landscape Features

As mentioned in Section 3.2, the Project (Mine) area is generally flat with an existing ridgeline to the west. Additional features in the region include permanent and ephemeral creeks and a river, which dissect the site, predominantly flowing in an east to west direction (Figure 3-1). These are Carmichael River, Cabbage Tree Creek, Eight Mile Creek and various other unnamed creeks, which are ephemeral (see Plate 3-1).

There are a number of nature reserves and protected areas within or nearby the site. Bygana West Nature Refuge intersects the southern end of the Project (Mine) site and is approximately 6 km long. Doongmabulla Mound Springs Nature Refuge is approximately 10 km west and Wilandspey Conservation Park approximately 30 km north-east of the Project (Mine) (Figure 3-1).

Dirt roads and access tracks, fencelines and stock watering infrastructure comprise the other dominant features of the landscape's character.

Given the rural character of the area, artificial night lighting levels are expected to be very low, if present at all.

Plate 3-1 Indicative Landscape Character (Land Form, Vegetation and Natural Features)

Cattle (April 2011)

Cleared Grazing Land (April 2011)

Open Woodland North of Mine Site (April 2011)

Low Woodland South of Carmichael River (April 2011)

Carmichael River (November 2010)

Cabbage Tree Creek (April 2011)

3.5 Viewing Locations and Sensitive Receptors

3.5.1 Overview

The visual catchment provides the basis upon which viewing locations and sensitive receptors can be identified and further assessment undertaken. The viewing locations are areas where full or screened views of the site are possible and where there is human activity. In this project, the main experience of the site will be via a minor road, Moray Carmichael Road, which dissects the site generally in an east to west direction (Figure 3-1). There is also one homestead, 6 km west of the Project (Mine), which is discussed in further detail below with the other viewing locations. Remaining homesteads in the vicinity of the Project are screened from the development area due to topographical features.

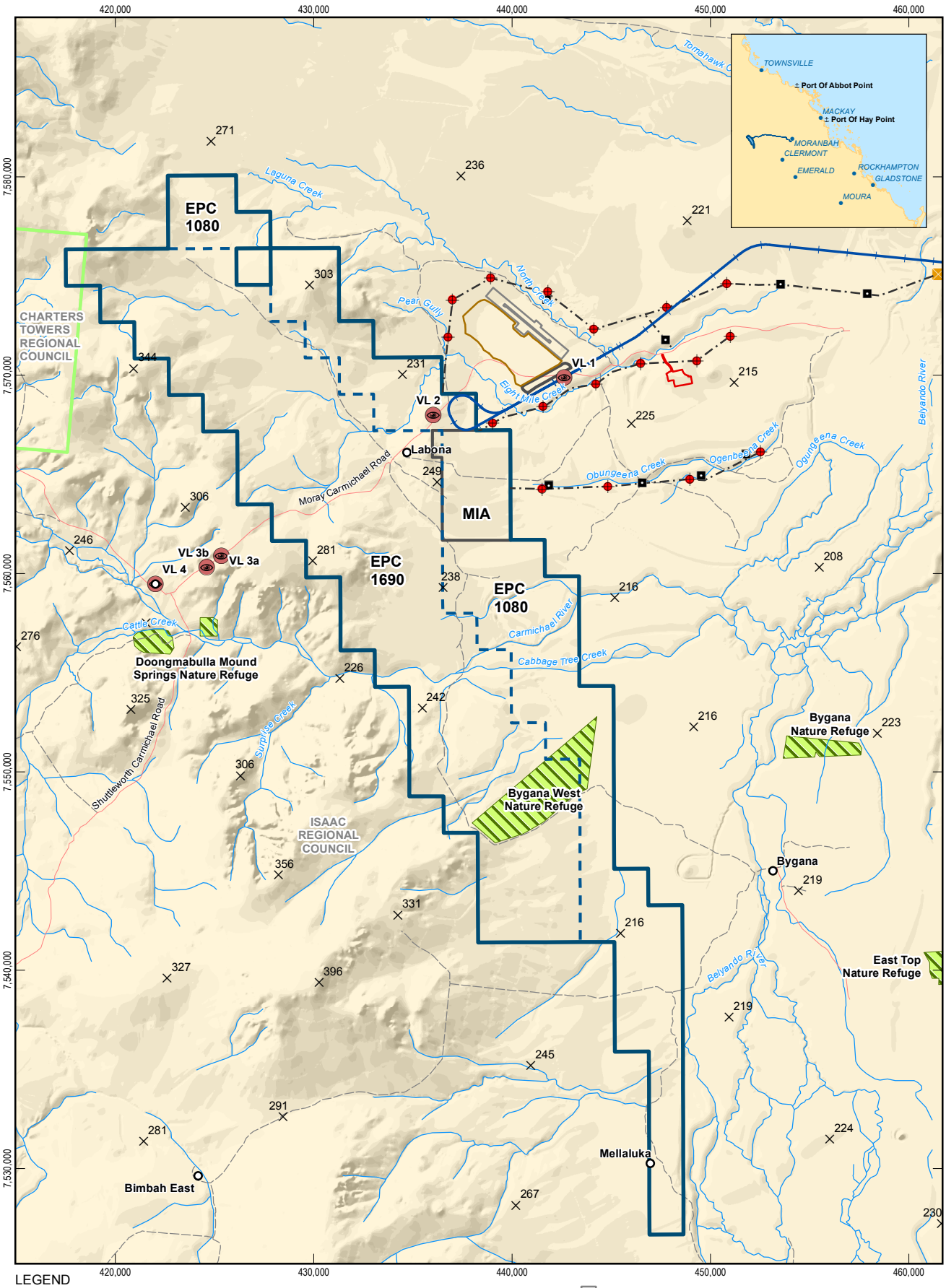
3.5.2 Representative Viewpoints – Public

Moray Carmichael Boundary Road – East

The Moray Carmichael Boundary Road bisects the Project (Mine) site; this is a minor road, used for local access. The description of the existing scenic environment is provided for four locations along the Moray Carmichael Boundary Road as it traverses the Study Area in an east to west direction. These are depicted in viewing locations 1 and 2.

Moray Carmichael Boundary Road – West

Moray Carmichael Boundary Road west of the Project site transverses a ridge line which generally runs in north-south direction. Two locations, one on top and at the bottom of the ridge are depicted in viewing locations 3A and 3B.



LEGEND

- Homestead
- Spot Height
- Viewing Location
- Local Road
- Track
- Watercourse
- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area
- Local Government Area Boundary
- Nature Refuge
- Mine (Offsite)
- Borehole
- Storage Site (Instream)
- Storage Facility (Offstream)
- Pipeline Network
- Airport Location
- Rail Siding
- Industrial Area
- Workers Accommodation Village

1:275,000 (at A4)

0 2 4 6 8 10

Kilometres

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

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Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision D
Date 10-10-2012

Viewing Locations

Figure: 3-1

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Data Source: DERM: Nature Refuge, Elevation, LGA Boundaries (2011); © Copyright Commonwealth of Australia - Geoscience Australia: Roads, Homesteads, Watercourses, Spot Height (2007); DME: EPC 1690 (2010)/EPC 1080 (2011); GHD: Visual Impact Assessment (2011); Gassman/Hyder: Mine (Offsite) (2012); Adani: Alignment Opt9 Rev3 (2012). Created by: BW, CA

Viewing Location 1: View west along Moray Carmichael Boundary Road, towards the Project (Mine) site

Location	Moray Carmichael Boundary Road, approximately 7 km from the Project (Mine) site (Location 1)
Landform and Significant Landscape Features	Topography is flat.
Vegetation	Open paddocks of native grassland with scattered/ clumped trees and shrubs.
Water	Low lying plains, may be flooded in wet season.
Land Use	Primarily agricultural for cattle grazing.
Visual Context	Views from this viewpoint are characterised by: ◗ Flat topography and sparse vegetation allows open, long views over broad pastures to low woodlands. ◗ Some short, intermediate vistas to nearby shrubs. Views are experienced by local road users.
Visual Sensitivity	Low

Viewing Location 2: View south-west-west along Moray Carmichael Boundary Road, towards proposed Project site

Location	Moray Carmichael Boundary Road, approximately 1.6 km within the Project (Mine) site boundary (Location 2)
Landform and Significant Landscape Features	Topography is flat.
Vegetation	Scattered/ clumped trees and shrubs, surrounded by native grassland.
Water	Low lying plains, may be flooded in wet season.
Land Use	Primarily agricultural for cattle grazing.
Visual Context	Views from this viewpoint are characterised by: ◗ Flat topography and sparse vegetation allows open, long, background views over broad pastures to woodlands. ◗ Some short, intermediate vistas to nearby shrubs. Views are experienced by local road users.
Visual Sensitivity	Low

Viewing Location 3A: Top of ridge line, west of Project (Mine) site, looking south-west

Location	Moray Carmichael Boundary Road, west of the Project (Mine) site
Landform and Significant Landscape Features	Topography is undulating.
Vegetation	Scattered/ clumped trees and shrubs, surrounded by native grassland.
Water	Water erosion may occur in wet season
Land Use	Primarily agricultural for cattle grazing.
Visual Context	Views from this viewpoint are characterised by: ◗ Flat topography and sparse vegetation allows open, long, background views over broad pastures to woodlands. ◗ Some short, intermediate vistas to nearby shrubs. Views are experienced by local road users.
Visual Sensitivity	Low

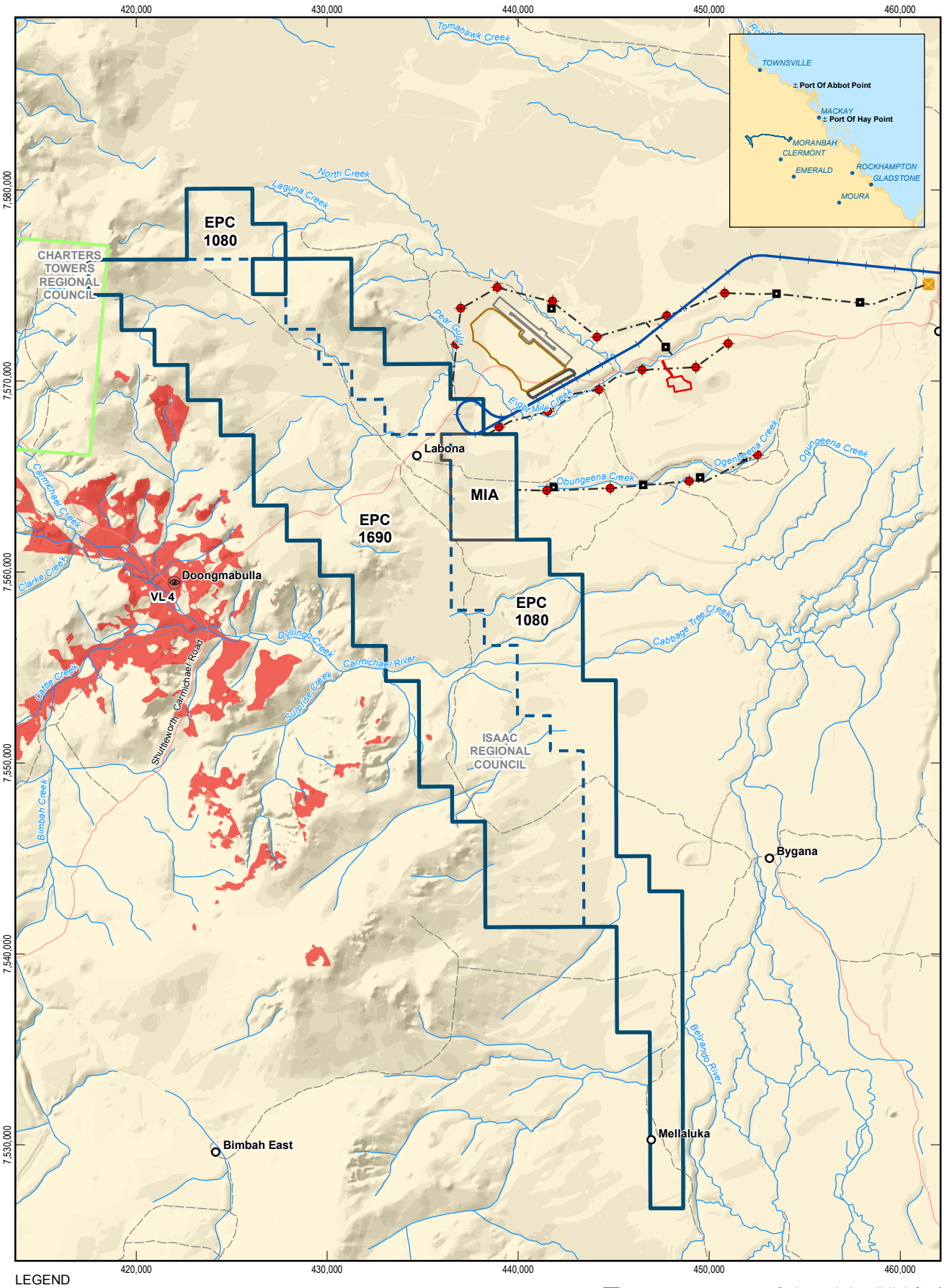
Viewing Location 3B: View north-north-east towards the ridge line west of Project (Mine) site	
	
Location	Moray Carmichael Boundary Road, approximately 3.5 km from the Project (Mine) site
Landform and Significant Landscape Features	Sloping topography in a north-easterly direction towards the Project (Mine) site
Vegetation	Mixed shrubby woodland and native grassland.
Water	Water erosion may occur in wet season
Land Use	Predominantly agricultural land uses
Visual Context	Views from this viewpoint are characterised by: ◗ Views towards the top of the ridge line, with short and intermediate views to vegetation. Views are experienced by local road users.
Visual Sensitivity	Low

3.5.3 Representative Viewpoints – Private/ Residential Property

One residential property is located, approximately six kilometres, from the Project (Mine) Site. This site is identified as viewing location 4.

Viewing Location 4: Doongmabulla Homestead, facing east towards the Project (Mine) site.

Location	The homestead is located approximately 6 km from the Project (Mine). It is located on a minor road (Receptor 4).
Landform and Significant Landscape Features	The homestead is situated at an elevation of 250 m. The topography rises to the north and east directions to a ridge line, which at its nearest highest point is approximately 3 km from the homestead at an elevation of 310 m.
Vegetation	Mixed shrubby woodland and native grassland.
Water	Water erosion may occur in wet season
Land Use	Agricultural lands uses.
Visual Context	The existing visual context consists of a predominantly rural agricultural and natural landscape, with a ridge line dominating the north and eastern views. Views are experienced by occupants of the homestead.
Visual Sensitivity	Low



LEGEND

- Homestead
- Viewing Location
- Local Road
- Track
- Watercourse
- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area
- Local Government Area Boundary
- Zone of Theoretical Visibility (View from Doongmabulla Homestead)
- Mine (Offsite)
- Borehole
- Storage Site (Instream)
- Storage Facility (Offstream)
- Pipeline Network
- Airport Location
- Rail Siding
- Industrial Area
- Workers Accommodation Village

1:285,000 (at A4)

0 2 4 6 8 10

Kilometres

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

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Carmichael Coal Mine and Rail Project

Zone of Theoretical Visibility for Doongmabulla Homestead

Job Number 41-25215
Revision D
Date 10-10-2012

Figure: 3-2

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Data Source: DERM: Elevation, LGA Boundaries (2011); © Copyright Commonwealth of Australia - Geoscience Australia: Roads, Homesteads, Watercourses (2007); DME: EPC 1690 (2010)/EPC 1080 (2011); GHD: Visual Impact Assessment, Viewing Location (2011); Gassman/Hyder: Mine (Offsite) (2012); Adani: Alignment Opt9 Rev3 (2012). Created by: BW, CA

4. Potential Impacts and Mitigation Measures

4.1 Overview

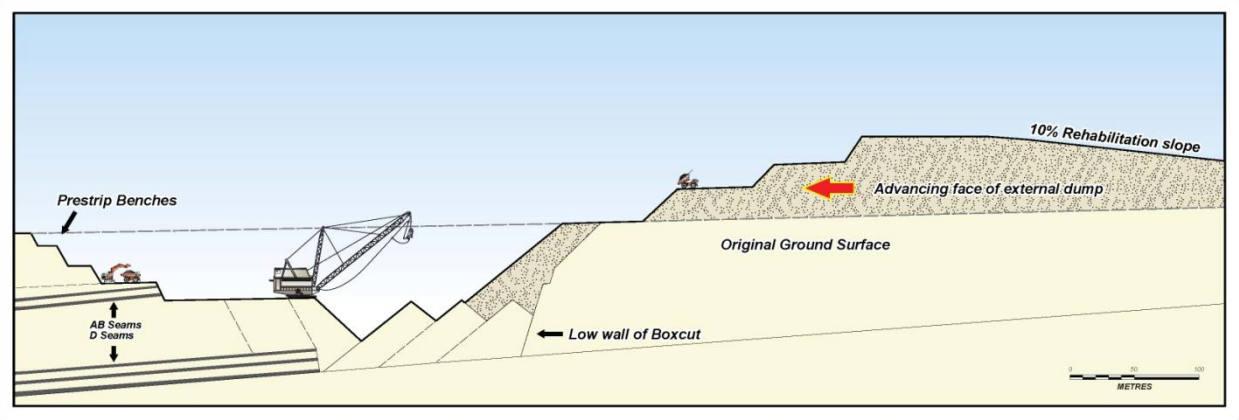
The Project (Mine) will result in a change to existing landscape character over a period of 90 years. The change will be progressive throughout the life of the Project (Mine) and will consist of conversion of 44,730 ha of land from low intensity cattle grazing character to a mining landscape character.

The substantial and permanent change in the landscape will result from:

- Progressive clearing of vegetation over the open cut mining footprint and out of pit spoil dump areas
- Creation of out of pit spoil dumps extending along much of the eastern length of the proposed mining lease. This will represent a permanent change in topography
- Creation of open cut pits and then partially backfilled residual voids. This will represent a permanent change in topography
- Some potential loss of trees from subsided areas over the proposed underground mines
- Installation of infrastructure, including a coal handling and preparation plant (CHPP) within the mine site and an industrial area, airport and workers accommodation village in the off-site infrastructure area. These features will be present for the life of the mine
- Creation of Run of Mine (ROM) and product stockpiles of coal. These features will be present for the life of the mine
- The change in land use resulting from the development of the Project (Mine). This will include the development of industrial infrastructure associated with the coal handling and preparation plant (CHPP) as well as mining operations, development of pits, haul roads and out-of-pit disposal areas

The mine itself comprises a series of open cut and underground mine workings, mine infrastructure area (including coal handling and preparation plant, coal stockpiles, support building) and overburden stockpile areas. The overburden stockpiles are expected to have a finished level of approximately 100 m taking into account mounding and final slope formation. Plate 4-1 provides an indication of the mine operations. The mine will be developed in stages across the Project life of 90 years with varying degrees of mining activity and progressive rehabilitation occurring during this time.

Plate 4-1 Indicative Cross-section of Mine Operations

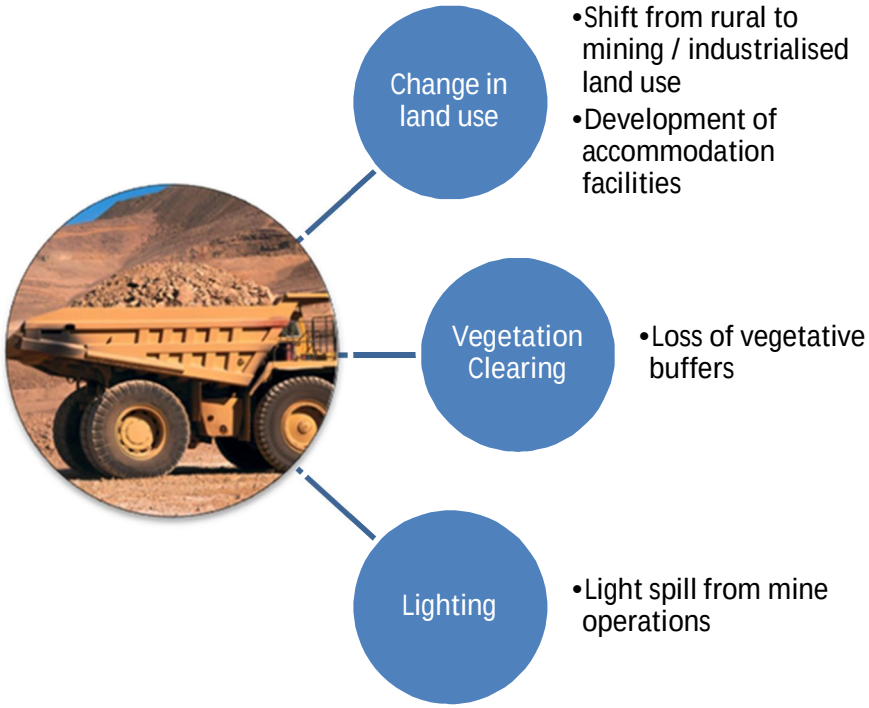


The development of the workers accommodation village, airstrip and associated infrastructure will occupy approximately 1,416 ha replacing existing low intensity cattle grazing. This change will occur within the first construction year of the Project (Mine).

The assessment of the potential impacts is based on the baseline environment information presented in Section 3 of this report. Each of the sensitive receivers identified for the Study Area and the Viewing Locations is described as being Low in accordance with the definitions provided in Section 2.4.4.

Potential impacts have been analysed on the basis of desktop analysis, site survey, consultation with relevant stakeholders and consideration of the elements of development. Figure 4-1 provides a conceptual overview of potential impacts.

Figure 4-1 Conceptual Overview of Potential Environmental Impacts



4.2 Assessment of Project (Mine) Onsite Infrastructure

4.2.1 Assessment of Impacts on Publically Accessible Viewing Locations

Viewing Location 1 (View west along Moray Carmichael Boundary Road towards the Project site) is approximately 7 km away surrounded by relatively flat terrain and scattered low vegetation. It is considered to be of low sensitivity. The development of the mine is unlikely to be visible from this point thus any change to the landscape is likely to be negligible. No significant impacts are predicted on this Viewing Location.

Viewing Location 2 (view south-west-west along Moray Carmichael Boundary Road, towards proposed Project site) is located within the Project (Mine) site 1.6 km from the boundary and will therefore experience a greater impact from changes in the landscape. The change to the landscape is predicted

to be moderate. The Viewing Location is only relevant to road users passing through the area, thus seeing only glimpses of the Project (Mine). The significance of the impact is therefore minor.

Viewing Location 3A is west of the Project (Mine) site and viewers driving east along the Moray-Carmichael Road from this point will see the mine site. The sensitivity of this receptor is considered low due to the limited number of roads users in this area and the fact road users will only experience temporary views of the Project (Mine). The change in landscape character as a result of the Project (Mine) will be large. The significance of this change would be moderate on this Viewing Location.

Viewing Location 3B is approximately 3.5 km from the Project (Mine) site and is screened by a prominent ridgeline. Therefore, it is unlikely that construction and operation of the mine will be visible from this point and no significant impact is predicted.

4.2.2 Assessment of Impacts on Viewing Locations on Private Property

Doongmabulla homestead (Viewing Location 4) is approximately six kilometres away from the Project (Mine) site and separated by a ridge. The zone of visibility analysis in Figure 4-2 shows that the mine site is not visible from the homestead due to local topography. The sensitivity of this receptor is therefore negligible. Any change to the landscape as a result of the Project (Mine) would not be significant to this receptor.

4.2.3 Mitigation Measures

The impacts of the Project (Mine) upon the landscape character and visual qualities of the Study Area due to changes in land use are unavoidable due to the location of the coal deposit.

Notwithstanding this, while permanent changes to topography will occur, disturbed areas will be rehabilitated. On closure of the mine, all structures will be decommissioning and removed.

The Project would aim to achieve construction without causing undue visual disruption to existing receptors. The following mitigation measures are recommended in regard to changes in the landscape character for the Project (Mine):

- Removal of hoardings, barriers and traffic management signage when no longer required
- Minimisation of dust emissions onto retained areas outside the Project (Mine) footprint
- Limiting vegetation clearance to required areas only

4.2.4 Summary of Impact Assessment of Project (Mine) Onsite Infrastructure

The change in land use and resultant change in landscape character is described as a significant modification having a permanent impact. A moderate significant impact is predicted on Viewing Location 3A. Importantly, whilst this impact is significant this Viewing Location is used by very low numbers of people and, furthermore, is an unavoidable consequence of the Project (Mine). No other significant impacts are predicted.

4.3 Assessment of Project (Mine) Off-site Infrastructure

4.3.1 Assessment of Impacts on Publically Accessible Viewing Locations

Viewing Location 1 is immediately south of the industrial area and airstrip and west of the workers accommodation village. This location is surrounded by relatively flat terrain and scattered low vegetation. It is of low sensitivity. The workers accommodation village and airstrip will be visible from this point and the magnitude of the change is considered to be large. The Project (Mine) Offsite infrastructure will have a moderate significant impact on this Viewing Location. Views from this point are limited in duration and are also limited due to the short-term views afforded to local road users.

Viewing Location 2 is located approximately 12 km from the workers accommodation village. This location is of negligible sensitivity. The magnitude of the change is considered to be low due to the distance from the workers accommodation village and airstrip. No significant impacts are predicted on this Viewing Location.

Viewing Location 3A and 3B are located on the western side of the proposed mine, separated by a ridge. The off-site infrastructure will not be visible from these locations.

4.3.2 Assessment of Impacts on Viewing Locations on Private Property

Doongmabulla homestead (Viewing Location 4) is also on the western side of the mine and will not be able to view the off-site infrastructure. No significant impacts are predicted to the view from this homestead.

4.3.3 Mitigation Measures

Mitigation in regard to the development of the workers accommodation village and airstrip relates to retention and maintenance of vegetation or revegetation along the Carmichael Moray Road and the boundary of the off-site infrastructure to mitigate the impact of this aspect of the Project (Mine).

4.3.4 Summary of Impact Assessment of Project (Mine) Off-site Infrastructure

The change in land use and resultant change in landscape character is described as a significant modification having a permanent impact. A moderate significant impact is predicted to Viewing Location 2. Importantly, whilst this significant impact is an unavoidable consequence of the Project (Mine) offsite infrastructure, very low numbers of people use this viewing location. No other significant impacts are predicted.

4.4 Light Spill from Mine Operations and Off-site Infrastructure

Development of the Project (Mine) onsite and off-site infrastructure will necessitate the installation of lighting for safety and security of operations as the proposed mine will operate 24 hours per day. Impacts from lighting will involve the following:

- Static floodlights associated with mine operations
- Lighting around the mine infrastructure area, workshops and ancillary buildings
- Vehicle lights moving around the site
- Lighting from the workers accommodation village, industrial area, rail siding and airstrip

Taken together, and in the absence of mitigation, lighting emissions will result in a bright glow which would be visible from surrounding areas. At present, artificial night lighting levels are expected to be very low indeed, if present at all, and this is considered to be an impact of minor significance.

4.4.1 Mitigation Measures

The Project (Mine) would aim to achieve construction and operation without causing undue visual disruption to existing receptors. The following mitigation measures are recommended in regard to lighting for the Project (Mine):

- Use luminaires which reduce light spill, sky glow and glare
- Utilise direction lighting wherever possible to reduce light spill
- Minimise security lighting, where practicable, to reduce additional sky glow during night operations

4.4.2 Summary of Lighting Impact Assessment

It is expected that the Project (Mine) will result in the moderate illumination of the night sky when seen from Viewing Locations. All of the receptors are of low sensitivity. It is predicted that night lighting impacts will be of minor significance. No further mitigation is required.

5. Conclusion

The landscape and visual impacts of the Project (Mine) will be of moderate significance on two viewing locations (VL2 and VL3A). These locations are viewed by road users passing through the area and are of low sensitivity overall. The impacts of the Project (Mine) are unavoidable. No other significant impacts are predicted, including potential impacts to Doongmabulla Homestead.

6. References

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Western Australian Planning Commission. 2007. *Visual Landscape Planning in Western Australia – a manual for evaluation, assessment, siting and design,* viewed 16 June 2011, http://www.planning.wa.gov.au/dop_pub_pdf/Landscape_Web_Pt1.pdf

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Appendix A

Terms of Reference Cross-reference

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Terms of Reference Cross Reference

Terms of Reference Requirement/Section Number	Section of this report
Section 3.2.1 Scenic Amenity and Lighting	
Description of environmental values	
Describe in general terms the existing character of the landscape and the general impression that would be obtained while travelling through and around it	Section 3 of this report
Outline existing landscape features, panoramas and views that have, or could be expected to have, value to the community	Section 3.5 of this report
Provide information in the form of maps and photographs, particularly where addressing the following issues:	Section 3.5 of this report
◗ major views, view sheds, outlooks and features contributing to the amenity of the area, including assessment from private residences	Section 3.5, Figure 3-1, Figure 3-2 of this report
◗ focal points, landmarks, waterways (e.g. rivers, streams, creeks other bodies of water and wetlands) and other features contributing to the visual quality of the area and the project site(s)	Section 3.4 of this report
◗ character of the local and surrounding areas including vegetation and land use	Sections 3.2 and 3.3 of this report
At a level of detail appropriate to the scale of the project, describe the relevant geomorphology supported by illustrative mapping highlighting any significant features and associated environmental values.	Section 3.2, Section 3.4, Figure 3-2 of this report and Volume 4 Appendix L
Potential impacts and mitigation measures	
Describe the potential beneficial and adverse impacts of the project on landscape character and visual qualities of the site and the surrounding area	Section 1 of this report
Provide details about measures to be undertaken to mitigate or avoid the identified impacts	Section 1 of this report
Lighting	
Assess and describe all potential impacts of the project's lighting, during all stages, with particular reference to objectives to be achieved and management methods to be implemented to mitigate or avoid, such as: ◗ The visual impact at night ◗ Night operations/maintenance and effects of lighting on fauna and residents ◗ The potential impact of increased vehicular traffic ◗ The changed habitat conditions for nocturnal fauna and associated impacts.	Section 4.4 of this report

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