



Carmichael Coal Mine and Rail Project Supplementary Environmental Impact Statement

Volume 4, Appendix C5b– Disney Quarry Applications

Containing

- IDAS Form 1 – Application details
- IDAS Form 5 – Material change of use assessable against a planning scheme
- IDAS Form 8 – Environmentally relevant activity
- IDAS Form 8 – Attachment for an application for an environmental authority
- IDAS Form 11 – Clearing native vegetation
- Disney Quarry supporting information by CDM Smith

IDAS form 1—Application details

(Sustainable Planning Act 2009 version 3.0 effective 1 July 2013)

This form must be used for **ALL** development applications.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete this form (*IDAS form 1—Application details*)
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in the *Sustainable Planning Act 2009* (SPA) or the Sustainable Planning Regulation 2009.

This form and any other IDAS form relevant to your application must be used for development applications relating to strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994* and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008*. Whenever a planning scheme is mentioned, take it to mean land use plan for the strategic port land, Brisbane core port land or airport land.

PLEASE NOTE: This form is not required to accompany requests for compliance assessment.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

Applicant details (Note: the applicant is the person responsible for making the application and need not be the owner of the land. The applicant is responsible for ensuring the information provided on all IDAS application forms is correct. Any development permit or preliminary approval that may be issued as a consequence of this application will be issued to the applicant.)

Name/s (individual or company name in full)	Adani Mining Pty Ltd			
For companies, contact name	Hamish Manzi - General Manager Environment and Sustainability			
Postal address	GPO Box 2569			
	Suburb	Brisbane		
	State	Queensland	Postcode	4000
	Country	Australia		
Contact phone number	07 3223 4800			
Mobile number (non-mandatory requirement)				
Fax number (non-mandatory requirement)	07 3223 4850			

Email address (non-mandatory requirement)

Reception.Australia

@adani.com

Applicant's reference number (non-mandatory requirement)

1. What is the nature of the development proposed and what type of approval is being sought?

Table A—Aspect 1 of the application (If there are additional aspects to the application please list in Table B—Aspect 2.)

a) What is the nature of the development? (Please only tick one box.)

☒ Material change of use ☐ Reconfiguring a lot ☐ Building work ☐ Operational work

b) What is the approval type? (Please only tick one box.)

☐ Preliminary approval under s241 of SPA ☐ Preliminary approval under s241 and s242 of SPA ☒ Development permit

c) Provide a brief description of the proposal, including use definition and number of buildings or structures where applicable (e.g. six unit apartment building defined as a *multi-unit dwelling*, 30 lot residential subdivision etc.)

Material Change of Use Development Application for Extractive Industry Involving Screening and Crushing Activities.

d) What is the level of assessment? (Please only tick one box.)

☒ Impact assessment ☐ Code assessment

Table B—Aspect 2 of the application (If there are additional aspects to the application please list in Table C—Additional aspects of the application.)

a) What is the nature of development? (Please only tick one box.)

☐ Material change of use ☐ Reconfiguring a lot ☐ Building work ☒ Operational work

b) What is the approval type? (Please only tick one box.)

☐ Preliminary approval under s241 of SPA ☐ Preliminary approval under s241 and s242 of SPA ☒ Development permit

c) Provide a brief description of the proposal, including use definition and number of buildings or structures where applicable (e.g. six unit apartment building defined as a *multi-unit dwelling*, 30 lot residential subdivision etc.)

Operational Works Development Application for Clearing of Native Vegetation

d) What is the level of assessment?

☐ Impact assessment ☒ Code assessment

Table C—Additional aspects of the application (If there are additional aspects to the application please list in a separate table on an extra page and attach to this form.)

☐ Refer attached schedule ☒ Not required

2. Location of the premises (Complete Table D and/or Table E as applicable. Identify each lot in a separate row.)

Table D—Street address and lot on plan for the premises or street address and lot on plan for the land adjoining or adjacent to the premises (Note: this table is to be used for applications involving taking or interfering with water). (Attach a separate schedule if there is insufficient space in this table.)

☒ Street address **and** lot on plan (All lots must be listed.)

☐ Street address **and** lot on plan for the land adjoining or adjacent to the premises (Appropriate for development in water but adjoining or adjacent to land, e.g. jetty, pontoon. All lots must be listed.)

Street address					Lot on plan description		Local government area (e.g. Logan, Cairns)
Lot	Unit no.	Street no.	Street name and official suburb/ locality name	Post-code	Lot no.	Plan type and plan no.	
i)		472	Twin Hills Rd, Clermont	4721	3235	PH752	Isaac Regional Council
ii)							
iii)							

Planning scheme details (If the premises involves multiple zones, clearly identify the relevant zone/s for each lot in a separate row in the below table. Non-mandatory)

Lot	Applicable zone / precinct	Applicable local plan / precinct	Applicable overlay/s
i)	Rural	Belyando Shire Planning Scheme 200	N/A
ii)			
iii)			

Table E—Premises coordinates (Appropriate for development in remote areas, over part of a lot or in water not adjoining or adjacent to land e.g. channel dredging in Moreton Bay.) (Attach a separate schedule if there is insufficient space in this table.)

Coordinates (Note: place each set of coordinates in a separate row)				Zone reference	Datum	Local government area (if applicable)
Easting	Northing	Latitude	Longitude			
					☐ GDA94 ☐ WGS84 ☐ other	Refer to maps in Supporting Document

3. Total area of the premises on which the development is proposed (indicate square metres)

36.17 hectares (Approximately 361,700m²)

4. Current use/s of the premises (e.g. vacant land, house, apartment building, cane farm etc.)

Rural activities - cattle breeding and fattening

5. Are there any current approvals (e.g. a preliminary approval) associated with this application? (Non-mandatory requirement)

☒ No ☐ Yes—provide details below

List of approval reference/s	Date approved (dd/mm/yy)	Date approval lapses (dd/mm/yy)

6. Is owner's consent required for this application? (Refer to notes at the end of this form for more information.)

☐ No
☒ Yes—complete either Table F, Table G or Table H as applicable

Table F

Name of owner/s of the land	
I/We, the above-mentioned owner/s of the land, consent to the making of this application.	
Signature of owner/s of the land	
Date	

Table G

Name of owner/s of the land	State of Queensland (Owner), F & PR DENNIS EDWIN (Leaseholder)
☒ The owner's written consent is attached or will be provided separately to the assessment manager.	

Table H

Name of owner/s of the land	
☐ By making this application, I, the applicant, declare that the owner has given written consent to the making of the application.	

7. Identify if any of the following apply to the premises (Tick applicable box/es.)

- ☒ Adjacent to a water body, watercourse or aquifer (e.g. creek, river, lake, canal)—complete Table I
- ☐ On strategic port land under the *Transport Infrastructure Act 1994*—complete Table J
- ☐ In a tidal water area—complete Table K
- ☐ On Brisbane core port land under the *Transport Infrastructure Act 1994* (No table requires completion.)
- ☐ On airport land under the *Airport Assets (Restructuring and Disposal) Act 2008* (no table requires completion)

Table I

Name of water body, watercourse or aquifer

Table J

Lot on plan description for strategic port land	Port authority for the lot

Table K	
Name of local government for the tidal area (if applicable)	Port authority for the tidal area (if applicable)

8. Are there any existing easements on the premises? (e.g. for vehicular access, electricity, overland flow, water etc)

☒ No ☐ Yes—ensure the type, location and dimension of each easement is included in the plans submitted

9. Does the proposal include new building work or operational work on the premises? (Including any services)

☐ No ☒ Yes—ensure the nature, location and dimension of proposed works are included in plans submitted

10. Is the payment of a portable long service leave levy applicable to this application? (Refer to notes at the end of this form for more information.)

☐ No—go to question 12 ☒ Yes

11. Has the portable long service leave levy been paid? (Refer to notes at the end of this form for more information.)

☒ No
☐ Yes—complete Table L and submit with this application the yellow local government/private certifier's copy of the receipted QLeave form

Table L		
Amount paid	Date paid (dd/mm/yy)	QLeave project number (6 digit number starting with A, B, E, L or P)

12. Has the local government agreed to apply a superseded planning scheme to this application under section 96 of the *Sustainable Planning Act 2009*?

☒ No
☐ Yes—please provide details below

Name of local government	Date of written notice given by local government (dd/mm/yy)	Reference number of written notice given by local government (if applicable)

13. List below all of the forms and supporting information that accompany this application (Include all IDAS forms, checklists, mandatory supporting information etc. that will be submitted as part of this application. Note: this question does not apply for applications made online using MyDAS)

Description of attachment or title of attachment	Method of lodgement to assessment manager
IDAS Forms 1, 5 8 and 11	Supplementary EIS
Development Application Supporting Documentation	Supplementary EIS
Traffic and Transport Report (Attachment to Supporting Documentation)	Supplementary EIS
Air and Noise Impact Assessment Reports (Attachment to Supporting Documentation)	Supplementary EIS
Vegetation Clearing and PMAV Reports (Attachment to Supporting Documentation)	Supplementary EIS

14. Applicant's declaration

☒ By making this application, I declare that all information in this application is true and correct (Note: it is unlawful to provide false or misleading information)

Notes for completing this form

- Section 261 of the *Sustainable Planning Act 2009* prescribes when an application is a properly-made application. Note, the assessment manager has discretion to accept an application as properly made despite any non-compliance with the requirement to provide mandatory supporting information under section 260(1)(c) of the *Sustainable Planning Act 2009*

Applicant details

- Where the applicant is not a natural person, ensure the applicant entity is a real legal entity.

Question 1

- Schedule 3 of the Sustainable Planning Regulation 2009 identifies assessable development and the type of assessment. Where schedule 3 identifies assessable development as "various aspects of development" the applicant must identify each aspect of the development on Tables A, B and C respectively and as required.

Question 6

- Section 263 of the *Sustainable Planning Act 2009* sets out when the consent of the owner of the land is required for an application. Section 260(1)(e) of the *Sustainable Planning Act 2009* provides that if the owner's consent is required under section 263, then an application must contain, or be accompanied by, the written consent of the owner, or include a declaration by the applicant that the owner has given written consent to the making of the application. If a development application relates to a state resource, the application is not required to be supported by evidence of an allocation or entitlement to a state resource. However, where the state is the owner of the subject land, the written consent of the state, as landowner, may be required. Allocation or entitlement to the state resource is a separate process and will need to be obtained before development commences.

Question 11

- The *Building and Construction Industry (Portable Long Service Leave) Act 1991* prescribes when the portable long service leave levy is payable.
- The portable long service leave levy amount and other prescribed percentages and rates for calculating the levy are prescribed in the Building and Construction Industry (Portable Long Service Leave) Regulation 2002.

Question 12

- The portable long service leave levy need not be paid when the application is made, but the *Building and Construction Industry (Portable Long Service Leave) Act 1991* requires the levy to be paid before a development permit is issued.
- Building and construction industry notification and payment forms are available from any Queensland post office or agency, on request from QLeave, or can be completed on the QLeave website at www.qleave.qld.gov.au. For further information contact QLeave on 1800 803 481 or visit www.qleave.qld.gov.au.

Privacy—The information collected in this form will be used by the Department of State Development, Infrastructure and Planning (DSDIP), assessment manager, referral agency and/or building certifier in accordance with the processing and assessment of your application. Your personal details should not be disclosed for a purpose outside of the IDAS process or the provisions about public access to planning and development information in the *Sustainable Planning Act 2009*, except where required by legislation (including the *Right to Information Act 2009*) or as required by Parliament. This information may be stored in relevant databases. The information collected will be retained as required by the *Public Records Act 2002*.

OFFICE USE ONLY

Date received

Reference numbers

NOTIFICATION OF ENGAGEMENT OF A PRIVATE CERTIFIER

To

Council. I have been engaged as the private certifier for the building work referred to in this application

Date of engagement	Name	BSA Certification license number	Building classification/s

QLEAVE NOTIFICATION AND PAYMENT (For completion by assessment manager or private certifier if applicable.)

Description of the work	QLeave project number	Amount paid (\$)	Date paid	Date receipted form sighted by assessment manager	Name of officer who sighted the form

The *Sustainable Planning Act 2009* is administered by the Department of State Development, Infrastructure and Planning. This form and all other required application materials should be sent to your assessment manager and any referral agency.

IDAS form 5—Material change of use assessable against a planning scheme

(Sustainable Planning Act 2009 version 3.0 effective 1 July 2013)

This form must be used for development applications for a material change of use assessable against a planning scheme.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete *IDAS form 1—Application details*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in the Sustainable Planning Act 2009 (SPA) or the Sustainable Planning Regulation 2009.

This form must also be used for material change of use on strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994* and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008* that requires assessment against the land use plan for that land. Whenever a planning scheme is mentioned, take it to mean land use plan for the strategic port land, Brisbane core port land or airport land.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

- 1. Describe the proposed use.** (Note: this is to provide additional detail to the information provided in question 1 of *IDAS form 1—Application details*. Attach a separate schedule if there is insufficient space in this table.)

General explanation of the proposed use	Planning scheme definition (include each definition in a new row) (non-mandatory)	No. of dwelling units (if applicable) or gross floor area (if applicable)	Days and hours of operation (if applicable)	No. of employees (if applicable)
Quarrying	Extractive Industry	N/A	24hrs a day, 7	33-35 personnel

- 2. Are there any current approvals associated with the proposed material change of use?** (e.g. a preliminary approval.)

☐ No ☒ Yes—provide details below

List of approval reference/s	Date approved (dd/mm/yy)	Date approval lapses (dd/mm/yy)

3. Does the proposed use involve the following? (Tick all applicable boxes.)

The reuse of existing buildings on the premises	☐ No	☐ Yes
New building work on the premises	☐ No	☐ Yes
The reuse of existing operational work on the premises	☒ No	☐ Yes
New operational work on the premises	☐ No	☒ Yes

Mandatory supporting information

4. Confirm that the following mandatory supporting information accompanies this application

Mandatory supporting information	Confirmation of lodgement	Method of lodgement
All applications		
A site plan drawn to an appropriate scale (1:100, 1:200 or 1:500 are recommended scales) which shows the following: - the location and site area of the land to which the application relates (<i>relevant land</i>) - the north point - the boundaries of the relevant land - any road frontages of the relevant land, including the name of the road - the location and use of any existing or proposed buildings or structures on the relevant land (note: where extensive demolition or new buildings are proposed, two separate plans [an existing site plan and proposed site plan] may be appropriate) - any existing or proposed easements on the relevant land and their function - the location and use of buildings on land adjoining the relevant land - all vehicle access points and any existing or proposed car parking areas on the relevant land. Car parking spaces for persons with disabilities and any service vehicle access and parking should be clearly marked - for any new building on the relevant land, the location of refuse storage - the location of any proposed retaining walls on the relevant land and their height - the location of any proposed landscaping on the relevant land - the location of any stormwater detention on the relevant land.	☒ Confirmed	Supplementary EIS for the Carmichael Coal Mine and Rail Project.
A statement about how the proposed development addresses the local government's planning scheme and any other planning instruments or documents relevant to the application.	☒ Confirmed	Supplementary EIS for the Carmichael Coal
A statement about the intensity and scale of the proposed use (e.g. number of visitors, number of seats, capacity of storage area etc.).	☒ Confirmed	Supplementary EIS
Information that states: - the existing or proposed floor area, site cover, maximum number of storeys and maximum height above natural ground level for existing or new buildings (e.g. information regarding existing buildings but not being reused) - the existing or proposed number of on-site car parking bays, type of vehicle cross-over (for non-residential uses) and vehicular servicing arrangement (for non-residential uses).	☒ Confirmed ☐ Not applicable	Supplementary EIS for the Carmichael Coal Mine and Rail Project.

A statement addressing the relevant part(s) of the State Development Assessment Provisions (SDAP).	☒ Confirmed ☐ Not applicable	Supplementary EIS
When the application involves the reuse of existing buildings		
Plans showing the size, location, existing floor area, existing site cover, existing maximum number of storeys and existing maximum height above natural ground level of the buildings to be reused.	☐ Confirmed ☒ Not applicable	
When the application involves new building work (including extensions)		
Floor plans drawn to an appropriate scale (1:50, 1:100 or 1:200 are recommended scales) which show the following: - the north point - the intended use of each area on the floor plan (for commercial, industrial or mixed use developments only) - the room layout (for residential development only) with all rooms clearly labelled - the existing and the proposed built form (for extensions only) - the gross floor area of each proposed floor area.	☐ Confirmed	N/A
Elevations drawn to an appropriate scale (1:100, 1:200 or 1:500 are recommended scales) which show plans of all building elevations and facades, clearly labelled to identify orientation (e.g. north elevation)	☐ Confirmed	N/A
Plans showing the size, location, proposed site cover, proposed maximum number of storeys, and proposed maximum height above natural ground level of the proposed new building work.	☐ Confirmed ☒ Not applicable	
When the application involves reuse of other existing work		
Plans showing the nature, location, number of on-site car parking bays, existing area of landscaping, existing type of vehicular cross-over (non-residential uses), and existing type of vehicular servicing arrangement (non-residential uses) of the work to be reused.	☐ Confirmed ☒ Not applicable	
When the application involves new operational work		
Plans showing the nature, location, number of new on-site car parking bays, proposed area of new landscaping, proposed type of new vehicle cross-over (non-residential uses), proposed maximum new vehicular servicing arrangement (non-residential uses) of the proposed new operational work.	☒ Confirmed ☐ Not applicable	Supplementary EIS for the Carmichael Coal Mine and Rail

Privacy—Please refer to your assessment manager, referral agency and/or building certifier for further details on the use of information recorded in this form.

OFFICE USE ONLY

Date received

Reference numbers

The *Sustainable Planning Act 2009* is administered by the Department of State Development, Infrastructure and Planning. This form and all other required application materials should be sent to your assessment manager and any referral agency.

Department of State Development, Infrastructure and Planning

PO Box 15009 City East Qld 4002

tel 13 QGOV (13 74 68)

info@dsdip.qld.gov.au

www.dsdip.qld.gov.au

IDAS form 5—Material change of use assessable
against a planning scheme
Version 3.0—1 July 2013

IDAS form 8—Environmentally relevant activity

(Sustainable Planning Act 2009 version 3.0 effective 1 July 2013)

This form must be used for development applications for an environmentally relevant activity.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete *IDAS form 1—Application details*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in either the *Sustainable Planning Act 2009* (SPA), the Sustainable Planning Regulation 2009, the *Environmental Protection Act 1994* or the Environmental Protection Regulation 2008.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

1. **What is the nature of the proposed environmentally relevant activity (ERA)?** (complete a new Table A for each proposed ERA—including ERAs that are not concurrence ERAs)

Table A

ERA number and name	ERA 16 - Extractive and Screening Activities
ERA threshold	Extracting more than 1,000,000 tonnes of material
Applicable fees	\$ 551
Proposed scale/capacity	Up to 19.93 million tonnes
Type of approval sought	☒ Development permit and environmental authority (see notes) ☐ Preliminary approval
Is the proposed ERA a concurrence ERA?	☐ No ☐ Yes

2. **Are there any existing ERAs on or associated with the premises?**

- ☒ No
☐ Yes—complete a new Table B for each existing ERA

Table B

ERA number and name	
ERA threshold	
Existing scale/capacity	
Is the ERA proposed to continue on site?	☐ No ☐ Yes

3. Does the proposed activity involve any of the following? (Tick all applicable boxes.)

- ☐ Release of water or waste to a wetland for treatment
- ☐ Release of waste directly to groundwater

Mandatory supporting information

4. Confirm that the following mandatory supporting information accompanies this application

About the subject land	Confirmation of lodgement	Method of lodgement
Description of the site, including site maps showing vegetation, topography and any areas of cultural or heritage significance.	☒ Confirmed	Supplementary EIS for the Carmichael Coal
Details of any known acid sulphate soils within or adjoining the premises.	☐ Confirmed ☐ Not applicable	Supplementary EIS for the Carmichael Coal
Details about how the choice of the site, at which the activity is to be carried out, minimises serious environmental harm on areas of high conservation value and special significance and sensitive land uses at adjacent places.	☒ Confirmed	Supplementary EIS for the Carmichael Coal
Details about how the location for the activity on a site protects all environmental values relevant to adjacent sensitive uses.	☐ Confirmed	Supplementary EIS for the Carmichael Coal
Details about how the design of the facility permits the operation of the site, at which the activity is to be carried out, in accordance with best practice environmental management.	☒ Confirmed	Supplementary EIS for the Carmichael Coal
About the proposed ERA		
Attachment to IDAS form 8—application for an environmental authority (EM941) completed and required information provided.	☐ Confirmed	Supplementary EIS for the Carmichael Coal
A statement addressing the relevant part(s) of the State Development Assessment Provisions (SDAP).	☒ Confirmed ☐ Not applicable	Supplementary EIS for the Carmichael Coal

Notes for completing this form:

- An environmental authority is required to operate an ERA.
- A development approval is only required if at least one of the ERAs to be operated is a concurrence ERA.
- Schedule 2 of the *Environmental Protection Regulation 2008* states the aggregate environmental scores, the thresholds that apply to ERAs, and which ERAs are concurrence ERAs (denoted by a 'C' in schedule 2, column 3).
- This development application is taken to be an application for an environmental authority. This application is not properly made unless it includes the [Attachment to IDAS form 8—application for an environmental authority \(EM941\)](#).
- There are annual fees associated with the operation of an ERA. These fees are initially payable 20 business days after the environmental authority takes effect. After this initial payment, annual fees will be payable on the anniversary of the take effect day. Chapter 8 and Schedule 10 of the *Environmental Protection Regulation 2008* contain all information about the applicable fees and how they are calculated.

Privacy—Please refer to your assessment manager, referral agency and/or building certifier for further details on the use of information recorded in this form.

OFFICE USE ONLY

Date received Reference numbers

The *Sustainable Planning Act 2009* is administered by the Department of State Development, Infrastructure and Planning. This form and all other required application materials should be sent to your assessment manager and any referral agencies.

Attachment

Environmental Protection Act 1994

IDAS form 8—attachment for an application for an environmental authority

This form is to be attached to the IDAS form 8 when making a development application for prescribed environmentally relevant activities (ERAs). Under section 115 of the Environmental Protection Act 1994 (EP Act) the development approval application is taken to be an application for an environmental authority for the prescribed ERAs.

It is recommended that applicants read the technical information requirement on what to provide with an ERA application, prior to making an application. This information is located on the business and industry website **www.business.qld.gov.au**.

All applicants must be a registered suitable operator before carrying out an ERA. If you are not already registered as, or have applied for registration as, a suitable operator, fill in the application form in Attachment 2 of this form and submit it with this form and the IDAS application.

If you would like to have a pre-lodgement meeting please fill out and lodge the form Application for a Pre-Design/Pre-Lodgement Meeting (EM1125¹), prior to lodging this application form.

Definitions of terms used in this form

Where there is inconsistency between the definition of terms here and the terms used in the EP Act, the terms in the EP Act apply.

Environmentally relevant activity (ERA)	A resource activity or a prescribed ERA
Prescribed ERA	An environmentally relevant activity that is not a resource activity and is prescribed under section 19 of the EP Act.
Registered suitable operator	A person who, or a corporation which, under section 318I of the EP Act has been assessed as being suitable to carry out an ERA and has been listed on the suitable operator register.
Resource activity	An activity that is any of the following: (a) a geothermal activity (b) a greenhouse gas (GHG) storage activity (c) a mining activity (d) a petroleum activity.

¹ This is the publication number. The publication number can be used as a search term to find the latest version of a publication at **www.qld.gov.au**.

IDAS form 8—attachment for an application for an environmental authority

GUIDE

Take particular care in filling out the applicant details as these are legally required for the issuing of any environmental authority. Applicant details, including the name and the address should reflect the details of the person or registered legal entity.

If more space is required for any responses, please attach additional information as a separate page.

A sole applicant is an applicant where there is only 1 person or business applying to obtain an environmental authority.

A principal applicant is the individual or business nominated to act on behalf of joint applicants.

It is particularly important to enter the correct Australian business number (ABN); Australian company number (ACN) of the incorporated company; association number (AN) of the incorporated association; or the title and section of the legislation that gives the statutory corporation its legal status.

If there is an agent acting on behalf of the sole or principal applicant, provide details in this section. An agent could be a consultant or a contact for the environmental authority holder.

As statutory documents need to be sent to all applicants, this section can also be used when there are multiple environmental authority holders to nominate an address for statutory documentation to be sent 'care of' to.

Application details

1. Applicant details

SOLE OR PRINCIPAL APPLICANT DETAILS	
INDIVIDUAL OR BUSINESS NAME (INCLUDE TRADING NAME IF RELEVANT) ADANI MINING PTY LTD	
ABN/ACN/AN (IF RELEVANT) 27 145 455 205	
RESIDENTIAL ADDRESS OR REGISTERED BUSINESS ADDRESS (NOT A POST OFFICE BOX ADDRESS) LEVEL 25, 10 EAGLE STREET, BRISBANE, QLD 40	
POSTAL ADDRESS (IF DIFFERENT FROM ABOVE) GPO BOX 2569, BRISBANE, QLD 4001	
CONTACT PERSON HAMISH MANZI	
PHONE 07 3223 4800	FACSIMILE 07 3223 4850
EMAIL HAMISH.MANZI@ADANI.COM	

When there is more than 1 applicant complete Attachment 1—Appointment of principal applicant by all joint applicants.

Agent for principal applicant / address for service

The address supplied here will also be used as a service address for sending statutory documents. If blank, statutory documents will be sent to the sole or principal applicant.

INDIVIDUAL OR BUSINESS NAME (INCLUDE TRADING NAME IF RELEVANT)	
RESIDENTIAL ADDRESS OR REGISTERED BUSINESS ADDRESS (NOT A POST OFFICE BOX ADDRESS)	
POSTAL ADDRESS (IF DIFFERENT FROM ABOVE)	
CONTACT PERSON	
PHONE	FACSIMILE

IDAS form 8—attachment for an application for an environmental authority

EMAIL	

All applicants, including joint applicants must include their details in this section.

Once a person or corporation has been registered as a suitable operator for the carrying out of an ERA, no further suitable operator applications need to be made as long as the applicant for the environmental authority matches the name (including ABN/ACN etc, if applicable) recorded on the suitable operator register.

A person who holds a valid registration certificate given under the former section 73F of the EP Act or a valid environmental authority given under the former chapter 5 or 5A of the EP Act is taken to be a registered suitable operator under section 705 of the EP Act.

If you have previously been approved as a registered suitable operator, you can find the suitable operator registration number on the decision notice advising you of your approved application or, if you have a valid existing registration certificate, the approval number listed on the registration certificate.

2. Registered suitable operator

Have all applicants been registered as a suitable operator? Tick the box that applies and provide any further requested detail.

APPLICANT NAME	SUITABLE OPERATOR REGISTRATION STATUS	SUITABLE OPERATOR REGISTRATION NUMBER
	☒ I am a registered suitable operator. You must provide your suitable operator registration number in the adjacent column. ☐ I have lodged an application to be registered suitable operator and am waiting for it to be decided ☐ I am not an existing registered suitable operator and I have not yet lodged an application to become a registered suitable operator. You must complete the application form in Attachment 2 and submit it with the development application. Attachment 2 must be completed in full. The application form in Attachment 2 is taken to be lodged when it is received by Permit and Licence Management within the Department of Environment and Heritage Protection.	649121

IDAS form 8—attachment for an application for an environmental authority

There are currently 8 matters of national environmental significance (MNES) which have been defined in the *Environmental Protection and Biodiversity Conservation Act 1999*. These are:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)

To determine whether the proposed ERA will have a significant impact on MNES and for referral requirements, please refer to the guidance provided by the Federal Department of Sustainability, Environment, Water, Population and Communities on www.australia.gov.au

3. Matters of national environmental significance

Is the proposed ERA/ERA project likely to have a significant impact on a matter of national environmental significance?

- ☒ Yes → please select 1 of the following:
- ☒ the proposed amendment has been referred to the Federal Government Environment Minister or delegate
 - ☐ the proposed amendment has not yet been referred to the Federal Government Environment Minister or delegate.
- ☐ No

4. Details of the prescribed ERAs

Do any of the ERAs in Table A of IDAS form 8 have eligibility criteria developed that you can comply with?

- ☐ Yes → attach details of these ERAs and identify the standard conditions that you can comply with
- ☒ No

5. Will the ERAs be carried out as a single integrated operation?

Will more than one ERA be operated at the location?

- ☐ Yes → complete the rest of this question
- ☒ No → go to question 6

Will the ERAs be operated as a single integrated operation?

- ☐ Yes → provide supporting information in the following table
- ☐ No → go to question 6

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SUPPORTING INFORMATION

A single integrated operation must meet all the following criteria:

- (a) the activities are carried out under the day-to-day management of a single responsible individual, for example, a site or operations manager
- (b) the activities are operationally interrelated
- (c) the activities are, or will be, carried out at 1 or more places
- (d) the places where the activities are carried out are separated by distances short enough to make feasible the integrated day-to-day management of the activities.

6. Take effect date

Do you want the environmental authority to take effect on a nominated date or event?

☐ Yes → nominate the date or event below and then go to question 7

NOMINATED TAKE EFFECT DATE OR EVENT

☒ No → go to question 7

You may choose to nominate a date or event for when the environmental authority will take effect. An event can include a phase of your project you know will occur before you commence operation (for example commissioning of equipment). This take effect date or event will be the date or event from which your annual fees will commence to be charged (your anniversary date).

Where you have nominated a take effect date, you must not commence any activities approved under the environmental authority until the take effect date stated on the environmental authority occurs. If you nominated an event, you will need to give written notice to the administering authority that the stated event has occurred before you commence your operation.

A biodiversity offset is required where an applicant has demonstrated they have made all practical and reasonable efforts to avoid and minimise impacts on state significant biodiversity values, but there is a residual development impact on 1 or more of these values

The Queensland Biodiversity Offsets Policy can be accessed at www.ehp.qld.gov.au.

7. Biodiversity offsets

Are the ERAs administered by a local government?

☐ Yes → go to question 8

☒ No → complete the rest of this question

Do the activities involve a negative impact to a state significant biodiversity value?

☐ Yes → attach supporting information that:

☐ demonstrates that all practical and reasonable efforts to avoid and minimise impacts on state significant

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For further information on technical information to provide with your application, please refer to the business and industry website
www.business.qld.gov.au

For further information on technical information to provide with your application, please refer to the business and industry website
www.business.qld.gov.au

Where there is more than 1 applicant, this declaration is to be signed by all applicants, unless a principal applicant has been nominated in Attachment 1, in which case the principal applicant can sign on behalf of all the joint applicants.

biodiversity values has been undertaken.

☐ describes how the requirements of the Queensland Biodiversity Offsets Policy will be met.

☒ No

☐ Don't know/uncertain

8. Assessment of the environmental impact and provision of specific supporting information

You must provide an assessment of the likely impact of each ERA on environmental values, including:

- a description of the environmental values likely to be affected by each relevant activity
- details of any emissions or releases likely to be generated by each relevant activity
- a description of the risk and likely magnitude of impacts on the environmental values
- details of the management practices proposed to be implemented to prevent or minimise adverse impacts
- details of how the land the subject of the application will be rehabilitated after each relevant activity ceases.

☒ Tick to indicate that an assessment of the environmental impact and provision of specific supporting information has been attached.

9. Details of waste management

A description of the proposed measures for minimising and managing waste generated by the ERAs must be attached.

☒ Tick to indicate attachment

10. Details of contaminated land

Is there a site management plan in effect for contaminated land that relates to the land that is the subject of this application.

☐ Yes → attach details of the site management plan

☒ No

11. Declaration

Note: If you have not told the truth in this application you may be prosecuted.

I declare that:

- I am the applicant or an authorised signatory for the applicant.

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Where the sole or principal applicant is a company, this form is to be signed by an authorised person for that company.

Privacy statement

Where ERAs are administered by the Queensland Government:

The Department of Environment and Heritage Protection and Department of Agriculture, Fisheries and Forestry are collecting the information on this form to process your application for an environmental authority. This collection is authorised under sections 115 and 125 of the *Environmental Protection Act 1994*. Your personal information will only be accessed by authorised employees within these departments and will not be disclosed to any other parties unless authorised or required by law. For queries about privacy matters please email privacy@ehp.qld.gov.au or telephone: (07) 3330 5436.

Where ERAs are administered by a local government:

Contact the local government for their privacy information.

- I have identified in question 4, any ERAs that can comply with the eligibility criteria and standard conditions.
- The information provided is true and correct to the best of my knowledge. I understand that it is an offence under section 480 of the *Environmental Protection Act 1994* to give to the administering authority or an authorised person a document containing information that I know is false, misleading or incomplete in a material particular
- I understand that failure to provide sufficient information may result in the application being refused
- I understand that all information supplied on or with this application form may be disclosed publicly in accordance with the *Right to Information Act 2009* and the *Evidence Act 1977*.
- I understand that I am responsible for managing the environmental impacts of these activities, and that approval of this application is not an endorsement by the administering authority of the effectiveness of management practices proposed or implemented.

APPLICANT'S NAME HAMISH MANZI - ADANI MINING PTY LTD	
SIGNATURE 	
POSITION OF SIGNATORY GENERAL MANAGER- ENVIRONMENT AND SUSTAINABILITY	DATE 16 JULY 2013
JOINT APPLICANT'S NAME (IF APPLICABLE)	JOINT APPLICANT'S SIGNATURE (IF APPLICABLE)
JOINT APPLICANT'S NAME (IF APPLICABLE)	JOINT APPLICANT'S SIGNATURE (IF APPLICABLE)

Applicant checklist

- ☒ Application form has been signed and completed.
- ☐ Attachment 1: Appointment of principal applicant by all joint applicants has been signed and completed (if applicable).
- ☐ Attachment 2: Application to be registered as a suitable operator signed and completed (if applicable).
- ☐ Question 4: Identification of the prescribed ERAs where eligibility criteria and

IDAS form 8—attachment for an application for an environmental authority

standard conditions can be met, have been attached (if applicable).

- ☒ Question 7: Supporting information for biodiversity offsets (if applicable).
- ☒ Question 8: Information for assessment of environmental impacts attached (if applicable).
- ☒ Question 9: Details of waste management attached (if applicable).
- ☐ Question 10: Details of contaminated land attached (if applicable).

All requested information must be provided with this application, otherwise it will not be considered properly made.

Please include a word searchable electronic PDF copy of the application documents when you lodge your application.

Further information

The latest version of this publication and other publications referenced in this document can be found at www.qld.gov.au using the publication number (EM941 for this document) as a search term.

Please submit this attachment, together with any additional information, with all relevant IDAS forms to the assessment manager for the development application.

IDAS form 11—Clearing native vegetation

(Sustainable Planning Act 2009 version 3.0 effective 1 July 2013)

This form must be used for development applications that involve the clearing of native vegetation.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete *IDAS form 1—Application details*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application
- include the relevant application fee, noting that referral agency fees (where applicable) are to be paid to the referral agency

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in the *Sustainable Planning Act 2009* (SPA) or the Sustainable Planning Regulation 2009.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

1. What type of development is proposed?

- ☒ Operational work for clearing vegetation made assessable under Schedule 3 of the Sustainable Planning Regulation 2009
- ☒ Material change of use of the premises
- ☐ Reconfiguring a lot

2. What type of approval is being sought?

- ☒ Development permit
- ☐ Preliminary approval
- ☐ Both—provide details below

Mandatory supporting information

3. Confirm that the following mandatory supporting information accompanies this application

For ALL applications	Confirmation of lodgement	Method of lodgement
A property vegetation management plan including as defined under the Vegetation Management Act 1999 schedule. Note: A property vegetation management plan must show the matters prescribed in s.11 of the Vegetation Management Regulation 2012.	☒ Confirmed	Supplementary EIS for the Carmichael Coal Mine and Rail
A statement addressing the relevant part(s) of the State Development Assessment Provisions (SDAP).	☐ Confirmed ☐ Not applicable	Supplementary EIS for the

For ALL applications	Confirmation of lodgement	Method of lodgement
For an operational work application for which the assessment manager is the local government		
Written confirmation that the chief executive of the Department of Natural Resources and Mines is satisfied the proposed clearing is for a relevant purpose under the <i>Vegetation Management Act 1999</i> , section 22A.	☒ Confirmed ☐ Not applicable	Supplementary EIS for the
For an operational work application where the assessment manager is the Department of Natural Resources and Mines		
Either of the following: - written confirmation that the chief executive of the Department of Natural Resources and Mines is satisfied the proposed clearing is for a relevant purpose under the <i>Vegetation Management Act 1999</i>, section 22A; or - information identifying the relevant purpose under the <i>Vegetation Management Act 1999</i>, section 22A and demonstrating how the proposed clearing is for that purpose.	☐ Confirmed ☒ Not applicable	Supplementary
For applications for a material change of use or reconfiguring a lot		
The following additional detail to be included in the property vegetation management plan: - details of the location and extent of: - infrastructure, including buildings, fences, roads and electrical, telecommunication or sewerage services; and - firebreaks and fire management lines; and - details of the way the proposed clearing complies with the applicable concurrence agency policy under the <i>Vegetation Management Act 1999</i>.	☒ Confirmed ☒ Not applicable	

Notes for completing this form

- The Department of Natural Resource and Mines (DNRM) website contains a comprehensive range of information about the *Vegetation Management Act 1999*, including assessment codes and policies, as well as the *Landholder's guide to vegetation clearing applications*.
- Question 3 for operational work applications —Under the *Vegetation Management Act 1999*, the proposed vegetation clearing is only for a relevant purpose if the applicant satisfies the chief executive of the Department of Natural Resources and Mines (DNRM) that the development applied for is one of the purposes listed in section 22A of that Act. If the assessment manager is the local government, the applicant must obtain confirmation from the chief executive of DNRM that the proposed clearing is for a relevant purpose and provide this with the application. However, if DNRM is the assessment manager, the applicant has the choice of either obtaining this confirmation before making the application, or providing adequate information for DNRM to make the decision on whether the proposed clearing is for a relevant purpose at the time the application is received.

Privacy—Please refer to your assessment manager, referral agency and/or building certifier for further details on the use of information recorded in this form.

OFFICE USE ONLY

Date received

Reference numbers

The *Sustainable Planning Act 2009* is administered by the Department of State Development, Infrastructure and Planning. This form and all other required application materials should be sent to your assessment manager and any referral agency.

Adani Mining Pty Ltd

Disney Quarry

Material Change of Use for Extractive Industry,
Environmentally Relevant Activity 16 and
Operational Works for Vegetation Clearing





Adani Mining Pty Ltd

Disney Quarry

12 July 2013

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Table of Contents

Section 1	Introduction	1-1
1.1	Purpose and Scope	1-1
1.2	The Proponent	1-1
1.3	Project Overview	1-1
1.4	Development Approval Process	1-5
1.4.1	Assessment and Referral Agencies and Triggers	1-6
1.5	Application Requirements Cross-Reference	1-7
Section 2	Development Justification	2-1
2.1	Need for Quarry Material	2-1
2.1.1	Quarried Products Uses and Specification	2-2
2.1.2	Transport Costs	2-2
2.2	Alternatives to the Project	2-2
2.2.1	Alternatives Considered for Mine and Rail Project	2-2
2.2.2	Alternatives Considered for Quarry Project	2-3
2.2.3	Alternative Methods of Operation	2-3
Section 3	Project Details	3-1
3.1	Site Details	3-1
3.2	Development Description	3-2
3.3	Project Planning and Design	3-3
3.4	Quarry Development Proposal	3-4
3.4.1	Initial Construction and Commissioning Phase	3-4
3.4.2	Site Access and Internal Roads	3-4
3.4.3	Water Storages, Stormwater and Erosion Control	3-5
3.4.4	Vegetation Clearing and Topsoil Management	3-6
3.4.5	Development of Extraction Cells	3-6
3.4.6	Material Processing	3-8
3.4.7	Product Stockpiling and Despatch	3-9
3.4.8	Ancillary Facilities	3-9
3.4.9	Machinery and Equipment	3-9
3.4.10	Storage of Fuels, Lubricants and Chemicals	3-10
3.4.11	Hours of Operation	3-10
3.4.12	Public Utility and Services	3-10
3.4.13	Lighting	3-11
3.4.14	Waste Management	3-12
3.4.15	Workforce	3-12
3.4.16	Health and Safety and Emergency Response	3-12
3.4.17	Rehabilitation and Landscaping	3-14
Section 4	Environment and Management	4-1
4.1	Terrestrial Ecology	4-1
4.1.1	Vegetation Communities and Fauna Habitats	4-1
4.1.2	Potential Impacts to Terrestrial Ecology	4-10
4.1.3	Terrestrial Ecology Management	4-10
4.2	Aquatic Ecology, Surface Water and Hydrology	4-12
4.2.1	Aquatic Ecology	4-12
4.2.2	Surface Water and Hydrology	4-12
4.2.3	Potential Impacts	4-16
4.2.4	Aquatic Ecology, Surface Water and Hydrology Management	4-16
4.3	Landscape and Visual Amenity	4-17

4.3.1	Bushfire Risk and Management	4-18
4.3.2	Visual Amenity Potential Impacts.....	4-18
4.3.3	Landscape and Visual Amenity Management.....	4-19
4.4	Soils, Geology and Topography	4-19
4.4.1	Geology.....	4-19
4.4.2	Soils.....	4-23
4.4.3	Potential Impacts.....	4-29
4.4.4	Management of Soils, Geology and Topography.....	4-29
4.5	Groundwater.....	4-30
4.5.1	Existing groundwater	4-30
4.5.2	Potential Impacts.....	4-34
4.5.3	Groundwater Management.....	4-35
4.6	Contaminated Land.....	4-36
4.7	Air Quality	4-37
4.7.1	Existing Environment.....	4-37
4.7.2	Project Criteria	4-37
4.7.3	Potential Impacts.....	4-38
4.7.4	Air Quality Management	4-39
4.8	Noise.....	4-40
4.8.1	Existing Environment.....	4-40
4.8.2	Proposed Criteria and Assessment.....	4-41
4.8.3	Noise Impacts.....	4-41
4.8.4	Noise Management	4-43
4.9	Traffic, Transport and Site Access.....	4-44
4.9.1	Traffic and Transport Requirements.....	4-44
4.9.2	Potential Impacts.....	4-46
4.9.3	Management Measures.....	4-46
4.10	Cultural Heritage.....	4-47
4.10.1	Indigenous Cultural Heritage Assessment.....	4-47
4.10.2	Non-Indigenous Cultural Heritage Assessment.....	4-48
4.10.3	Potential Impacts.....	4-48
4.10.4	Management of Cultural Heritage.....	4-49
Section 5	Land Use Planning.....	5-1
5.1	State Planning Instruments.....	5-1
5.1.1	State Planning Policies	5-1
5.1.2	Mackay, Isaac and Whitsunday Regional Plan 2012 and State Planning Regulatory Provisions	5-2
5.2	Local Planning Instruments	5-3
5.2.1	Belyando Shire Planning Scheme 2009	5-3
Section 6	Conclusion.....	6-1
Section 7	Bibliography	7-1
Section 8	Acronyms and Abbreviations.....	8-3

List of Figures

Figure 1-1 Quarry project area	1-4
Figure 3-1 Extraction and schematic site layout.....	3-7
Figure 3-2 Quarry material requirements over the operation life of the quarry.....	3-8
Figure 3-3 Batter treatments	3-15
Figure 3-4 Schematic of quarry bench rehabilitation	3-16
Figure 4-1 Ecological values within and surrounding the site.....	4-4
Figure 4-2 Conservation significant species locations	4-9
Figure 4-3 Surface water and hydrology.....	4-15
Figure 4-4 Detailed stratigraphy	4-21
Figure 4-5 Regional geology.....	4-22
Figure 4-6 Land Resource Areas.....	4-25
Figure 4-7 Annual wind rose (2006).....	4-40
Figure 4-8 Noise impacts - quarry and haulage	4-42
Figure 4-9 Access routes and haulage (TTM, 2013).....	4-44

List of Tables

Table 1-1 Development approvals subject to this application.....	1-5
Table 1-2 Referral agencies.....	1-6
Table 1-3 <i>Belyando Shire Planning Scheme 2009</i> requirements cross-reference.....	1-7
Table 1-4 <i>Sustainable Planning Act 2009</i> requirements cross-reference	1-8
Table 1-5 <i>Environment Protection Act 1994</i> requirements cross-reference	1-9
Table 3-1 Site details.....	3-1
Table 3-2 Water usage	3-5
Table 4-1 Mapped REs within the proposed indicative Disney Quarry site.....	4-2
Table 4-2 Wildlife online flora search result	4-5
Table 4-3 Weed species identified within Disney Quarry survey area	4-5
Table 4-4 Protected matters search results with respective field observations.....	4-6
Table 4-5 Relationship of AMUs to LRAs for Disney area, Central Highlands.....	4-24
Table 4-6 Description of Agricultural Management Units regional to the Disney area.....	4-26
Table 4-7 Potential constraints of soils from Disney area	4-28
Table 4-8 Groundwater bore details within 10 km of the Disney Quarry.....	4-32
Table 4-9 Project air quality goals (VIPAC, 2013).....	4-37
Table 4-10 Quarry dust results at Disney Homestead (VIPAC, 2013)	4-38
Table 4-11 Summary of noise monitoring results (VIPAC, 2013)	4-41
Table 4-12 EPP (Noise) acoustic quality objectives for dwellings	4-41
Table 4-13 Estimated daily and peak hour vehicle generation for Disney Quarry (TTM)	4-45
Table 4-14 Native Title claim details	4-47
Table 4-15 Queensland Heritage Register search results	4-48
Table 5-1 State Planning Policy assessment	5-1
Table 5-2 Assessment against Desired Environmental Outcomes.....	5-3
Table 5-3 Alternative solutions.....	5-4

List of Plates

Plate 1-1: View of northern extraction area	1-2
Plate 1-2: View of southern extraction area (1).....	1-3
Plate 1-3: View of southern extraction area (2).....	1-3
Plate 3-1: Telecommunication tower contained on Lot 1 BL55	3-1
Plate 4-1: Existing and proposed quarry site	4-1
Plate 4-2: Incorrectly mapped RE adjacent to proposed quarry site	4-3
Plate 4-3: Disney Quarry site - view of typical low-lying woodland across to main rocky hill	4-3
Plate 4-4: Mistake Creek downstream of Disney Quarry (GHD, November 2012)	4-14
Plate 4-5: Drainage line observed on-site (east hill)	4-16
Plate 4-6: Water infrastructure on approach to site.....	4-18
Plate 4-7: Gravel resource in northern extraction area	4-28

Appendices

Appendix A - Adani Environment and Sustainability Policy
Appendix B - PMAV
Appendix C - Traffic and Transport Impact Assessment
Appendix D - Vegetation Clearing Report
Appendix E - EHP Wildlife Online Search
Appendix F - Conservation Significant Species
Appendix G - Conceptual Erosion and Sediment Control Plan
Appendix H - AMU Summary
Appendix I - EMR/CLR Search
Appendix J - Air Quality Impact Assessment
Appendix K - Noise Impact Assessment

Document History and Status

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Executive Summary

CDM Smith Australia (CDM Smith) has been engaged by Adani Mining Pty Ltd (Adani) to obtain a number of approvals to support quarry development. Adani is seeking to develop the Carmichael Coal Mine and Rail Project in the Galilee Basin, approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland. As part of the development, Adani will require significant quantities of quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works. To supply the necessary quarry material, Adani propose to develop six new quarries.

This application is for the Disney Quarry, a new quarry proposed to be located on Lot 4 SP116046. The site is located adjacent to the Gregory Development Road, within the Isaac Regional Council (IRC) area. The lot is zoned Rural under the *Belyando Shire Planning Scheme 2009* and is primarily used for agricultural activities.

This application seeks a Development Permit for:

- Material Change of Use for Extractive Industry;
- A concurrent Environmental Authority for Environmentally Relevant Activity 16 (ERA) for Extractive and Screening Activities is triggered for extracting more than 1,000,000 tonnes (t) of material per year; and
- Operational Works for Vegetation Clearing.

This report provides the information necessary for the Assessment Manager and Referral Agencies to efficiently assess the proposed development against relevant statutory planning and environmental instruments. The land use and planning assessment (Section 5) has established that the quarry is generally consistent with the requirements of the *Belyando Shire Planning Scheme 2009* and State Planning instruments.

Summary of Extraction and Quarry Operations

The initial site development will consist of implementing environmental controls, access and haul roads. The creation of hardstand areas and infrastructure areas will be undertaken, with site infrastructure being brought in and set up, including crib and office buildings, ablution facilities and fuel storage.

There will be four extraction areas covering a total of 92.57 ha with a yield of 11.75 million tonne. The quarry will operate during the Carmichael Coal Mine and Rail Project construction period which is likely to be over two to three years commencing in 2014. This site will be rehabilitated once the rail construction is completed.

Summary of Environmental Aspects

Environmental issues and constraints were considered in the planning and design of the quarry development. The location, layout and staging of the proposed development has to a large extent, been influenced by environmental constraints. Particular considerations were the flora and fauna, minimisation of the impact on visual amenity and noise and dust emissions by locating the quarry between ridgelines as well as impacts from transport of the quarry material.

In particular, site surveys undertaken for fauna and flora by CDM Smith and Saunders Havill Group identified that the area is extensively disturbed and contains a significant amount of exotic species. There are three areas mapped as endangered ecosystems under the current State vegetation mapping, however this was found to be inconsistent with the on-ground extent with only a small patch of Brigalow along the western edge of the site. This area has been avoided through the quarry planning and design. A Property Map of Assessable Vegetation (PMAV) application is included for the Department of Natural Resources and Mines (NRM), see Figure 4-1.

During the first fauna survey undertaken 29th January to 3rd February 2013 and potential signs of Koala (Vulnerable – EPBC Act) activity, in the form of tree scratches, were recorded at the proposed Disney Quarry. Nevertheless, no scats were found to indicate recent activity and no individuals were sighted during the field surveys. In addition, scratches may also have been created by Lace Monitor (*Varanus Varius*) which can produce similar scratch marks. The vegetation on site is dominated by *Eucalyptus crebra* (Narrow Leaf Ironbark) and *Corymbia clarksoniana* (Long Fruited Bloodwood), with the occasional *Corymbia dallachiana* (Ghost Gum). The density of this vegetation is not considered ideal for Koala habitat, however, they are not necessarily restricted to bushland or remnant areas and are known to exist and breed within farmland (Dique DS, 2004). Relatively minor clearing is required for the quarry development.

Due to the potential signs of Koala activity, a second site survey was carried out to further clarify whether Koalas occur on site. The survey used direct observation and floral assessment to determine if the area supports an important population under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Findings of the EPBC Koala population assessment found there is unlikely to be significant impact on EPBC matters.

Comprehensive acoustic and air quality reports have been prepared by VIPAC Engineers and Scientists. Modelling of acoustic emissions was undertaken based on the highest production month and demonstrates that quarry operations can comply with the indoor noise criteria of 30dB $L_{Aeq,adj,1hr}$ during the night during peak production. In addition, dust modelling illustrates that the quarry can achieve compliance with the *Environmental Protection (Air) Policy 2008*. Management measures will be implemented to ensure impacts from noise and dust remain minimal.

TTM Traffic Engineering Group undertook a detailed assessment of the traffic impacts in accordance with the guidelines for assessment of road impacts of development (GARID). This established that Disney Quarry and associated quarries will not have a significant or assessable pavement impact on the state controlled road network. Access into the site will predominately be via a private access road to the south which leads onto the Carmichael Coal Mine and Rail Project haul road. An eastern access from the Gregory Development Road will be utilised in the early stages of quarry development until the rail haul road and access have been constructed.

No significant impact upon groundwater is expected from the quarry operations. The quarry is also situated in a position of elevated hydraulic gradient and the lowest level of the quarry will remain above 230 m Australian Height Datum (AHD). There may be some localised impacts to surrounding bores and/or possible recharge, however, monitoring bores will be installed to provide early detection of any potential impact.

Active weed monitoring and control will be undertaken to ensure clean weed free fill is provided from the site to prevent and spread of weed species through the removal and transport of fill.

Erosion and sediment controls will be designed, implemented and maintained in accordance with International Erosion Control Association (IECA) Guidelines 2008. Site stormwater will be collected and reused on site for dust suppression and quarry operations where possible. The quarry is also staged with progressive rehabilitation to ensure only a limited and manageable area

to minimise exposure to erosion and sediment loss. Clean stormwater will be diverted away from the quarry workings.

Diesel and hydrocarbons will be stored on site in hard stand areas which will be bunded pursuant to *Australian Standard 1940 Storage and Handling of Flammable and Combustible Liquids*.

A cultural heritage clearance survey was undertaken by the Jangga People for the initial geotechnical investigations. The survey indicated that Disney Hill may be culturally significant to the Jangga People and that further consultation with the Jangga People may be required. The site will have a cultural heritage clearance survey undertaken by the Jangga People as Native Title Claimants of the area under the agreed Cultural Heritage Management Plan prior to works being undertaken.

Adani have provided ongoing site specific environmental management and mitigation commitments which have been identified within this report (Section 4) in addition the site will be operated under the Project Construction Environmental Management Plan (CEMP). These environmental management commitments address construction and operational requirements under the *Environmental Protection Act 1994* (EP Act), *Environmental Protection Regulation 2009* and subordinate legislation. The impact assessment has determined that the environmental management outlined for measures site will adequately address (avoid, reduce or manage) the potential environmental impacts identified in Section 4.

In summary, the objectives of this quarry development are to:

- Provide short term quarry operation to provide necessary construction material for the Carmichael Coal Mine and Rail Project construction;
- Minimise any potential environmental impact associated with the operation;
- Preserve identified remnant vegetation on site by operating with a buffer from the Brigalow area;
- Provide employment for the local workforce;
- Minimise impacts to local and state roads by using internal accesses and haul roads where possible; and
- Rehabilitate the land post quarry production.

The Disney Quarry development provides essential construction material for the Carmichael Coal Mine and Rail Project and is located strategically close to the rail corridor to minimise haulage requirements. Consideration of environmental and conservation issues has largely determined the location, extent and design of this quarry.

Section 1 Introduction

1.1 Purpose and Scope

This report has been prepared to provide the necessary supporting information for a development application to State Assessment Referral Agency (SARA). The purpose of this report is to address all requirements for the proposed development under Queensland and local environmental and planning.

The application provides sufficient information for the assessment manager, referral agencies and other interested parties to adequately assess the potential impacts and controls regarding the development. The scope of the assessment considers the construction, operation and rehabilitation of the Disney Quarry and all works associated with the quarry. It also addresses direct and indirect impacts on the environment, community and local transport network.

1.2 The Proponent

The proponent for this quarry development is Adani Mining Pty Ltd (Adani), who is also the proponent of the Carmichael Coal Mine and Rail Project. Adani is an Australian subsidiary of Adani Enterprises Limited, a company based in Ahmedabad, India. Adani Enterprises Limited has diverse interests in global trading, development and operation of ports, inland container terminals, establishment of special economic zones, oil refining, logistics, gas distribution, power generation, transmission and trading.

Adani established in Australia in mid-2010 with the intent of engaging in exploration and mining coal resources. Adani initially purchased the right to seek a Mining Lease Application (MLA 70441) over Exploration Permit for Coal (EPC) 1690 and then secured similar rights to the eastern and northern parts of EPC 1080 in December 2011. This initiated the development of the Project. Adani Abbot Point Terminal Pty Ltd (AAPT), also an Australian subsidiary of Adani Enterprises Limited, has purchased the lease of Abbot Point Coal Terminal 1 and is seeking to develop Abbot Point Coal Terminal 0 as part of their overall programme for coal exportation.

Adani has not been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources. Since establishing in Australia, Adani has sought to deliver community benefit from its business involvement. Adani's Environment and Sustainability Policy is included in **Appendix A**.

1.3 Project Overview

Adani is developing the Project in the Galilee Basin, approximately 160 km north-west of the town of Clermont, Central Queensland (Figure 1-1). Whilst providing material to support the construction of the overall Carmichael Coal Mine and Rail development, the Adani quarries will also provide material to upgrade local infrastructure and roads as agreed with IRC and possibly provide material fill to other Adani projects in the area. The early requirements for material for infrastructure and road upgrades have positioned these developments outside the Scope of the Carmichael Coal Mine and Rail Project EIS and assessment process.

To supply the necessary quarry material, Adani proposes to develop the Disney Quarry, the subject of this report. The proposed Disney Quarry will be an embankment material quarry located on Lot 4 SP116046 with an access road through easement ABL55, which connects the Gregory

Development Road to Lot 1 BL55. The site is located adjacent to the Gregory Development Road, within the IRC area. The lots are zoned Rural under the *Belyando Shire Planning Scheme 2009* and are primarily used for agricultural activities.

Total quarry material requirements are approximately 34 million tonne for construction of the Carmichael Coal Mine and Rail Project and the associated local council road upgrades. The Disney Quarry has an inferred resource quantity of 35.92 million tonnes, however, only 11.75 million tonnes is proposed to be extracted with a proposed operational footprint of 92.57 ha and a depth of 5 mbgl. It is anticipated that the material extracted from the Disney Quarry would be used for rail embankments, capping, sub-base and select fill.

There will be two access roads from the Disney Quarry, one onto the Gregory Development Road and one in the south to the rail corridor haul road. The rail corridor haulage road will cross the Gregory Development Road.

Material from the Disney Quarry will be taken from the extraction area shown in Figure 3-1. Historic quarrying has occurred within the northern part of the extraction area (Plate 1-1). The southern part of the extraction area will be located on a currently unutilised part of the site (Plate 1-2 and Plate 1-3). Material will be extracted via bulldozer and pushed to a stockpile zone at the entrance to the northern extraction area (Figure 3-1). The stockpiles will then be loaded via a loader or excavator either straight into a truck or through a screening plant, dependent upon the material quality.



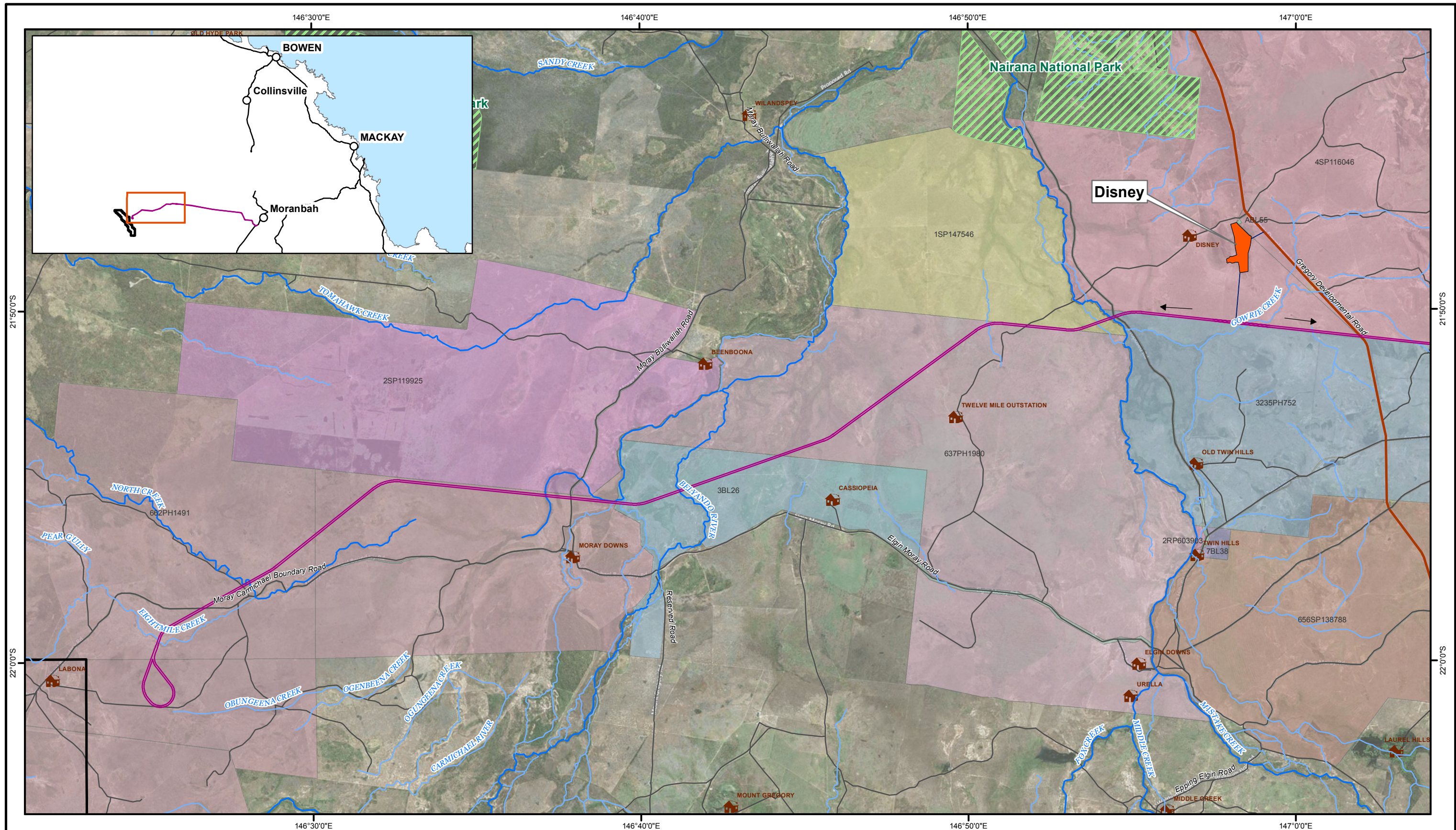
Plate 1-1: View of northern extraction area



Plate 1-2: View of southern extraction area (1)



Plate 1-3: View of southern extraction area (2)



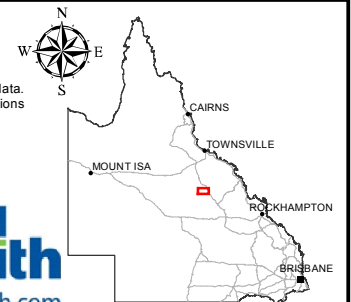
Adani Quarry Permits and Approvals
Figure 1-1 Quarry project area

Legend

- | | | |
|-------------------------------|--------------------------------|-----------------------------|
| ○ Town | — Proposed Adani Rail Corridor | — Ergon Electricity Network |
| 🏠 Homestead | — Minor Road | — Major watercourse |
| ⛑ Carmichael Mine - ML 70441 | — Major Road | — Minor watercourse |
| 🌿 National Park | — Railway | ➡ Haulage Route |
| 🟠 Disney Quarry Approval Area | — Quarry Access Road | |

DISCLAIMER
CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.
Data source:
Adani, 2012;
DERM, 2010;
Base Layer by Bingmaps, 2011.

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1.4 Development Approval Process

Approvals under State and local legislation are required to be obtained before the development can proceed to the construction phase. The Moray Quarry is required for activities and development of resource operations relating to actions occurring under the *Mineral Resources Act 1989* (MR Act) and the *State Development and Public Works Organisation Act 1971* (SDPWO Act). This application has been submitted with the Supplementary EIS for the Carmichael Coal Mine and Rail Project. Accordingly, under s37 of the SDPWO Act the decision period for this application will commence on the date of issue of the Queensland Coordinator General's Report. The information and referral stages do not apply to the application as they will be undertaken as part of the SEIS process.

Queensland's *Sustainable Planning Act 2009* (SP Act) and *Sustainable Planning Regulation 2009* (SP Regulation) seek to achieve sustainable planning outcomes through managing the process in which development takes place, managing the effects of development on the environment, and continuing the coordination and integration of local, regional and state planning.

Under the SP Act (Sch 8, Section 10(1)), a Material Change of Use (MCU) of premises generally means:

- (i) *The start of a new use of the premises; or*
- (ii) *The re-establishment on the premises of a use that has been abandoned; or*
- (iii) *A material increase in the intensity or scale of the use of the premises.*

Therefore, the development of the Disney Quarry will require a MCU application under the SP Act. In accordance with the SP Regulation [Sch 3, Table 3, (1)].

The following approvals are being sought with this application:

Table 1-1 Development approvals subject to this application

Approval	Trigger	Assessment
Material Change of Use Development Permit for Extractive Industry	Sch 8, Section 10(1) - <i>Sustainable Planning Regulations 2009</i> 4.4.1 - <i>Belyando Shire Planning Scheme 2009</i> Impact Assessable where an industrial use is a 'total use area is over 150m2 in a rural zone.	Impact Assessable
Environmental Authority for Environmentally Relevant Activity 16 – Extractive and Screening Activities. Threshold 2(c) and 3 (c).	Sch 3, Table 2, Item 1 - <i>Sustainable Planning Regulations 2009</i> <i>Environmental Protection Regulations 2008</i>	Impact Assessable
Operational Works Development Permit for Vegetation Clearing	Sch 3, Table 4, (1)(c) <i>Sustainable Planning Regulations 2009</i> <i>Vegetation Management Act 1999</i>	Code Assessable under the Brigalow Belt and New England Tablelands Bioregion RVMC – Version 2

1.4.1 Assessment and Referral Agencies and Triggers

The MCU Development Permit for Extractive Industry under the *Belyando Shire Planning Scheme 2009* will be assessed by SARA as the assessment manager.

A number of referral agencies are triggered within this application; these are outlined in Table 1-2.

Table 1-2 Referral agencies

Referral Agency	Trigger
Isaac Regional Council	- <i>Material Change of Use under the SP Act within Council area</i>
Department of Transport and Main Roads (TMR)	- <i>Development on Land relating to a State-controlled road (SCR) (SP Reg, Sch 7, Table 3, Item 1) as the lot containing the development is within 100m of a SCR; and</i> - <i>Using machinery having an annual throughput of product or 10,000t (SP Reg, Sch 11, Item 22) as in accordance with Sch 7 of the SP Act (Table 3, Item 2) the Extractive Industry development exceeds the 10,000t per year threshold. TMR is a concurrence agency to the MCU application.</i>
Department of Environment and Heritage Protection (EHP)	Environmentally Relevant Activity 16 – Extractive and Screening Activities (SP Act, Sch 3, Table 2, Item 1) as they are the administering authority.
Department of Natural Resources and Mine (NRM)	NRM will be a Concurrence Agency (SP Reg, Sch 7, Table 2, Item 5) for clearing of native vegetation on land subject to a lease (SP Reg, Sch 3, Part 1, Table 4). The Property Vegetation Management Plan (PVMP) for the proposed vegetation clearing is provided in Appendix B .

The following has been considered, however, no further referral agencies are triggered and this should only be used as a note:

- The lot proposed to contain the Disney Quarry is adjacent to a Conservation Estate (Nairana National Park). However, development applications are no longer referred to EHP for an advice agency response;
- Disney Quarry is within a declared catchment area however, NRM will only be a concurrence agency if a reconfiguration is involved;
- If the Disney Quarry interferes with a watercourse, lake, spring, aquifer or from overland flow it will require a development approval from NRM; and
- The Disney Quarry is within the *Water Resource (Burdekin Basin) Plan 2007* area. Therefore, authorisation is required from NRM to access and/or construct works to take groundwater.

1.5 Application Requirements Cross-Reference

The content required for development applications is specified within the following legislation and planning provisions.

- *Belyando Shire Planning Scheme 2009* – Planning Scheme Policy 1 (Information Council may request);
- *Sustainable Planning Act 2009* (SP Act) – Section 314 (Impact assessment-generally); and
- *Environmental Protection Act 1994* (EP Act) – Schedule 4 Dictionary (Standard criteria).

A cross-reference table for the requirements of the above listed legislation has been provided below:

Table 1-3 Belyando Shire Planning Scheme 2009 requirements cross-reference

No.	Criteria to be Addressed	Section of this Document
2.1 Plans		
1 (a)	Plans should contain - a site analysis plan identifying and describing all existing site features, such as the cadastral boundaries of the site, “buildings”, structures”, Roads, vehicle and pedestrian access, car parking, servicing areas, vegetation, topographic, hydraulic and geological features	Figure 1-1
1 (b)	Plans should contain - a proposal plan identifying and describing the extent of modification of site features, such as, the cadastral boundaries of the site, “buildings”, “structures”, roads, vehicle and pedestrian access, car parking, servicing areas, vegetation, topographic, hydraulic and geological features.	Figure 3-1
1 (c)	Plans should contain - a landscaping plan detailing the location, extent, densities and species of proposed plantings and other external treatments.	Not provided, refer to Alternative Solution – PC 11 in Table 5-3
2	Plans should be drawn to scale and observe recognised drafting conventions.	Refer to Figure 1-1, Figure 3-1, Figure 3-2 and Figure 4-1
2.2 Existing “Use” and Site Details		
1 (a)	Details provided should include - existing and previous “use” of the site.	Section 3.1
1 (b)	Details provided should include - existing and previous “use” of adjoining or adjacent sites.	Section 3.1
1 (c)	Details provided should include - floor areas of “buildings” and other external activity areas, including car parking, storage areas and the like.	Not relevant for existing use as not existing buildings are being used
1 (d)	Details provided should include - site characteristics e.g. levels and contours	Figure 1-1 and Figure 3-1
1 (e)	Details provided should include - descriptions of surrounding land uses, including the height and appearance of “buildings”.	Section 3.1
1 (f)	Details provided should include - the nature and location of all services and infrastructure, including easement details.	Section 3.1 and Figure 3-1
2.3 Proposed “Use” and Site Details		
1 (a)	Details provided should include - details of the proposed “use”, including floor area of “buildings”, external materials, treatments and colours of “buildings” and “structures”.	Section 3
1 (b)	Details provided should include - details of external activity areas, including car parking, storage areas and the like.	Section 3
2.4 Amenity		
1 (a)	Hours of operation.	Section 3.4.11
1 (b)	Deliver times of goods.	Table 5-3
1 (c)	Heights of “buildings” and structures.	Stockpile - 3.4.7.1 Lighting - 3.4.13 Demountables - 3.4.8
1 (d)	Setbacks and boundary clearances of all “buildings” and structures”.	
1 (e)	External lighting arrangements.	Section 3.4.13
2.5 Infrastructure		

No.	Criteria to be Addressed	Section of this Document
1 (a)	Known or determined flood levels.	Section 4.2.2,
1 (b)	Proposed water supply.	Section 3.4.12
1 (c)	Proposed effluent disposal.	Section 3.4.12
1 (d)	Proposed stormwater disposal.	Section 4.2.4
1 (e)	Proposed method of liquid and solid waste disposal.	Section 3.4.14
1 (f)	Proposed electricity supply.	Section 3.4.12
1 (g)	Proposed telecommunication.	Section 3.4.12
2.6 Traffic and Servicing		
1 (a)	Traffic likely to be generated by the proposal.	Appendix C
1 (b)	The number, type and frequency of vehicles likely to service the proposal.	Appendix C
1 (c)	The times and arrangements for servicing of the “premises”.	Appendix C
1 (d)	Anticipated carparking requirements.	Appendix C
1 (e)	The extent of car parking, vehicle manoeuvring areas, crossover/access details, loading/unloading areas, service areas.	Appendix C
2.7 Emissions		
1 (a)	The nature of any anticipated emissions (including odour, noise, dust, run-off and the like).	Section 4.7
1 (b)	Measures proposed for the control of emissions.	Section 4.7.4 and Section 4.8.4
1 (c)	The location and methods of containment and control of waste disposal and waste storage areas.	Section 3.4.14
1 (d)	Types, quantities, storage methods, and protection measures relating to storage and use of chemicals.	Section 4.5.3
1 (e)	Emergency equipment and procedures to be utilised.	Section 3.4.16
2.8 Environmental		
1 (a)	Location of ridgelines and escarpments.	Section 0
1 (b)	Location of “watercourses” and “lakes” and the extent of associated riparian buffers.	Section 4.2
1 (c)	Location of effluent disposal areas.	Section 3.4.12
1 (d)	Location and extent of existing vegetation.	Section 4.1.1
1 (e)	Location and extent of vegetation to be retained.	Appendix D
1 (f)	Location of any known sites of indigenous, cultural or natural heritage.	Section 4.10
2.9 Constraint Areas		
1	Sufficient detail should be provided to enable “Council” to accurately determine the likely impact of the proposal on constraint areas, as identified in the Planning Scheme.	Section 3.3

Note: Section 2.10 - Reconfiguring a Lot has not been addressed in this cross-reference table as this is not part of the development.

Table 1-4 Sustainable Planning Act 2009 requirements cross-reference

No.	Criteria to be Addressed (as per Section 314)	Section of this Document
(2) The assessment manager must assess the part of the application against each of the following matters or things to the extent the matter or thing is relevant to the development—		
(a)	The State planning regulatory provisions.	Section 5.1.2
(b)	The regional plan for a designated region, to the extent it is not identified in the planning scheme as being appropriately reflected in the planning scheme.	Section 5.1.2
(c)	If the assessment manager is not a local government—the laws that are administered by, and the policies that are reasonably identifiable as policies applied by, the assessment manager and that are relevant to the application.	Assessment manager is Isaac Regional Council
(d)	State planning policies.	Section 5.1.1
(e)	Temporary local planning instruments.	Section 5.2
(f)	Preliminary approval to which section 242 applies.	N/A – No Preliminary Approvals relevant to the quarry.
(g)	The planning scheme.	Section 5.2.1

No.	Criteria to be Addressed (as per Section 314)	Section of this Document
(h)	For development not in a planning scheme area—any planning scheme or temporary local planning instrument for a planning scheme area that may be materially affected by the development.	N/A
(i)	If the assessment manager is an infrastructure provider—an adopted infrastructure charges resolution or the priority infrastructure plan.	N/A
(3) In addition to the matters or things against which the assessment manager must assess the application under subsection (2), the assessment manager must assess the part of the application having regard to the following		
(a)	The common material.	N/A
(b)	Any development approval for, and any lawful use of, premises the subject of the application or adjacent premises.	No known existing approvals
(c)	Any referral agency's response for the application.	Referral agencies have been listed

Table 1-5 Environment Protection Act 1994 requirements cross-reference

No.	Criteria to be Addressed (as per "standard criteria" definition)	Section of this Document
(a)	The principles of ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development'.	Section 6
(b)	Any applicable environmental protection policy.	Appendix J and Appendix K
(c)	Any applicable Commonwealth, State or local government plans, standards, agreements or requirements.	Section 5
(d)	Any applicable environmental impact study, assessment or report.	This document
(e)	The character, resilience and values of the receiving environment.	Section 4.1
(f)	All submissions made by the applicant and submitters.	N/A
(g)	The best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows: (i) an environmental authority; (ii) a transitional environmental program; (iii) an environmental protection order; (iv) a disposal permit; and (v) a development approval.	No environmental authorities or development approvals have been granted for the proposed development.
(h)	The financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument.	As above, not applicable.
(i)	The public interest.	Section 2
(j)	Any applicable site management plan.	Activities will be carried out in accordance with the Project CEMP.
(k)	Any relevant integrated environmental management system or proposed integrated environmental management system.	Adani are currently developing an environmental management system (EMS) in accordance with standards, for their entire operations. The EMS will apply to the Disney Quarry.
(l)	Any other matter prescribed under a regulation.	As set out in Table 1-3 and Table 1-4

Section 2 Development Justification

2.1 Need for Quarry Material

Quarry material is used in the building and construction industry as an essential base component for a range of infrastructure. The quarry industry is largely tied to infrastructure development, therefore, with major growth in the resource sector the necessity for quarry material has greatly increased over the past few decades. Quarries throughout Queensland help facilitate the development of the States resource sector and are vital to the construction of local public infrastructure such as roads.

Adani is proposing to develop a 60 million tonne per annum (Mtpa) thermal coal mine in the north Galilee Basin. All coal will be railed via a privately owned rail line connecting to the existing Aurizon rail infrastructure near Moranbah, and shipped through coal terminal facilities at the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion). Operational life of the Carmichael Coal Mine and Rail Project will continue until 2071 and rehabilitation will cease in 2074.

The Project is comprised of two major components:

- The Project (Mine): a greenfield coal mine over EPC1690 and the eastern part of EPC1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities and offsite infrastructure.
- The Project (Rail): a greenfield rail line connecting the Mine to the existing Goonyella rail system to provide for export of coal via the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion).

Adani Enterprises Limited sees supply from Queensland coal resources as key to meeting its target of generating 20,000 Megawatts (MW) of power from its Indian power plants by 2020. If the Carmichael Coal Mine and Rail Project does not proceed it would likely lead to Adani's demand for coal being met outside of Australia and the benefits of significant economic investment would not be realised.

A key component of the Carmichael Coal Mine and Rail Project is the supply of suitable local quarry material. The Carmichael Coal Mine and Rail Project will require a significant amount of quarry material for upgrade and maintenance works on existing infrastructure and the construction of new infrastructure. Provisional amounts of fill expected to be needed for the Project total approximately 34 million tonnes.

Region-wide investigations have identified an acute shortage of appropriate quarry material for construction of a Project the size of the Carmichael Coal Mine and Rail development. Existing quarries in the area are primarily historic, small and do not contain appropriate infrastructure to immediately utilise. Although existing quarries will be used, they contain limited supplies of material and are not capable of supplying the different types or volumes of materials required. Therefore, the development of new quarries is required and the Disney Quarry will be a major source of the necessary embankment and fill material for the rail construction.

The development of the Disney Quarry, will provide royalties to the State for the sale of the quarry material, provide jobs through direct employment and support services, and provide necessary

material for the construction and upgrading of local infrastructure. Therefore, it is considered that the quarries are an essential development for the local area, regional and the State as a whole.

2.1.1 Quarried Products Uses and Specification

The construction of the rail and road require certain quarry materials with characteristics that ensure the infrastructure meets the engineered design life. Quarry material needs to be of a particular sound, strength, durability, resistance and have particular behaviours to be useful for construction requirements.

The construction of the Carmichael Coal Mine and Rail Project will require:

- Embankment fill;
- Structural fill;
- Ballast; and
- Main Roads Department (MRD) types of material.

2.1.2 Transport Costs

Quarry materials are high bulk, low cost materials. Transport costs can be a significant proportion of the total cost of the material. The majority of quarried products are carted in tip truck, dog and truck configurations. Cartage rates per tonne effectively reflect the hourly rate and the cost of transporting road base which is about 30 – 40% of the cost of the material to the user.

It would be economically unfeasible for quarry material to be transported from significant distances for the construction of the rail project. In addition, there would be increased impact to the environment (fuel consumption, emissions and dust), state and local roads and the community if material is required to have long cartage distance.

There is currently no operational or approved quarry within short cartage distance along this portion of the rail corridor to source quarry material, therefore, a new quarry development is required. Disney is an ideal quarry option as it is in close proximity to the rail corridor (2.3 km) and contains an abundant source of embankment material for construction of the railway.

2.2 Alternatives to the Project

The development of the quarries will significantly support the construction of the Carmichael Coal Mine and Rail development and must be located in close proximity to the Project, transportation of material from surrounding regions is not considered to be a viable alternative.

2.2.1 Alternatives Considered for Mine and Rail Project

In accordance with the Commonwealth EPBC Act [Schedule 4, Section 2.01(g)], alternatives to the Carmichael Coal Mine and Rail Project were reviewed and discussed as part of the EIS. The EIS noted that Adani had access to EPC 1690 and part of EPC 1080 however, has no other access to coal mining within Australia (GHD, November 2012). Therefore, there are currently no other commercially available alternative for Adani to proceed with a major open cut and underground coal mine.

The Galilee Basin is not currently serviced by any rail infrastructure which would enable export of coal product from the Project, or other resource activities. Adani has also identified opportunities

to link the rail to current and proposed rail infrastructure, to minimise the potential environment and social impacts of linear infrastructure within the rural environs while facilitating the export of resources from the Galilee Basin region. Transport of coal by rail is the only economically feasible option for transport to the ports for export.

A no action option, that is, that Adani does not develop the Project, would likely lead to Adani's demand for coal being met from outside of Australia. The no action option for the Project would see significant capital investment totalling approximately \$21.5 billion foregone. Estimates have indicated that \$5.9 billion will be spent in the years preceding 2022. The remaining \$15.6 billion will be spent over the remaining years of operation (GHD, November 2012).

2.2.2 Alternatives Considered for Quarry Project

The location of suitable resources is limited due to the constraints imposed by geology, access, land and environmental values. Ideally quarries should be conveniently located to limit heavy truck transport and so reduce end user costs and environmental and infrastructure impacts associated with haulage.

As part of the Project development 37 quarry locations were identified for investigation. Geotechnical investigations undertaken in late 2012 determined the nature of potential resources at each location and in combination with environmental constraints analyses eight sites were chosen to proceed for further investigations with five sites proposed to proceed with development.

In addition to environmental constraints, investigations have identified an acute shortage of appropriate quarry material for construction of a Project the size of the Carmichael Coal Mine and Rail development. Existing quarries in the area are primarily historic, small and do not contain appropriate infrastructure to immediately utilise.

Investigations have also considered hauling material from larger existing quarries in the surrounding areas of Clermont, Moranbah, Charters Towers, Townsville and Emerald. However, due to the distance it was determined that haulage costs and the potential impact on the road network would be excessive and this was rejected as an alternative option.

2.2.3 Alternative Methods of Operation

A number of locations and layout plans were also considered in the development of the proposed plan. The adopted layout is considered optimum for containing potential environmental impacts without compromising economic efficiency.

Section 3 Project Details

3.1 Site Details

The Disney Quarry is proposed to be located on Lot 4 SP116046 with an access road through a separate section of the lot. Table 3-1 details the lot and easement on which the development is proposed and identifies the use for the lot, and the planning scheme zone under the *Belyando Shire Planning Scheme 2009*. It is noted that Lot 1 BL55 is not part of this application and nothing related to this development will hinder access to, or operation of, the telecommunication infrastructure on that lot.

Table 3-1 Site details

Lot and Plan	Address	Area	Zoning	Current Use(s)	Proposed Use(s)
Lot 4 SP116046 (Leasehold)	Charters Towers Rd, Belyando 4721	47,600ha	Rural	Cattle breeding and fattening	Disney Quarry

The site lies within the Northern Brigalow Belt bioregion, however extant vegetative conditions vary considerably. The site is within an area primarily used for cattle grazing, however this is a large and topographically complex site that remains well vegetated over much of its extent. Site inspections have confirmed that historical quarrying has occurred in the location of the proposed Disney Quarry (Figure 3-1) and the area is highly disturbed. The remainder of the lot is predominantly used for cattle grazing and associated agricultural activities.

A telecommunications tower and associated building are located near the entrance road on a rise in the north-east of the site (Plate 3-1). The lot containing the telecommunications tower (Lot 1 BL55) is not included within this application and no activities or infrastructures are proposed on the lot as part of this application.



Plate 3-1: Telecommunication tower contained on Lot 1 BL55

The lot on plan contains a number of residential buildings and ancillary structures. All known residential buildings on the lot are located approximately 2.1 km to the west of the proposed quarry pit. These residences will be screened from the quarry operations [230 m AHD] by a hill that rises to 290 m AHD and runs in a general north-south direction (Figure 3-1). In addition, the proposed operation will be screened from the Gregory Development Road by two vegetated hills that rise to approximately 258 m AHD.

3.2 Development Description

The applicant proposes to initiate formal quarry operations on Lot 4 SP116046. The development proposal includes the construction of all ancillary facilities specifically:

- Stockpile areas;
- Demountable site buildings;
- Fuel storage and treatment facilities;
- Water storage and treatment facilities; and
- Internal and external access roads.

Equipment used in the abovementioned areas will generally consist of bulldozers, excavators, loaders and a water cart. Additionally minor ancillary equipment, including service trucks, will be on site when required. Temporary facilities will be erected on site which will include a demountable office, crib room, ablution facilities and a small car park. A small lay down area hardstand, and suitably bunded fuel storage area will be located near the site infrastructure at the main point of egress from the site. All refuelling will be completed on a hard stand area, and all major servicing will be completed off site. Waste materials will be disposed of offsite at a licensed facility.

The extraction area for the Disney Quarry has been defined as 92.57 hectares. Embankment material will be extracted from the quarry and transported, via a dedicated haul route and the Gregory Development Road, to the Carmichael Coal Mine and Rail Project corridor. The construction of the rail corridor and activities associated with it, including quarry material haulage, are addressed within the Carmichael Coal Mine and Rail Project EIS.

3.3 Project Planning and Design

A range of environmental, social, geological, construction and cultural constraints were considered during the design and location of the quarry. Initial desktop constraints maps were generated to identify the following constraints:

- Rivers, waterways, water bodies, dams and wetlands [particularly those triggered under State Planning Policy (SPP) 4/11 – Protecting Wetlands of High Ecological Significance in the Great Barrier Reef Catchments];
- Topography and landforms;
- Available resources (identified through exploratory drilling at each of the potential quarries and borrow pits);
- Regional Ecosystems (REs), in particular endangered and of concern REs, high value regrowth vegetation and Essential Habitat;
- Indigenous cultural heritage and Native Title claims;
- Environmental features such as restricted areas, nature refuges and reserves;
- The degree of existing disturbance (e.g. currently cleared areas and sites already utilised for quarrying activities);
- The presence of other infrastructure (including homesteads and settlements), mining and exploration lease and permit boundaries, coal resource areas, roads, power lines and pipelines; and
- Strategic Cropping Land (SCL).

Following the desktop constraints assessment, two site inspections including a vegetation assessment was undertaken to ground truth the site features. The findings of these site inspections were fed into the location and design of the quarry plan to ensure minimal impact to the environment.

Consideration was given to safety, noise, visual amenity, water quality, rock quality, engineering constraints, capital and operating costs and distance of the site from the required construction areas.

Disney was determined to be a preferred location due to proximity to rail corridor, shielding of operational impacts from the topography (air, dust, noise, visual impacts). The design and staging within the quarry development plans further took into account site features including protection of the identified Brigalow area and minimising footprint through progressive rehabilitation.

3.4 Quarry Development Proposal

3.4.1 Initial Construction and Commissioning Phase

This stage of development will involve:

- Demarcating the extent of the approved quarry area with durable permanent markers;
- Vegetation clearing and topsoil removal from first stage of Quarry development;
- Stabilisation and revegetation of any final infrastructure batters and embankments;
- Construction of temporary internal haul road;
- Establishing initial stormwater runoff and erosion controls;
- Access road upgrades and road drainage works;
- Creation of hard stand areas;
- Installation of ancillary services (fuel storage, site office etc); and
- Installation of mobile crushing and screening plant.

Site preparation is likely to commence in early 2014.

3.4.2 Site Access and Internal Roads

Two main access roads to the Disney Quarry are proposed as part of the development:

1. Northern access - an access off the Gregory Development Road is proposed for the northern entrance to the quarry. The road will utilise an existing access track; and
2. Southern access – the primary access is proposed approximately 2.4 km south of the Northern access. This road will link to the extraction area and the propose rail haul road. This road will directly link to the Carmichael Coal Mine and Rail Project corridor in the south and detour the Gregory Development Road. This access will be used for haulage of quarry material.

Site access roads will be constructed with a gravel pavement with a minimum of 9 m width. An internal haul road will be developed down the centre of the extraction area to transport material to the processing area. This internal haul road will be relocated as the linear cell extraction is moved onto the second row of cells to be extracted.

The traffic and transport arrangements for the Disney Quarry are further discussed in **Appendix C – Traffic and Transport Impact Assessment**.

3.4.3 Water Storages, Stormwater and Erosion Control

The site erosion and sediment controls will be designed in accordance with International Erosion Control Association (IECA) Guidelines 2008 recommended drainage design standards for temporary drainage structures in QLD with an anticipated design life >24 months.

Where possible, stormwater will be harvested for use on site and ultimately the objective of the site is to be self sufficient for water required for all on site operations other than potable water requirements.

All quarry workings will be free draining and the following will be undertaken:

- Stormwater will be captured in a water storage device and re-used on site for dust suppression and progressive rehabilitation;
- Clean water will be diverted away from the quarry workings into undisturbed catchment and drainage lines;
- Erosion and sediment controls will be designed, implemented and maintained in accordance with IECA 2008; and
- Water diversion structures will be established in advance of land disturbance, where possible.

Each stage of the quarry development plan requires establishing a number of physical controls, this includes installing culverts along the haul road, construction of diversion channels to divert clean water from entering areas of disturbance and establishing a sediment pond/capacity sump to collect site water runoff for reuse on site.

Site runoff collected in the sediment ponds will where possible be reused on-site. The water usage requirements for Disney Quarry are outlined in Table 3-2 below.

Table 3-2 Water usage

Quantity	Dust Suppression Truck	Dust Suppression Plant	Plant Pugmill	General Usage
Litres Per Day (l/day)	360,000	N/A	N/A	15,000
Total Kiloliters Per Month (kl/month) - 11,250				

A water storage dam will be constructed to collect rain and stormwater and allow for a 1 in 1 year storm event for water supply for on site water use. Under the *Water Resources (Burdekin Basin) Plan 2007* a permit for taking overland flow is not required for storages under 250 ML. Adani will consider a number of alternative options of water supply should additional water be deemed necessary for the quarry. This may include bore water supply, large water storages and sourcing from an existing water supply. Any alternative water supply options will be permitted separately and are not discussed herein.

3.4.4 Vegetation Clearing and Topsoil Management

The site clearing includes removal of vegetation and debris. In order to avoid large areas of the quarry being unnecessarily exposed to the erosive effects of wind and rain, areas will be opened / cleared immediately in advance of extraction fronts in accordance with staged plan.

All turf, topsoil and other organic and unsuitable material shall be stripped from the site. Wherever possible, such material will be stockpiled and reused for site rehabilitation. Topsoil stockpiles will be to a maximum height of approximately 3.5 m and stabilised, revegetated and generally treated to facilitate the soil remaining in a productive condition for later rehabilitation.

Fencing is required due to the high concentrations of livestock on the properties adjacent to the proposed quarry area. Fencing standards will be confirmed upon consultation with relevant landowners and in accordance with requirements to facilitate fauna movement.

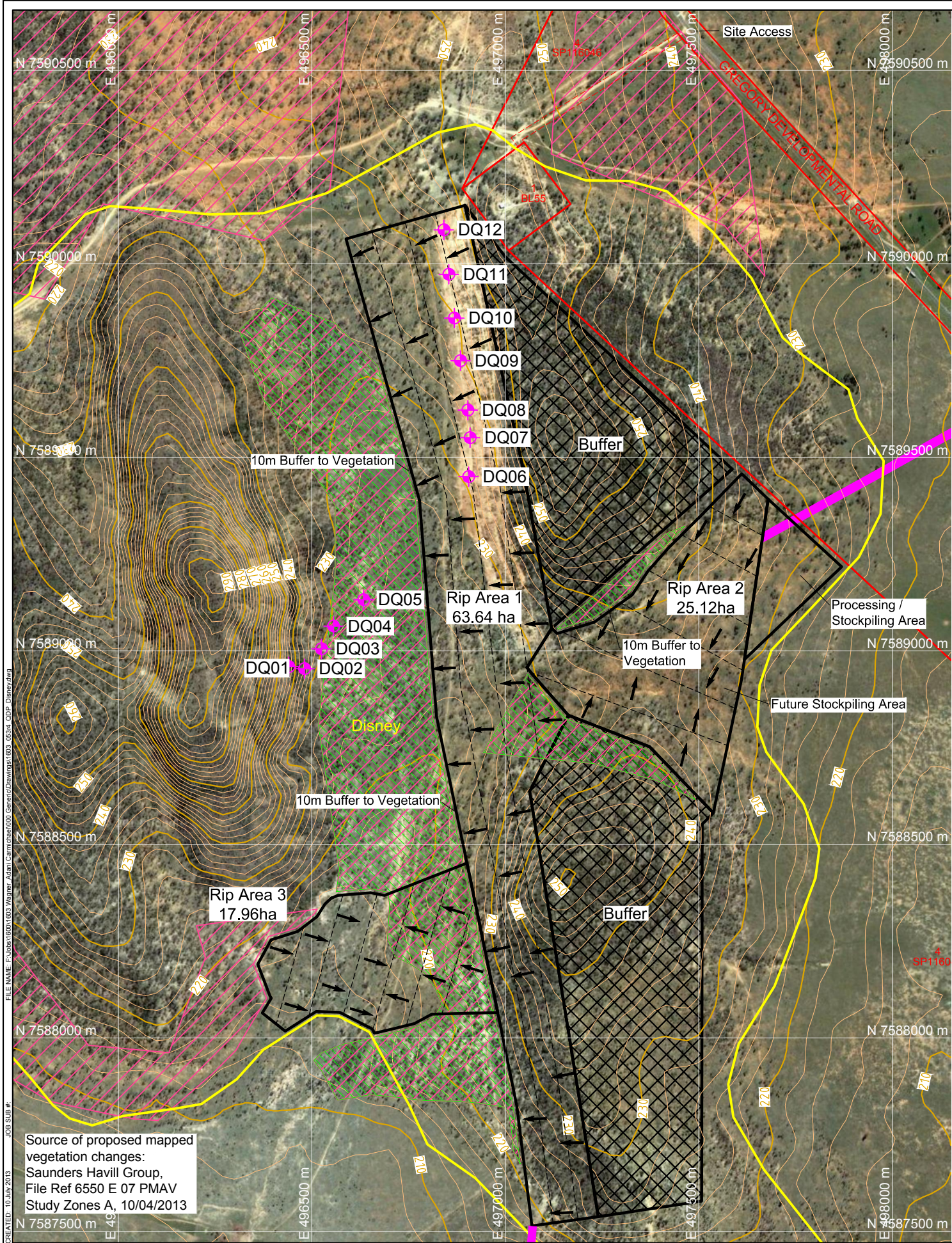
An Operational Works Development Permit for Vegetation Clearing is required under the *Vegetation Management Act 1999* (VM Act). Accordingly, relevant documentation for this application has been provided in **Appendix D**.

3.4.5 Development of Extraction Cells

The extraction cell preparation will begin with stripping topsoils and stockpiling of the residual soil profile for latter rehabilitation over the first few cells of the area to be developed. Clearing and overburden stripping will only be undertaken for one or two cell ahead of the current active cell. A number of cells measuring approximately 70 m long by 30 m wide will be ripped to 5 mbgl. Extraction will start by development of a series of linear rip faces with the dozer ripping and pushing material to a stockpile which will then be loaded via loader/excavator either straight into a truck. No blasting will be undertaken at the Disney Quarry. Following the complete extraction of the cell, progressive rehabilitation will commence.

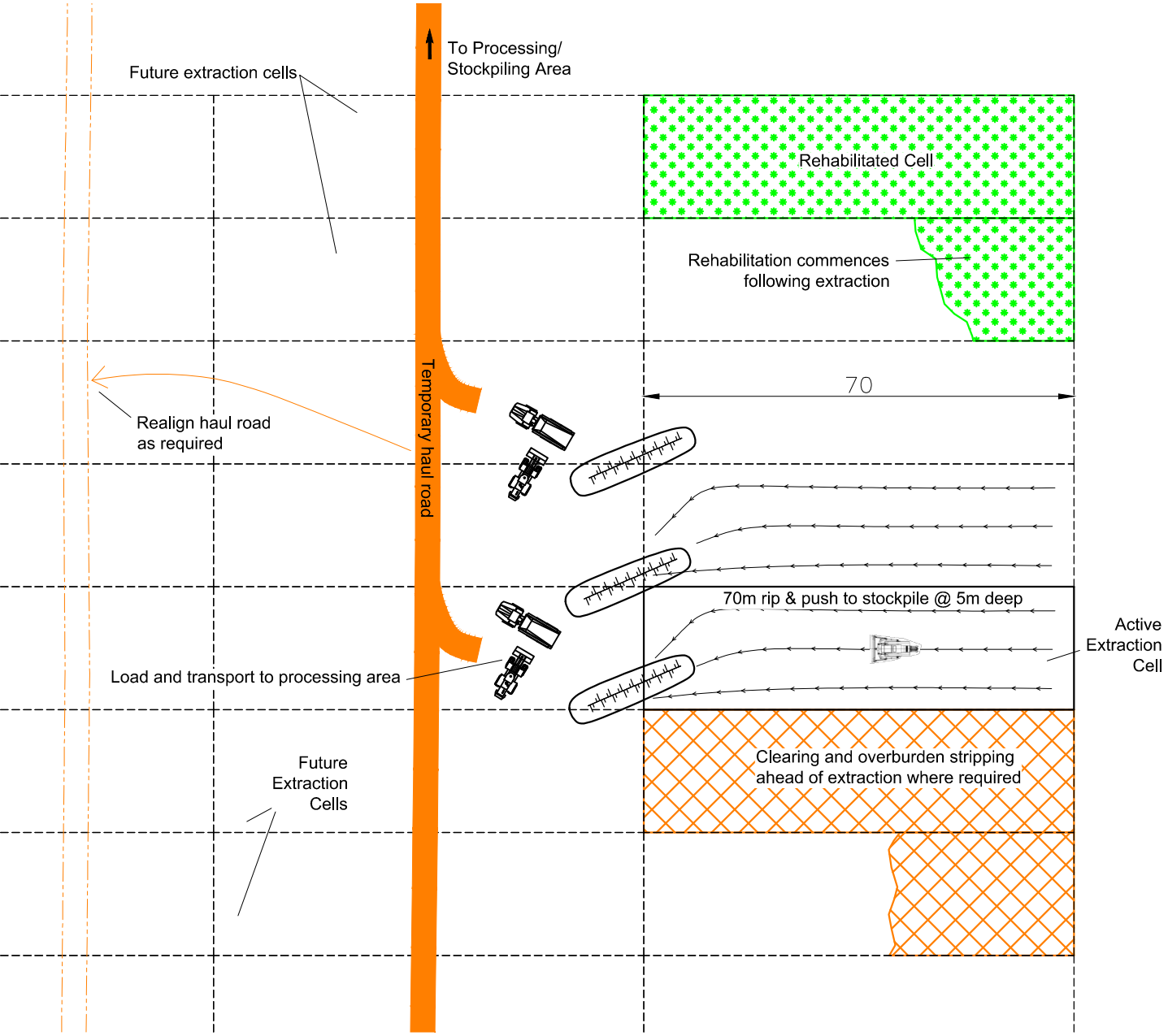
3.4.5.1 Sequence of Extraction

An outline of the proposed quarry development layout and sequence of working is presented graphically in Figure 3-1. The Quarry Development Plan will guide the development of the quarry and these plans are largely self explanatory. Once the quarry workings have been established quarry development will progress in a logical and sequential fashion with clearing of the next cell in preparation of workings and progressive rehabilitation of the expired extraction areas.



Conceptual Extraction Sequence (Ripping)

Scale 1:1,000



NOTE: Extraction Areas will require conventional drill and blast techniques

Disney Volume Estimate

	Area	Estimated Volume @ 5m Thick	Tonnes
	ha	m ³	t
Rip Area 1	63.64	3,182,000	8,432,300
Rip Area 2	25.12	1,256,000	3,328,400
Rip Area 3	17.96	898,000	2,379,700

REV	DESCRIPTION	DATE	BY
2	Revised extraction area design	03/06/13	LT
3	Added Adani Eastern Access Road	08/07/13	LT
4	Expanded Rip Area 2 and southern buffer footprint	10/07/13	LT

Data Sources:
Photography: Google Maps. Date accessed: 2013-01-23
Topography: 1s SRTM 2008 DEM-S © Commonwealth of Australia (Geoscience Australia) 2012
Cadastre: Ecosystem:
Other:

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Legend:

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Test Pit (Cardno 2012)
- Remnant Vegetation Containing Endangered Regional Ecosystems
- Endangered Regional Ecosystems Proposed as Least Concern
- Overburden Stripping
- Progressive Rehabilitation
- General Direction of Extraction
- Access Road (Supplied by Adani)



PROJECT: Disney Quarry
CLIENT: Wagner Quarries Pty Ltd

TITLE: Figure 3-1 Extraction and schematic site layout

GROUNDWORK plus

SCALE: 1:12,500

DATE: 10 July 2013
PRINTED: 10 July 2013

DRAWN: [blank]
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DRAWING NUMBER: 1603.053
REVISION: 4

DATUM: HORIZONTAL / VERTICAL / ZONE
MGA / AHD / 55

3.4.6 Material Processing

Material on the Disney site will not be processed through a screening or crushing process; however, on occasion a mobile screen may be required depending on the product extracted. It is expected that material will be ripped and stockpiled ready for dispatch to laydown areas along the rail construction corridor.

3.4.6.1 Products Produced and Production Rates

The Disney Quarry will be a short term operation commencing in 2014 and operating until construction of the Carmichael Coal Rail component of the project is completed. There may be slight changes to the operation life of the quarry as it is dependent upon the construction schedule for the Carmichael Coal Mine and Rail Project.

It is anticipated that 6 million tonnes of CBR>20 material will be required from this site over this three year period and approximately 5.8 million tonnes of embankment material. The initial indications of volumes required over this time period have been illustrated in Figure 3-2 below.

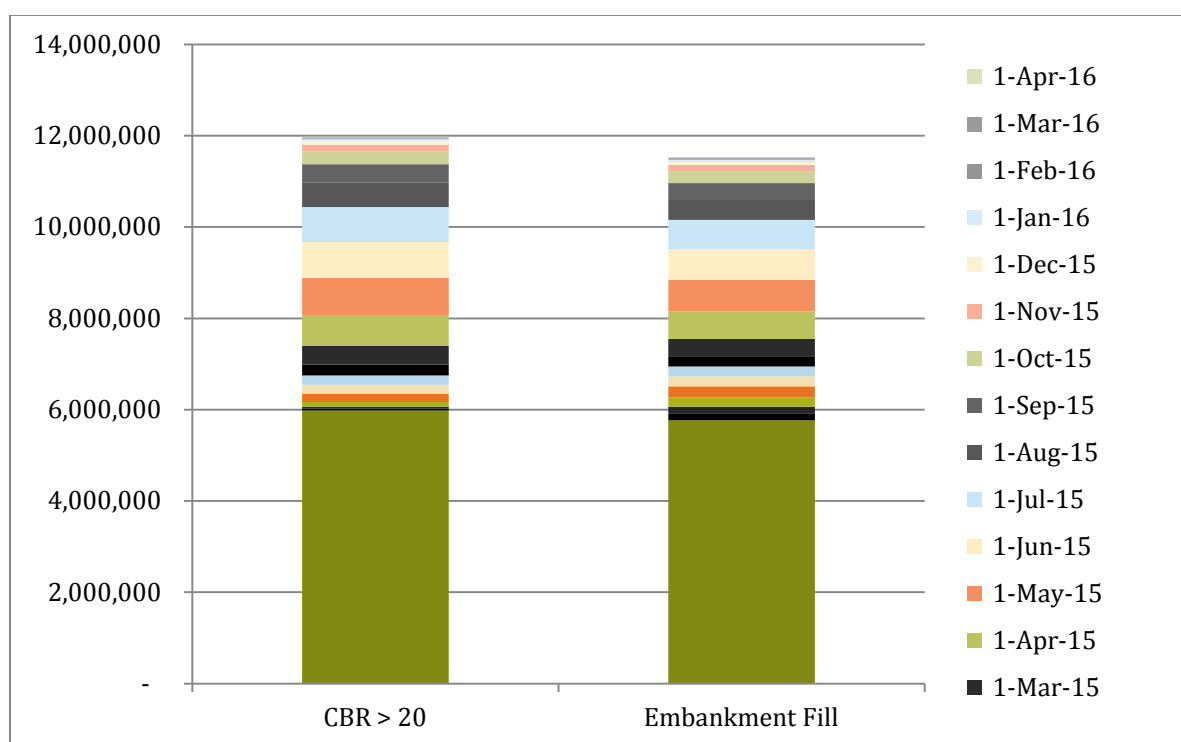


Figure 3-2 Quarry material requirements over the operation life of the quarry

The highest annual production rate for a financial year is expected to be during 2015 to 2016 when up to 7 million tonnes of material or just over 10 million tonnes for the calendar year of 2015. This volume and demand may change and is dependent upon construction schedule and construction progress of the Carmichael Coal Mine and Rail Project.

3.4.7 Product Stockpiling and Despatch

3.4.7.1 Location of Stockpiles and Management

Stockpiling of processed products is necessary to meet construction requirements, schedules and quality control testing. Some product stockpiles will be maintained at the proposed quarry site in the area indicated on the site plan for stockpiles. The road base and fill stockpile will be approximately 3.5-7m high. Material will predominately be transported offsite to stockpile locations along the rail corridor to await use in construction. Stockpiles will be arranged to provide ready access to different products and to provide maximum benefit for noise attenuation from fixed and mobile plant.

3.4.7.2 Dispatch and Quantity Records

The volume carried in each truck will be recorded. All records on a per trip/per day basis will be maintained with logged records of tonnes per load and destination kept.

Quarry material will be hauled with road registered triples, capable of holding 75 tonnes of material. It is anticipated that an average of 498 truck movements will be required per day and 1,342 truck movements per day during peak production (one month period).

All loads accessing public roads will be covered. No trucks will be permitted to leave the site unless the load is legal and secure. A driver's code will apply to all truck drivers and its requirement will apply to driver behaviour and attitudes both on and off the site. The internal site access road between the site access points will be hard packed with a gravel pavement.

Road signs and internal quarry road speed limits will be restricted to 40 km per hour and access road speed limits of 80 km per hour enforced on site to minimise dust and ensure safe operation of the site.

3.4.8 Ancillary Facilities

The following facilities will be erected on the proposed quarry site to service the quarry workings:

- One crib and ablution block (height of approximately 2.7 m);
- One spares container 20 ft;
- Security gates and cameras; and
- Portable water tanks (25,000 L) and pumps.

3.4.9 Machinery and Equipment

The following is an indicative list of equipment that will be used on site

- Two D10T Bulldozers;
- One CAT349DL Excavator;
- Two CAT980H Loaders;
- One water truck (Mack 8x4 Wheeler);
- Two light vehicles;

- Seven light plants (ALLIGHT); and
- One 10KVA Genset.

Major machinery and equipment to be deployed permanently on site will include the loaders, excavators, haul trucks and water trucks. Other equipment to be deployed on an 'as needed' basis will potentially include bull dozers, screening and or crushing plant. Equipment will be maintained in accordance with manufacturer's recommendations and inspected daily with a regular maintenance program in place.

Minor and major servicing of mobile plant will be undertaken on site. Major servicing will be generally undertaken by specialist service providers. Refuelling of mobile plant will be undertaken on hardstand area with spill prevention measures in place.

3.4.10 Storage of Fuels, Lubricants and Chemicals

Fuel storage on site will be in a self bunded fuel tank and will store up to 25,000 L maximum of diesel at any one time. Fuel will be on a hard stand area with spill kits located beside the refill area. Any spill will be cleaned up immediately.

Minor amounts of oils, hydraulic fluids, greases, coolants and other maintenance items will be stored on site in the 20 ft storage container which will be self bunded or within portable bunds within the container area. In addition, minor amounts of cleaning solvents, paints and thinners will also be stored.

Weed control chemicals and sprays may be stored on site for maintenance weed control. In addition, fertilisers and pesticides in small quantities required for progressive rehabilitation works will be stored on site.

All minor chemical and other substances will be safely stored with required separation distances, bunding and within a lockable storage.

3.4.11 Hours of Operation

The quarry will operate 24 hours a day with the following restrictions on certain activities:

- Extraction, stockpiling and dispatching – 24 hours (Monday to Sunday); and
- Plant and equipment maintenance - 24 hours (Monday to Sunday).

3.4.12 Public Utility and Services

3.4.12.1 Electricity, telecommunications and potable water

The following will be the utilities and services at the site:

- Electricity supply will be by a 10 Kilo Volt Amperes (KVA) generator as no connection to main powers is available at the site;
- Telecommunications will be by a satellite phone in the office building, as no mobile reception is available at the site; and
- Potable Water supplies will be trucked in and stored in a 25,000 L water tank on site for drinking and ablutions operation. On site water for construction and dust suppression will be captured on site from stormwater in retention dams and reused on site.

3.4.12.2 Sewage and Waste Water Management

Waste water will be treated in portable treatment plants comprising modular units with capacity to treat up to 21 Equivalent Persons (EP). Waste water from the system will be disposed off through sub-surface irrigation to a fixed landscape. It is expected that a 10 EP work force on site will produce a maximum of 500 litres/day. The sub surface irrigation will be physically separated from any work area in a suitable location.

The on site system is not required to have licensing under the *Environmental Protection Act 1994* as the facility is not deemed to be a "sewage treatment plant" as it has a peak design capacity of less than 21 EP. However, the installations will comply with the *Sewerage and Water Supply Act 1949* which require approvals to install, change or take away on-site sewage facilities.

Sewage systems will be managed in accordance with the Australian Standard (AS) 1547.200 - Onsite Domestic Wastewater Management, as this standard applies to systems dealing with up to 10 persons.

The functional requirements of on-site sewage treatment systems are that they be designed, operated and maintained to:

- Ensure that wastewater effluent reuse practices do not create a mode of transmission for disease;
- Encourage the application of wastewater effluent to the landscape in the most efficient and sustainable method;
- Bring about simple, safe and cost-effective operation and routine service requirements;
- Ensure soil condition is not degraded;
- Ensure that by-products are disposed in an hygienic manner which is not detrimental to the environment or public health; and
- Ensure that the wastewater effluent is maintained within the boundary of the property from which it is produced so that off-site impacts are minimised or prevented (e.g. contamination of surface water and groundwater by nitrogen and phosphorus from the effluent, environmental nuisance).

3.4.13 Lighting

It is proposed that the quarry will operate 24 hours a day, as such lighting for night operations is required. Lighting will be provided at the extraction face, the site office and the access roads to allow for night operations.

Illumination of the Disney Quarry will be provided by seven industry recognised COMBILITE. The COMBILITE features four 1500 W metal halide lights with automatic start-up and shut down and an integrated control panel. The light output will be a strong and clear pure-white illumination with a 350 degree mast rotation function whilst fully extended and operational.

When compacted for transport, the unit itself stands at 2.35 m; when the mast is fully extended the unit can reach a nominal maximum height of 9.0 m. Width of the actual unit is 1.65m whilst the draw bar has an ability to extend to 3.14 m. The unit runs off a 1.1 L, 3 cylinder Perkins 403D-11

engine, meeting all current and proposed Australian emissions legislation. The unit is also fitted with a fluid containment tray to prevent any environmental spills.

The lights will be located at the entry and exit of the site, the quarry working face and processing areas. The lights will be moved and positioned according to the stage of quarry development. Consideration will be given to reducing light spill from the boundary of the site.

3.4.14 Waste Management

Quarry developments do not generate a significant amount of waste. Types of waste likely to be generated on site include:

- Paper and general wastes from the officers, workshop and amenities facilities;
- Scrap metals;
- Oils, greases and waste fuels; and
- Contaminated soils from any clean up of fuel, oil or grease spill.

Wastes will be sorted and recycled where possible. Paper and general wastes from the offices, workshops and amenities will be stored in appropriate containers prior to delivery to designated landfill, refuse transfer or recycling depots. The nearest landfill is located Turrama Road, Clermont QLD 4721. General waste will be transported to this facility. Scrap metals will be collected by contractor for recycling. Oils, greases and waste fuels from machinery servicing will be collected and securely stored on site in a bunded area prior to disposal off site to licensed refuse site or recycling agency.

3.4.15 Workforce

There will be approximately eight to ten full time employees on site during the quarry operations. Employees will be sourced from local area or if fly in fly out, accommodated in the local rail construction camp to the east of the Disney Quarry along the rail haul road. Employees will use the rail haul road where possible to access the Disney Quarry.

Employees will be transported to the quarry site on a mini bus and returned to the temporary camp accommodation at the end of the shift. In addition, to the site personnel, part time and casual truck drivers, maintenance fitters, drill and blast personnel and other sub contractors may be employed either directly or as sub contractors.

3.4.16 Health and Safety and Emergency Response

3.4.16.1 Public Safety

The need to ensure the safety of the public from quarrying and quarry related activities is recognised by the proponent. Statutory requirements will be enforced and other company initiatives will be implemented to avoid injury to the public. These would include fencing, erection of signage, machinery marking and alarms, and safety procedures.

Site safety procedures will be implemented and reviewed as necessary. The quarry will be operated in accordance with the *Mining and Quarrying Safety and Health Act 1999* (MQSH Act) and associated regulations.

3.4.16.2 Occupational Health and Safety

A site safety plan will be prepared and updated as necessary. The plan will include induction procedures, standard work procedures, risk assessment procedures, employee training and all occupational health and safety requirements to ensure statutory compliance, audit and monitoring requirements.

3.4.16.3 Emergency Response

In accordance with the Guidance Note QGN 15: (Emergency Preparedness for small mines and quarries document), an individual Emergency Response Plan (ERP) will be developed prior to construction which considers, as a minimum:

- The type of operation;
- Site hazards;
- The range of personnel;
- Training of personnel;
- Geography of the surrounding area and remoteness; and
- Available equipment.

Adani will identify and record who should receive copies of the ERP. If information changes there will be a system developed that ensures changes are made to the site ERP and any controlled copies. The ERP will be written in plain English with critical information well indexed and easily referenced. The ERP will consist of a number of elements that contain relevant information relating to the site including the following generic topics:

- Mine information;
- Plans and drawings;
- Risk management;
- Emergency equipment/facilities;
- First aid requirements;
- Personnel training;
- Incident control;
- Communication;
- Contact lists;
- Securing the site;
- Procedures for controlling site specific hazards; and
- Records.

3.4.17 Rehabilitation and Landscaping

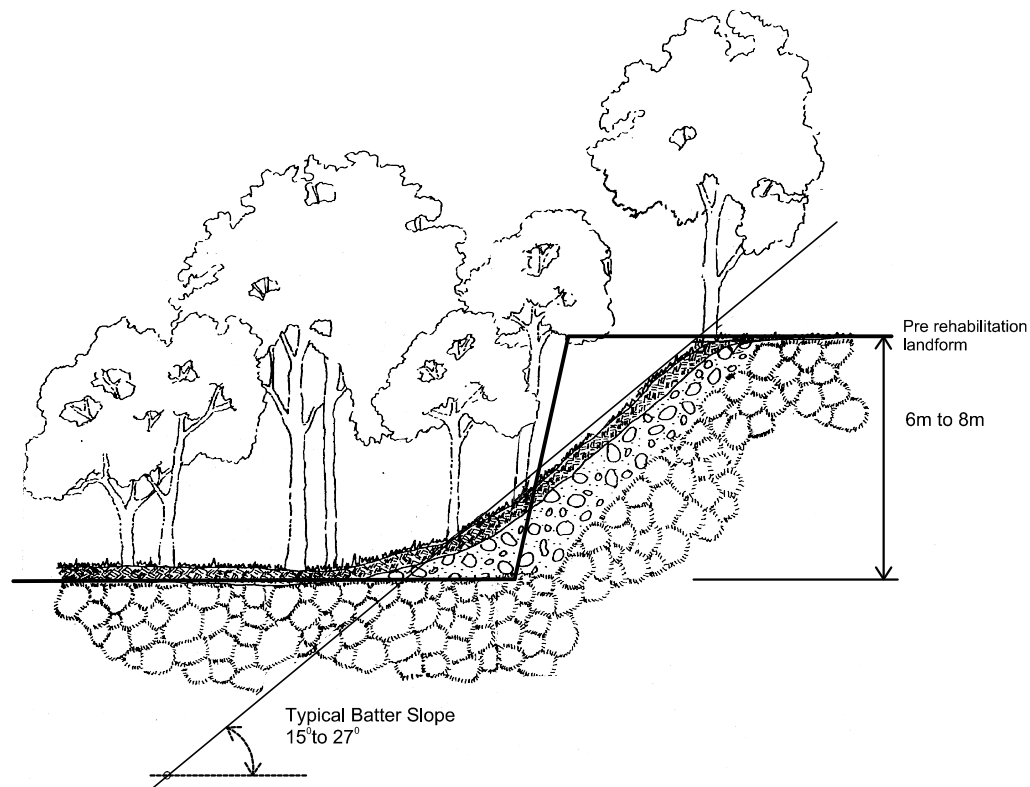
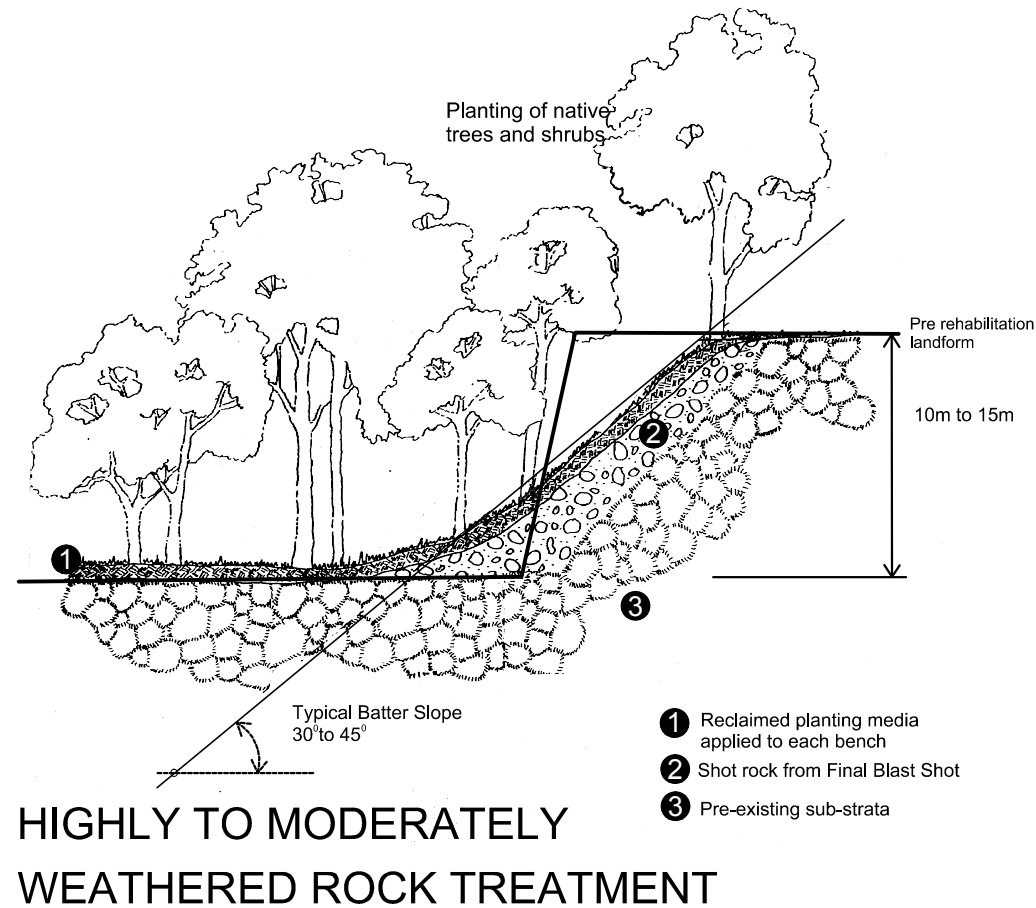
Landscaping of the site is not considered, given the rural nature of the location and its position between two ridgelines. Visual amenity impacts to the public are likely to be minimal and there is significant visual screening from existing vegetation and topography from the Gregory Development Road and the Disney homestead.

Rehabilitation is an essential component of quarry planning and development. A staged and progressive rehabilitation program has been included in the Quarry Development Plan see Figure 3-1 to ensure the minimum disturbed area is open at any time.

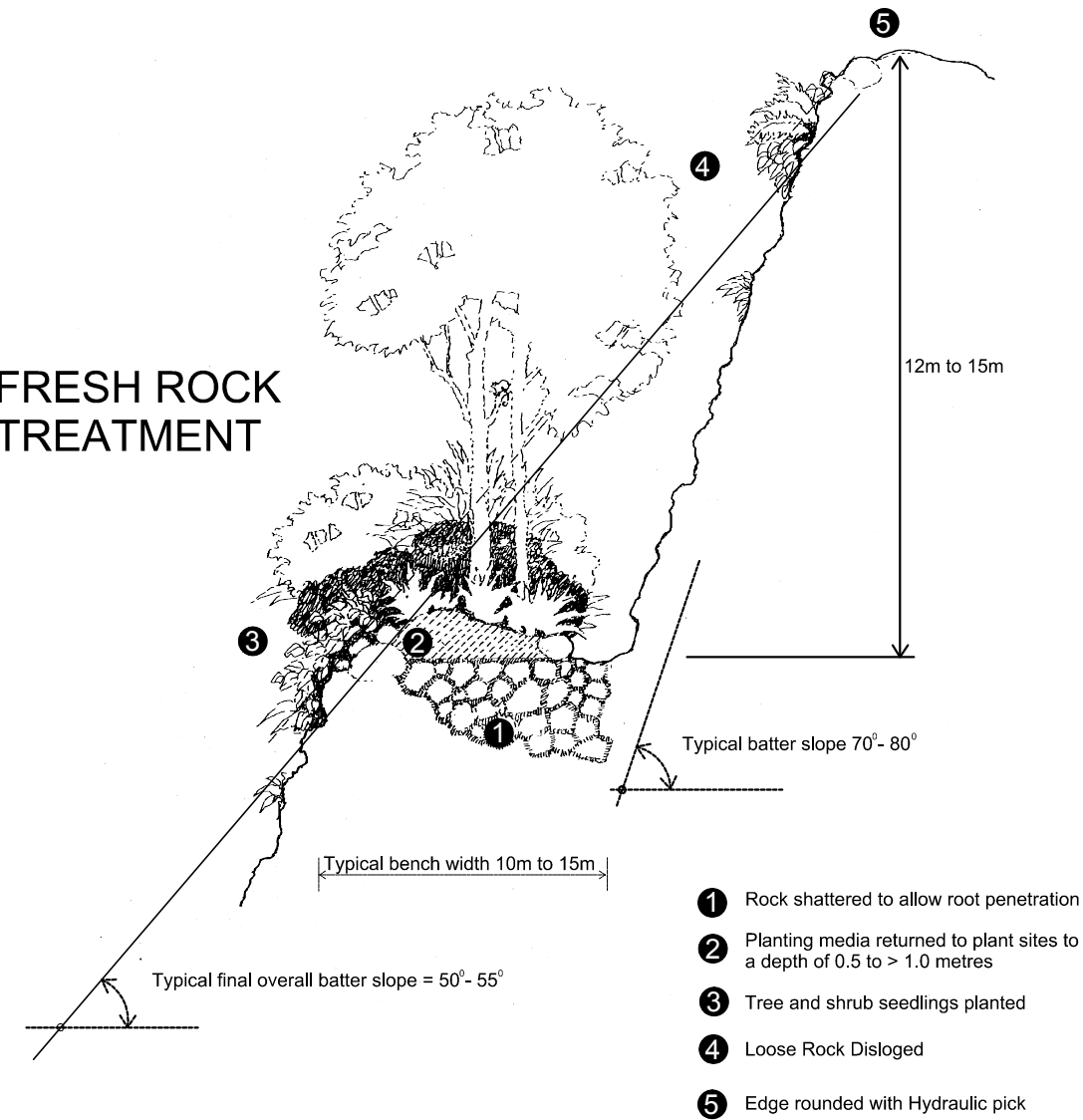
Any remaining open extraction areas will be rehabilitated and better treatments applied to all benches in accordance with Figure 3-3 and Figure 3-4. The following rehabilitation methods will be applied:

- All temporary infrastructure and facilities will be removed;
- Disturbed land will be reinstated to a stable form to enable land to reach pre-existing condition similar to the surrounding contour of the land;
- There will be no void left as land will be reprofiled to the gully contour;
- Permanent erosion and sediment controls will be designed to provide long-term stability to the disturbed area;
- Reinstatement of the topsoil over the contoured profile;
- Seed of native grasses or sterile crops during initial reinstatement works to assist in stabilising the area and reducing the potential for weed outbreaks;
- Allow natural regeneration of vegetation where viable, if not successful assisted regeneration using local species and sourced stock will be used;
- Fertilisers and soil supplements will be used only as necessary and with the agreement of landholders and authorities;
- Temporary access roads will be closed and rehabilitated to a condition compatible with the surrounding land use; and
- Weed control and ongoing monitoring will be implemented to ensure successful regeneration.

Revegetation will be carried out in consultation with the leaseholder and with the relevant government department or agency to ensure the measures proposed are acceptable and have a high likelihood of success.



FRESH ROCK TREATMENT



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JOB SUB #

CREATED: 25 June 2013

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Topography:

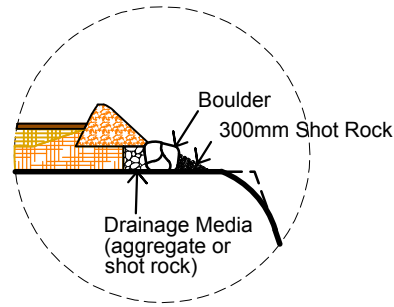
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Ecosystem:

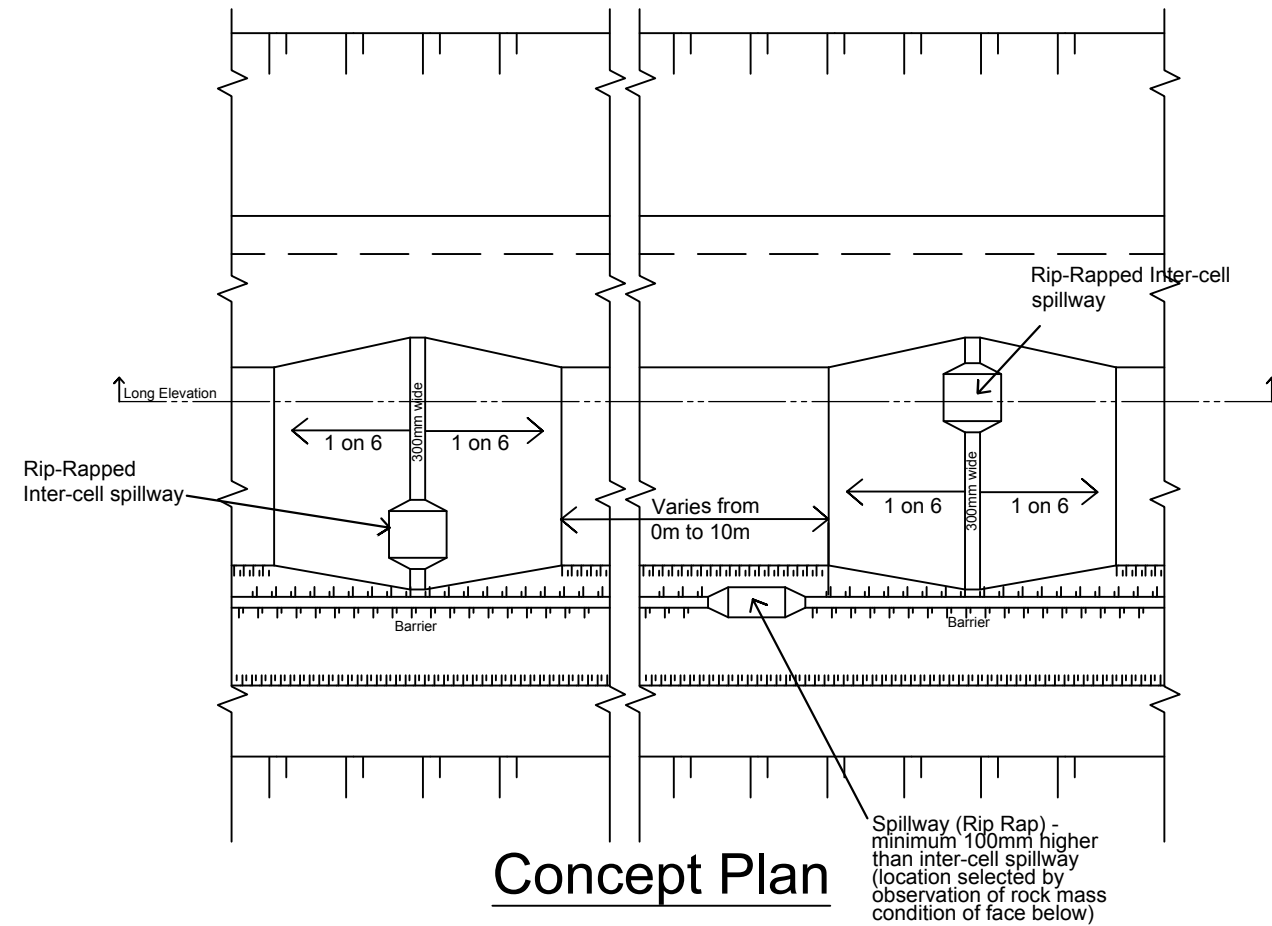
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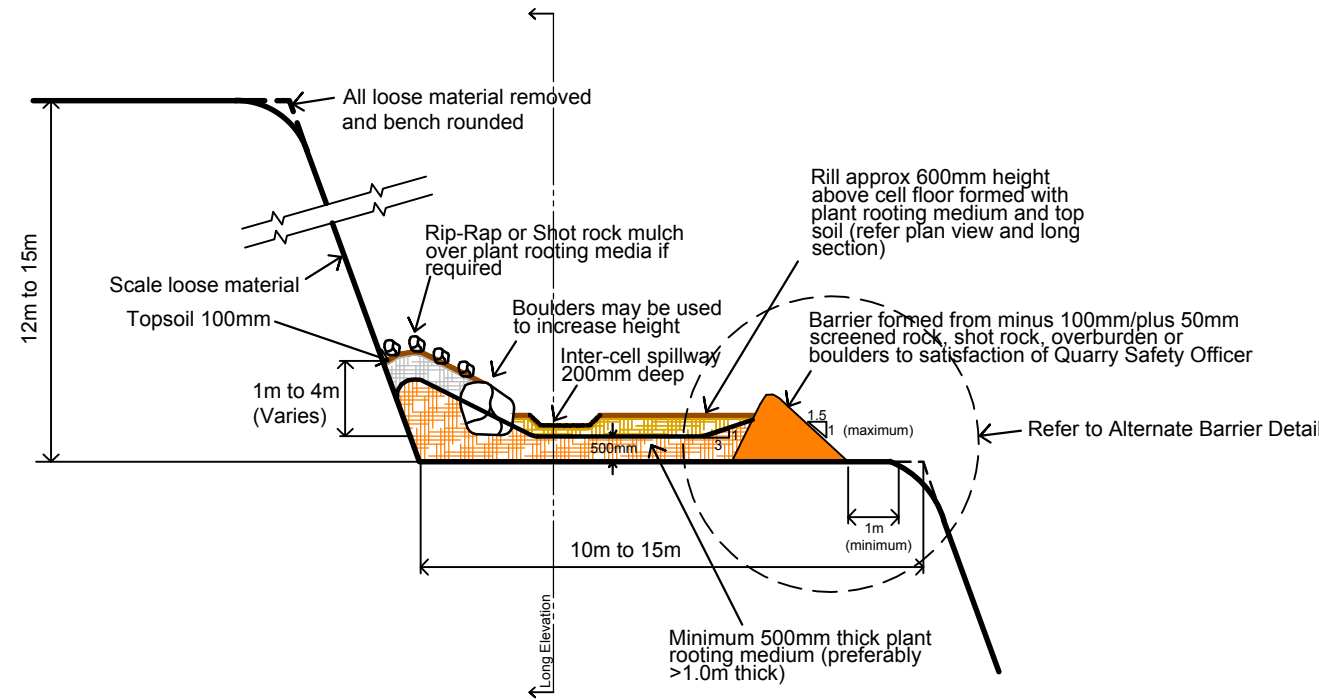
PROJECT:	Disney Quarry	TITLE:	Figure 3-3 Batter treatments
CLIENT:	Wagner Quarries Pty Ltd	DRAWING NUMBER:	1603.099
PH: +61 7 3871 0411	DATE: 25 June 2013	DRAWN: MH	DATUM: HORIZONTAL / VERTICAL / ZONE
WWW.GROUNDWORK.COM.AU	PRINTED: 25 June 2013	CHECKED:	/ /



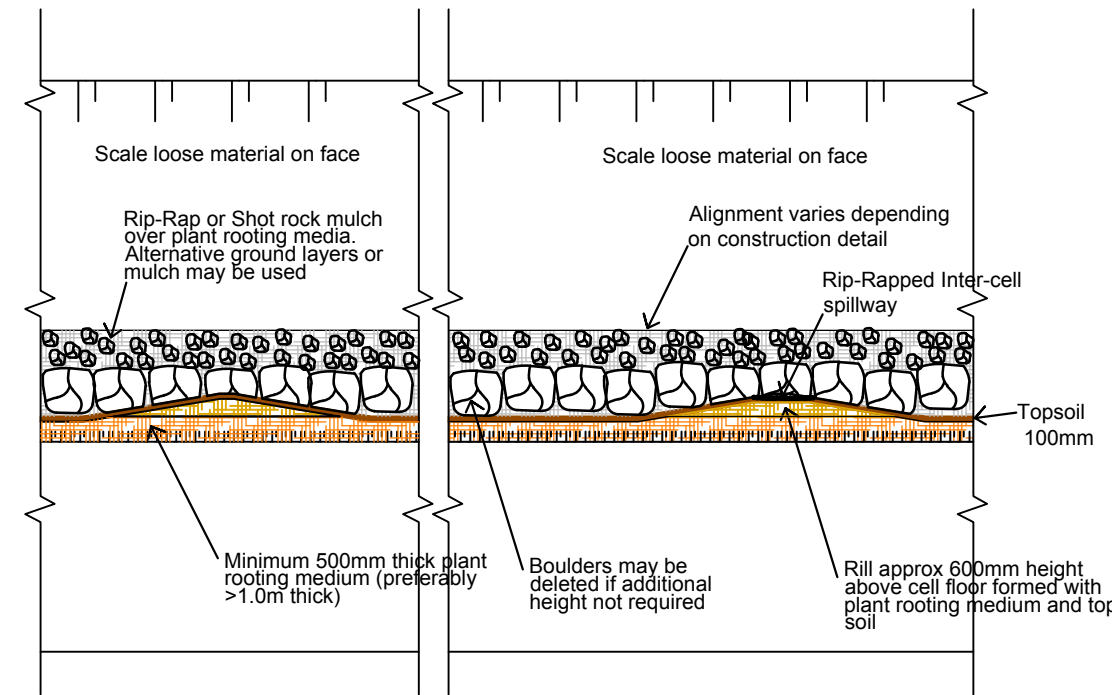
Alternate Barrier Detail



Concept Plan



Concept Cross Elevation



Concept Long Elevation

FILE NAME: F:\Jobs\16031003_Wagner_Arden_Carmichael\000_General\Drawings\1603_100_schematic Bench Rehab.dwg
JOB SHEET #
CREATED: 25 June 2013

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Data Sources:
Photography:
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Ecosystem:
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Legend:

PROJECT: Disney Quarry	TITLE: Figure 3-4 Schematic of quarry bench rehabilitation
CLIENT: Wagner Quarries Pty Ltd	GROUNDWORK plus PH: +61 7 3871 0411 WWW.GROUNDWORK.COM.AU SCALE: 1:150 When Printed On A3 DATE: 25 June 2013 PRINTED: 25 June 2013 DRAWN: MH CHECKED:
DRAWING NUMBER: 1603.100	REVISION: DATUM: HORIZONTAL / VERTICAL / ZONE / /

Section 4 Environment and Management

4.1 Terrestrial Ecology

The Disney Quarry site occurs in an agricultural area primarily used for grazing. As a result of historic and current grazing activities, the extent, connectivity and ecological integrity of vegetation communities and the fauna habitat they provide, have been altered significantly from the natural state. The Disney Quarry area comprises a mix of remnant and regrowth vegetation, with no defined watercourses (excluding drainage lines which were observed to be dry) bisecting the quarry area. Part of the site has already been subject to limited quarry activities in the past.

4.1.1 Vegetation Communities and Fauna Habitats

The proposed site is within the Brigalow Belt North Bioregion, a region with a high diversity of RE (Sattler and Williams 1999). Biodiversity loss is widespread and affects most areas of the region to varying degrees (Dight, 2009).

Vegetation at Disney Quarry is dominated by eucalypt woodland with some patches of *Acacia* forest. The woodland is often sparse in low lying areas, which is likely a result of past land management practices (Plate 4-1). A dense grassy, ground layer dominated by the introduced Buffel Grass (*Cenchrus ciliaris*) exists in lower lying areas. Spinifex (*Triodia sp.*) dominates the ground layer in some rocky areas. Plate 4-1 shows the existing vegetation and existing material stockpiles at the proposed quarry site.



Plate 4-1: Existing and proposed quarry site

Several areas are currently mapped as Brigalow (*Acacia harpophylla*) associated vegetation communities. Six regional ecosystems (REs) have been mapped within the site consisting of approximately 35.5 ha of mapped Least Concern remnant vegetation and 20.42 ha of mapped non-remnant vegetation. Descriptions of these REs are provided below in Table 4-1 and illustrated in Figure 4-1.

Table 4-1 Mapped REs within the proposed indicative Disney Quarry site

RE	Vegetation Management Act 1999 class	Biodiversity status	Short description
REs within the site			
11.11.15	Least concern	No concern at present	<i>Eucalyptus crebra</i> woodland on deformed and metamorphosed sediments and interbedded volcanic. Undulating plains.
11.11.15c	Least concern	No concern at present	Woodland with <i>Corymbia setose</i> present to dominant, usually with <i>Corymbia clarksoniana</i> , <i>Eucalyptus melanophylla</i> , <i>Corymbia dallachiana</i> and <i>Eucalyptus crebra</i> , with occasional shrubs of <i>Petalostigma pubescens</i> and <i>Alphitonia excels</i> .
11.4.6	Of concern	Endangered	<i>Acacia cambagei</i> woodland on Cainozoic clay plains
11.4.8	Endangered	Endangered	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. Argyrodermon</i> on Cainozoic clay plains.
11.4.9	Endangered	Endangered	<i>Acacia harpophylla</i> open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains.
11.3.10	Least concern	No concern at present	<i>Eucalyptus brownii</i> woodland on alluvial plains
REs within close proximity to the site			
11.11.12	Least concern	No concern at present	<i>Eucalyptus persistens</i> low woodland on deformed and metamorphosed sediments and interbedded volcanics.

Field surveys undertaken of the areas regional ecosystems by Saunders Havill in March 2013 found that species composition within the mapped remnant polygon is consistent with Least Concern Regional Ecosystem 11.11.15. Species dominating include *Eucalyptus crebra* (Narrow Leaf Ironbark) and *Corymbia clarksoniana* (Long Fruited Bloodwood) with the occasional *Corymbia dallachiana* (Ghost Gum).

The proposed Disney Quarry areas are located adjacent to a mapped Endangered Regional Ecosystem running north south along the quarry's western boundary and two smaller polygons running largely east west and located towards the centre of the proposed quarry area, shown in Plate 4-2. The site flora survey identified that the two small central Endangered polygons contain evidence of species associated with adjacent Least Concern RE 11.11.15. The relatively large Endangered polygon to the west of the proposed quarry contains canopy species dominated by *Eucalyptus brownii* (Reid River Box) with one small patch of *Acacia cambagei* (Stinking Wattle) recorded in its North-West portion. Two isolated patches of *Acacia harpophylla* (Brigalow) containing no more than ten trees within each were recorded within the polygon. An image of the typical low-lying woodland across the site is provided in Plate 4-3.

The mapped endangered polygons contain a composition regional ecosystem community including 80% Of Concern RE 11.4.6, 10% Endangered RE 11.4.8, 5% Endangered RE 11.4.9 and 5% Least Concern RE 11.3.10. Field flora surveys of these areas however have failed to detect the presence of Endangered REs.

In accordance with the site survey, a Property Map of Assessable Vegetation (PMAV) has been included for submission to the Department of Natural Resources and Mines (NRM) to amend the current vegetation mapping. Under these changes, Endangered polygons in the centre of the site

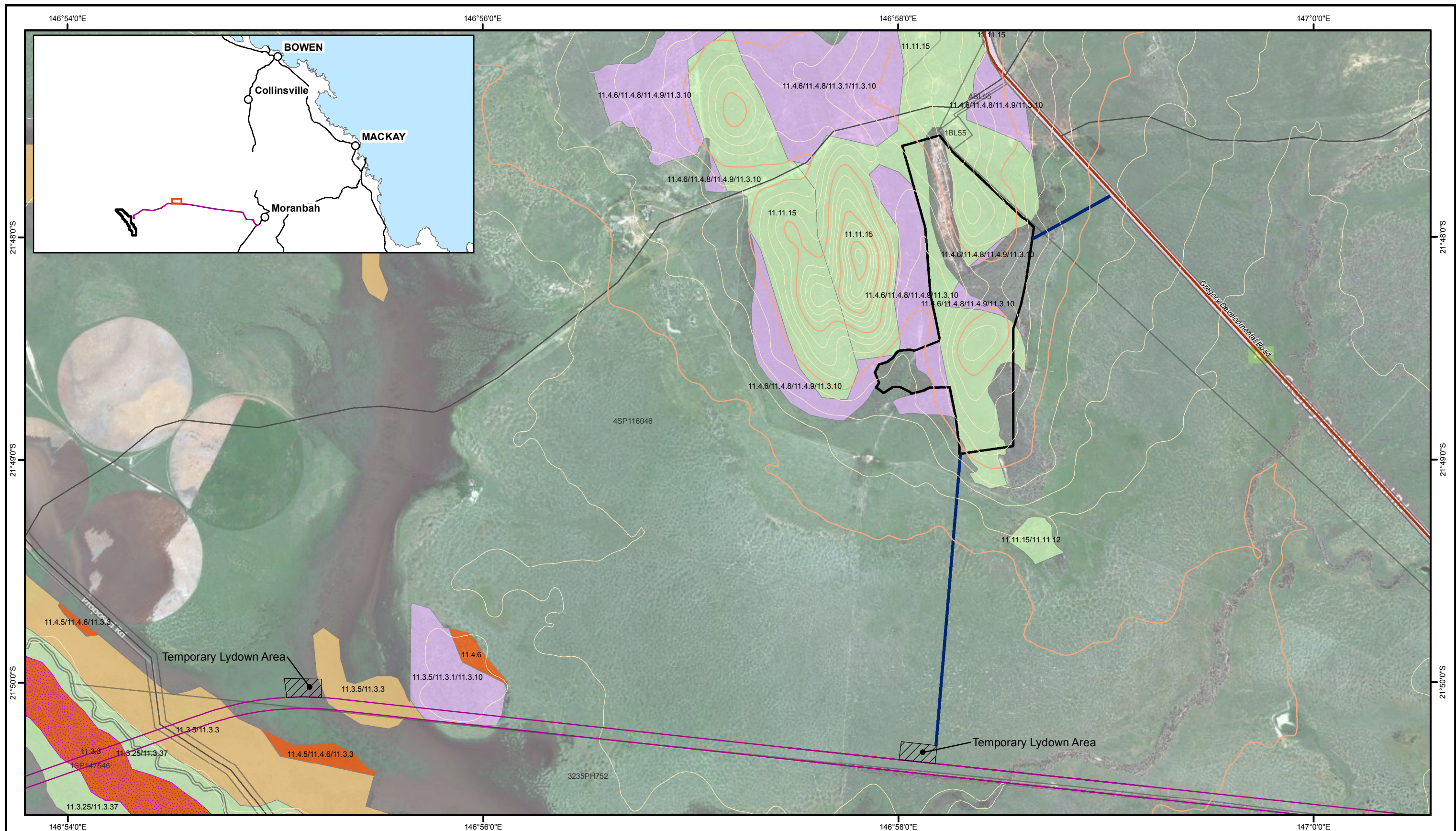
and to the west of the proposed quarry will be amended to Least Concern. Therefore, the quarry development will only be impacting Least Concern vegetation and no Endangered REs will be affected. The full vegetation assessment report and the PMAV are provided in **Appendix B**.



Plate 4-2: Incorrectly mapped RE adjacent to proposed quarry site



Plate 4-3: Disney Quarry site - view of typical low-lying woodland across to main rocky hill



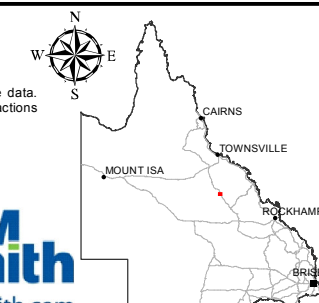
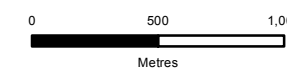
Adani Quarry Permits and Approvals
Figure 4-1 Ecological values within and surrounding the site

Legend

- Carmichael Mine - ML 70441
- Threatened Ecological Community (EPBC)
- Property Boundary
- Disney Quarry Disturbance Area
- Proposed Adani Rail Corridor
- Minor Road
- Major Road
- Minor watercourse
- Quarry Access Road

Regional Ecosystems v6.1

- Endangered Subdominant
- Of Concern Dominant
- Of Concern Subdominant
- Not of Concern



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Data source:
Adani, 2012;
DERM, 2010;
Base Layer by Bingmaps, 2011.



4.1.1.1 Flora Species

The Commonwealth Government EPBC Protected Matters search results indicate that there is a potential for a Threatened Ecological Community (TEC) listed as Endangered (under the EPBC Act) to occur within the area: Brigalow (*Acacia harpophylla* dominant and co-dominant). Two isolated patches of *Acacia harpophylla*, containing no more than ten trees within each patch, were recorded within the investigation area. Overall, field observations indicated very little presence of Brigalow on site and a specific vegetation survey confirmed that the species composition is consistent with Least Concern RE (11.11.15) and not a TEC. Additionally, the Protected Matters search results indicated *Acacia ramiflora* (listed as Vulnerable) is likely to occur within the area. This species typically occurs in woodland on sandstone hills and some sandstone occurs on the site. Scattered patches of *Acacia* species were observed on site.

The Queensland Government Wildlife Online search (**Appendix E**) lists four conservation significant plant species as potentially occurring at the site (Table 4-2). All of these species are listed as least concern under the *Nature Conservation Act 1992* (NC Act). The field survey confirmed the presence of *Corymbia clarksoniana* (Long Fruited Bloodwood) in low numbers, however, the three other species were not recorded.

Table 4-2 Wildlife online flora search result

Scientific Name	Common Name	NC Act Status	Field observation
<i>Eucalyptus drepanophylla</i>	Narrow-leaved Ironbark	Least Concern	Not identified
<i>Eucalyptus xanthoclada</i>	Yellow-Branched Ironbark	Least Concern	Not identified
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	Least Concern	Identified on site
<i>Tephrosia astragaloides</i>	Unknown	Least Concern	Not identified

4.1.1.2 Weed Species

According to the EPBC protected matters search tool, the following four weeds of national significance have the potential to occur in the quarry area:

- Rubber Vine (*Cryptostegia grandiflora*);
- Olive Hymenachne (*Hymenachne amplexicaulis*);
- Parkinsonia (*Parkinsonia aculeata*); and
- Parthenium (*Parthenium hysterophorus*).

All four of these species are also listed as Class 2 pests under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act). A total of four introduced weed species were identified within the Disney survey area including Parthenium (Table 4-3). The occurrence of this weed species is consistent with the distribution shown in the latest Biosecurity Queensland Annual Pest Distribution Survey data.

Table 4-3 Weed species identified within Disney Quarry survey area

Species Name	Common Name	LPA Class	WoNS
<i>Melinis repens</i>	Red Natal Grass	-	-
<i>Parthenium hysterophorus</i>	Parthenium	2	Declared

Species Name	Common Name	LPA Class	WoNS
<i>Pennisetum ciliare</i>	Buffel Grass	-	-
<i>Sida cordifolia</i>	Flannel Weed	-	-

4.1.1.3 Fauna Species

The Protected Matters and EHP Wildlife online desktop assessment of database records indicated the possible occurrence of 13 fauna species listed as Endangered, Vulnerable or Near Threatened (EVNT) under the NC Act and EPBC Act. It also recorded eight species listed as Migratory under the EPBC Act. The EPBC Protected Matters database search tool predicted the presence of a further three species listed as Endangered or Vulnerable (EPBC Act) and three species listed as Migratory potentially occurring at the site. The results from the EPBC Protected Matters search results are provided in Table 4-4, with their respective field observations. A full list of predicted conservation significant fauna species and their potential to occur on the site are provided in **Appendix F**.

Table 4-4 Protected matters search results with respective field observations

Species	EPBC Act Status	Preferred habitat	Field observation
Birds			
<i>Erythroriarchis radiatus</i> (Red Goshawk)	Vulnerable	Prefers areas close to the coast featuring extensive open forest and woodland with a mosaic of vegetation types. Nests in tall emergent trees close to water.	Unlikely - Landscape heavily cleared and unsuitable
<i>Geophaps scripta scripta</i> (Squatter Pigeon)	Vulnerable	Occurs in dry woodland. Generally on sandy soils close to water.	Unlikely - Observed on two occasions in general area but habitat on site is marginal for this species.
<i>Neochmia ruficauda ruficauda</i> (Star Finch – southern/easter)	Endangered	Occurs in grassy open woodlands near water. Prefers areas of intact woodlands.	Unlikely - Habitat unsuitable. Out of species present range
<i>Peophila cincta cincta</i> (Black-throated Finch – southern)	Endangered	Prefers temporary shallow wetlands. Nests in freshly flooded wetlands with low vegetation.	Unlikely - Habitat unsuitable.
<i>Rostratula australis</i> (Australian Painted Snipe)	Vulnerable, Migratory	Prefers areas close to the coast featuring extensive open forest and woodland with a mosaic of vegetation types. Nests in tall emergent trees close to water.	Unlikely - No suitable habitat.
Mammals			
<i>Phascolarctos cinereus</i> (Koala)	Vulnerable	Occurs in a variety of eucalypt woodlands and open forest.	Likely - Signs of Koala activity (tree scratches) in wider area.
Reptiles			
<i>Denisonia maculata</i> (Ornamental Snake)	Vulnerable	Prefers seasonally inundated areas on deep cracking clay soils and adjacent habitat. Feeds exclusively on frogs. Rare to absent where Cane Toads are abundant.	Unlikely - Habitat unsuitable.
<i>Egernia rugosa</i> (Yakka Skink)	Vulnerable	Occurs in a variety of dry sclerophyll woodlands largely in the Brigalow Belt. Constructs burrows in a variety of soil types.	Potential - Habitat suitable
<i>Furina dunmali</i> (Dunmall's Snake)	Vulnerable	Rarely encountered. Forests to woodlands, associated with Brigalow scrub.	Unlikely - No database records and on edge of known distribution
Migratory Marine Birds			

Species	EPBC Act Status	Preferred habitat	Field observation
<i>Apus pacificus</i> (Fork-tailed Swift)	Migratory	Aerial foraging species that occur over a variety of landscapes including highly modified environments.	Occurs - White-throated Needle tail occurs seasonally in the area.
<i>Ardea alba</i> (Great Egret)	Migratory	Eastern Great Egret occurs on a variety of wetlands and intertidal habitats.	Known - Observed in general area however quarry site is unsuitable
<i>Ardea ibis</i> (Cattle Egret)	Migratory	Cattle Egret prefers damp grassy areas for feeding, particularly pasture.	Potential – Potential to occur in area however quarry site is unsuitable
<i>Gallinago hardwickii</i> (Latham's Snipe)	Migratory	Occurs in generally low numbers in a variety of permanent or ephemeral wetlands across eastern Australia.	Potential – Potential to occur in area however quarry site is unsuitable
Migratory Terrestrial Species			
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	Migratory	Occurs in coastal areas including beaches, estuaries and lagoons, but may range well inland on larger rivers. Predominantly feeds on fish.	Unlikely - Habitat unsuitable
<i>Merops ornatus</i> (Rainbow Bee-eater)	Migratory	Widespread species that may occur in a variety of habitats. Nests in burrows in sandy banks.	Known - Observed in general area

The Queensland Government Wildlife Online search (**Appendix E**) lists 30 protected fauna species (all birds) as potentially occurring at the site. All of these species are listed as least concern under the NC Act except for the Squatter Pigeon which is listed as Vulnerable. An overview of conservation significant fauna observed in the area is provided in Section 4.1.1.4 below.

4.1.1.4 Conservation Significant Fauna Observed

Four terrestrial fauna species listed as EVNT under the EPBC Act and/or NC Act were recorded within the surrounding area:

- Cotton Pygmy-goose (*Nettapus coromandelianus*) (NC Act – Near Threatened; EPBC – Migratory) – minimum of 30 individuals observed on large farm dam approximately 12.5 km south of the proposed Disney Quarry;
- Squatter Pigeon (EPBC Act and NC Act – Vulnerable) – two individuals observed approximately 14 km south of the proposed Disney Quarry; and
- Ornamental Snake (EPBC Act – Vulnerable; NC Act – Vulnerable) – recorded approximately 8 km south-west of the proposed Disney Quarry.

In addition, potential signs of Koala (EPBC Act – Vulnerable (QLD, NSW and ACT)) in the form of tree scratches were recorded in the area of the proposed Disney Quarry and some of the vegetation is known Koala feed species. However, dedicated Koala field surveys failed to identify any Koalas, or further indicative signs (i.e. scats), within the Disney Quarry area. Therefore, it was concluded that this area is not significant for Koalas.

Conservation significant species observation recordings are depicted in Figure 4-2. An additional four species listed as Migratory under the EPBC were also sighted in the surrounding areas:

- White-throated Needletail (*Hirundapus caudacutus*);
- Eastern Great Egret;

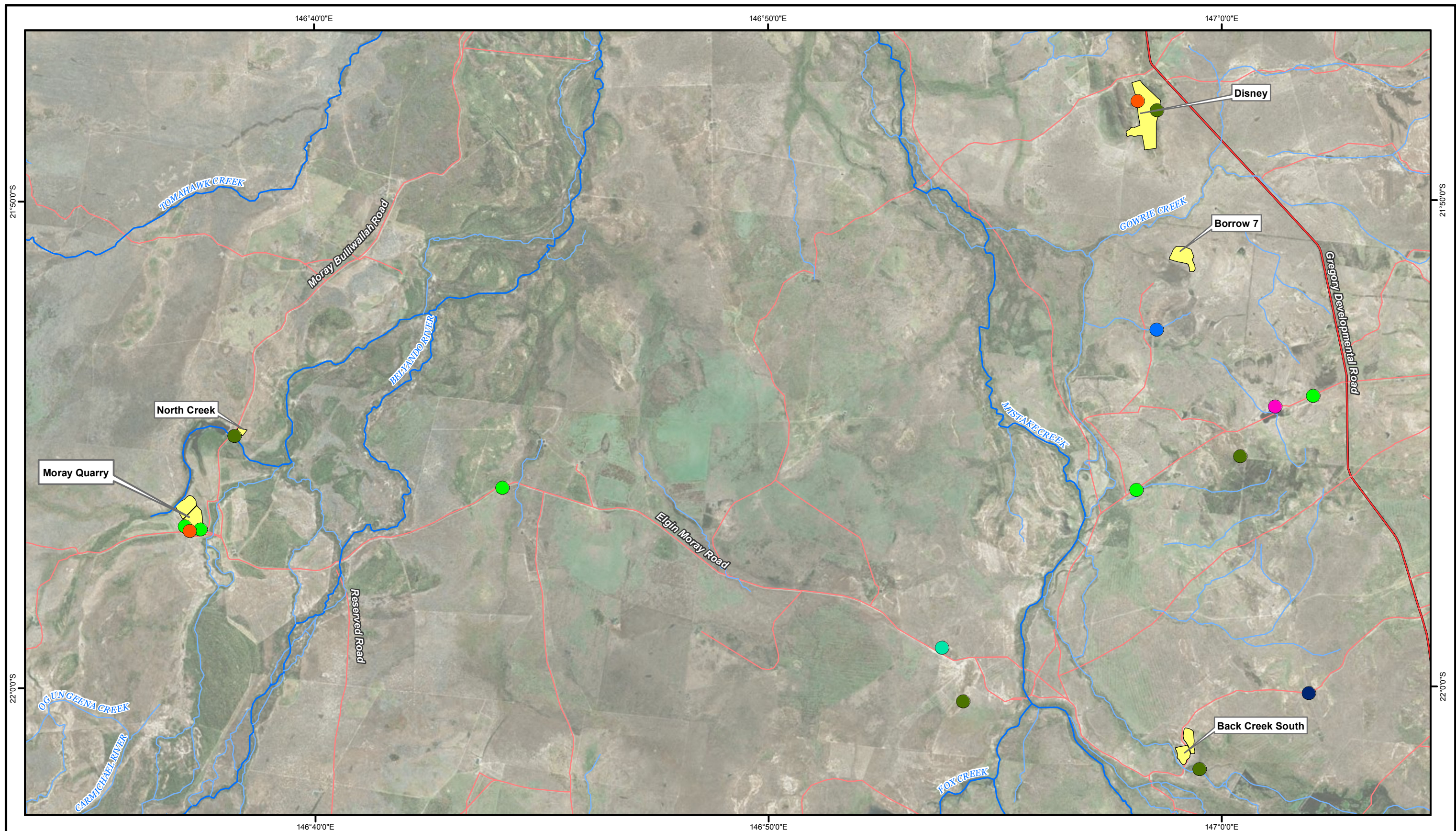
- Glossy Ibis (*Plegadis falcinellus*); and
- Rainbow Bee-eater.

Of the species listed above only Rainbow Bee-eater and potential signs of Koala activity were recorded within the area of the proposed Disney Quarry. The remaining species were recorded within the surrounding area.

4.1.1.5 Protected Areas

Four protected areas are located in the regional area of the proposed Disney Quarry: Wilandspey Conservation Park, Nairana National Park, Mazeppa National Park and Epping Forest National Park (Scientific). The southern boundary of Nairana National Park lies adjacent to the property on which the proposed Disney Quarry site is located (Lot 4 SP116046). The proposed Disney Quarry itself is located 4.7 km south of the south-east corner of the National Park (Figure 1-1). Wilandspey Conservation Park is located approximately 40 km due west of the Disney Quarry. Both parks protect significant tracts of Brigalow woodlands. Neither National Park is located adjacent to the proposed quarry site, nor will they be traversed during construction or operation. Therefore, no impacts are expected on these areas.

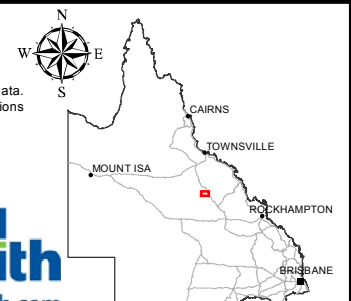
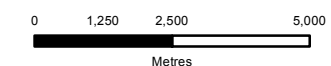
Mazeppa National Park is located 55 km south-east of the Site and is adjacent to the east side of the Gregory Development Road. Epping Forest National Park is located approximately 63 km south-west of the Site and is accessed from Elgin Road. Epping Forest National Park is well known as the location of the last remaining wild population of the Northern Hairy-nosed Wombat (*Lasiorninus krefftii*). These protected areas are well south of the proposed quarry site and will not be impacted by the developments activities.



Adani Quarry Permits and Approvals
Figure 4-2 Conservation significant species locations

Legend

- | | | |
|--|--|--|
| — Minor Road | ● Squatter Pigeon | ● Rainbow Bee-eater |
| — Major Road | ● Potential Koala Scratches | ● Eastern Great Egret |
| — Major watercourse | ● Ornamental Snake | ● White-throated Needle-tail |
| — Minor watercourse | ● Cotton Pygmy-Goose and Glossy Ibis | |
| ■ Quarry Investigation Area | | |



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Data source:
Survey by CDM Smith, 2013; Adani, 2013; DERM, 2010;
Base Layer by Bingmaps, 2011.

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4.1.2 Potential Impacts to Terrestrial Ecology

The development of the Disney Quarry may result in the following potential direct impacts on the terrestrial ecology:

- Clearing of 56.9 ha of Least Concern vegetation, including the removal of potential Koala habitat;
- Removal of existing habitat within the quarry footprint until site is rehabilitated. Most animals will be able to move away from the area of primary impact into adjacent areas, this will be further encouraged through the progressive clearing of the cells just prior to extraction;
- Potential animal strikes from vehicle movements both from clearing operations and from material haulage; and
- Vegetation clearing would potentially disrupt avifauna breeding if undertaken during spring, a time when birds nesting and raising young (Biota 2004).

A number of potential indirect impacts will also be present due to the operation of the quarry itself through increased noise, dust emissions and traffic increases, including:

- Disturbance to fauna, distress from operational noise;
- Increase in dust residue on plant foliage decreasing the sunlight absorption and photosynthesis process; and
- Potential to increase weed distribution through spread of weed within the fill, or on vehicles carting the quarry material.

4.1.3 Terrestrial Ecology Management

The main objectives of flora and fauna management include:

- Avoid (where possible) and minimise disturbance and adverse impacts on native flora and fauna;
- Ensuring no injury or death to native fauna;
- Ensuring no vegetation is disturbed outside of areas designated for clearing within the quarry area; and
- Avoid any spread or increase in weed distribution through quarry operations.

4.1.3.1 Flora Management

To avoid high-value habitat including Brigalow communities within the area the quarry footprint has been strategically located within already cleared areas. The quarry operation will include the following (as minimum):

- Methods to prevent mortality of native species during pre-construction, construction and operation;
- All surveys will be undertaken by suitably qualified persons;
- Measures to rehabilitate areas that have been disturbed during construction; and

- Vegetation outside the quarry area will be protected from heavy machinery and other development-related disturbances.

4.1.3.2 Fauna Management

Initial surveys have failed to identify any hollows or breeding places. Nevertheless, during the preclearance survey, large and small hollows that may provide shelter for fauna will be identified and marked. These hollows will then be saved (recovered) and used for habitat in non-disturbed areas in the quarry surrounds.

All fauna will be identified, captured and released to suitable habitat locations. These locations will be established prior to clearing activities in a manner suitable to the needs of species or species groups, in accordance with relevant permits.

In the event any native fauna are injured as a result of quarry activities, they will be transported to a native animal hospital/refuge facility. Records of all captures and deaths will be kept by the site's Environmental Officer and notification procedures and field audits will be established. The cause of any injuries or deaths will be investigated and new management measures will be implemented to minimise the potential of it occurring again.

Fencing will be established around construction activities to exclude fauna from entering the site. Fencing will be inspected regularly to ensure no fauna species are trapped. A speed limit will also be established on site to limit the incidence of fauna mortality. Targeted training and awareness for terrestrial ecology matters and responsibilities will be provided to all staff and contractors during site inductions. Ongoing training including the observance of (and compliance with) speed limits and reporting of on site fauna observations and fauna mortality will be implemented.

The Koala-sensitive Design Guideline: A guide to koala-sensitive design measures for planning and development activities provides guidance on minimising impacts to Koala's and potential habitats (Department of Environment and Heritage Protection, 2012). The following management measures from this guideline will be adopted to ensure risk of injury or habitat damage is minimised the quarry development:

- Locate the design of the development to avoid vegetation species favoured by Koala's;
- Construction phases that do not increase the risk of death or injury to Koalas;
- Clearing of native vegetation, will be undertaken as sequential clearing and rehabilitation of the site will include Koala favoured species; and
- Clearing of Koala habitat trees, undertaken in the presence of a fauna spotter.

4.1.3.3 Pest and Weeds

Pest (including feral animals) and weed management will include, as a minimum:

- Measures for a pre-construction weed audit to be undertaken;
- If noxious weeds are identified, weed control will be undertaken in the surrounding area to minimise any contamination of fill material to be transported off-site;
- Routine inspections that will include observations for declared plants, listed weeds, feral cat and pig, rabbit, red fox and other identified pests within the construction area;
- A control/eradication plan for pests that may potentially occur on the quarry site;

- Identification of treatment methods and techniques, chemicals, equipment and sources of assistance for pest and weed management;
- Weed hygiene declaration forms to accompany plant and machinery being brought to site;
- Vehicle wash-down protocols and processes to ensure vehicles and their loads as per the Weed Hygiene Declaration (Part 2);
- Methods for monitoring and control of weed populations within the site;
- Control measures and processes of how to maintain weed infestations; and
- Processes to ensure weed free certifications can be provided with the fill material as per the Weed Hygiene Declaration (Part 1).

Training will be provided to all construction personnel regarding pest plant, weed and pest and feral animal awareness. A car park for housing vehicles entering the site will be provided and regularly checked for any weed and pest animal infestations. Treatment of weeds will be undertaken in accordance with the Biosecurity Queensland guidelines and fact sheets for each species as well as other appropriate sources of weed management which provide best practice techniques.

4.2 Aquatic Ecology, Surface Water and Hydrology

4.2.1 Aquatic Ecology

As previously mentioned, there are no major water bodies or declared watercourses within the site. A minor drainage line was observed on-site between the central and eastern rises, however it did not contain any water, and would likely only flow intermittently following heavy rainfall periods. As a result, it is not expected that any drainage lines, or any other habitat on site, would support any aquatic flora or fauna within the site. The closest major waterway is Mistake Creek, approximately 6.7 km to the west (Figure 4-3).

The EPBC Protected Matters Search results indicated the potential presence of four Migratory wetland species. No wetland habitat was observed on the site and it is unlikely the site provides any value for these species. The EHP Wildlife Online Search (**Appendix E**) has indicated the potential presence of a range of aquatic dependant flora in the area. Previous studies undertaken for the Carmichael Coal Mine and Rail Project have identified 26 aquatic dependant flora. The majority of these are listed as least concern under the NC Act and none are identified as conservation significant under the EPBC Act (GHD, November 2012). However, the site provides no habitat suitable to the aquatic species, and the closest likely habitat is Mistake Creek, approximately 6.7 km to the west.

4.2.2 Surface Water and Hydrology

The site is located within the Burdekin River Basin, which forms part of Australia's North East Coast Drainage Division (NLWRA, 2002). The Burdekin River is one of Australia's largest and carries a massive sediment load. On average it is the biggest single source of sediment and fresh water to the Great Barrier Reef lagoon (NRM, 2002). Specifically, the site is located within the Suttor River Sub-basin area, which drains into arid inland areas in the south and central west via the smaller Cape River (Board, 2005). There are two EHP mapped wetlands located close to the quarry area: a lacustrine wetland (i.e. farm dam) 6 km to the west; and riverine wetland associated with Mistake Creek 7 km to the west. Lacustrine wetlands are defined as fresh water systems that

are found in a topographic depression or dammed river, have little vegetation cover (less than 30%) and are larger than 8 hectares.

In accordance with the Burdekin Water Quality Improvement Plan (2009), the site is located within the Mistake Creek sub-catchment. Drainage lines within the Disney Quarry site and in the surrounding area primarily feed into Mistake Creek. The overall condition of the Mistake Creek sub-catchment is considered representative of its feeder tributaries. It was noted during field surveys that despite the Clermont region having received a total of 144.8 mm of rainfall in the previous month (BOM, 2013) there was no flowing water in any of the sites drainage lines.

Mistake Creek has slumped highly eroded banks and beds choked with loose sediment (Plate 4-4). This material is mobilised readily once there is appreciable flow. The condition of Mistake Creek is consistent with the greater Mistake Creek sub-catchment which has experienced significant decline in the quality of riparian areas over the last 30 years (Dight, 2009). Soil loss within the Mistake Creek sub-catchment primarily comes from hillslope erosion (74%), gully erosion (15%) and stream bank erosion (11%) (Dight, 2009).

Models and water quality monitoring data from the CSIRO shows that the water quality in the Belyando Floodplain sub-catchment contains slightly elevated sediment concentrations and loads during wet season flow events (Roth, 2002).

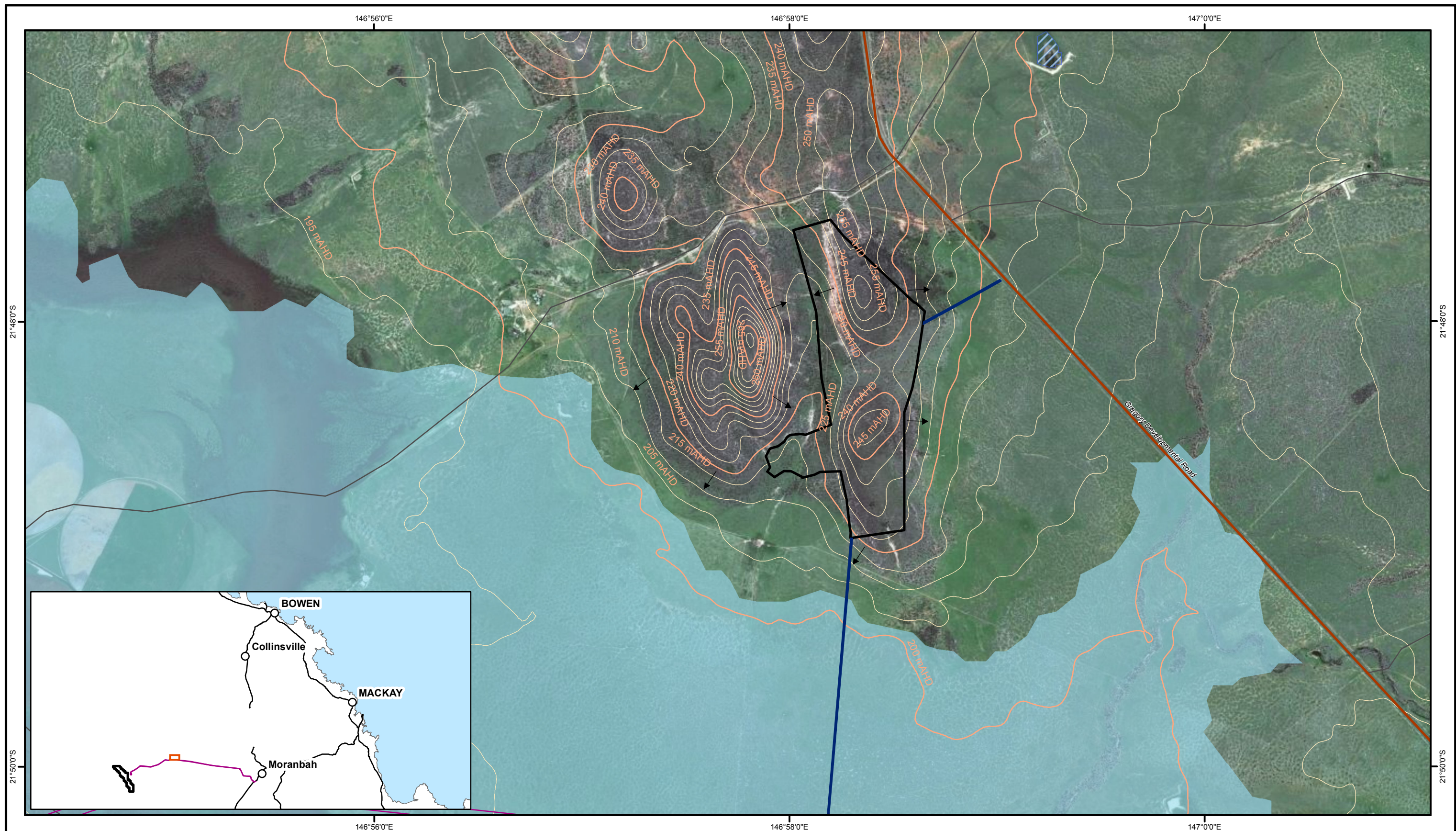
The catchment upstream of Mistake Creek is 7,900 km² in size (GHD, November 2012). Monthly rainfall data has been plotted from the records at Moranbah, Alpha and Moray Downs. Rainfall characteristics include:

- Rainfall patterns, in terms of summer maximum, winter minimum and annual totals are broadly similar across this relatively large area. The annual total depths for the three rain gauges are 588 mm, 559 mm and 521 mm. These totals are consistent with the Bureau of Meteorology (BOM) regional average of 550 mm;
- In any month of the year, including in the typical wet season months, there can be zero rainfall; and
- The monthly rainfall trends described above are reflected in the gauged daily river flows. Similarly, the pronounced annual variations in rainfall, including the persistence of both dry years and wet years, are evident in the annual discharges at St Annes (Belyando / Suttor Rivers) and Goonyella.

Disney Quarry is located between two ridgelines and as such surface water will be limited to that running off the ridge on the quarry side. Diversion bunds will be constructed around the quarry extraction area to ensure the runoff from the ridgelines does not enter the site. Water will be directed to the south towards water storage for collection and reuse on site.



Plate 4-4: Mistake Creek downstream of Disney Quarry (GHD, November 2012)



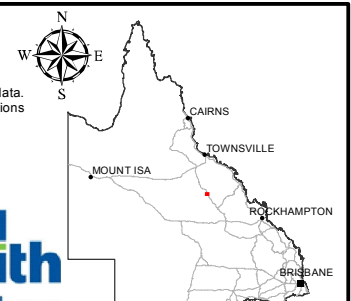
Adani Quarry Permits and Approvals
Figure 4-3 Surface water and hydrology

Legend

- Town
- ⬢ Carmichael Mine - ML 70441
- ⬢ Disney Quarry Disturbance Area
- ⬢ Quarry Access Road
- ⬢ Wetland
- ⬢ Flood Prone Area (1 in 100 year)
- Proposed Adani Rail Corridor
- Railway
- Minor Road
- Major Road
- Major watercourse
- Minor watercourse
- ➔ Indicative surface water drainage direction

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Data source:
Adani, 2012; DERM, 2010; Flood by QLD Reconstruction Authority, 2012; Elevation created from 1sec SRT DEM, Base Layer by Bingmaps, 2011.

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The on site inspection did not observe any standing water on the site despite a total of 144.8 mm of rainfall being received in the Clermont region during the month prior to undertaking fieldwork (BOM, 2013).



Plate 4-5: Drainage line observed on-site (east hill)

Disney Quarry is within a high point on the landscape and is not within a flood hazard mapped areas or known to flood historically.

4.2.3 Potential Impacts

The quarry poses no potential impacts to aquatic ecology. The quarry has potential for some localised impacts to surface water and hydrology by altering the surface water runoff flows around the quarry workings and into storage dams for reuse on site. The diversion of surface water flows may cause some erosion and sediment movement and possible scouring during large rain events. This will be managed through the installation of erosion and sediment controls outlined in the conceptual erosion and sediment control plan in **Appendix G**.

4.2.4 Aquatic Ecology, Surface Water and Hydrology Management

As mentioned in Section 4.2.1 above, no major watercourses currently exist within the quarry area except for a minor drainage line. This minor drainage line did not contain any water during the field survey. Due to the absence of any water bodies or aquatic ecology habitats, it is not anticipated that the quarry will have any major impacts on surface water or aquatic ecological values directly within the quarry area

In order to ensure the appropriate protection of downstream surface waters, the following measures will be implemented:

- Erosion and Sediment Control Plans (ESCPs) will be implemented prior to the commencement of construction;
- Disturbance areas will be minimised to reduce the volume of disturbed sediment that may potentially effect downstream water bodies;
- Native vegetation clearance will only be undertaken in accordance with relevant permits and approval conditions; and
- Vegetation clearance will consider constraints such as slop and proximity to drainage lines.

Onsite water management will include:

- Details of the water management system, including design criteria, storage capacities, drains and diversion structures; and
- Measures to monitor weather forecasts from the Bureau of Meteorology to plan for potential rainfall events that may hinder construction or operational activities, and management measures to be implemented in the event that a heavy rainfall event is predicted.

4.3 Landscape and Visual Amenity

The surrounding area consists of remnant sedimentary basins with extensive plains and low lying woodlands. Vegetation is relatively continuous although sparse in some areas. The area has been subject to disturbance from previous quarry activity, cattle grazing and erosion. At the approach to the proposed Disney Quarry site is existing water infrastructure used for cattle (see Plate 4-6). Opposite this is a telecommunications tower and associated building.

The existing land use of the site is predominately grazing land. A range of powerlines bisect Lot 4 SP116046, however, these are not located close to the development and no electrical utility companies are referral agencies to the development application. The landscape consists mainly of remnant sedimentary formations, with granitic intrusions in the form of isolated ranges surrounding the quarry area. The site is dominated by a large rocky ridgeline running north-south in the centre with lower rocky rises on either side. The proposed quarry is to be located between the centre and eastern rises and to the south-east of the centre rise.

Previous clearing of vegetation has caused loss of habitat and fragmentation of REs, whilst overgrazing and weed infestations have caused land degradation and reduced soil health in many areas (Roth CH, 2002).



Plate 4-6: Water infrastructure on approach to site

4.3.1 Bushfire Risk and Management

Bushfire risk mapping has been created for the Isaac region by the Rural Fire Service of Queensland. The most recent mapping (2008) indicates that Disney Quarry site occupies a mixture of 'Low' and 'Medium' category fire-risk areas. Disney is connected by (more or less) unbroken vegetation to Willandspey National Park north of the site. The Disney Homestead lies approximately 2.1 km west of Disney Quarry site and within 500 m of the nearest extant vegetation. Vegetation on the remaining boundaries has been cleared and is now largely exotic grassland (Buffel Grass) used for cattle grazing with scattered small regrowth trees. The proponent will develop a Fire Risk Management Plan in consultation with IRC and local landowners to minimise any risk of fire as a result of the project's activities.

4.3.2 Visual Amenity Potential Impacts

During the short term operation of the quarry there is likely to be temporary visual impacts from earth moving and construction vehicles, haulage trucks. Given the short nature of these impacts being limited to the construction period they are not considered significant.

During the night operations there will be impacts from night lighting. With 24 hour operations visual impacts are predominately more noticeable at night and will be able to be seen from much greater distances. From the Gregory Development Road a glow will be seen from behind the ridgelines, however this will be a temporary impact as the traffic passes this area, it is unlikely that the Disney Homestead will be impacted due to the topography shielding the operations.

4.3.3 Landscape and Visual Amenity Management

The proponent commits to ensuring that the placement of plant and equipment minimises its visibility from the Gregory Development Road and the sensitive receptor to the west of the proposed quarry location.

Management measures the right to be in place to mitigate impacts, include:

- Retain appropriate screening and landscape buffers between Gregory Development Road, public vantage points and surrounding homesteads;
- Minimise clearing between the site and the Gregory Development Road;
- Undertake progress rehabilitation to minimise visual impacts of the site; and
- Consultation with potentially affected sensitive receptors.

4.3.3.1 Management of Lighting Impacts

Only essential lighting will be included in the development. Throughout the construction phase, night lighting will be limited to specific construction activities and safety. Lighting will be required for the operation of the quarry over the 24 hour period, lighting will be provided at the site office and amenities area as well as on the working area of the quarry. Main access routes will be identified and illuminated appropriately. Lighting design will comply with the best available technologies (i.e. Type 6 luminaires) and include light shrouding techniques (i.e. be well shielded, full cut-off and downward directed type fixtures). Luminaires will be mounted low in the vertical plane and use the lowest intensity for the task. Surfaces of structure and ground covering will be designed to minimise reflection. To ensure lighting management measures are complied with, periodic visual inspections, audits and corrective management of light sources will be undertaken.

4.4 Soils, Geology and Topography

4.4.1 Geology

The Disney Quarry is located within Late Devonian – Early Carboniferous Drummond Basin, which predominantly comprises of a thick succession of sedimentary and volcano-lithic rocks. The geological profile of the basin is generally comprised of sedimentary and volcano-lithic sediments of the Drummond Group, divided into numerous formations that range in age from Late Devonian to Early Tertiary.

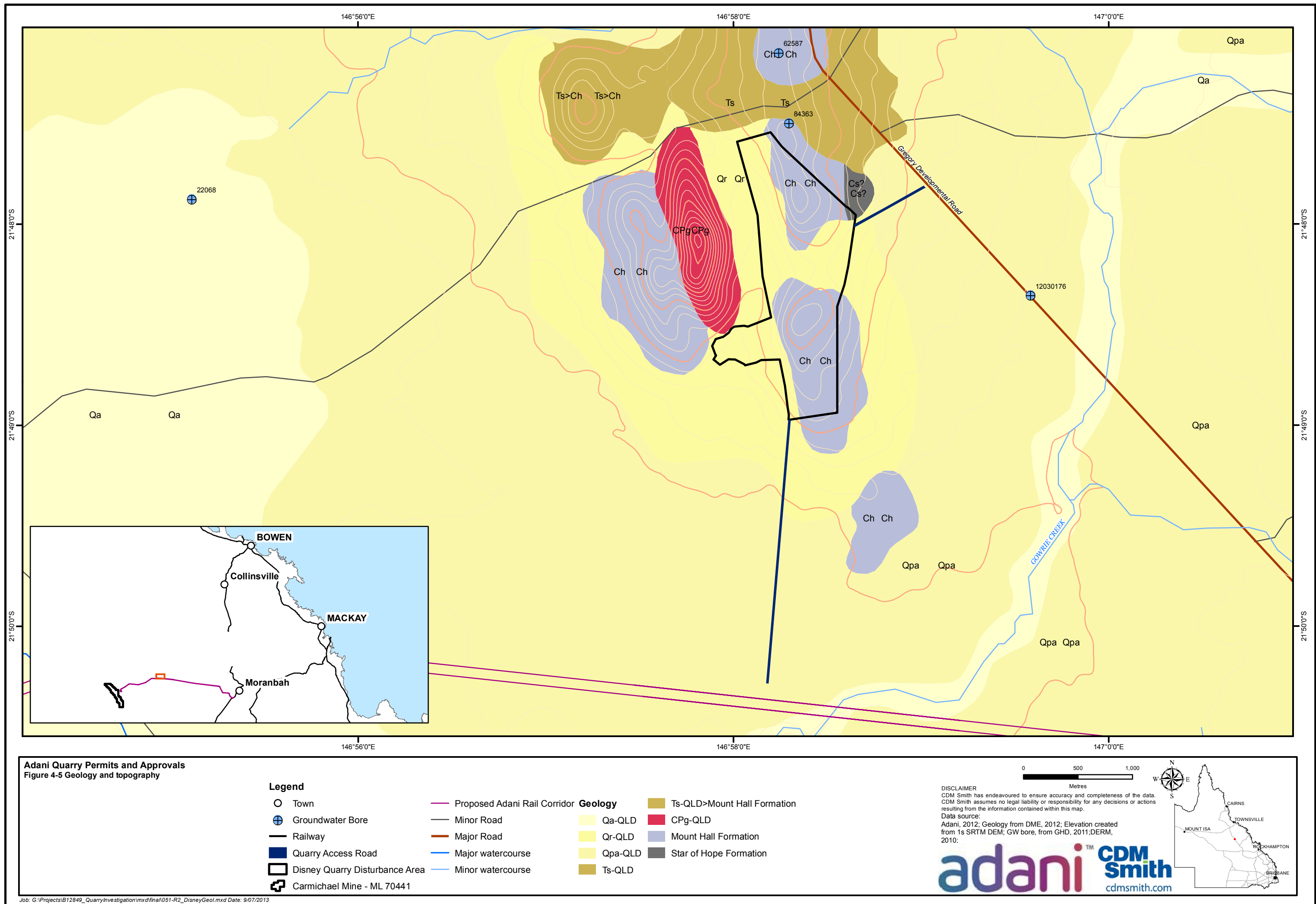
Present on the western part of the Drummond Basin are sedimentary formations of the overlying Bowen Basin. Overlying these formations are predominantly colluvial and alluvial Tertiary deposits, some of which feature deep weathering profiles resulting in the formation of duricrusts and silcrete deposits. The Tertiary deposits are overlain with predominantly unconsolidated alluvial deposits of Quaternary age. In sporadic locations throughout the Drummond Basin, granitoid intrusions, as well as basal rocks of the Anakie Metamorphic Group are present as outcrops. The presence of these older rocks indicates partial to complete erosion of the overlying strata. A detailed stratigraphy of the Drummond Basin is provided in Figure 4-4.

Structurally, the Drummond Basin comprises several anticline and synclines, as well as faults, most of which are responses to orogenic movements (Buchanan Geology Notes). The main folding episode in the Drummond Basin was at the end of the Lower Carboniferous age, as a result of the uplift of Anakie Inlier, which marks the basement of the basin. Other orogenic movements

resulting in structural deformation include granitoid intrusions and acid volcanic extrusion (Buchanan Geology notes). In places little evidence of these structures remain, as they have been masked by Quaternary alluvial deposits. Key geology and structures regional to the Disney Quarry area is discussed below.

Figure 4-4 Detailed Stratigraphy (Olgers, 1970)

Age		Rock unit and map symbol	Thickness (feet)	Lithology	Palaeontology	Stratigraphic Relationships	Environment of deposition	
CAINOZOIC	QUATERNARY	(Qa)	0-50	Silt, sand, gravel, alluvium		Unconformable on all older rocks	Fluvial	
		(Qs)	Superficial	Sand, sandy soil, colluvium			Aeolian/fluvial	
		(Cz)	Superficial	Soil, sand, gravel			In situ weathering, aeolian and fluvial	
		(Czd)	Superficial	Silcrete, ferricrete (duricrust)		Best developed on Tertiary in NE and on Moolayember Form.	Weathering profile	
	TERTIARY	(T)	0-30	Poorly sorted argillaceous sandstone, commonly lateritized.		Unconformable on all other rocks	Mainly fluvial with piedmont deposits near the hills and ranges.	
MESOZOIC	JURASSIC TO LOWER CRETACEOUS	Ronlow Beds (J/Kr)	200-300	Sandstone, dominantly quartz sandstone. Minor mudstone and siltstone	Silicified wood, plant debris. Microspores and pollens	Disconformable on Moolayember Form. Elsewhere ?disconformable under Walumbilla Form. Probably equivalent of Hutton Sst-Hooray Sdst sequence elsewhere in Eromanga Basin.	Fluviatile deposition in rivers, on floodplains, and local lakes	
	MIDDLE TO UPPER TRIASSIC	Moolayember Formation (Rm)	1000 ±	Dominantly mudstone and siltstone, interbeds of lithic sandstone and quartz sandstone	Poorly preserved plants (White, 1965). Microspores.	Conformable on the Warang Sst. Boundary gradational	Freshwater basin.	
	LOWER TRIASSIC	Warang Sandstone (Rlw)	600	Kaolinitic quartz sandstone, minor lenticular ferruginous siltstone. Large scale trough cross-bedding	Unfossiliferous. Spores elsewhere	Disconformable on Rewan Form.; equivalent to Dunda Beds and Clematis Sst. in south. Unconformable on Betts Creek Beds and Unit C-P	Fluvial and aeolian	
		Dunda Beds (Rld)	250 ±	Lithic to quartz sandstone with subordinate thick intervals of mudstone and siltstone	Plant fossils in Galilee Sheet area (White, 1965)	Probably disconformable on Rewan Form.	Fluvial	
		Rewan Formation (Rlr)	Subsurface only. 1058 in Exoil Lake Galilee No. 1 Well 12m south of Sheet area	Subsurface only. Lithic sandstone, mudstone, shale, siltstone, minor quartz sandstone in neighbouring areas.	Spores and plant remains elsewhere.	Possibly conformable on Betts Creek Beds subsurface.	Fluvial and possibly deltaic	
PALAEOZOIC	UPPER PERMIAN	Betts Creek Beds (Pub)	200+	Interbedded feldspathic lithic sandstone; commonly carbonaceous. Coal recorded in subsurface. Minor conglomerate lenses. Sandstone thin-to thick-bedded, commonly trough cross-stratified.	Mainly poorly preserved plant fragments (White, 1965).	Unconformable on C-P	Mainly fluvial, some swamp deposits	
	UPPER CARBONIFEROUS TO LOWER PERMIAN	(C-P)	5000 ±	One small outcrop of lithic sandstone at White Cliffs. Elsewhere conglomerate, sandstone, siltstone, mudstone, coal.	Indeterminable plant material	Unconformable between Drummond Basin sequence, and Betts Creek Beds and Warang Sst.	Swamp, fluvial, glacial and fluvio-glacial.	
	LOWER CARBONIFEROUS	Drummond Group	Natal Formation (Cln)	4000 +	Alternating sequence of fine feldspathic quartz sandstone, olive siltstone and mudstone; concretions are common.	Poorly preserved plant material	Conformable on Bulliwallah Form.	Shallow freshwater.
			Bulliwallah Formation (Clb)	6000	Thin to thick bedded, fine to medium feldspathic quartz sandstone; minor olive mudstone, pebbly feldspathic quartz sandstone and algal limestone.	Poorly preserved plant fossils; algae .	Conformable on Star of Hope Form.	Shallow freshwater.
			Star of Hope Formation (CIs)	2000	Lapilli tuff, welded tuff, tuffaceous sandstone, minor acid flows; volcanic lithic sandstone; quartz pebbly sandstone and conglomerate.	Plants (White, 1967).	Conformable on Raymond Form.	Fluvial and terrestrial.
			Raymond Formation	3500	Fine to medium quartz sandstone, locally feldspathic; minor interbeds of clayey sandstone and mudstone.	Plants (White, 1967).	Conformable on Mount Hall Form.	Fluvial (mainly flood plain).
			Mount Hall Formation (Clh)	9000 ±	Cross-bedded pebbly and conglomeratic quartz sandstone, coarse quartz sandstone. Minor mudstone and lithic sandstone.	Wood fragments	Conformable on Scartwater Form.	Fluvial (mainly point bar).
	UPPER DEVONIAN TO LOWER CARBONIFEROUS		Scartwater Formation (D/Cw)	4000 +	Fine feldspathic sandstone with interbeds of calcarenite, algal limestone, olive mudstone, lithic tuff and tuff.	Plants (White, 1967).	Probably conformable on Llanarth Volcanics and unconformable on Saint Anns Form. and Ukalunda Beds	Fluvial
			Llanarth Volcanic Member (D/Cl)	3200	Dominantly fine tuff. Some thin acid flows and locally at the base volcanic lithic sandstone and conglomerate.	Plants (White, 1967)	Overlapped by Scartwater Form. north of Saint Anns homestead.	Shallow water and terrestrial
			Saint Anns Formation (D/Ca)	2400	Acid and intermediate flows, crystal tuff and lapilli tuff and algal limestone at top. Arkosic, feldspathic and lithic sandstone, conglomerate minor green mudstone and phosphatic sandstone.	Plants (White, 1967); Algae and worm casts.	Unconformable on Ukalunda Beds	Shallow water, possibly partly marine; the upper volcanic part of the unit may be terrestrial.
			Silver Hills Volcanics (D/Cs)	2000 +	Rhyolite, breccia, crystal lithic tuff, fine tuff.		Probably unconformable on Anakie Metamorphics.	Probably largely terrestrial.
			MIDDLE DEVONIAN	Ukalunda Beds (Dk)		Lithic and feldspathic sandstone, siltstone, schist, slate, phyllite. Richly fossiliferous limestone in area to the east.	Rich marine fauna elsewhere (Malone et al., 1966).	Unconformable on Anakie Metamorphics.
	PRE-DEVONIAN	Anakie Metamorphics (Pza)		Schist, slate, phyllite, sandstone, shale.	Algae elsewhere (Malone et al., 1965).	Oldest unit in the area.		



Within the region of the Disney Quarry area, several formations of the Drummond Group are present which together with the Anakie Metamorphic Group present as outcrops. These older rocks, over much of the area are overlain with Tertiary sediments and overprinted by Quaternary unconsolidated sediments in proximity to major drainage lines.

Specifically, Belyando River and its tributaries envelope the Disney area, resulting in surficial geology that is dominated by Quaternary and Tertiary deposits present to the north, west, south and far east. These deposits are present on low-lying plains associated Mistake Creek to the west and Diamond Creek to the east. Away from these low-lying areas and towards the Disney Quarry area, elevation increases giving rise to synclines and anticlines, present immediately north, where outcrops of the underlying Mount Hall Formation become evident.

Several other outcrops are noted in the Disney Quarry region. These include Bulliwallah Formation, present to the northwest and Mount Hope Formation, comprising grainitoid intrusives to the north. In between these units are elongated outcrops of Mount Hall Formation, overprinted by Tertiary alluvial/colluvial deposits. Where Mount Hall Formation is noted to the northwest, numerous anticlines and synclines are present, which appear to be part of a continuous system noted closer to the Disney Quarry area.

Other structures noted regional to the Disney Quarry area include numerous northwest-southeast striking faults, spatially confined to the Bulliwallah Formation and Mount Hope Formation, noted northwest of the Disney Quarry area.

The local geology of the Disney Quarry comprises Mount Hall Formation, which is present as outcrops as a result of the increased elevation and anticline identified in the regional geology. As elevation decreases, towards low-lying plains, the Mount Hall Formation is overprinted by Tertiary and Quaternary alluvial/colluvial deposits.

Given that the underlying geology of the proposed quarry area is dominated by Mount Hall Formation, which comprises porous geological materials (pebbly and conglomeratic sandstone, coarse quartz sandstone with minor mudstones), hydraulic connectivity of surface water to groundwater may exist that may increase likelihood of groundwater impacts. However as the proposed quarry is located in elevated area associated with a potential anticline, a deep groundwater table is inferred. Consequently, no significant impacts are expected if appropriate environmental practices associated with quarry development are implemented. Potential hydrological impacts are addressed in detail in Section 4.5.

4.4.2 Soils

The Geological Survey of Queensland Interactive Resource Tenure Map broadly defines the soils regional to the Disney area to comprise red massive earths, associated with undulating lands with high gravelly ridges. These soil classifications are primarily based on desktop level interpretation of available geological, aerial and geomorphological information due to a lack of physical mapping at the local scale.

Landuse in the Central Queensland area, prior to the recent boom in mining activity, has primarily been for agricultural/pastoral purposes, and consequently more meaningful information on soils is available from land management studies undertaken for the area. The Department of Primary Industries (DPI) has undertaken land management studies aimed at identifying and grouping areas with similar physico-geographical and pedological properties directed towards sustainable development. The DPI group areas at a local scale into two divisions according to land management requirements for specific land types; Land Resource Area (LRA) and Agricultural Management Unit (AMU). LRA are broad landscape units that have been mapped and grouped for

different soils developed from related geological units with recurring patterns of topography and vegetation. AMU further separates the LRA units into groups of soil with similar landforms, vegetation and agricultural potential that require similar management requirements. Each LRA can contain multiple AMUs.

This tool was adopted by CDM Smith, as each identified soil unit/s is complemented with a summary sheet that identifies common properties including a generalised lithological profile and photo, limitations and management recommendations for each soil type, group as AMU (**Appendix H**).

The Disney Quarry area falls within the Central Highlands, which at a regional scale comprises five LRAs, see Figure 4-6. Each LRA, in turn comprises of numerous AMUs. Given that AMUs provide a better description of the productivity potential of the land, AMUs also provide a more rigorous assessment of the potential impacts that may arise as a result of soil disturbance and further allows the development of appropriate safeguards to return the land to productivity, following disturbance.

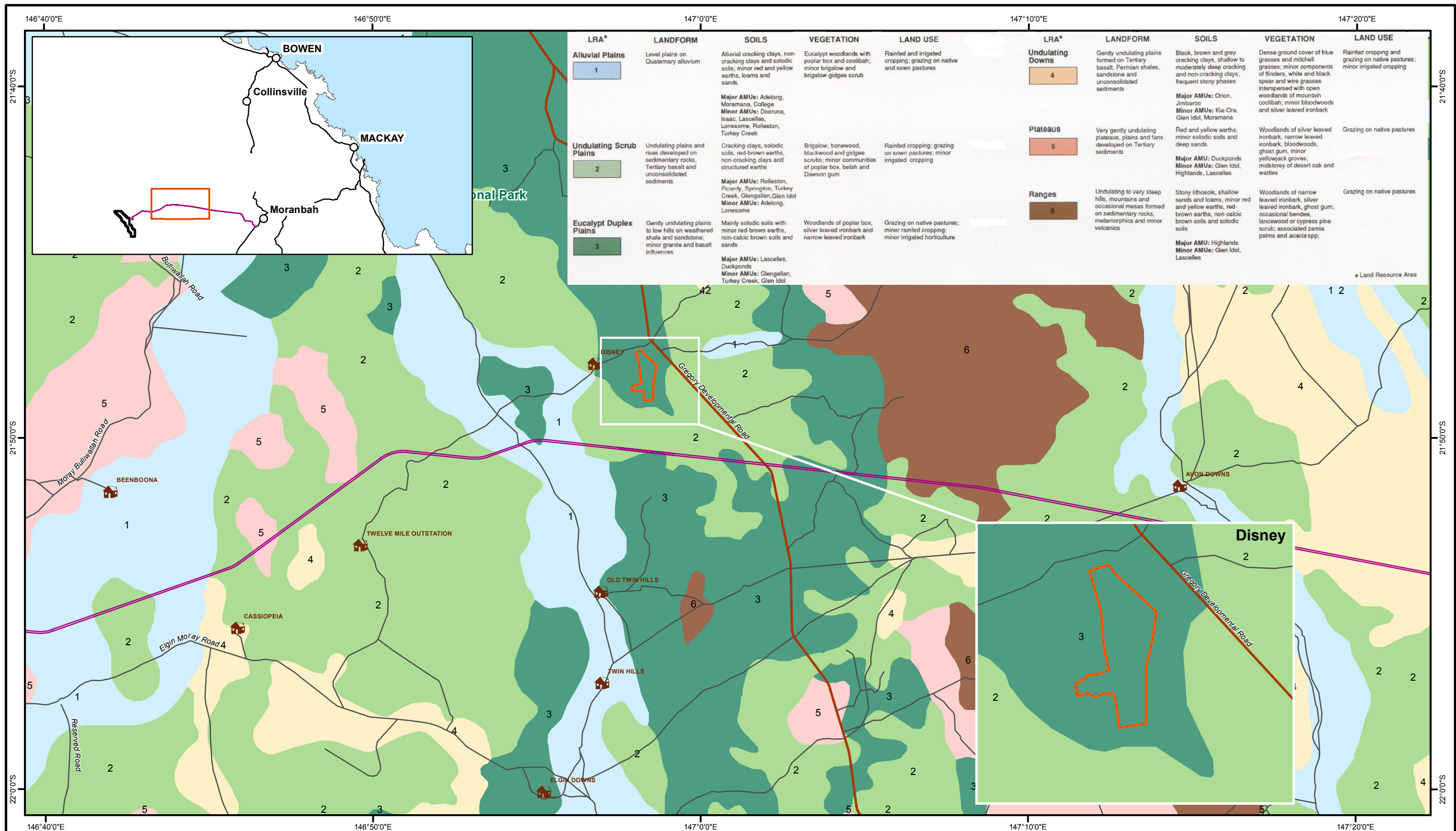
Table 4-5 provides a summary of the common AMUs associated with each LRA for areas regional to the Disney Quarry area. Description of each AMU is provided in Table 4-5, which shows that the dominant flora type together with surface soils can be used as relatively quick field guide to identify the types of soils present in the area.

Table 4-5 Relationship of AMUs to LRAs for Disney area, Central Highlands

LRA	AMUs	
	Major Occurrence	Minor Occurrence
LRA 1: Alluvial Plains	Adelong, Moramana, College	Dooruna, Issac, Lascelles, Lonesome, Rolleston, Turkey Creek
LRA 2: Undulating Scrub Plains	Rolleston, Picardy, Springton, Turkey Creek, Glengallan, Glen Idol	Adelog, Lonesome
LRA 3: Eucalypt Duplex Soils	Lascelles, Duckponds	Glengallan, Turkey Creek, Glen Idol
LRA 5: Plateaus	Duckponds	Glen Idol, Highlands, Lascelles
LRA 6: Ranges	Highlands	Lascelles, Glen Idol

Locally, the Disney Quarry encompasses an area classed as LRA 3 that is enveloped by LRA 2, Figure 4-6. Table 4-5 identifies that numerous AMUs, and hence soil types are present within the area. Table 4-6 indicates that pockets of different soils exist locally, which is significantly different to the desktop based tenure maps (Figure 4-6). According to Table 4-6, dominant soil types present local to the Disney area include:

- Uniform clays – non-cracking to heavy cracking with potentially a sandy crust and variable quantity of mulch;
- Duplex soils – hard setting sandy loams; and
- Deep uniform sandy materials – loose to firm and predominant in sand.



Adani Quarry Permits and Approvals
Figure 4-6 Land Resource Areas

Legend

- Town
- Homestead
- Carmichael Mine - ML 70441
- Disney Quarry Disturbance Area
- Proposed Adani Rail Corridor
- Minor Road
- Major Road
- Railway
- Major watercourse
- Minor watercourse

0 2,500 5,000
Metres

DISCLAIMER
CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.
Data source:
Adani, 2012;
DERM, 2010.

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Table 4-6 Description of Agricultural Management Units regional to the Disney area

LRA	General Soil Type	AMU	Soil Surface/Description	Distinguishing Features
LRA 2 Undulating Scrub Plains	Uniform clays	Adelong	Heavy cracking clay with a strong but thin (about 2mm) mulch; may have thin sandy crust	Dark, uniform and deep (more than 90 cm) heavy clays on flat to gently undulating floodplains. Dense brigalow, coolabah scrub. Shallow gilgai can occur
		Picardy	Cracking and forming a fine, 'soft' mulch	Red, brown to dark grey soils under gidgee, brigalow and softwood scrub. Deep (more than 90 cm), well structured clays often shallow gilgai less than 40 cm deep
		Rolleston	Cracking or non-cracking with sandy crust, coarse mulch or hard setting surface	Grey, brown heavy clays typically under whipstick or slightly stunted brigalow scrub with associated eucalyptus (mainly Dawson Gum) and a range of understorey species. Subsoils are pale coloured and often mottled below 60 cm depth. Drainage is restricted – GILGAI ABSENT OR LESS THAN 40 CM DEEP
		Lonesome		Grey, brown heavy clays typically under whipstick or slightly stunted brigalow scrub with associated eucalyptus (mainly Dawson Gum) and a range of understorey species. Subsoils are pale coloured and often mottled below 60 cm depth. Drainage is restricted – GILGAI MORE THAN 40 CM DEEP
		Springton		Mainly reddish brown to brown often non-cracking and gravelly clay. Distinctive coarse-structured subsoil at 30 cm depth which is indicated by surface waterlogging and reduced water storage capacity (i.e. regularly water stressed plants). Soil depth is greater than 45 cm but often less than 90 cm to rock or gravel. Vegetation commonly brigalow, Dawson Gum, bendee or gidgee scrub
	Duplex Soils	Glengallan	Sandy loam, hard	Pale grey to brown shallow sandy loam surface (<20 cm to clay) overlies very hard, coarse and mottled clay subsoils. Very poorly drained, and a bleached soil layer above the clay is common. Open box, ironbark woodlands with associated brigalow, currant bush and others
		Glenidol		Reddish brown sandy loam to clay loam overlies moderately well drained (i.e. few mottles) clay subsoils. Open ironbark, brigalow or box with associated species
		Turkey Creek		A thin sandy duplex soil under brigalow, Dawson Gum scrub. After cultivation, a sandy clay surface plough layer to 20 cm forms.

LRA	General Soil Type	AMU	Soil Surface/Description	Distinguishing Features
LRA 3 – Eucalypt Duplex Plains	Duplex Soils	----- Glengallan ----- Lascelles ----- Duckponds	Sandy loam, hard setting	Pale grey to brownish yellow sandy loam over hard and coarse mottled clay which is poorly drained. Soil immediately above the clay is often bleached and/or gravelly. Poplar box, ironbark, brigalow are dominant tree types. Key distinguish feature is based on the depth of surface horizon: ----- Shallow sandy loam (<20 cm to clay) ----- Moderate depth to sandy loam (20 to 45 cm to clay) ----- Deep sandy loam (>45 cm to clay)
	Deep, uniform, sandy	Duckponds	Loose to firm; very sandy	Deep sands or sandy loams of red, yellow to pale brown earths. Tall open bloodwoods, ironbark, cypress pine and a range of associated species.

Typical constraints which result from the physical properties of soil types that are potentially present locally to the quarry area are detailed in Table 4-7. A summary of each AMU is provided in **Appendix H**, which details the physical properties of the soils and identifies typical constraints and safeguards for their disturbance.

Table 4-7 Potential constraints of soils from Disney area

Soil Type	AMUs	Potential Constraints
Uniform clays	Adelong, Picardy, Rolleston, Lonesome and Springton	Water logging; Medium to high erosion potential; Salinity potential for surface and/or sub-soils
Duplex soils	Glengallan, Glen Idol, Turkey Creek, Lascelles and Duckpond	Hard setting; Medium to extremely high erosion potential; Infertility; Potentially sodic sub-soil; Generally poorly drained with the exception of DUCKPOND and GLEN IDOL AMU which are well drained and exhibit high infiltration and therefore are sensitive to groundwater recharge
Deep uniform sandy materials	Isaac and Duckponds	well drained and exhibit high infiltration and therefore are sensitive to groundwater recharge



Plate 4-7: Gravel resource in northern extraction area

4.4.3 Potential Impacts

The potential impacts to the soils, geology and topography include:

- Increased risk of erosion and sediment movement from clearing vegetation, alterations to drainage patterns and stormwater flows, excavation and stockpiling of material and operating during high rain fall events. The impacts from erosion and sediment movement are predicted to be localised and remediated during the rehabilitation process.
- Sediments within water runoff have the potential to collect in the surface waters. However, the nearest waterway is Gowrie Creek 3.5 km to east and it is unlikely that sediment will impact Gowrie Creek.
- Localised salinity hotspots, as a result of vegetation removal;
- Loss of topsoil that may contribute to soil infertility during rehabilitation;
- Areas dominated by sandy materials are likely to exhibit high infiltration rates and therefore sensitive to groundwater recharge. Although a deep groundwater table is inferred given the location of the proposed quarry is on an anticline, localised soil impacts may result from impacts of contaminants (e.g. fuel spills and leaks); and
- Localised changes to landform as an unavoidable result of the extraction of material. There will be some impacts on local topography by altering the final landform through the removal of 11 million tonnes of material, thus creating a deeper valley between the existing two ridges. Changes in slope and landform can alter the runoff intensity and flow paths increasing erosion risk and altering local hydrology.

4.4.4 Management of Soils, Geology and Topography

The objectives of soils, geology and topography management will be to ensure:

- Appropriate soil conservation practices are planned and implemented;
- Creation of stable post-construction landforms; and
- Installation of controls in accordance with the project ESCP and guideline requirements.

Management measures will be implemented to minimise any impacts to soils, geology and topography. Loss of topsoil and to a lesser extent subsoil from the construction area is important in terms of rehabilitation success. Topsoil is the most valuable resource in relation to rehabilitation and needs to be retained on site and in a good re-usable condition (GHD, November 2012).

A conceptual erosion and sediment control plan has been prepared by a suitable qualified professional and incorporated into the site plan; this is provided in **Appendix G**. The staged site plans and erosion and sediment control plan includes the following controls, as a minimum:

- Site water will be directed into water storage dams for use on site, offsite water will be diverted away from the site to keep water clean;
- Measures to limit the area of disturbance and progressively clear areas immediately before construction;
- Minimises the period soils are left exposed during construction;

- Material stockpiles will have silt fences or established bunds installed on the downstream side, and diversion bunds on the upstream side; and
- Placement of sediment traps and silt fences to minimise off-site impacts.

On site implementation measures also to be implemented include:

- Processes to maintain a site monitoring program to assess erosion control measures;
- Areas of identified dispersive soils shall be closely monitored to assess the efficacy of the erosion control measures and progressive land rehabilitation works will be undertaken where land is disturbed as use of those areas ceases. Regrading will be undertaken post disturbance to produce slopes that are suitable for the proposed land use;
- Strip and stockpile topsoil for rehabilitation;
- Records will be maintained of stripped material to ensure usable soils are retained and logs of stockpiles and kept to reconcile predicted and actual soil volumes; and
- Reprofile the land to match the surroundings and reinstate pre-existing natural drainage flows and pathways.

Fossils

Although no evidence of fossils has been noted in the proposed quarry area, it is acknowledged that sedimentary settings similar to those associated with the quarry site preserve fossiliferous records. If any unique or scientifically important fossil specimens are uncovered, the quarry operator will consult with the Queensland Museum regarding the find. Work will avoid the find area until advice is received from the Queensland Museum is received.

4.5 Groundwater

4.5.1 Existing groundwater

The proposed Disney Quarry site falls within the Burdekin Basin Catchment, where the *Water Resource (Burdekin Basin) Plan 2007* and *Burdekin Basin Resource Operations Plan 2010*, apply. The WRP for the Burdekin Basin Catchment does not have management requirements for groundwater.

4.5.1.1 Bowen Unincorporated Area Groundwater Resource Area

Groundwater management units (GMUs) have been identified for the whole of Australia as part of the Australian Water Resources Assessment 2000 (DSEWPaC, 2009). The assessment forms part of the *2000-2002 National Land and Water Resource Audit*. The Disney Quarry is located within the Unincorporated Area (UA) – Bowen Basin Groundwater Management Units, referred to as the Bowen UA.

The major aquifers within the Bowen UA are Quaternary-aged alluvium, the sand and gravel horizons of the Tertiary-aged sediments and the Tertiary-aged basalts (Australian Government, 2009). The majority of groundwater can be defined as marginal quality; however, supplies of good quality groundwater are common from the alluvial and basalt aquifers. Poorer quality groundwater is typical of the coal bearing strata particularly in the Bowen Basin Stratigraphy. The achievable bore yields are generally below 5 litres per second (L/s) and consequently most groundwater development would be limited to stock and domestic supplies (GHD, 2012).

Aquifers within the Bowen UA are generally utilised for pastoral, irrigation, mining, stock and domestic, and town water. Increased irrigation, developments in the local coal industry and increased mining activity in the gem fields have resulted in recent increases to groundwater demands (Australian Government, 2009). Despite this, the groundwater resources in the Bowen UA are not heavily exploited and the Bowen UA is not considered a major priority and therefore has not been considered to require active management in the form of a resource plan (DSEWPaC, 2009).

4.5.1.2 Hydrostratigraphic Units

Based on the analysis of existing borehole logs and geological mapping the following hydrostratigraphic units are delineated beneath and within the vicinity of the Disney Quarry:

- Unconsolidated Sediments –comprising unconsolidated alluvium, colluvium and miscellaneous sediments of Quaternary to Tertiary age. Colluvium is mapped on the slopes and toward the base of the outcropping units and alluvial deposits dominate the low-lying areas along existing creeks and drainage lines; and
- Bedrock – dominated by Tertiary, Carboniferous and Permian sedimentary rocks and a number of outcropping igneous volcanic and metamorphic units. The bedrock is interpreted as a fractured rock aquifer.

The geological map indicates that a number of outcropping bedrock units occur within the Disney Quarry area, forming topographic highs with unconsolidated sediments (colluvium) occurring along the base of the outcropping units. The shallow Quaternary alluvium (Qa and Qpa in Figure 4-6) follows the major rivers, creeks and drainage lines, the closest of which include Gowrie Creek and Mistake Creek, approximately 2.5 km south and 7 km west of the quarry, respectively. Borehole log at RN 12030176, located approximately 1.5 km east of the quarry and close to Gowrie Creek, indicates approximately 13 m of clay-rich Quaternary sediments overlying the Mt Hall Formation. Elsewhere, an indicative thickness of the alluvium may be inferred from borehole logs further away from the quarry. For example, alluvium thicknesses of 54 and 40 m are indicated at RN 12030089, located along the Belyando River approximately 32 km south-west of the quarry, and at RN 90368, located a further 20 km to the west, respectively (GHD, 2012).

Depths to the top of Tertiary sediments and bedrock in the broader Carmichael Coal Mine and Rail Project area presented in GHD (2012) are based on limited borehole data from the DNRM Groundwater Database. The data indicate the depth to the top of Tertiary sediments and Carboniferous bedrock to be 36 to 60 m below ground level (bgl) and 39 to 96 m bgl, respectively.

4.5.1.3 Groundwater Users and Bores

A search of the Queensland DNR Groundwater database (2012) identified eight registered bores within a 10 km buffer surrounding the quarry site, five of which are active or existing. Table 4-8 outlines all the registered bores within 10 km of the Disney Quarry site.

Table 4-8 Groundwater bore details within 10 km of the Disney Quarry

Registered Number (RN)	Type	Distance from Quarry	Depth to water (SWL)	Target Aquifer and other details
84363	Existing	Northern edge of site	Not Available	Mt Hall Conglomerate Formation. Intersects Aquifers from 54.9 to 88mbgl, 110 – 199mbgl and 122 to 126mbgl. EC recorded at 495.
62587	Existing	0.5 km north	60.96 mbgl	EC recorded as good
12030176	Existing, sub artesian monitoring bore	1.5 km east	43.26 mbgl	Mt Hall Conglomerate Formation. EC values high with 52000 to 53,000 recorded at depth of 69mbgl.
22068	Existing	5 km west	Not Available	Not Available
62536	Existing	5 km south	27.4 mbgl	Brackish water quality recorded
132307	Abandoned and destroyed water supply bore	7 km east	Not Available	Bore depth to 134m.
89040	Not Available	9km north-east	Not Available	Not Available
89009	Not Available	9.5 km north-east	Not Available	Not Available

It should be noted that prior to 1998 there was no requirement for registration of private bores. It is possible that there are additional water supply bores that are being utilised that have not been identified in this desktop review.

4.5.1.4 Aquifer Properties and Bore Yield

No aquifer properties and bore yield data are available within the quarry area. Bore yield data within the broader Carmichael Coal Mine and Rail Project area are summarised in GHD (2012) and provide indications of the general productivity of aquifers in the region. The majority of the bore yield data are less than 5 L/s, typical of the Bowen UA, with the exception of 11 L/s yield recorded at RN30176, an abandoned water supply bore located approximately 52 km south-west of the Disney Quarry and installed within the bedrock. RN 90368 is an existing water supply bore in the alluvium, located approximately 3 km south of RN30176, with maximum recorded yield of 3.9 L/s.

4.5.1.5 Groundwater Flow Regime

A registered bore, RN 62587, is located approximately 500 m north of the quarry boundary at an elevation of approximately 250 m AHD. The bore has a depth of 97.5 m with a measured depth to water of 60.96 m bgl. This is approximately equal to a groundwater elevation of 189 m AHD. There is no borehole log available at this location; however, a borehole log at RN 84363, located approximately 650 m to the south of RN 62587 and within the quarry area, suggests that the bore is installed within the Mt Hall Formation (bedrock). Another registered bore, RN 12030176, is located approximately 1.5 km east of the Disney Quarry and installed within the Mt Hall Formation. Bore hydrograph for RN 12030176 indicates an average groundwater elevation of approximately 160 m AHD, with a measured depth to water reading of 43.26 m bgl (GHD, 2012). The lower groundwater elevation at RN 12030176 compared to RN 62478 is consistent with the lower ground elevation (approximately 203 m AHD) at this location. More site specific data would be necessary to understand the groundwater flow direction within the quarry area. The available data suggest that within the quarry area the water table is likely to occur within the bedrock and broadly follows topography.

On a regional scale, the alluvium along creeks and drainage lines would be expected to be the major location of recharge and discharge of groundwater. Episodic rainfall and runoff events, especially those that cause flooding along these creeks, are likely to supply recharge to the water table. Therefore, during these wet periods the creeks function as losing streams and the groundwater system receives recharge. During longer dry periods, transpiration by vegetation and potential evaporation of shallow groundwater along creeks and drainage lines would discharge groundwater back to the atmosphere. Regionally, the water table is likely to follow the regional topography with the water table occurring within the alluvium at some depth below the invert of major creeks and rivers, including Mistake Creek to the west of the Disney Quarry. This is evidenced by depth to water recorded at registered bores RN 12030089 (11.3 m bgl) and RN 90368 (15 m bgl), which are installed within the alluvium along the Beylando River and located approximately 32 and 52 km south-west of the Disney Quarry, respectively.

As part of the Carmichael Coal Mine and Rail Project EIS, GHD (2012) prepared bore hydrographs for registered bores in Project (Rail) Section 2 and Project (Rail) Section 3. The hydrographs indicate that the water levels in the bedrock aquifer (Anakie Metamorphics, the Mt Hall Formation and the Suttor Formation) have remained relatively static and have not responded to seasonal variations in rainfall. This includes bore hydrograph for RN 12030176 located approximately 1.5 km to the east of the quarry boundary. This is consistent with the interpretation that most of the rainfall induced recharge is likely to be occurring along the existing creeks and drainage lines via alluvium, with some recharge potentially occurring over parts of the bedrock albeit at reduced rates.

4.5.1.6 Groundwater dependant springs

According to the Springs of Queensland dataset (EPA, 2005) there are no reported spring complexes within the surrounding area. The nearest springs are the Doongmabulla Springs, which are listed under the Directory of Important wetlands and located approximately 76 km west from the Disney Quarry.

4.5.1.7 Groundwater Dependant Ecosystems

The National Atlas of Groundwater Dependent Ecosystems (GDE) (BOM, 2013) presents the current knowledge of GDEs across Australia, and shows known GDEs as well as ecosystems that potentially use groundwater. The mapping indicates zones of low potential to support

groundwater dependent vegetation within the quarry area, however no GDEs were identified in the Disney Quarry area through previous field investigations. Further away from the quarry, zones of high potential to support groundwater dependent vegetation have been identified along Mistake Creek, approximately 8 km west of the quarry. The Carmichael Coal Mine and Rail Project EIS indicates that flow in Mistake Creek (approximately 6.7 km to the west) may be groundwater fed during pro-longed dry periods, such that a series of semi-permanent waterholes are likely to be maintained along the water course. Therefore, GHD (2012) suggests that vegetation within the riparian zone is likely to be groundwater dependent to some degree and this is consistent with the GDE Atlas.

4.5.1.8 Groundwater Quality

Groundwater at RN 62587, located approximately 500 m north of the quarry boundary, is indicated to be brackish but no electrical conductivity (EC) data is available. At RN 12030176, located approximately 1.5 km east of the quarry, the available EC data range from 52,200 to 53,100 microsiemens per centimetre ($\mu\text{S}/\text{cm}$). Both bores are constructed in the bedrock and high EC readings are consistent with other EC data from bedrock aquifers within the broader Carmichael Coal Mine and Rail Project area further to the east and west of the Disney Quarry (GHD, 2012). One EC measurement of 373 $\mu\text{S}/\text{cm}$ is available from the Tertiary sediments at RN 17980, located more than 58 km south-west of the quarry. No water quality data are available from the alluvium.

4.5.1.9 Water Supply for Quarry

Water supply options are currently being investigated. Quantities of water sufficient to satisfy the site operational requirements may be sourced on site from stormwater harvesting and groundwater seepage. The site operational water requirements are outlined in Section 3-5.

It is understood that Adani will consider a number of alternative options of water supply should additional water be deemed necessary for the quarry. This may include bore water supply, large water storages and sourcing from an existing water supply. Any alternative water supply options will be permitted separately and are not discussed herein.

4.5.2 Potential Impacts

The potential groundwater impacts due to the quarry include:

- Drawdown of the water table due to quarry excavation and associated dewatering activities. The extent of the impact will largely depend on the potential for the base of the quarry to intersect the water table and hydrogeological properties of the aquifer surrounding the quarry. The potential drawdown impacts include the lowering of water table at the location of potentially groundwater dependent vegetation and lowering of water levels at registered and unregistered bores. It is understood that the proposed quarry depths are 5 and 15 m below pre-construction ground elevation of 220 to 255 m AHD. This gives a lowest anticipated quarry elevation of 205 m AHD is above the groundwater elevation of 189 m AHD recorded at RN 62587. On this basis, the likelihood of intersecting the water table during construction is considered low;
- Drawdown of the water table due to pumping from groundwater supply bores. The likelihood of impact is considered low due to the anticipated low bore yield and supplementary water demand. The risk is conservatively assessed as moderate due to the presence of registered bores and current uncertainty about their uses. However, there are no current plans to source water from bores and any impacts will be assessed in the approvals required for a water bore;

- Alteration of the local groundwater flow regime during construction and associated changes in the hydrogeological properties of the surrounding formations are likely to be low risk with potential minor changes to localised groundwater flow regime;
- Damage to the integrity of the existing registered bores RN 84363, located within the quarry area and RN 62587, located within 500 m of the quarry boundary, due to construction activities carries a medium risk. This can be mitigated through undertaking baseline bore assessments prior to quarry development;
- Localised recharge to the water table from quarry operations and associated salinisation and mounding of the water table is considered a low risk. This may arise if the water table is not intersected by the quarry and stormwater at the site is not properly managed. The mounding of the water table may facilitate lateral transport of dissolved salts or contaminants within the saturated zone. Appropriate management of water in the pit, particularly if dewatering is required, would minimise recharge induced impacts; and
- The risk of localised degradation of groundwater quality due to accidental leaks or spills of chemicals during construction and subsequent lateral migration of contaminants if present within the saturated zone is considered low as the risk of groundwater contamination can be minimised through appropriate management of on-site chemicals.

4.5.3 Groundwater Management

Based on the preliminary risk assessment, a number of potential impacts to groundwater due to proposed works are identified, which are primarily related to the existing registered bores at and within the vicinity of the quarry area. Site specific data will be needed to re-assess the risks associated with these potential impacts. The main objectives with regards to groundwater include:

- Prevention of the degradation of groundwater quality in the area within and surrounding the development;
- Protection and maintenance of integrity of surrounding bores;
- Protecting the quality of existing groundwater resources; and
- Ensuring the development does not impact values associated with groundwater dependent ecosystems.

In order to minimise adverse impacts to groundwater, the following management methods will be undertaken:

- Laydown areas for vehicles and machinery and storage areas for chemicals, oils and fuels will be contained in appropriately designed facilities. Containment and correct storage will prevent spills, leaks, infiltration and surface runoff and hence prevent contaminants from entering aquifers, waterways and the general environment;
- Spill kits will be available to all personnel in the event of a spill or leak;
- Potential contaminants will be stored and handled in a controlled manner to prevent impacts to creeks, rivers, bores or groundwater dependent ecosystems;
- Visual inspections of any groundwater seepage during extraction activities. If the water table is intersected during construction, the rate of groundwater seepage is likely to be low due to the assumed low permeability of the bedrock. It is assumed that groundwater seepage could be managed by in-pit sump pumping to facilitate dry construction; and

- A number of groundwater monitoring bores shall be installed and tested prior to construction to assess baseline groundwater conditions including depth to water, groundwater flow direction, indicative aquifer permeability and groundwater quality. This will assist in the planning for construction requirements; i.e., dewatering and bore water supply). Some of the monitoring bores should be placed outside of the perimeter of the quarry such that they could be monitored during construction if deemed necessary.

4.6 Contaminated Land

The site has been used for historical quarrying operations and a range of agricultural activities, particularly cattle breeding and fattening. A search of the Environment Management Register (EMR) and Contaminated Land Register (CLR) indicates that no known notifiable activity has been undertaken on Lot 4 SP116046. The EMR/CLR Search is attached in **Appendix I**. In addition, multiple site inspections have failed to reveal any indication of hazardous materials being stored, or hazardous activities being undertaken, in the area of the proposed development.

4.7 Air Quality

4.7.1 Existing Environment

The quarry is located within a rural regional landscape dominated by agricultural and mining activities. The air quality is generally of a good standard. VIPAC undertook background monitoring of air quality at the Disney Homestead to allow the incremental impact of the quarry to be assessed against the existing background pollutant concentrations.

The existing levels of particulate matter were monitored at Disney Homestead between the 27th March and 1st April 2013, using an environmental dust monitor, which records a particulate matter value every five minutes. Analysis of the data determined the background particulate matter concentration of 10 micrometers or less (PM₁₀) to be 10 micrograms per m³ (µg/m³). The PM₁₀ concentration has been used to derive appropriate background concentrations for PM_{2.5} and total suspended particulate matter (TSP).

The following estimates of background levels of dust have been determined:

- Annual average concentration of TSP of 45 µg/m³;
- 24-hour average concentration of PM₁₀ of 18 µg/m³;
- 24-hour average concentration of PM_{2.5} of 1.8 µg/m³; and
- Dust deposition of 50 mg/m²/day.

Full details of the background monitoring are provided within the Air Quality Assessment prepared by VIPAC in **Appendix J**.

4.7.2 Project Criteria

The *Environmental Protection (Air) Policy 2008* prescribes ambient air quality goals relevant to this quarry. Provided are criteria for PM₁₀ (particulate matter less than 10 microns in diameter), PM_{2.5} (particulate matter less than 2.5 microns in diameter). The most critical of these is the PM₁₀ criterion as the fraction of PM_{2.5} against PM₁₀ emissions from extraction operations is small (typically less than 10%).

Deposited dust is commonly used as a measure of the potential for dust nuisance, high levels can reduce the amenity of an area. No formal criteria for dust deposition exist within Queensland, however the EHP has recommended a nuisance guideline of 120 mg/m²/day.

From all of the regulations, the strictest applicable criteria have been selected for this assessment and are presented in Table 4-9

Table 4-9 Quarry air quality goals (VIPAC, 2013)

Pollutant	Basis	Criteria	Averaging Time	Exceedances*
TSP	Human Health	90 µg/m ³	1-year	-
PM ₁₀	Human Health	50 µg/m ³	24-hour	Five days per year
PM _{2.5}	Human Health	25 µg/m ³	24-hour	-
Dust deposition	Amenity	120 mg/m ² /day	30 days	-

* Allowance intended for natural events such as dust storms or bushfires

Particulate emissions from the surrounding environment include contributors from farming activities (i.e. dust from cultivated areas) and smoke from activities associated with burning off. The closest noise and/or vibration source to the proposed Disney Quarry site would be the Gregory Development Road, toward the eastern boundary of the site.

4.7.3 Potential Impacts

Air quality impacts are likely to include dust emissions and vehicle and equipment emissions at the quarry operational area and along the haulage routes. The activities likely to contribute to the impacts to air quality include:

- Ripping of quarry material;
- Stockpiling;
- Operation of fuel burning equipment on site through exhaust emissions;
- Loading of quarry material into haulage trucks; and
- Movement of haulage trucks along dirt roads and haul roads.

An Air Quality Assessment report for the Disney Quarry has been prepared and is provided **Attachment D** to this report.

VIPAC undertook modelling and assessment of the potential impact of the quarry operations using the 3-dimensional dispersion wind field model, CALPUFF and The Air Pollution Model (TAPM), which is a 3-dimensional prognostic model developed and verified for air pollution studies by the CSIRO to simulate the impacts from the quarry. The modelling was based on the peak production month of May 2015 when 1.51 million tonne will be extracted. This rate was modelled for a year duration and as such the modelling results show the worst case scenario with minimal controls in place (dust suppression with a water truck). The actual impacts of the quarry are likely to be significantly less than the predictions and modelling of the worst case scenario.

The nearest sensitive receptors to the proposed quarry are the Gregory Development Road which lays 720m to the east and a homestead approximately 2.1 km to the west. The residence will be screened from the quarry operations (230 m AHD) by a hill that rises to 290 m AHD and runs in a general north-south direction. In addition, the proposed operation will be screened from the Gregory Development Road by two vegetated hills that rise to approximately 258 m AHD.

The TSP, PM₁₀, PM_{2.5} and dust deposition results for the Disney Homestead are detailed in Table 4-10.

Table 4-10 Quarry dust results at Disney Homestead (VIPAC, 2013)

Pollutant	Background Levels	Quarry Related Activities	Total	Criteria	Compliance
Dust Deposition (mg/m ² /day)	50	25.79	75.79	120 mg/m ² /day (30 days)	Yes
TSP (µg/m ³)	45	17.68	62.68	90 µg/m ³ (1-year)	Yes
PM ₁₀ (µg/m ³)	18	31.89	49.89	50 µg/m ³ (24-hour)	Yes
PM _{2.5} (µg/m ³)	1.8	18.26	20.06	25 µg/m ³ (24-hour)	Yes

VIPAC's monitoring and modelling of air quality indicates that even in the worst case scenario peak production the operations will be compliant with required air quality standards. It was noted that highest contributor to all pollutants is from haul truck movements.

The distances between the other five quarries and the Disney Quarry are so great, that cumulative impacts of dust will not occur at the closest receptor to the Disney Quarry, the Disney Homestead. For this reason, cumulative impacts of these other quarries upon the Disney Homestead have not been predicted.

4.7.4 Air Quality Management

Air quality and dust management measures will include the following measures:

- Watering of tracks and roads to minimise wheel-generated dust;
- Ongoing visual dust inspections;
- Water sprays should be used for excavation activities where necessary;
- Water spraying of stockpiles will be done on a frequent basis in order to keep the raw material moist to suppress fugitive dust release. The frequency of watering will depend on weather conditions;
- Progressive clearing to minimise the area of potential dust generating areas subject to wind erosion;
- Earth moving activities should be avoided or restricted during meteorological conditions that are favourable for dust dispersal;
- Restriction of the speed of traffic to minimise wheel generated dust;
- Ensuring all vehicles are suitably fitted with exhaust systems that minimise gaseous and particulate emissions to meet vehicle design standards;
- Limiting vegetation and soil clearing, so as to minimise the area of exposed soil that may generate dust;
- Cattle grids placed on entrance to any sealed public road to assist in the removal of dust from vehicles prior to haulage on the public road;
- Compaction of construction-site and stabilisation of vegetation to minimise dust lift off as a result of wind erosion;
- Place organic mulch and/or plant exposed soils to reduce dust generation and wind erosion;
- General awareness of minimising dust levels and its benefits should be instructed to workforce personnel;
- Complaint management processes that ensure complaints are readily registered and appropriately addressed; and
- Haul vehicles will be covered when travelling on public roads or when significant dust is being produced from works on-site.

4.8 Noise

4.8.1 Existing Environment

The nearest sensitive receptor to the quarry is the Disney Homestead, located 2.1 km west of the quarry. The terrain between the receptor and Disney Quarry ranges from 190 m to 280 m with a hill between the quarry and sensitive receptor. The noise environment is a rural, quiet environment with noise contributions limited to rural traffic and agricultural activities.

Winds occur predominantly from the northeast during spring and summer, often no greater than 18 km/h. In autumn and winter, the dominant winds occur from the southeast with the highest wind speed of 28 km/h. The cooler, drier air is characteristic of the dominant southeast winds of moderate strength, usually with long calm periods in the winter (VIPAC, 2013).

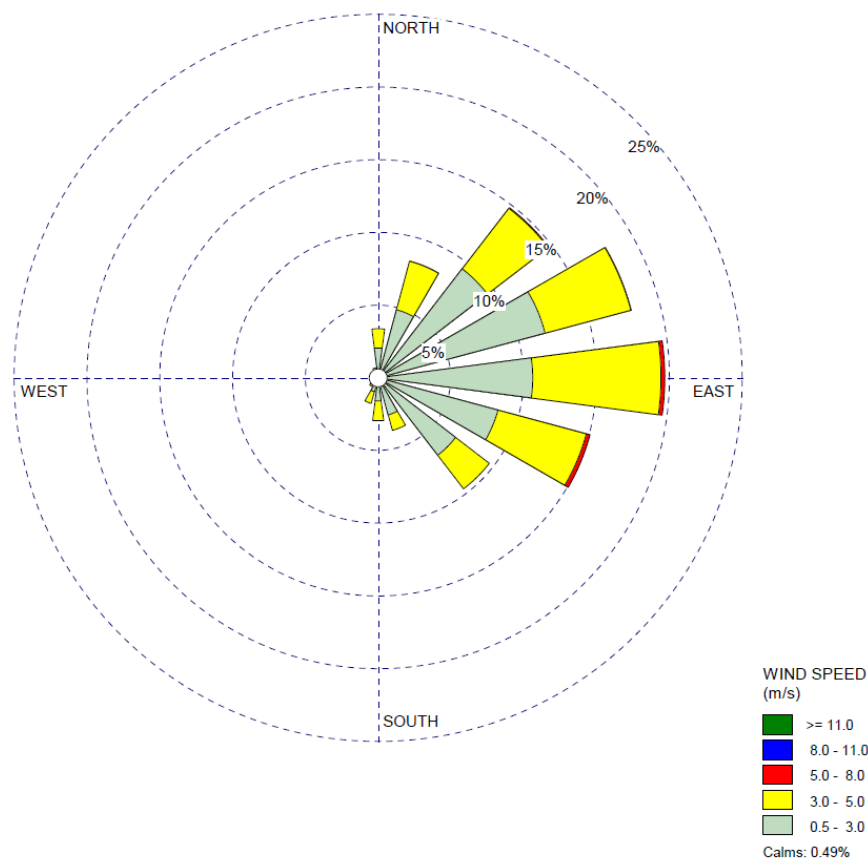


Figure 4-7 Annual wind rose (2006)

The existing noise environment has been determined through unattended ambient noise monitoring between 27 March and 4 April 2013. The noise monitoring locations have been identified as Disney Receptor and Old Twin Hills Receptor located within the vicinity of the homesteads on these properties.

Table 4-11 provides the noise monitoring results for all of the days captured at each location. It should be noted that all of the noise monitoring locations are free-field positions. The noise

monitoring data for individual days is shown in tabulated and graphical form in within the full Noise Assessment provided in **Appendix K**.

Table 4-11 Summary of noise monitoring results (VIPAC, 2013)

Noise Descriptor	Old Twin Hills			Disney		
	Day (07:00-18:00)	Evening (18:00-22:00)	Night (22:00-07:00)	Day (07:00-18:00)	Evening (18:00-22:00)	Night (22:00-07:00)
L_{Aeq} (Average)	43.5	43.8	32.5	41.5	42.3	37.3
$L_{Aeq, 1 \text{ Hour}}$ (Max)	47.4	47.1	38.4	47.0	45.2	43.2
L_{A90} (Average)	32.8	33.5	24.5	29.2	35.7	28.1
L_{Amax} (24 hour)	76.3			76.3		

4.8.2 Proposed Criteria and Assessment

The *Environmental Protection (Noise) Policy 2008* (EPP (Noise)) is designed to protect the acoustic environment for health and well-being. Section 8 and Schedule 1 of the EPP (Noise) outlines these acoustic quality objectives as shown in Table 4-12

Table 4-12 EPP (Noise) acoustic quality objectives for dwellings

Sensitive Receptor	Time of Day	Acoustic Quality Objectives (measured at receptor) dB(A)			Environmental Value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,hr}$	$L_{A1,adj,1hr}$	
Dwelling (outdoors)	Daytime & evening	50	55	65	Health & Wellbeing
Dwelling (indoors)	Daytime & evening	35	40	45	Health & Wellbeing
	Night-time	30	35	40	Sleeping

The time periods referred to in the EPP (Noise) are defined as: Day: 7 am to 6 pm, Evening: 6 pm to 10 pm, Night: 10 pm to 7 am

The Acoustic Quality Objective applicable to this project is the Dwelling (indoors) night time criteria of 30 dB $L_{Aeq,adj,1hr}$. This noise level is an indoor level. In order to predict the external levels, a façade transmission loss of 7 dB has been applied. As such, the adjusted external night time criteria of 37 dB $L_{Aeq,adj,1hr}$ is applied.

The prediction of noise has been predicted using SoundPLAN noise modelling software with the CONCAWE prediction methodology to take into consideration the weather conditions at the site. The significant construction and operational noise sources used for this assessment have been obtained from VIPAC's database of noise emissions. The noise modelling has assessed both the on site operations and the haulage of material along the site access road.

4.8.3 Noise Impacts

Noise sources are likely to include the following:

- Operation of vehicles and equipment, primarily the dozer and excavator;
- Excavation and stockpiling of material;
- Haulage of quarry material; and
- Reversing alarms on vehicles and equipment.

There will be no blasting activities at the Disney site.

The worst-case scenario of 1.51 million tonnes extracted and hauled from the site is expected to comply with the external night time noise criteria of 37 dB(A) during stable weather conditions. The highest noise level is predicted to be a maximum of 37 dB(A) at the Disney receptor for May 2015 when the extraction rate is 1.51 million. This represents the peak production which will only occur for 4.86% of the quarry life, approximately 1 million tonnes will be extracted for 24% of the time and remaining time will be less than 800,000 tonnes a month which is half of the modelled noise impact.

The modelling shows the predicted night time noise levels for the combined extraction activities and haulage during the peak production rate month will be 37(dB $L_{Aeq, 1hour}$) at the Disney homestead and 36(dB $L_{Aeq, 1hour}$) at the Old Twin Hills homestead. This is in compliance with the proposed external noise criteria of 37 (dB $L_{Aeq, 1hour}$).

Figure 4-8 shows the noise impact profile for the combined quarry and haulage activities at the Disney site during night time at peak production.

The combined noise levels show that noise levels are driven by the extraction activities, primarily from the dozer and excavator. The results have shown that compliance with the acoustic objectives for the night-time period has been achieved at all receptors during peak output in stable conditions. During unstable weather conditions the noise level may increase up to 3 dB(A) at the Disney receptor.

This impact and modelling is based on no noise mitigation measures in place. A number of noise mitigations will be installed to ensure noise impacts are reduced and limits not exceeded.

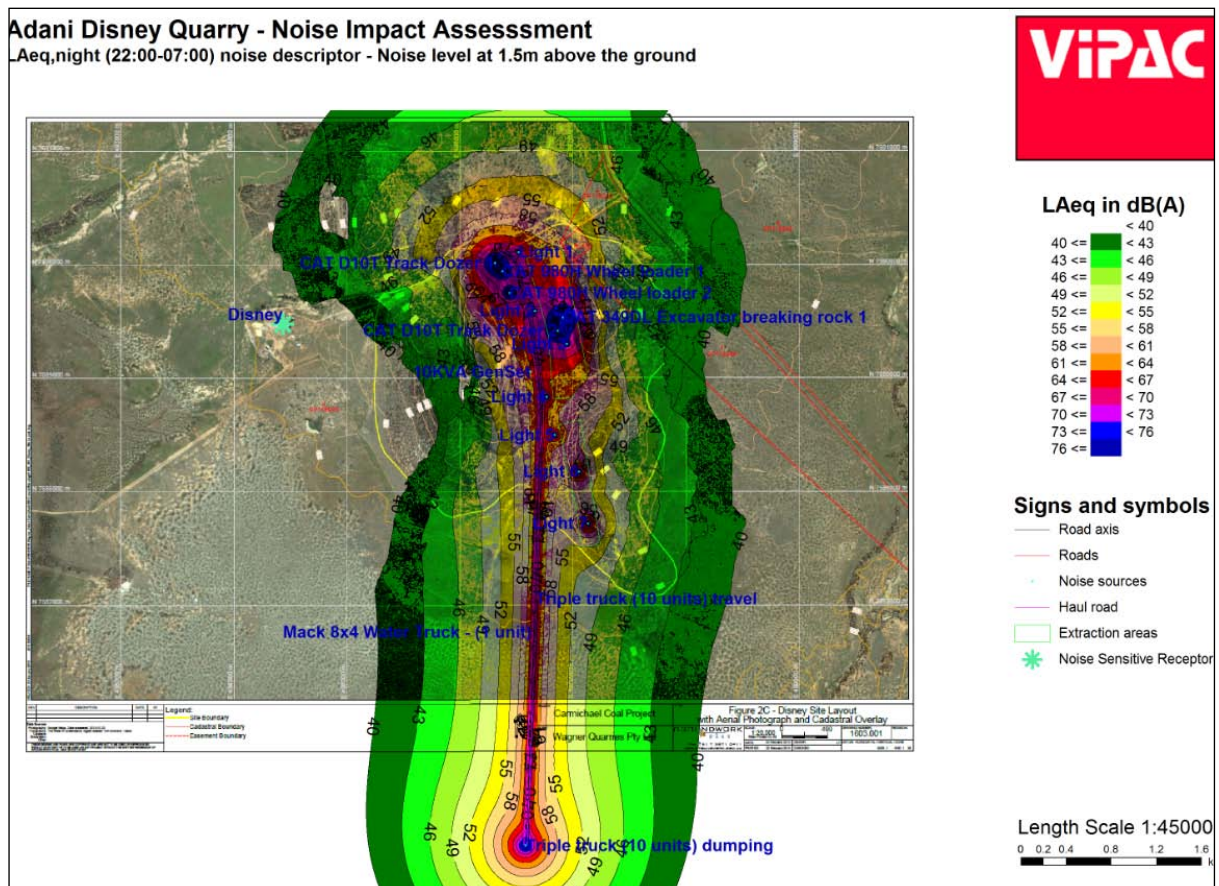


Figure 4-8 Noise impacts - quarry and haulage

4.8.4 Noise Management

Noise management measures will include the following:

- Avoiding unnecessary revving of engines and switch off equipment when not required;
- Keeping haul routes well maintained and avoid steep gradients;
- Ensure that all operators of plant and haul trucks do not drive aggressively and horn use is limited;
- Minimise the drop heights of materials;
- Start up plant and vehicles sequentially rather than all together;
- Audible reversing warning systems on mobile plant and vehicles shall be of a type which, whilst ensuring that they give proper warning, has a minimum noise impact on persons outside sites. When reversing, mobile plant and vehicles should travel in a direction away from sensitive receptors whenever possible;
- As far as reasonably practicable, sources of significant noise shall be enclosed. The extent to which this can be done depends on the nature of the machine or process to be enclosed and their ventilation requirements;
- Plant shall always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise sensitive areas. Where possible, loading and unloading should also be carried out away from such areas;
- Machines that might have intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and wastes energy;
- Plant from which the noise generated is known to be particularly directional should, wherever practicable, be orientated so that the noise is directed away from noise-sensitive areas; and
- Acoustic covers to engines shall be kept closed when the engines are in use and idling.

Noise monitoring will be carried out in the event of a complaint and a formal request from the administering authority to ensure noise levels are meeting compliance with requirements.

4.9 Traffic, Transport and Site Access

4.9.1 Traffic and Transport Requirements

Traffic generated by the Disney Quarry development through construction and site set up, employees, service vehicles and the haulage of quarry material. The study area as shown in Figure 4-9 therefore incorporates the Gregory Development Road to the quarry access only, with haulage of quarry material occurring from the southern access directly onto the rail haul road.

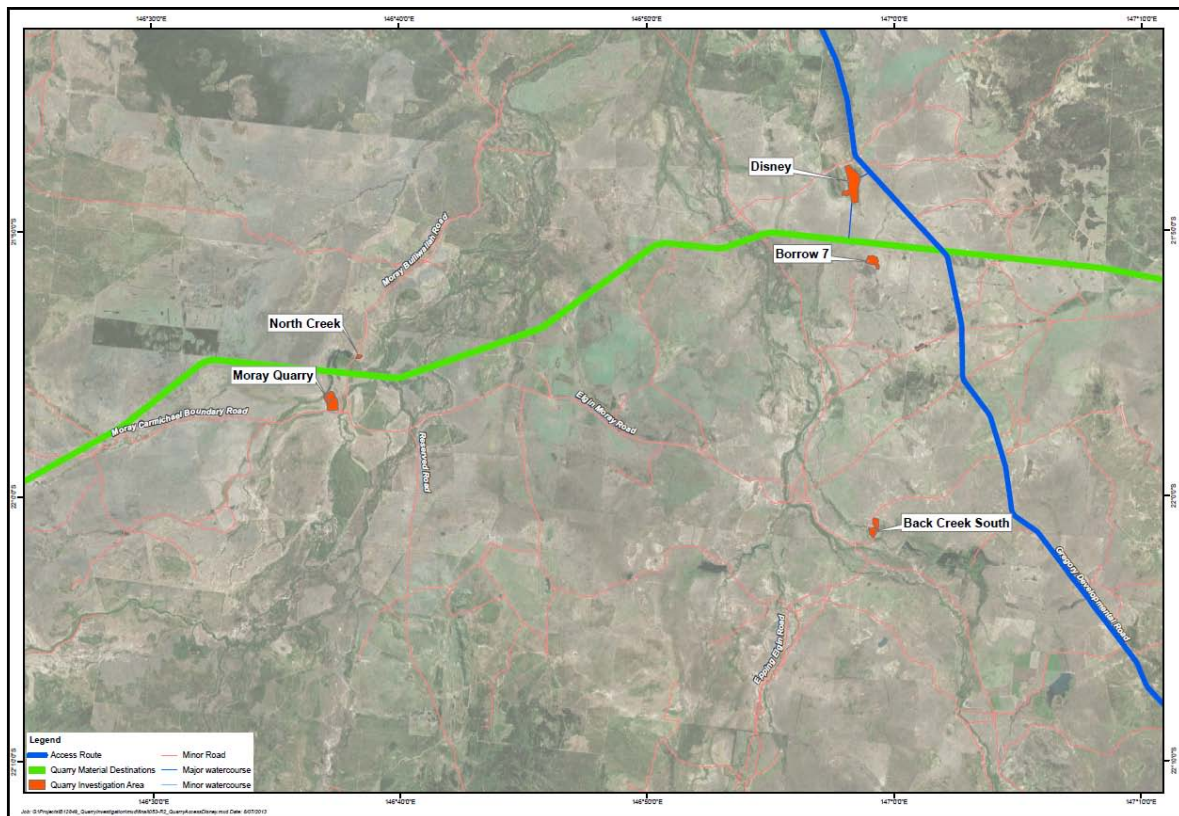


Figure 4-9 Access routes and haulage (TTM, 2013)

TTM has undertaken a detailed estimate of the likely development traffic generation and distribution, with the site predicted to generate a maximum monthly traffic volume of 1,342 vehicles (in/out) during the peak production month.

The access route for service vehicles will be the Gregory Development Road (Belyando Crossing to Peak Downs Highway) this is a State Controlled and is in generally good condition. The highway is a sealed, two lane, 8 m wide carriageway and 0.5m shoulder widths with a speed limit of 110km per hour.

The gravel access into Disney Quarry from the Gregory Development Road is a typical priority 3 arm rural highway access intersection with no turn treatments; it has good visibility of a minimum of 350m in each direction. This will be used for service vehicles and early workers access until the Rail Haul road indicated in green in Figure 4-9 Access routes and haulage (TTM, 2013) is constructed.

All haulage of quarry material will be via the rail haul road to the stockpile areas within the rail corridor. Haulage of quarry material will be undertaken by AB Triple vehicles with an average payload of 75 tonnes.

The highest predicted annual haulage from Disney Quarry will be 10,500,000 t. Haulage will be restricted to the local road network and the rail haul road. As this quarry will provide material for the rail line on the west of the Gregory Development Road, some haulage movements will cross the state controlled road network. The operation of the Gregory Development Road / haul road intersection will be assessed by other parties through the planning process for the rail component of the project.

TTM has estimated the daily and peak hour haul vehicle generation, and this is shown in Table 4-13 Table 4-13 Estimated daily and peak hour vehicle generation for Disney Quarry (TTM).

Table 4-13 Estimated daily and peak hour vehicle generation for Disney Quarry (TTM)

Tonnage/day	Average tonnes per load	Trucks in (load bearing)	Trucks out (non load bearing)	Total daily truck movements	Peak hour truck movements
Total Average: 18,650t	75	249 (2,291 ESA)	249 (416 ESA)	498 (2,707 ESA)	100
Total Peak Month: 50,344t	75	671 (6,173 ESA)	671 (1,121 ESA)	1,342 (7,294 ESA)	268
Crossing GDR Average: 15,380t	75	205 (1,886 ESA)	205 (342 ESA)	410 (2,228 ESA)	82
Crossing GDR Peak: 43,862t	75	585 (5,382 ESA)	585 (977 ESA)	1,170 (5,967 ESA)	234

*ESA = Equivalent Standard Axles

In addition to the haulage of material there will be a number of service vehicles required to set up the site and service the operation of the site, these include:

- 40 truck movements required for set up of the site and delivery and mobilisation of equipment and plant;
- One fuel delivery per week from Townsville to be transported in B-double with a 50,000L capacity, this will also service other proposed local quarry sites; and
- Two water deliveries per week from Carmichael Coal Mine and Rail Project water source or from bore on site.

This equates to 162 truck movements during the first year of the quarry including the set up of the quarry.

Disney Quarry traffic is expected to increase traffic on the public roads in the study area by no more than 10 vehicles per day vehicles during peak operations and as such the current service level 'A' is expected to be retained on all roads.

Up to 1,170 vehicles per day are predicted to cross the Gregory Development Road, however as previously mentioned this impact will be addressed through the planning process for the rail component of the Carmichael Coal Mine and Rail Project.

4.9.2 Potential Impacts

TTM Consulting was engaged to undertake a Traffic and Pavement Impact Assessment for the development of the Disney Quarry. The scope of the transport assessment included:

- Identification of likely traffic volumes, distribution and composition from the future development;
- Identification of likely traffic impact of development on the public road network;
- Identification of likely pavement impact of development on the public road network;
- Road upgrades to be provided to mitigate the impact of the proposed development on the external road network, if any; and
- Access configuration to provide efficient and safe manoeuvring between the site and the public road network.

A summary of the impacts as assessed in the report are:

- Assessment in accordance with the GARID guidelines found that Disney Quarry and associated quarries will not have a significant or assessable pavement impact on the state controlled road network;
- TTM consider that no school route, pedestrian or cyclist will be impacted with the development proposal. TTM are of the view that there are no traffic planning or engineering reasons why the proposed development should not proceed as planned; and
- TTM considers that all intersections within the study area will operate under uninterrupted flow conditions.

A copy of the Traffic and Transport Impact Assessment undertaken by TTM is provided in **Appendix C** to this report.

4.9.3 Management Measures

In order to mitigate the impacts of traffic and transport from the quarry site and within the quarry site the following general measures will be implemented:

- Haulage of quarry material will be restricted to the rail haul road and avoid transport of material on State and local roads;
- Limiting vehicle speed within the site to 40kms and 80kms per hour along the rail haul to reduce dust and safety impacts; and
- A Traffic Management and Maintenance Plan will be developed and implemented prior to commencement of the Carmichael Coal Mine and Rail Project.

The management measures that will be implemented for the Disney access road from Gregory Development Road include:

- Installation of basic left (BAL) and basic right (BAR) turn treatments are required at the Gregory Development Road / Disney access intersection prior to quarry operations;
- The provision of a formal sealed access to the property boundary;

- A cattle grid at the property boundary where quarry access is onto a sealed public road to remove dust and gravel from vehicle tyres; and
- Lane flares at the access to allow service vehicles to enter and exit simultaneously without conflict.

4.10 Cultural Heritage

The desktop assessment of cultural heritage values for this report includes:

- Identification of indigenous stakeholders through registered cultural heritage bodies, Native Title tenure and Indigenous Land Use Agreements (ILUA);
- Identification of non-aboriginal cultural heritage places and values through evaluation of relevant cultural heritage databases; and
- Identification of heritage sites collected in EIS completed within the area.

4.10.1 Indigenous Cultural Heritage Assessment

The principle legislation protecting indigenous cultural heritage in Queensland is the *Aboriginal Cultural Heritage Act 2003* (ACH Act). Under the ACH Act a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the 'cultural heritage duty of care').

There is one registered Native Title claim covering the Site (QUD6230/98, QC98/10), and an Indigenous Land Use Agreement (ILUA) is currently being prepared between Adani and the Jangga people (Table 4-14). The Site is on leasehold land and therefore Native Title is not extinguished, as such, the quarry and its associated operations will be addressed within the forthcoming ILUA with Jangga Operations Pty Ltd. No further Native Title determinations were identified from the National Native Title Register (NNTR) for the study area.

Table 4-14 Native Title claim details

Name	Tribunal No.	Status	Agreement Details
Jangga People Registered Native Title Claim Area (QUD 6230/98)	QC98/10	In Negotiation	Area Agreement

In addition to the current ILUA negotiations, Adani have the following agreements with the Jangga People:

- An Early Works Agreement was established in July 2011 for cultural heritage clearances undertaken from July to November 2011; and
- A Cultural Heritage Management Plan (CHMP) for the life of the Project was established and approved by the Chief Executive of EHP in November 2011. The CHMP is being amended to include the Disney Quarry operations.

Indigenous cultural heritage studies undertaken with the Carmichael Coal Mine and Rail Project EIS have identified indigenous cultural heritage sites located within the region. The Carmichael Coal Mine and Rail (2012) literature suggested there is considerable evidence of the close association of discreet archaeological deposits within soaks and gilgai. In addition, cultural heritage surveys undertaken for the initial geotechnical investigation works for the quarries indicate that the Disney Hill may be culturally significant to the Jangga People.

Adani understands its duty of care to protect and manage Aboriginal cultural heritage values under the ACH Act, and is committed to the management of cultural heritage values in and surrounding the Disney Quarry site. Adani will manage those values and mitigate project impacts through the CHMP as executed with the Jangga People, and through further pre-clearance cultural heritage surveys undertaken by qualified heritage personnel.

4.10.2 Non-Indigenous Cultural Heritage Assessment

The *Queensland Heritage Act 1992* (QH Act) is the principle legislation protecting non-indigenous cultural heritage in Queensland. The QH Act establishes the Queensland Heritage Council, which administers the Queensland and local heritage registers. Under the QH Act, penalties may apply for damage caused to places or items on the registers.

The Carmichael Coal Mine and Rail Project EIS (GHD, November 2012) listed the Great Barrier Reef and the Tree of Knowledge (Barcaldine) as the only Non-Indigenous cultural heritage sites applicable to the overall Project. Neither of these sites is within close proximity to the proposed Disney Quarry and therefore the development will not impact listed Non-Indigenous cultural heritage sites. Nevertheless, un-listed Non-Indigenous cultural heritage sites exist and these can include homesteads, churches, convict paving, agricultural buildings, survey trees, various sheds and huts, windmills, camps, tracks and stock routes. Various registers and data sources were consulted to identify existing sites of significant cultural heritage. Table 4-15 below lists of results from the Queensland Heritage Register search.

Table 4-15 Queensland Heritage Register search results

Title	Registration Type	Street Name	Location
Carmila Cane Lift	State Heritage	49 Hindles Road	Carmila West
Christ Church Anglican Church	State Heritage	Cannon Street	Saint Lawrence
Clermont Cemetery	State Heritage	Cemetery Road	Clermont
Irlam's Ant Bed Building	State Heritage	Clermont-Alpha Road	Oaky Creek
Meatworks and Wharf Site	State Heritage	Settlement Road	Saint Lawrence
Nebo Hotel	State Heritage	2 Reynolds Street	Nebo
Police Station and former Courthouse and Cell Block	State Heritage	Macartney Street	Saint Lawrence
Stone Farm Building	State Heritage	739 Fleurs Lane	Clermont

(GHD, November 2012)

The searches have indicated that there are no known Indigenous or non-Indigenous Cultural Heritage sites on the Property or within the immediate vicinity.

4.10.3 Potential Impacts

A cultural heritage survey was undertaken by the Jangga people on the 5 September 2012, and identified potential artefacts. On site mitigation measures were instigated and all initial disturbance sites were declared as being clear of cultural heritage constraints.

There may be potential impacts to cultural heritage items in the form of displacement (removal from site through cultural heritage survey) or unknown destruction if present items are not identified and removed during the cultural heritage surveys.

4.10.4 Management of Cultural Heritage

Cultural Heritage will be managed through the CHMP. The CHMP defines and describes the objectives and practical measures for protecting or enhancing Indigenous cultural heritage environmental values, these include:

- Provisions for review and amendment;
- Commitment to implementing duty of care requirements;
- Commitment to ongoing field assessment of areas to be disturbed; and
- Commitment to adopting a hierarchical policy of avoidance through to management of impact (GHD, November 2012).

The management and mitigation processes set out in the CHMP include:

- Cultural heritage awareness training;
- Continued communication; and
- Continued cultural heritage assessment and associated reporting.

Adani will work with relevant Aboriginal parties to include cultural heritage training into its induction materials for exploration, construction and operation. Representatives from relevant Aboriginal groups will have the opportunity to present cultural heritage awareness training face to face with key project personnel (GHD, November 2012).

No activities will be commenced until a full assessment of the Site has been undertaken in line with the CHMP. Aboriginal parties and their relevant archaeologists will report on the outcomes of their surveys, including: methodology, nature and extent of Aboriginal cultural heritage observed, significance of artefacts, items or places of conservation or cultural heritage values and their values, likely impacts and recommendations for management (GHD, November 2012).

Based on the recommendations contained in the survey report and ongoing communications, management measures will be implemented and may include avoidance, further assessment, mitigation and or monitoring (GHD, November 2012).

Section 5 Land Use Planning

The Disney Quarry development triggers assessment against multiple State and Local legislative instruments and includes three referral agencies for the activities. Section 5 provides an assessment of the proposed development against the relevant legislative instruments.

5.1 State Planning Instruments

5.1.1 State Planning Policies

A State Planning Policy (SPP) is a statutory instrument developed by the State Government for matters of state interest and is prepared under the SP Act. SPPs may provide detailed codes and standards used in technical aspects of development assessment. Assessment against the 13 current SPPs is given in Table 5-1, only the temporary SPP 2/12 – Planning for Prosperity is applicable to the Disney Quarry development.

Table 5-1 State Planning Policy assessment

State Planning Policy	Applicability
Temporary SPP 2/12 – Planning for Prosperity	The SPP applies to development on the Property and gives additional weight in the decision making process to: ▪ Agricultural uses in an area zoned for agricultural uses; and ▪ Mineral and extractive resource development which is complementary to an area's primary intended use. Part 2 of the SPP states that when making a decision on a development the assessment manager shall give weight to <i>“extractive industry development which can be shown to be complementary to an area's primary intended use”</i> (p.3). Under the <i>Belyando Shire Planning Scheme 2009</i>, Extractive Industry is listed as an ‘appropriate use’ within the Rural Zone. Therefore, SPP 2/12 is applicable to the development and shall be considered by IRC when assessing the development.
SPP 1/12 – Protection of Strategic Cropping Land (SCL)	The property does not contain any potential or confirmed SCL. Therefore, SPP 1/12 and the <i>Strategic Cropping Land Act 2011</i> (SCL Act) is not applicable to this development application.
SPP 4/11 – Protection Wetlands of High Ecological Significance in Great Barrier Reef Catchments	The SPP is not applicable as no wetland protection areas are located within the Property. The nearest is located approximately 6.3 km to the south of the development.
SPP 5/10 - Air, Noise and Hazardous Materials	The SPP is not applicable as the area is not listed as a management area for the purposes of the policy.
SPP 4/10 – Healthy Waters	The SPP is relevant to stormwater and wastewater management for urban purposes. The proposed development is for Extractive Industry in a Rural zoned area and therefore the SPP is not relevant.
SPP 3/10 – Acceleration of compliance assessment	The SPP is not applicable as reconfiguration of a lot is not proposed as part of the development.
SPP 2/10 – South East Queensland Koala Conservation	The SPP is not applicable as the Site is outside the South East Queensland area defined in the SPP.
SPP 2/07 – Protection of Extractive Resources and Guideline	The SPP is not applicable as no key resource areas are located within, or near, the Site.
SPP 1/07 – Housing and Residential Development	The SPP is not applicable as it applies only to local governments, and the development is seeking to establish an Extractive Industry.
SPP 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide	As per the introductory note in the <i>Belyando Shire Planning Scheme 2009</i> SPP 1/03 the flooding component of SPP 1/03 is the only part applicable to development in the former shire area. This is confirmed in

State Planning Policy	Applicability
	Annex 2 and Annex 3 of the SPP which exempts the Belyando Shire Council area from the fire and landslide provisions. In addition, no natural hazard management areas were identified as affecting the site.
SPP 2/02 – Planning and Managing the Development Involving Acid Sulfate Soils	Acid sulfate soils are not likely to occur at the Site as elevations are greater than 10 m AHD (elevation is approximately 230 m AHD). Therefore, an assessment against the provisions of SPP 1/02 has not been included.
SPP 1/02 - Development in the Vicinity of Certain Airports and Aviation Facilities	SPP 1/02 is not applicable as no aviation facilities are located at or near the Site.
SPP 1/92 – Development and the Conservation of Agricultural Land	All three types of Good Quality Agricultural Land (GQAL) are located on Lot 4 SP116046. GQAL Class A and B occur in two small isolated patches while Class C1 occurs through a large portion in the centre of the lot. Nevertheless, the location of the Extractive Industry development is outside the mapped GQAL area and therefore SPP 1/92 is not applicable to the development.

Note: The Queensland Government released a new Draft State Planning Policy (draft SPP) on the 22 April for public comment. This draft SPP is intended to replace the 13 current SPP's into one single SPP.

5.1.2 Mackay, Isaac and Whitsunday Regional Plan 2012 and State Planning Regulatory Provisions

The *Mackay, Isaac and Whitsunday Regional Plan 2012* (the Regional Plan) establishes the strategic direction for the region to 2031. As the pre-eminent plan for the region the regional plan takes precedence over all other planning instruments. The Regional Plan implements this strategy through a regional framework, Desired Regional Outcomes (DRO) and contains the Regional Plan State Planning Regulatory Provisions.

The proposed development is considered complementary to the regional framework and the DROs of the Regional Plan for the following reasons:

- The proposed development is located on a site with no known flooding, landslide or fire hazard mapping. The proposed development will assist in developing a sustainable regional economy and due to the temporary nature of the development it is not expected that climate change will have an impact;
- It will assist in diversifying the region's economy and provide employment opportunities;
- Quarry material from the proposed development will be used to construct "*infrastructure and services that meet the region's needs to support the economy*" (p.14) and accessibility;
- The development will be located in a currently disturbed environment and will limit impacts on the general environment;
- The development will facilitate the development of the region's natural resources, particularly the Carmichael Coal Mine and Rail Project which will provide rail access to the Galilee Basin;
- The surrounding ridgelines and points visible from public areas will be protected, therefore retaining the regional landscape; and
- The quarry will provide 8 – 10 on site jobs and potentially more than 30 haulage personnel. This complements the vision to develop a strong regional economy.

The proposed development is in the Regional Landscape and Rural Production Area of the Regional Plan. Although urban and residential uses are considered inappropriate in this area,

economic diversification is supported, including small-scale industrial development such as the Disney Quarry.

5.2 Local Planning Instruments

5.2.1 Belyando Shire Planning Scheme 2009

The proposed Disney Quarry is defined as 'Extractive Industry' under the *Belyando Shire Planning Scheme 2009* and is located within the Rural Zone. In accordance with Section 4.1.1 – Rural Zone Table of Assessment, an MCU for Extractive Industry is an impact assessable development to be assessed against all applicable codes.

5.2.1.1 Desired Environmental Outcomes

The *Belyando Shire Planning Scheme 2009* contains three Desired Environmental Outcomes (DEO), that set the strategic direction for the Shire. Given the scale and size of the proposal, together with the nature of the matters to be assessed, it is considered prudent to undertake an assessment against the relevant DEOs of the *Belyando Shire Planning Scheme 2009* to demonstrate that the proposal achieves the intent of the planning scheme.

Table 5-2 Assessment against Desired Environmental Outcomes

Desired Environmental Outcome	Assessment
The Natural Environment and Cultural Heritage	Under the DEO the ecological systems, natural environment and significant cultural heritage is to be protected and existing or intended landscape maintained. None of the ecologically significant sites listed in the DEO will be impacted by the development. As a result of historic and current grazing activities at the Disney Quarry site, the extent, connectivity and ecological integrity of vegetation communities and the fauna habitat they provide, have been altered. Nevertheless, the operations and extraction areas have been located to minimise impacts on the environment and management measures have been provided in Section 4. Therefore, it is considered that the proposal is consistent with this DEO.
Economic Development	The DEO states that the viability of the mining industry is to be protected and the economy of the area is to be diversified. In addition, natural resources are to be used suitably. The Disney Quarry development will be utilising a historic quarry area and it necessary of the construction of the Carmichael Coal Mine and Rail Project which will open up the Galille Basin to coal export opportunities. Therefore, it is considered that the proposal is consistent with this DEO.
Community Wellbeing	Under the DEO the towns of Moranbah and Clermont are retained as the primary employment centres for the Shire and provide the regions primary services. The towns are to maintain strong, connected and vibrant communities. The rural amenity and productive capacity of other parts of the Shire is to be maintained. The proposed development will increase demand for goods and services from the towns of Moranbah and Clermont, further establishing them as the primary service centres for the region. In addition, the quarry will be located in an unproductive area not classified as GQAL and the productive capacity of the surrounding agricultural land will be retained. Therefore, it is considered that the proposal is consistent with this DEO.

5.2.1.2 Rural Zone Code Assessment

The proposed Extractive Industry development is consistent with the outcomes for the Rural Zone Code (Section 4.1.2.2) particularly the following:

- *"The Rural 'Zone' retains its viability as an area of primary production and natural resource use, including mining."*
- *"Rural activities" and mining are appropriately located within the Rural "Zone" and are not prejudiced by inappropriate development."*
- *"Is located, designed and operated in a manner that protects and enhances the predominant rural scale, intensity, form and character"*
- *"Does not prejudice or impact adversely on other 'uses', particularly 'sensitive land uses', including those within other zones."*
- *"Has an appropriately designed access to the road network, and traffic generated by the development does not impact adversely on the local road network."*
- *"Does not adversely impact on areas and sites of conservation importance, including cultural and high landscape values."*

In accordance with the Rural Zone Code the following is an appropriate use:

- *"Extractive industries, where they are located and operated so as to ensure no unacceptable detrimental impact on surrounding uses or on the environment" [Section 4.1.2.2 (4) (b)].*

A review of development against the Performance Criteria and Acceptable Solutions for MCU in the Rural Zone has been undertaken. Where the proposed development does not comply with a Performance Criteria and Acceptable Solutions, alternative solutions have been proposed and are listed in Table 5-3.

Table 5-3 Alternative solutions

Performance Criteria	Acceptable Solutions
Amenity	
PC2 Non-"Rural Activities" - Scale Non-"rural activities" are of a scale that is consistent with the amenity and character of the locality and do not prejudice the operation and viability of other "uses" or activities in the Rural "Zone" or other "zones".	AS2 The "total use area" is less than 150m ² .
Alternative Solution – PC2	
The development is a non-rural activity and is considered consistent with the amenity and character of the locality. The total use area will be approximately 92.57 ha however due to its location (in the centre of two ridge lines) the development will not adversely impact the amenity of the surrounding area. Management measures to reduce light spillage, as well as prevent dust and noise impacts on surrounding sensitive receptors and the Gregory Development Road are outlined in Section 3. The location of the activity exceeds all minimum separation distances in schedule 2.	

Performance Criteria	Acceptable Solutions
PC3 Non-“Rural Activities” - Operating Hours Non-“rural activities” are operated so as to ensure that the activities and the operation of equipment occur at appropriate times to protect the amenity of the locality.	AS3 Non-“rural activities” are operated only between the hours of 7:00am and 6:00pm.
Alternative Solution – PC3 In order to maintain the Carmichael Coal Mine and Rail Project construction schedule the Disney Quarry is proposed to operate on a 24 hr basis. The location for the Extractive Industry is remote and the closest sensitive receptor is located approximately 2.1 km to the west of the proposed quarry pit. These residences will be screened from the quarry operations [located at 230 m AHD] by a ridge line that rises to 290 m AHD and runs in a general north-south direction (Figure 3-1). In addition, the proposed operation will be screened from the Gregory Development Road by two vegetated hills that rise to approximately 258 m AHD. The activities of the quarry at night will be minimised to essential operations only and management measures will implemented to avoid any potential noise and light impacts. Modelling of noise impacts at night during peak hour production demonstrates compliance can be met with EPP (Noise) criteria of health and wellbeing.	
PC4 Non-“Rural Activities” - Delivery of Goods The loading and unloading of goods in connection with non- “rural activities” occurs at appropriate times to protect the amenity of the locality.	AS4.1 Loading and unloading occurs only between the hours of: (a) 7:00am and 6:00pm, Monday to Friday; and (b) 7:00am and 12:00 (noon) on Saturdays. AS4.2 No loading and unloading occurs on Sundays and public holidays.
Alternative Solution – PC4 In order to maintain the Carmichael Coal Mine and Rail Project construction schedule the Disney Quarry is proposed to operate on a 24 hr basis. The location for the Extractive Industry is remote and the closest sensitive receptor is located approximately 2.1 km to the west of the proposed quarry pit. Modelling of noise impacts at night during peak hour production demonstrates compliance can be met with EPP (Noise) criteria of health and wellbeing. The activities of the quarry at night will be minimised to essential operations only and management measures will implemented to avoid any potential noise and light impacts.	
PC11 Landscaping and External Activity Areas Landscaping and external activity areas are provided on-site 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.	No acceptable solution is prescribed.
Alternative Solution – PC11 The development will be for an operating quarry and no permanent infrastructure is proposed. There will be a few hundred meters of vegetation between GRD and Quarry providing a natural screen. Therefore, landscaping is not considered necessary for the development. Possible landscaping of turn off area from Highway required (i.e. grassing).	
PC12 Lighting The design of lighting does not prejudice the amenity of the locality through poorly directed lighting, lighting overspill or lighting glare.	AS12 Direct lighting or lighting does not exceed 8.0 lux at 1.5 metres beyond the boundary of the site.

Performance Criteria	Acceptable Solutions
Alternative Solution – PC12	
Lighting will be directly focused on work fronts, access and amenities areas. Lighting will be provided by industry standard mobile light towers with four 1500 W halide lights with the ability to be directed towards the specific work area to prevent light spill from the boundary. The units are fitted with a fluid containment tray to prevent any environmental spills.	
Infrastructure	
PC14 Water Supply All “premises” have an adequate volume and supply of water for the “use”.	AS14.2 “Premises” are connected to an approved water allocation as provided by the relevant agency. or AS14.3 “Premises” are connected to a rain water tank with a minimum capacity of: (a) 45, 000 litres where not in a reticulated water supply area; (b) 22, 000 litres where in a reticulated water supply area.
Alternative Solution – PC14	
25,000L water tank on site to supply drinking water and ablution water. On site water for operations and dust suppression to be supplied by a water storage dams and sediment collection basins to collect overland flow from the quarry site.	
PC15 Effluent Disposal All “premises” provide for the treatment and disposal of effluent and other waste water to ensure the protection of public health and environmental values.	AS15.1 “Premises” are connected to Council’s reticulated Sewerage system. or AS15.2 “Premises” not in a sewered area have an on-site effluent disposal system in accordance with Schedule 1, Division 4: Standards for Sewerage Supply, Section 4.2.
Alternative Solution – PC15	
“Premises” not in a sewered area will have an on-site effluent disposal system in accordance with Schedule 1, Division 4: Standards for Sewerage Supply, Section 4.2.The on site sewage code (NRM) and the on site sewage facilities guidelines for effluent Quality (NRM) are no longer current documents. The site will comply with the AS1547.300 – On site Domestic –Wastewater management as this applies to systems dealing with up to 10 persons.	
PC19 Vehicle Parking and Service Vehicle Provision Vehicle parking and service vehicle provision is adequate for the “use” and ensures safe and functional operation for motorists and pedestrians.	AS19.1 All “uses” provide vehicle parking in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.2(1)(a). AS19.2 Car parking, service vehicle parking and manoeuvring areas are designed and constructed in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.2(1)(b).

Performance Criteria	Acceptable Solutions
Alternative Solution – PC19	
Under Schedule 1, Section 2.2 (1) (a) of the <i>Belyando Shire Planning Scheme 2009</i> , Industry uses (including Extractive Industry) must have 1 car parking space per 100m ² of total use area. The definition of ‘total use area’ would likely include all areas of the proposed development used for quarrying. To comply with the code for a 92.57 ha Extractive Industry activity would require an excessive number of car spaces. Adani will have 8 – 10 personnel on site at any one time. Workers will be transported from accommodation camps to the site by a mini bus and therefore vehicle parking need only accommodate mini bus and temporary visitors to site and as such proposes 4 car spaces, which will be segregated from the work and haul areas. This quantity of spaces will accommodate the workforce and no car parks for public vehicles are required.	
PC20 Roads Adequate all-weather road access is provided between the “premises” and the existing road network.	AS20 Roads are designed and constructed in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.1(1).
Alternative Solution – PC20	
Access road from the quarry will be directly to the rail haul road and will be designed for all weather access. The access roads will be hard patched gravel with a 9 m width.	
PC30 Excavation or Filling Excavating or filling of land: (a) ensures safety and amenity for the users of the “premises” and nearby land; (b) minimises soil erosion and instability of surrounding areas; and (c) does not degrade the environmental values of receiving waters	AS30.1 Batters have a maximum slope of 25%, are terraced at every rise of 1.5 metres and each terrace has a minimum depth of 750mm. AS30.3 The extent of filling or excavation does not exceed 40% of the site area or 500m ² whichever is lesser. AS30.4 Filling and excavation is not greater than 1 metre in height or depth.
Alternative Solution – PC30	
Not relevant to an extraction area, but is relevant to the development of site access roads. The extraction and filling for the access roads will meet AS30.1 and AS30.4. The access road will be 9 m wide and approximately 4000 m long, with an area of 36,000 m ² .	

Section 6 Conclusion

The Disney Quarry is proposed to be developed over 92.57 ha of generally disturbed land (grazing and quarry activities), approximately 144 km north-west of Clermont in Central Queensland. Disney Quarry is a large and topographically complex site that remains vegetated over much of its extent, however contains a significant amount of exotic species.

On site monitoring and surveys were carried out to assess the existing environment, the flora and fauna present, the existing background noise and air quality and the current road conditions and traffic movements.

Desktop analyses by field experts were undertaken for the flora and fauna, ecology, soils and geology, hydrogeology and traffic and transport.

The impact assessment has determined that the activity will be acceptable and no major or high risk impacts are likely. The main issues requiring careful management include:

- Weed control prior to development of the site to address Parthenium (and other weeds) presence;
- Careful management and noise controls of night time noise during the peak production month of May 2015 in unstable weather conditions to ensure noise limits are not exceeded; and
- Baseline monitoring of nearby groundwater bore and installation of groundwater bores to ensure there are no unexpected impacts to local groundwater.

The land use and planning assessment has established that the quarry is generally consistent with the requirements of the *Belyando Shire Planning Scheme 2009* and State Planning instruments.

In accordance with Australia's National Strategy for Ecologically Sustainable Development (1992), ecologically sustainable development is defined as *"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased"* (ESDSC, 1992). The Disney Quarry is proposed to be developed on a disturbed site and will be located to avoid Threatened Ecological Communities and areas of conservation significance. The Disney Quarry development seeks to appropriately utilise quarry resources for the construction of essential infrastructure to service the surrounding region. Comprehensive environment management controls will be enforced during construction and operation of the quarry and the ecological processes of the surrounding area will be maintained. The Disney Quarry will support the economy and employment in the local and wider region and is considered consistent with the principles of ecologically sustainable development.

Section 7 Bibliography

- Australian Government, 2009. *Australian Natural Resources Atlas: Groundwater Management Unit: Unincorporated Area- Bowen*. [Online]
Available at: <http://www.anra.gov.au/topics/water/overview/qld/gmu-unincorporated-area-bowen.html>
[Accessed 04 April 2013].
- Board, B. D. T., 2005. *Burdekin Dry Tropics Natural Resource Management Plan*. Townsville: Burdekin Dry Tropics Community.
- BOM, 2013. *Daily Rainfall - Clermont Post Office*. [Online]
Available at: <http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av>
[Accessed 19 February 2013].
- BOM, 2013. *Groundwater Dependant Ecosystems Atlas*. [Online]
Available at: www.bom.gov.au/water/groundwater/gde/
[Accessed 24 April 2013].
- Cardno, 2012. *Carmichael Coal Mine & Rail Project - Quarry Geotechnical Investigations*, s.l.: s.n.
- Department of Environment and Heritage Protection, 2004. *Planning for Noise Control Guideline*. [Online]
Available at: <http://www.ehp.qld.gov.au/register/p01369aa.pdf>
[Accessed 13 March 2013].
- Department of Environment and Heritage Protection, 2012. *Koala-sensitive Design Guideline: A guide to koala-sensitive design measures for planning and development activities*, Brisbane: Queensland Government.
- Dight, I., 2009. *Burdekin Water Quality Improvement Plan*. Townsville: NQ Dry Tropics.
- Dique DS, P. H. T. J. a. V. D., 2004. Determining the distribution of a regional koala population in south-east Queensland for conservation management. *Wildlife Research*, Volume 31, pp. 109-117.
- Eds, S. P. a. W. R., 1999. *The Conservation Status of Queensland's Bioregional Ecosystems*. Brisbane: Environmental Protection Agency.
- ESDSC, E. S. D. S. C., 1992. *National Strategy for Ecologically Sustainable Development*, Canberra: Australian Government.
- GHD, 2012. *Carmichael Coal Mine and Rail EIS - Rail Hydrogeology Report*, s.l.: s.n.
- GHD, November 2012. *Carmichael Coal Mine and Rail Project*. s.l.: Adani Mining Pty Ltd.
- NLWRA, 2002. *Australian Catchment: River and Estuary Assessment 2002*. Canberra: National Land and Water Resource Audit.
- NRM, 2002. *Burdekin Basin Draft Water Resource Plan: Water Supply Planning Study Report*. Brisbane: Department of Natural Resources and Mines.
- Olgers, F., 1970. *Buchanan Queensland*, Canberra: Bureau of Mineral Resources, Geology and Geophysics.
- Roth CH, L. G. a. C. D., 2002. *Overview of the Key Natural Resource Management Issue in the Burdekin Catchment, with particular reference to Water Quality and Salinity – Burdekin Catchment Condition Study Phase 1*. Townsville: CSIRO Land and Water.

Twaltes, M. a., 1993. *Understanding and Managing Soils in the Central Highlands*, Brisbane: Department of Primary Industries Training Series QE93002.

VIPAC, 2013. *Disney Quarry Noise Assessment*, s.l.: unpublished.

Section 8 Acronyms and Abbreviations

Acronym/Abbreviation	Description
AAPT	Adani Abbot Point Terminal Pty Ltd
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
AHD	Australian Height Datum
AMU	Agricultural Management Unit
BOR	Bureau of Meteorology
CBR	California Bearings Ratio
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Decibels
DEO	Desired Environmental Outcome
DPI	Department of Primary Industries (DPI)
DRO	Desired Regional Outcome
DTMR	Department of Transport and Main Roads (Qld)
EC	Electrical Conductivity
EHP	Department of Environment and Heritage Protection (Qld)
EIS	Environmental Impact Statement
EMR	Environment Management Register
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPC	Exploration Permit for Coal
EP Regulation	<i>Environmental Protection Regulation 2008</i>
EPP	Environmental Protection Policy
ERA	Environmentally Relevant Activity
ERP	Emergency Response Plan
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater Dependant Ecosystem
GMU	Groundwater Management Unit
GQAL	Good Quality Agricultural Land
ha	Hectare
IDAS	Integrated Development Assessment System
ILUA	Indigenous Land Use Agreement
IRC	Isaac Regional Council
km	Kilometre (s)
kVA	Kilo Volt Amperes
LRA	Land Resource Area
LT Act	<i>Land Title Act 1994</i>
m	Metre (s)
m ³	Cubic Metres
mbgl	Metres Below Ground Level
MCU	Material Change of Use
MLA	Mine Lease Application
MQSH Act	<i>Mining and Quarry Safety and Health Act 1999</i>
Mtpa	Million Tonnes Per Annum
NC Act	<i>Nature Conservation Act 1992</i>
NNTR	National Native Title Register
NRM	Department of Natural Resources and Mine (Qld)
PMAV	Property Map of Assessable Vegetation
PVMP	Property Vegetation Management Plan
QH Act	<i>Queensland Heritage Act 1992</i>
RE	Regional Ecosystem
RN	Registered Number

Acronym/Abbreviation	Description
SARA	State Assessment and Referral Agency
SCL	Strategic Cropping Land
SCR	State Controlled Road
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i>
SP Act	<i>Sustainable Planning Act 2009</i>
SP Regulation	<i>Sustainable Planning Regulation 2009</i>
SPP	State Planning Policy
SWL	Standing Water Level
SWMP	Stormwater Management Plan
t	Tonnes
TEC	Threatened Ecological Community
TDS	Total Dissolved Solids
TMR	Department of Transport and Main Roads (Qld)
UA	Unincorporated Area
µS/cm	Microsiemens per centimetre
VM Act	<i>Vegetation Management Act 1999</i>
VPD	Vehicles Per Day
WRP	<i>Water Resource (Burdekin Basin) Plan 2007</i>

Appendix A - Adani Environment and Sustainability Policy

Adani Mining Pty Ltd

Environment and Sustainability Policy

Adani Mining Pty Ltd is an environmentally responsible company that is committed to protection of the environment and to the sustainable management of its operations and activities.

We will achieve this by:

- Promoting engagement, participation and a culture of innovation;
- Encouraging the efficient use of water and energy, recycling of materials, reduction of waste and prevention of pollution;
- Improving our management of greenhouse emissions and energy efficiency;
- Implementing and maintaining an Environmental Management System in accordance with AS/NZS ISO 14001;
- Meeting or exceeding environmental legislation and other criteria to which we subscribe;
- Completing regularly reviews of our environmental performance and identify and implement opportunities for improvement;
- Motivating and influencing our suppliers and subcontractors with our approach towards responsible environmental practice;
- Promoting initiatives, systems, values and behaviours that drive environmental sustainability;
- Displaying strong leadership in environmental management internally and within the industries we operate; and
- Provide a positive environmentally friendly working environment.

We all have an accountability and responsibility to:

- Immediately report and remediate any damage, spills or loss of containment;
- Follow all environment and sustainability work practices, procedures, instructions and rules;
- Work in a manner which ensures minimal environmental impact;
- Encourage other employees to work in a responsible manner; and
- Participate in training.



Samir Vora
Chief Operating Officer

Date: 24th May 2012

Appendix B - PMAV

environmental management



Disney Quarry Complex PMAV

Gregory Development Road, Clermont

6550
3 May 2013
Adani Mining Pty Ltd





Document Control

Title	Disney Quarry Complex PMAV
Address	Gregory Development Road, Clermont
Job Number	6550
Client	Adani Mining Pty Ltd

Document Issue

Issue	Date	Prepared By	Checked By
Draft	08.04.2013	Dr Andrew Davies	Ross Marshall
Internal Review	10.04.2013	Dr Andrew Davies	Ross Marshall
Client Issue	11.04.2013	Dr Andrew Davies	Ross Marshall
Final	03.05.2013	Dr Andrew Davies	Murray Saunders

Disclaimer

This report has been prepared for **Adani Mining Pty Ltd**. **Saunders Havill Group** cannot accept responsibility for any use of or reliance upon the contents of this report by any third party.

Reports and/or Plans by Others

Reports and/or plans by others may be included within this PMAV report to support the document.



Table of Contents

1. Introduction	4
1.1. Report Purpose	5
2. Methodology	8
2.1. Desktop Research	8
2.2. Vegetation Survey Methodology	8
2.3. Scale	9
3. Desktop Analysis	10
3.1. Geology & Soils Mapping	10
3.2. Regional Ecosystem Mapping	13
3.3. Pre Clear Mapping	16
3.4. Regrowth Mapping	19
4. Field Survey	20
4.1. Summary	20
4.2. Zone 1	23
4.3. Zone 2	33
4.4. Zone 3	43
5. Proposed PMAV	50



Figures

- Figure 1: Site Context
- Figure 2: Site Aerial
- Figure 3: Geology Mapping
- Figure 4: Soils Mapping
- Figure 5: Regional Ecosystem Mapping
- Figure 6: Pre Clear Mapping
- Figure 7: Site Zones

Tables

- Table 1: Property Summary
- Table 2: Summary of RE Status
- Table 3: Vegetation Transect 1 – Lot 4 SP116046 – Disney Quarry
- Table 4: Vegetation Transect 2 – Lot 4 SP116046 – Disney Quarry
- Table 5: Vegetation Transect 3 – Lot 4 SP116046 – Disney Quarry
- Table 6: Vegetation Transect 4 – Lot 4 SP116046 – Disney Quarry
- Table 7: Vegetation Transect 5 – Lot 4 SP116046 – Disney Quarry
- Table 8: Vegetation Transect 6 – Lot 4 SP116046 – Disney Quarry
- Table 9: Vegetation Transect 7 – Lot 4 SP116046 – Disney Quarry
- Table 10: Vegetation Transect 8 – Lot 4 SP116046 – Disney Quarry

Plans

- Plan 1: Proposed PMAV



I. Introduction

The *Environmental Management Division* of the **Saunders Havill Group** was engaged by **Adani Mining Pty Ltd** to prepare a *Complex Property Map of Assessable Vegetation* (PMAV) application for the proposed quarry on the Disney property, Gregory Development Road, Clermont. The purpose of the Disney Quarry is to provide embankment material for the Carmichael Coal Mine and Rail Project, a 'significant project' under the *State Development and Public Works Organisation Act 1971*. This Complex PMAV application has been prepared as per the requirements outlined within the *Application Kit for a Property Map of Assessable Vegetation (2004)* and the *Vegetation Management Act 1999* (VMA) and is intended to rectify mapped Regional Ecosystems at the property scale.

The lot covers 47,600 ha, while the proposed Disney Quarry site encompasses an area of approximately 92.57 ha. The mapped polygons addressed in this PMAV cover an area of approximately 246 ha. Contextually, the assessment site is located approximately 144 kilometres North-West of Clermont (Refer to **Figures 1 & 2**). The surrounding land use is rural.

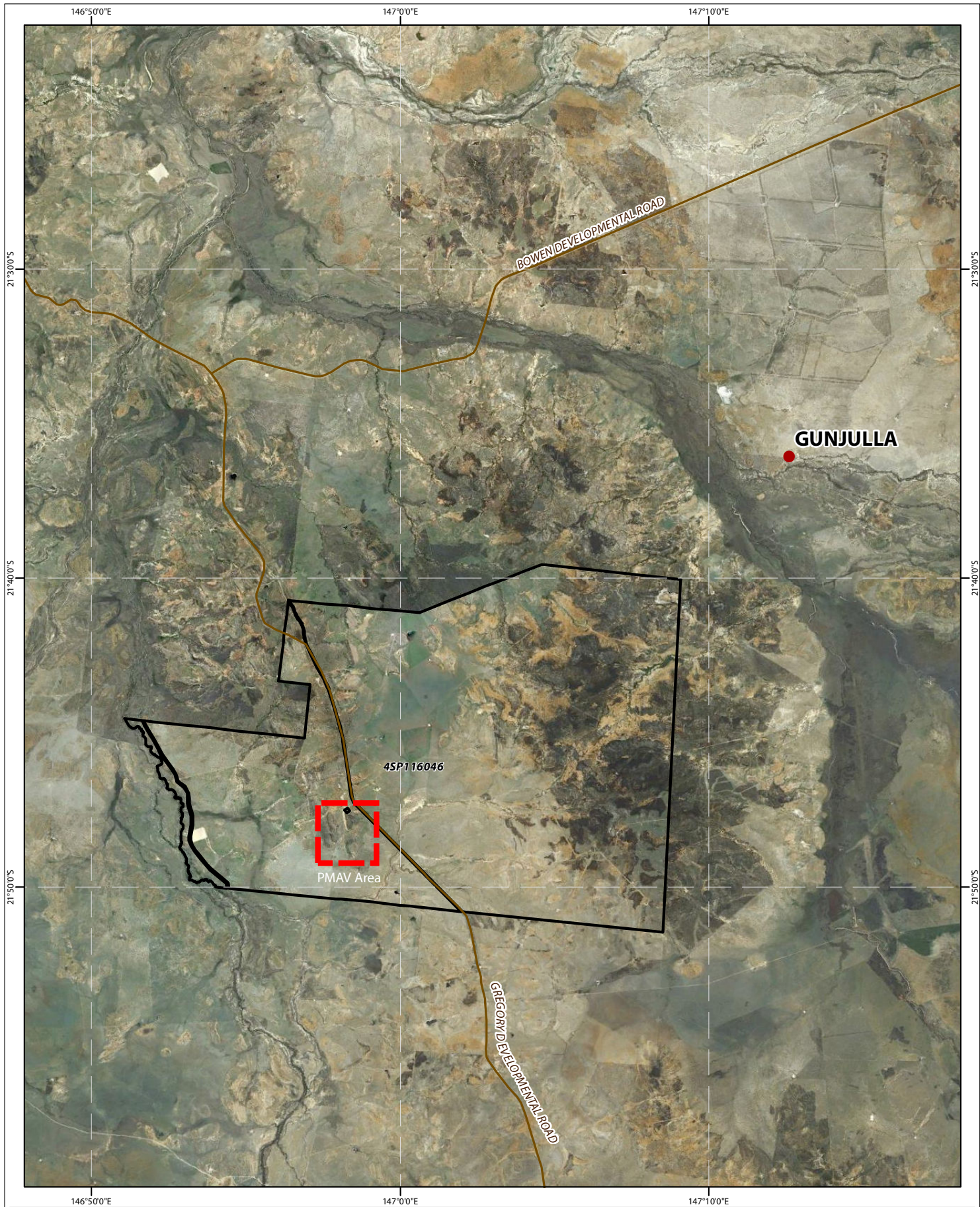
Table 1: Property Summary

Address	Gregory Development Road, Clermont
RPD	Lot 4 on SP116046
Area Addressed by PMAV	Approximately 246 ha
Local Government Area	Isaac Regional Council
Planning Scheme	<i>Belyando Shire Planning Scheme 2009</i>
Local Plan Zoning	Rural
VMA 1999	Least Concern RE 11.11.15 Composite Endangered • Of Concern RE 11.4.6 • Endangered RE 11.4.8 • Endangered RE 11.4.9 • Least Concern RE 11.3.10
Topography	Gentle Undulating Rise
Existing Land Use	Rangelands
Proposed Land Use	Quarry / Extraction
Land Tenure	Leasehold
Previous PMAV Applications	NA



I.I. Report Purpose

The purpose of this report is to provide supporting evidence for the submitted PMAV. The PMAV redefines the presence of mapped remnant communities on a section of the property and accurately delineates the true boundary of each of these communities at the property scale. The information within this report provides evidence to demonstrate that all categories and/or Regional Ecosystem codes assigned to the submitted PMAV are accurate.



Legend

- Town / Place Name
- Major Roads
- Lot 4 on SP116046

Figure 1 Site Context

File ref. 6550 E 01 Aerial Site Context A

Date 10/04/2013

Project Carmichael Coal Rail Project

0 1 2 4 6 8 10 km
Scale (A4): 1:300,000 [GDA 1994 MGA Z55]



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Legend



Figure 2 Site Aerial

File ref. 6550 E 01 Site Aerial A

Date 10/04/2013

Project Carmichael Coal Rail Project

0 50 100 200 300 400 500 m
Scale (A4): 1:15,597 [GDA 1994 MGA Z55]



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2. Methodology

A detailed site assessment was conducted to accurately map and define vegetation into categories as defined by the **Queensland Herbarium**. The applied methodology was designed to ensure an accurate delineation of the separate polygons and ensure all supporting information responds to the requirements of a properly made PMAV submission. The following steps were undertaken:

1. Desktop Research
 - Existing environmental studies undertaken on the surrounding lots by **Saunders Havill Group**
 - Regional Ecosystem species lists
 - Soil maps
2. Review of Historical Aerial Photography
3. Vegetation Survey
4. GPS Mapping of Vegetation Communities

2.1. Desktop Research

Prior to entering the site, the following vegetation based information resources were assessed to assist in the final determination of the on-site survey methodology:

- Existing vegetation mapping released under the provisions of the *Vegetation Management Act 1999* and Regional Ecosystem descriptions.
- Review of the **Queensland Herbarium** mapping methodology and procedures outlined in Neldner, V.J., Wilson, B.A., Thompson, E.J. and Dillewaard, H.A. (*Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*).
- Environmental Database Searches for the *Environment Protection and Biodiversity Conservation Act 1999*.
- Applicable Schedules of the *Nature Conservation (Wildlife) Regulation 1994*.
- Geology (250K), Soils and Topographical Maps.
- Specific **Queensland Herbarium** searches for records of unknown or specific vegetation species listed to occur in the region.
- Previous complex PMAV applications in the locality.

2.2. Vegetation Survey Methodology

Following the broad delineation of vegetation communities using historical aerial photography and information obtained in the desktop review (including stereoscopic analysis), a detailed vegetation survey was conducted to locate, describe and map the Regional Ecosystem polygons located on-site.

Standard Vegetation Transects (Form D) were utilised to evaluate vegetation status in the field. All mapping data were collected using a Trimble GEO-XT with sub 1 m accuracy. (Refer to **Plan 1** for Proposed PMAV Plan).



2.3. Scale

Spot 5 Imagery and aerial photography have been used to delineate the correct remnant boundary line-work. The remnant vegetation polygon was traversed and logged using a Trimble GEO-XT sub 1 m accurate GPS unit. The PMAV has been completed at a scale of 1:5000.



3. Desktop Analysis

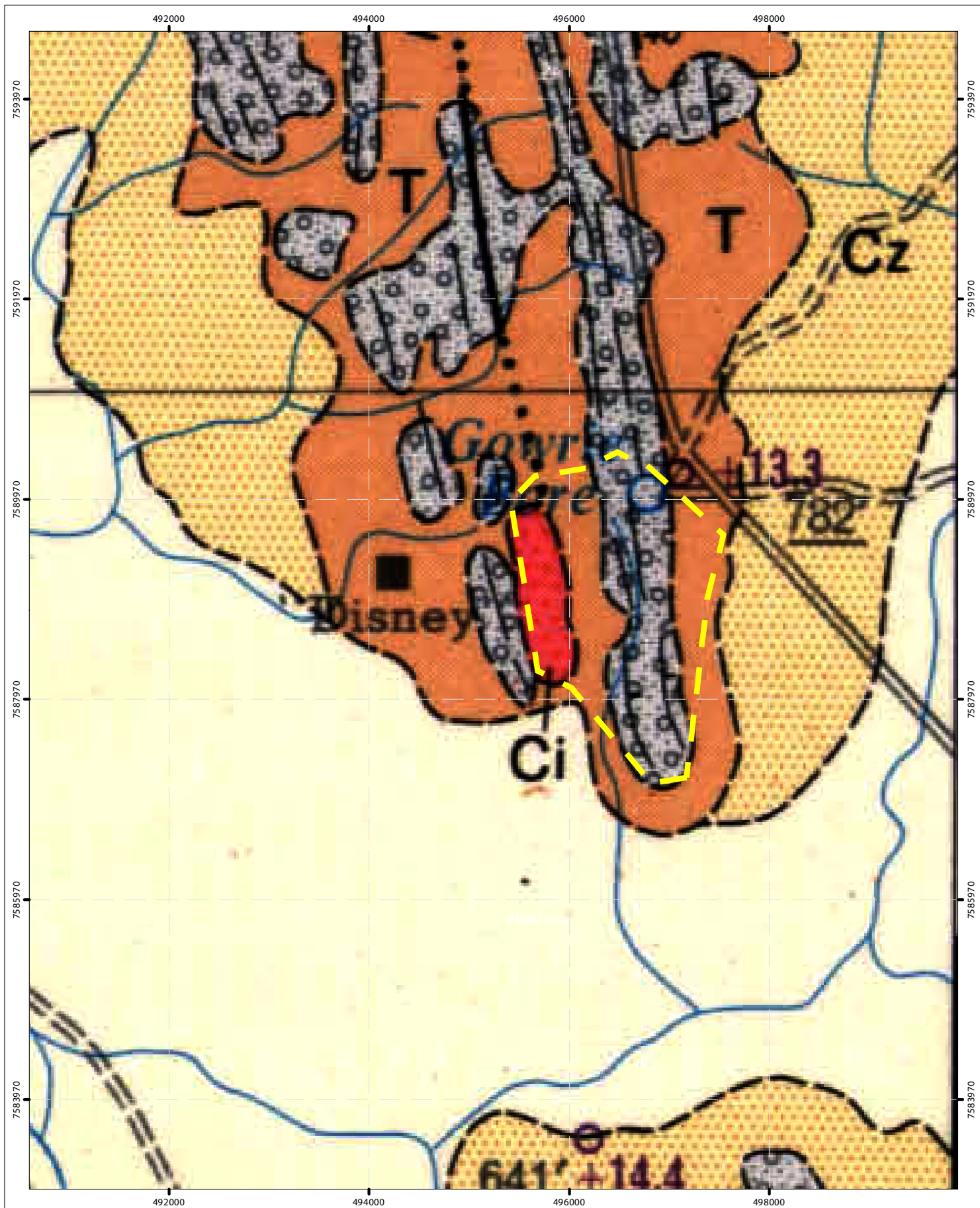
3.1. Geology & Soils Mapping

Geology mapping overlays elevated areas of the quarry site as 'Pebbly quartz, sandstone, quartz sandstone, conglomerate, minor mudstone and lithic sandstone - Clh' and lower areas as 'Agrillaceous sandstone, frequently lateralised - T' and 'Granite, quartz-feldspar porphyry, minor rhyolite - Ci' (**Figure 3**). Cz and T refer to relatively recent Cainozoic Tertiary deposits. Clh formations are part of the *Mount Hall Formation* of quartzose to feldspathic sublabile sandstone, quartz-pebble conglomerate, mudstone and red and green siltstone formed in the Lower Carboniferous.

Soil mapping indicates the quarry site is predominantly made up of Kandosols (**Figure 4**). Kandosols are described as;

Kandosols- structure-less soils

Kandosols are mostly well-drained, permeable soils although some Yellow and most grey Kandosols have impeded subsoil drainage. They are common in all states except Victoria and Tasmania but are most widespread in the arid and semi-arid interior. Kandosols are used for extensive agriculture in the wheatbelt of southern New South Wales and southwest Western Australia. In the better watered areas they are used for a range of horticultural crops. Most Kandosols have low fertility and land use is restricted to grazing of native pastures. Grazing lands are susceptible to surface soil degradation such as hardsetting and crusting even though grazing intensity is low.



Legend

- T Argillaceous sandstone, frequently lateritised
- Ci Granite, quartz-feldspar porphyry, minor rhyolite
- Cz Pebbly quartz, sandstone, quartz sandstone, conglomerate, minor mudstone and lithic sandstone

Figure 3 Geology Mapping

File ref. 6550 E 03 Geology A

Date 10/04/2013

Project Carmichael Coal Rail Project

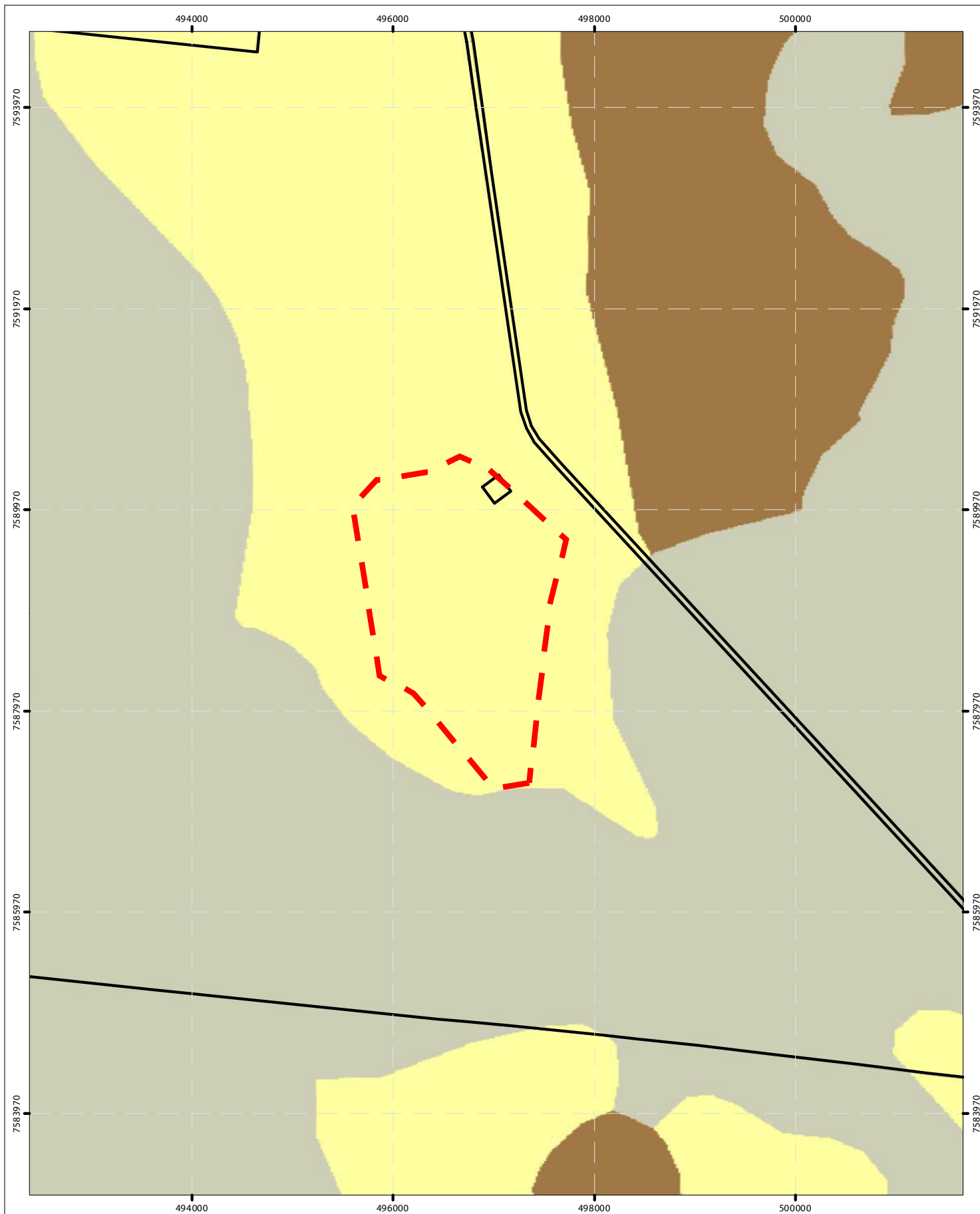
0 0.5 1 2 km
Scale (A4): 1:50,000 [GDA 1994 MGA Z55]



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Legend

-  Isaac DCDB
-  Kandosols
-  Vertosols

Figure 4 Soils Mapping

File ref. 6550 E 04 PMAV Soils A

Date 10/04/2013

Project Carmichael Coal Rail Project

0 0.5 1 2 km

Scale (A4): 1:50,000 [GDA 1994 MGA Z55]



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3.2. Regional Ecosystem Mapping

The quarry site is overlayed by *Regional Ecosystem and Remnant Mapping Version 6.1* with a remnant vegetation polygon comprised of Least Concern Regional Ecosystem 11.11.15 (100%) bordered by a polygon with composite Endangered Regional Ecosystem RE 11.4.6 (80%) / 11.4.8 (10%) / 11.4.9 (5%) / 11.3.10 (5%) (**Figure 5**).

RE 11.11.15 – Least Concern

Description	<i>Eucalyptus crebra</i> +/- <i>Corymbia erythrophloia</i> +/- <i>E. populnea</i> +/- <i>E. melanophloia</i> +/- <i>C. tessellaris</i> +/- <i>C. clarksoniana</i> woodland often with a shrubby layer. <i>Eucalyptus exserta</i> and <i>E. platyphylla</i> present in central coastal part of bioregion. Occurs on undulating rises and low hills, often with distinct strike pattern formed on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics and Permian sediments. (BVG1M: 13c). Major vegetation communities include: 11.11.15a: <i>Eucalyptus crebra</i>, <i>E. exserta</i> woodland. (BVG1M: 13c). 11.11.15b: <i>Eucalyptus drepanophylla</i> and/or <i>E. platyphylla</i> woodland +/- vine thicket species. (BVG1M: 13c). 11.11.15c: Woodland with <i>Corymbia setosa</i> present to dominant, usually with <i>Corymbia clarksoniana</i>, <i>Eucalyptus melanophloia</i>, <i>Corymbia dallachiana</i> and <i>Eucalyptus crebra</i>, with occasional shrubs of <i>Petalostigma pubescens</i> and <i>Alphitonia excelsa</i>. (BVG1M: 13c). 11.11.15d: Woodland with <i>Corymbia setosa</i> present to dominant, usually with <i>Corymbia clarksoniana</i>, <i>Eucalyptus melanophloia</i>, <i>Corymbia dallachiana</i> and <i>Eucalyptus crebra</i>, with occasional shrubs of <i>Petalostigma pubescens</i> and <i>Alphitonia excelsa</i>. Occurs on low rises and short hills derived from Devonian-Carboniferous sediments (mainly conglomerates in Beresford Stn). Associated soils are hard gravelly to stony, (BVG1M: 13c).
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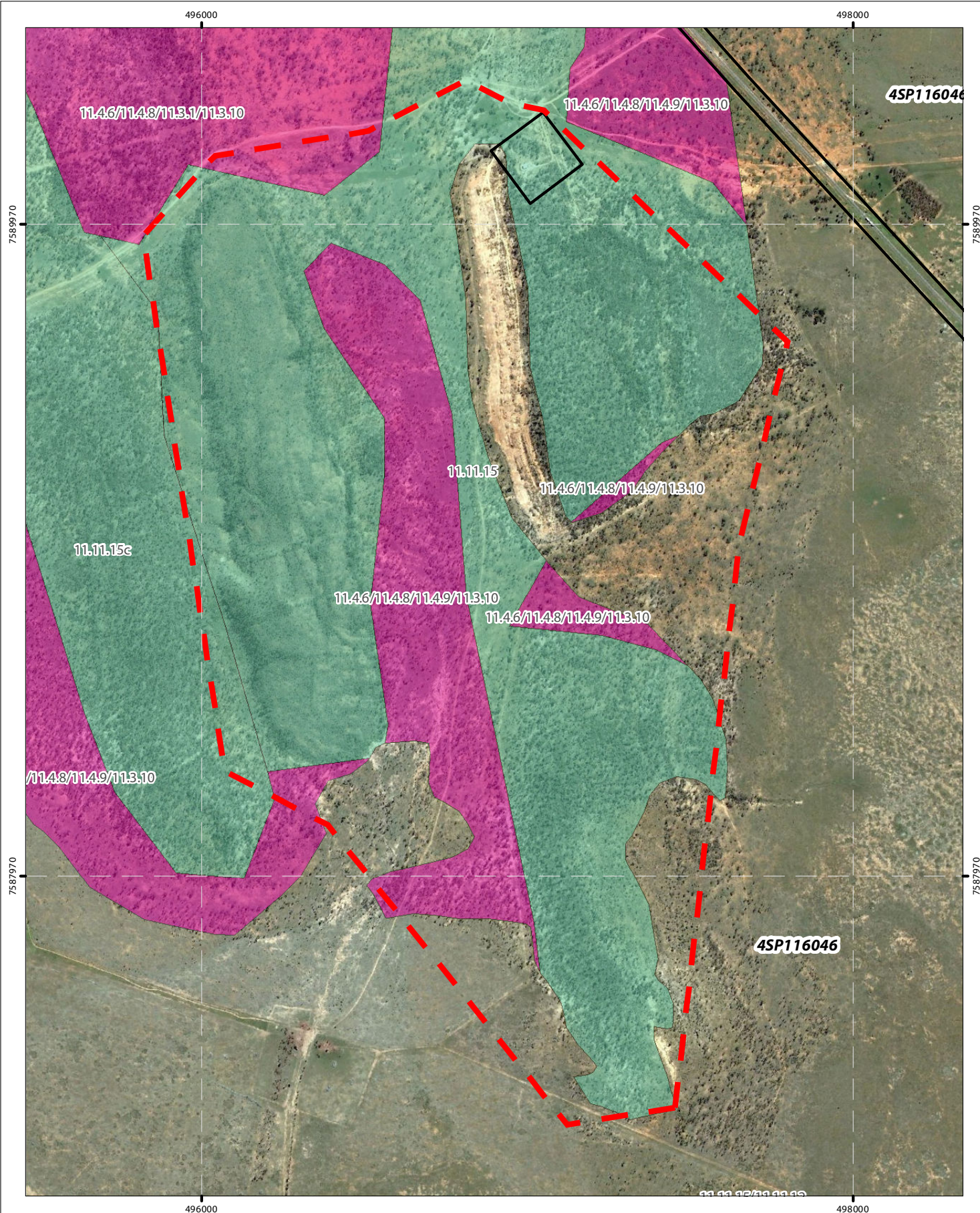
RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 - Endangered

Description	RE 11.4.6 – Of Concern: <i>Acacia cambagei</i> dominates the tree canopy (10-13 m high). There is a sparse to open low tree layer (7-9 m high) dominated by <i>Lysiphyllum carronii</i>, <i>Geijera parviflora</i>, <i>Acacia harpophylla</i>, and sometimes <i>A. argyrodendron</i>, <i>Terminalia oblongata</i>, and <i>Eremophila mitchellii</i>. An open shrub layer (1m high) dominated by species such as <i>Carissa ovata</i>, <i>Capparis lasiantha</i>, <i>Eremophila deserti</i>, <i>Apophyllum anomalum</i> and <i>Alectryon diversifolius</i> is also often present. The ground layer is sparse to open and dominated by grasses. Occurs on gently undulating plains formed from Cainozoic sediments. Associated soils are texture contrast with thin sandy or loamy surface horizons and strongly alkaline clay subsoils. (BVG1M: 26a)
Description	RE 11.4.8 – Endangered: Woodland to open-forest dominated by <i>Eucalyptus cambageana</i> and <i>Acacia harpophylla</i> or, sometimes in the north, <i>A. argyrodendron</i>. <i>E. thozetiana</i> is sometimes present on shallower soils. There is a moderately dense low tree layer (5 m high) layer dominated by species such as <i>Eremophila mitchellii</i> and a low shrub layer (2 m high) dominated by species such as <i>Carissa ovata</i> and <i>Geijera parviflora</i>. Occurs on level to gently undulating plains formed from Cainozoic deposits. Associated soils are usually deep texture contrast with thin loamy or sandy surface horizons overlying strongly alkaline clay subsoils. Surface or subsurface gravel is common. (BVG1M: 25a). Major vegetation communities include: 11.4.8a: Palustrine wetland (e.g. vegetated swamp). Gilgai and small depressions on clay plains usually associated with <i>Acacia harpophylla</i> ecosystems. Generally support a range of sedges, grasses and, when wet, aquatic species. (BVG1M: 34d)



Description	RE 11.4.9 – Endangered: Open-forest, occasionally woodland, dominated by <i>Acacia harpophylla</i> usually with a low tree mid-storey of <i>Terminalia oblongata</i> and <i>Eremophila mitchellii</i>. <i>Casuarina cristata</i> sometimes replaces <i>Acacia harpophylla</i> in the overstorey and <i>Lysiphyllum cunninghamii</i> sometimes co-dominates. Other low tree or shrub species such as <i>Alectryon diversifolius</i>, <i>Carissa ovata</i>, <i>Pittosporum spinescens</i>, <i>Ehretia membranifolia</i>, <i>Geijera parviflora</i> and <i>Flindersia dissosperma</i> may occur in the mid-storey or low shrub layer. <i>Acacia harpophylla</i> trees have been recorded as 11- 17 m high, the mid-storey layer 2- 8 m high and the low shrub layer 1-2 m high. Occurs on level to gently undulating Cainozoic plains, including weathered basalt. Associated soils are predominantly moderately deep to deep cracking clays that may be brown, red-brown or grey-brown, and with much surface gravel in some areas. (BVG1M: 25a). Major vegetation communities include: 11.4.9a: <i>Acacia harpophylla</i>, <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open-forest to woodland. (BVG1M: 25a). 11.4.9b: <i>Acacia harpophylla</i>, <i>Eucalyptus thozetiana</i> (sometimes <i>E. cambageana</i>) open-forest to woodland. (BVG1M: 25a).
Description	RE 11.3.10 – Least Concern: <i>Eucalyptus brownii</i> grassy woodland. This unit usually occurs as a woodland of <i>Eucalyptus brownii</i>. There is usually a grassy ground layer of <i>Aristida</i> spp., <i>Chloris</i> spp., <i>Fimbristylis dichotoma</i>, <i>Eriachne</i> spp., <i>Eragrostis</i> spp. and <i>Chrysopogon fallax</i>. Areas subject to less intensive grazing or on better soils contain <i>Heteropogon contortus</i>, <i>Bothriochloa bladhii</i> and <i>Chrysopogon fallax</i>. Occurs on Cainozoic alluvial plains. (BVG1M: 17a). Major vegetation communities include: 11.3.10a: Palustrine wetland (e.g. vegetated swamp). <i>Eucalyptus brownii</i> on closed depressions Occurs on closed depressions (BVG1M: 17a). 11.3.10b: Floodplain (other than floodplain wetlands). <i>Eucalyptus brownii</i> on floodplains (BVG1M: 17a).

When considering Regional Ecosystem mapping it should be noted that the mapping is compiled at a scale of 1:50,000 which may produce inaccuracies at the property scale.



Legend

DCDB

Regional Ecosystem v6.1

Remnant vegetation containing Endangered REs

Remnant vegetation containing Of Concern REs

Remnant vegetation that is a Least Concern RE

Figure 5 Regional Ecosystem v6.1

File ref. 6550 E05 REA

Date 8/05/2013

Project Carmichael Coal Rail Project

0 50 100 200 300 400 500 m
Scale (A4): 1:15,500 [GDA 1994 MGA Z55]



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3.3. Pre Clear Mapping

The quarry site is overlaid by *Pre Clear Mapping* with a polygon comprised of Not Of Concern Regional Ecosystem 11.11.15 bordered by composite Endangered Sub-Dominant Regional Ecosystem RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 (**Figure 6**).

RE 11.11.15 – Least Concern

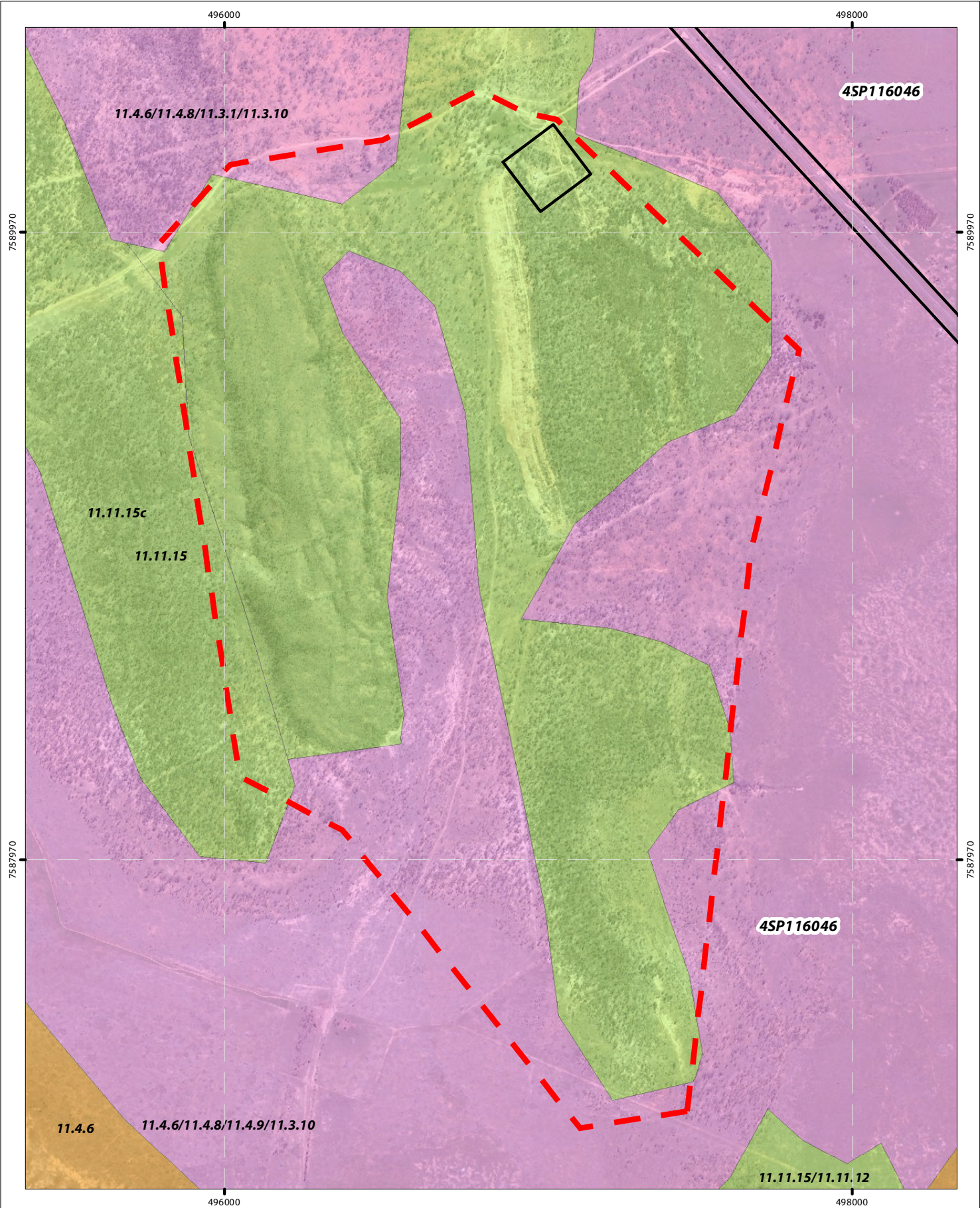
Description	<i>Eucalyptus crebra</i> +/- <i>Corymbia erythrophloia</i> +/- <i>E. populnea</i> +/- <i>E. melanophloia</i> +/- <i>C. tessellaris</i> +/- <i>C. clarksoniana</i> woodland often with a shrubby layer. <i>Eucalyptus exserta</i> and <i>E. platyphylla</i> present in central coastal part of bioregion. Occurs on undulating rises and low hills, often with distinct strike pattern formed on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics and Permian sediments. (BVG1M: 13c). Major vegetation communities include: 11.11.15a: <i>Eucalyptus crebra</i>, <i>E. exserta</i> woodland. (BVG1M: 13c). 11.11.15b: <i>Eucalyptus drepanophylla</i> and/or <i>E. platyphylla</i> woodland +/- vine thicket species. (BVG1M: 13c). 11.11.15c: Woodland with <i>Corymbia setosa</i> present to dominant, usually with <i>Corymbia clarksoniana</i>, <i>Eucalyptus melanophloia</i>, <i>Corymbia dallachiana</i> and <i>Eucalyptus crebra</i>, with occasional shrubs of <i>Petalostigma pubescens</i> and <i>Alphitonia excelsa</i>. (BVG1M: 13c). 11.11.15d: Woodland with <i>Corymbia setosa</i> present to dominant, usually with <i>Corymbia clarksoniana</i>, <i>Eucalyptus melanophloia</i>, <i>Corymbia dallachiana</i> and <i>Eucalyptus crebra</i>, with occasional shrubs of <i>Petalostigma pubescens</i> and <i>Alphitonia excelsa</i>. Occurs on low rises and short hills derived from Devonian-Carboniferous sediments (mainly conglomerates in Beresford Stn). Associated soils are hard gravelly to stony, (BVG1M: 13c).
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RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 - Endangered

Description	RE 11.4.6 – Of Concern: <i>Acacia cambagei</i> dominates the tree canopy (10-13 m high). There is a sparse to open low tree layer (7-9 m high) dominated by <i>Lysiphyllum carronii</i>, <i>Geijera parviflora</i>, <i>Acacia harpophylla</i>, and sometimes <i>A. argyrodendron</i>, <i>Terminalia oblongata</i>, and <i>Eremophila mitchellii</i>. An open shrub layer (1m high) dominated by species such as <i>Carissa ovata</i>, <i>Capparis lasiantha</i>, <i>Eremophila deserti</i>, <i>Apophyllum anomalum</i> and <i>Alectryon diversifolius</i> is also often present. The ground layer is sparse to open and dominated by grasses. Occurs on gently undulating plains formed from Cainozoic sediments. Associated soils are texture contrast with thin sandy or loamy surface horizons and strongly alkaline clay subsoils. (BVG1M: 26a)
Description	RE 11.4.8 – Endangered: Woodland to open-forest dominated by <i>Eucalyptus cambageana</i> and <i>Acacia harpophylla</i> or, sometimes in the north, <i>A. argyrodendron</i>. <i>E. thozetiana</i> is sometimes present on shallower soils. There is a moderately dense low tree layer (5 m high) layer dominated by species such as <i>Eremophila mitchellii</i> and a low shrub layer (2 m high) dominated by species such as <i>Carissa ovata</i> and <i>Geijera parviflora</i>. Occurs on level to gently undulating plains formed from Cainozoic deposits. Associated soils are usually deep texture contrast with thin loamy or sandy surface horizons overlying strongly alkaline clay subsoils. Surface or subsurface gravel is common. (BVG1M: 25a). Major vegetation communities include: 11.4.8a: Palustrine wetland (e.g. vegetated swamp). Gilgai and small depressions on clay plains usually associated with <i>Acacia harpophylla</i> ecosystems. Generally support a range of sedges, grasses and, when wet, aquatic species. (BVG1M: 34d)



Description	RE 11.4.9 – Endangered: Open-forest, occasionally woodland, dominated by <i>Acacia harpophylla</i> usually with a low tree mid-storey of <i>Terminalia oblongata</i> and <i>Eremophila mitchellii</i>. <i>Casuarina cristata</i> sometimes replaces <i>Acacia harpophylla</i> in the overstorey and <i>Lysiphyllum cunninghamii</i> sometimes co-dominates. Other low tree or shrub species such as <i>Alectryon diversifolius</i>, <i>Carissa ovata</i>, <i>Pittosporum spinescens</i>, <i>Ehretia membranifolia</i>, <i>Geijera parviflora</i> and <i>Flindersia dissosperma</i> may occur in the mid-storey or low shrub layer. <i>Acacia harpophylla</i> trees have been recorded as 11- 17 m high, the mid-storey layer 2- 8 m high and the low shrub layer 1-2 m high. Occurs on level to gently undulating Cainozoic plains, including weathered basalt. Associated soils are predominantly moderately deep to deep cracking clays that may be brown, red-brown or grey-brown, and with much surface gravel in some areas. (BVG1M: 25a). Major vegetation communities include: 11.4.9a: <i>Acacia harpophylla</i>, <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open-forest to woodland. (BVG1M: 25a). 11.4.9b: <i>Acacia harpophylla</i>, <i>Eucalyptus thozetiana</i> (sometimes <i>E. cambageana</i>) open-forest to woodland. (BVG1M: 25a).
Description	RE 11.3.10 – Least Concern: <i>Eucalyptus brownii</i> grassy woodland. This unit usually occurs as a woodland of <i>Eucalyptus brownii</i>. There is usually a grassy ground layer of <i>Aristida</i> spp., <i>Chloris</i> spp., <i>Fimbristylis dichotoma</i>, <i>Eriachne</i> spp., <i>Eragrostis</i> spp. and <i>Chrysopogon fallax</i>. Areas subject to less intensive grazing or on better soils contain <i>Heteropogon contortus</i>, <i>Bothriochloa bladhii</i> and <i>Chrysopogon fallax</i>. Occurs on Cainozoic alluvial plains. (BVG1M: 17a). Major vegetation communities include: 11.3.10a: Palustrine wetland (e.g. vegetated swamp). <i>Eucalyptus brownii</i> on closed depressions Occurs on closed depressions (BVG1M: 17a). 11.3.10b: Floodplain (other than floodplain wetlands). <i>Eucalyptus brownii</i> on floodplains (BVG1M: 17a).



Legend



Pre Clear

Endangered Dominant

Endangered Sub-Dominant

Of Concern Dominant

Of Concern Sub-Dominant

Not of concern

Figure 6 Pre Clear Mapping

File ref. 6550 E 06 Pre Clear A

Date 8/05/2013

Project Carmichael Coal Rail Project

0 50 100 200 300 400 500 m

Scale (A4): 1:16,000 [GDA 1994 MGA Z55]



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3.4. Regrowth Mapping

High Value Regrowth Version 2.1 does not overlay High Value Regrowth on the proposed quarry site.



4. Field Survey

Two (2) Senior Ecologists from the **Saunders Havill Group** traversed the site on the 12th and 13th of March 2013 to undertake a Regional Ecosystem assessment. Weather conditions were fine and breezy. The area currently mapped as remnant vegetation was traversed by foot and GPS points indicative of the area covered were recorded. Prior to undertaking the field survey, a basic desktop assessment was performed to gather baseline data.

4.1. Summary

The *Vegetation Management Act Regional Ecosystem and Remnant Mapping Version 6.1* overlays one RE polygon within the proposed Disney Quarry on Lot 4 on SP116046 (**Figure 5**). This remnant polygon constitutes approximately 64% of total quarry area within this property. The remaining portion of the proposed quarry includes an existing quarry mapped as non-remnant.

Adjacent to the proposed quarry are three mapped Endangered Regional Ecosystem polygons comprised of 80% Of Concern RE11.4.6, 10% Endangered RE11.4.8, 5% Endangered RE11.4.9 and 5% Least Concern RE11.3.10. The largest of these polygons is located along the proposed quarry's western boundary (Zone 1) and the other two polygons run East-West through the centre of the quarry extraction area (Zone 2). Six Vegetation Transects were completed within these mapped Endangered remnant polygons (1 to 3 in Zone 1 and 4 to 6 in Zone 2) (**Figure 7**).

The remaining Vegetation Transects (7 and 8) are located within the mapped Least Concern Regional Ecosystem polygon (Zone 3), with Vegetation Transect 8 used as a reference site (**Figure 7**). The species mix identified within this area is consistent with current Regional Ecosystem mapping and contains Least Concern RE 11.11.15.

Zone 1 mapped adjacent to the quarry along its western boundary is dominated by *Eucalyptus brownii* (Reid River Box) and not *Acacia harpophylla* (Brigalow) as suggested by mapping. In addition to the species composition, Land Zone characteristics (soil, sand and gravel with no obvious signs of clay plains as defined by Land Zone 4) contradicted current mapping. The proposed change of this polygon to Least Concern RE 11.5.3 is more consistent with species composition and Land Zone structure (refer to **Section 4.2**).

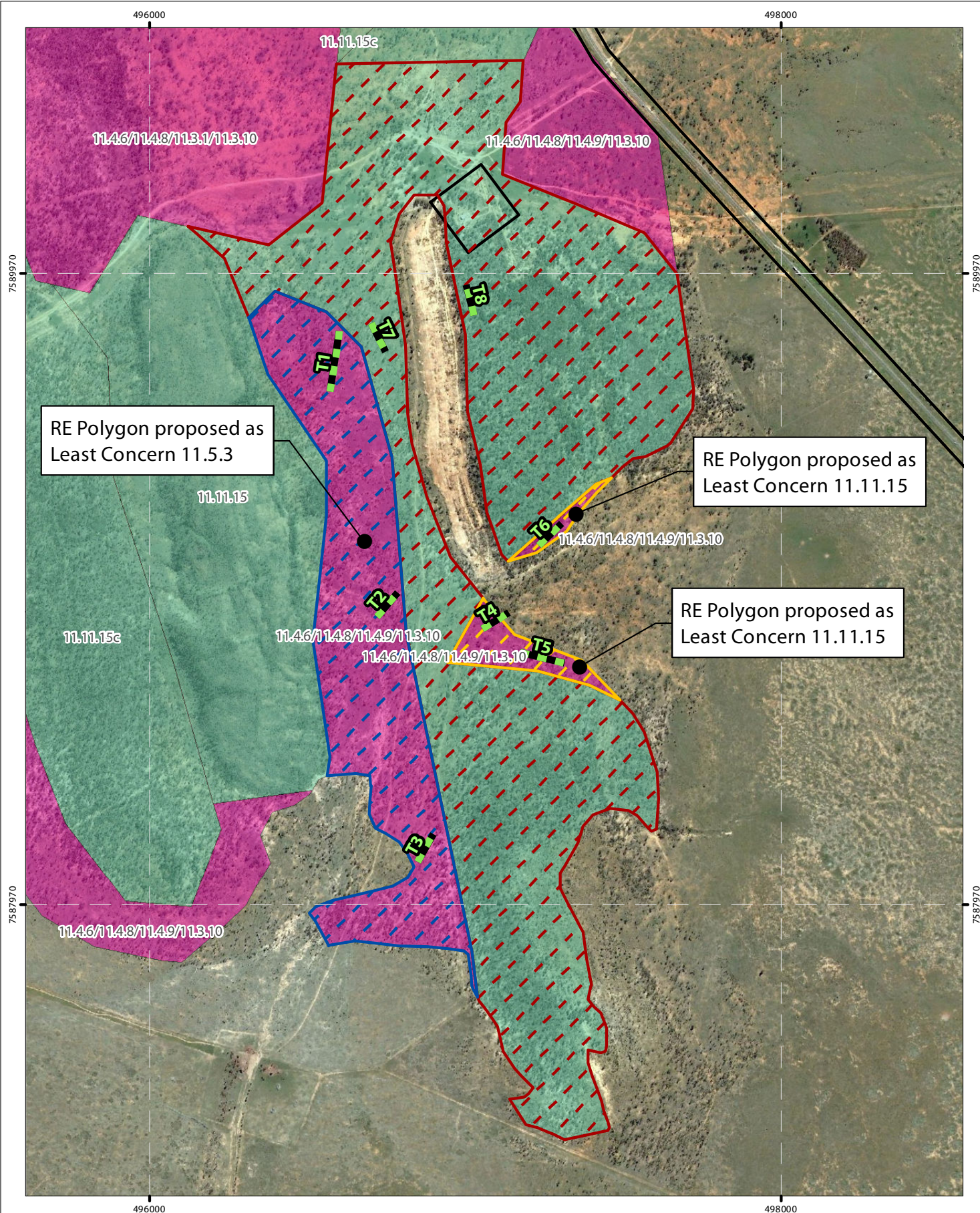
The actual proposed quarry site (Zone 3) is characterised by a vegetation community dominated by *Eucalyptus crebra* (Narrow Leaf Ironbark) and *Corymbia clarksoniana* (Long Fruited Bloodwood). The understorey contains species including *Petalostigma pubescens* (Quinine Bush) and *Alphitonia excelsa*, (Soap Tree); species consistent with Least Concern RE 11.11.15 (refer to **Section 4.4**). The same species were recorded within the two incorrectly mapped Endangered polygons in Zone 2 and a change to Least Concern RE11.11.15 at these sites is therefore proposed (refer to **Section 4.3**).

Proposed changes to RE mapping are depicted within the attached Proposed PMAV (**Plan 1**). See **Table 2**, next page, for a summary of the existing mapped status and observed communities within each Zone.



Table 2: Summary of RE Status

Zone	Current RE Mapping Version 6.1	Current RE Mapping (Area)	Vegetation Observed	Observed Vegetation Area
1	Endangered RE11.4.6/11.4.8/11.4.9/11.3.10	56.3 ha	Least Concern RE 11.5.3	56.3 ha
2	Endangered RE11.4.6/11.4.8/11.4.9/11.3.10	6.4 ha	Least Concern RE 11.11.15	6.4 ha
3	Least Concern RE11.11.15	183.3 ha	Least Concern RE 11.11.15	183.3 ha



Legend

DCDB

PMAV Transect

Site Zones

Zone 1

Zone 2

Zone 3

Regional Ecosystem v6.1

Remnant vegetation containing Endangered REs

Remnant vegetation containing Of Concern REs

Remnant vegetation that is a Least Concern RE

Figure 7 Site Zones

File ref. 6550 E 07 PMAV Study Zones A

Date 10/04/2013

Project Carmichael Coal Rail Project

0 50 100 200 300 400 500 m
Scale (A4): 1:16,000 [GDA 1994 MGA Z55]



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4.2. Zone I

Zone 1 is mapped as a composite RE comprised of Endangered RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10. Field assessment (Vegetation Transects 1, 2 & 3, below) demonstrated the presence of a Least Concern community consistent with RE 11.5.3.

The larger mapped Endangered polygon to the West of the proposed quarry contained canopy species dominated by *Eucalyptus brownii* (Reid River Box). A small patch of *Acacia cambagei* (Stinking Wattle) was recorded towards the North-West portion of the polygon. Two isolated patches of *Acacia harpophylla* (Brigalow) containing no more than ten (10) trees within each patch were also recorded within the broader polygon.

No clay deposits consistent with Land Zone 4 were observed throughout this assessment zone. Some sediments and small rocks eroded from the adjacent Land Zone 11 area were observed on the ground. Soils within this assessment zone generally appeared sandy with limited to no clay content.

For transect data and imagery from Zone 1, please see photo below and **Tables 3, 4 & 5**.



Photo: Zone 1 Vegetation



Table 3: Vegetation Transect 1 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 – Observed RE 11.5.3

Site No.	1	Recorder:	Dr Andrew Davies / David Havill	Date:	12.03.2013
Purpose	Regional Ecosystem & Remnant Check within adjacent Endangered polygon				
Locality:	Lot 4 SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	11.0 m	7.0 - 15.0 m	Medium
T2	3.5 m	3.0 - 6.0 m	Sparse
T3			
S1	1.4 m	1.0 - 2.0 m	Very Sparse
S2			
G	0.8 m	0.0 - 1.0 m	Dense
Structural formation:	Woodland		
Ecologically dominant layer:	T1		

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:				MGA55	Transect length:		200 m
Start point:	Zone	5	5	E	496602.10		N	7589788.42
End point:	Zone	5	5	E	496572.79		N	75895.17

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.0 - 4.9 m	4.9 m	10.3 m	<i>Eucalyptus brownii</i>	Reid River Box
22.3 - 28.5 m	5.2 m	7.4 m	<i>Eucalyptus brownii</i>	Reid River Box
19.0 - 33.2 m	4.2 m	9.1 m	<i>Eucalyptus brownii</i>	Reid River Box
39.6 - 43.6 m	4.0 m	10.0 m	<i>Eucalyptus brownii</i>	Reid River Box
43.6 - 45.6 m	2.0 m	9.5 m	<i>Eucalyptus brownii</i>	Reid River Box
87.6 - 90.6 m	4.0 m	10.2 m	<i>Eucalyptus brownii</i>	Reid River Box
91.9 - 95.6 m	3.2 m	10.6 m	<i>Eucalyptus brownii</i>	Reid River Box
134.2 - 138.4 m	4.2 m	8.9 m	<i>Eucalyptus brownii</i>	Reid River Box



Interval	Intercept	Height	Scientific name	Common Name
145.2 - 150.0 m	4.3 m	10.3 m	<i>Eucalyptus brownii</i>	Reid River Box
15.0 - 154.7 m	4.7 m	10.5 m	<i>Eucalyptus brownii</i>	Reid River Box
172.8 - 181.3 m	8.5 m	9.9 m	<i>Eucalyptus brownii</i>	Reid River Box

Summary:

Minimum height of plants included in the transect table:	7.4 m
Intercept of EDL 0 - 50 m:	20.3 m
Intercept of EDL 50 - 100 m:	7.2 m
Intercept of EDL 100 - 150 m:	8.5 m
Intercept of EDL 150 - 200 m:	13.2 m
Measured crown cover % of EDL 0 - 200 m:	24.6 %
Structural formation:	Woodland

Conclusions/notes:

- *Eucalyptus brownii* (Reid River Box) was the dominant species recorded throughout the mapped Endangered polygon.
- No species consistent with Endangered RE11.4.8 or RE11.4.9 were recorded within the transect.
- No evidence of Land Zone 4 was recorded throughout the mapped endangered polygon.
- Some cattle disturbance was recorded throughout the polygon.
- No Threatened Ecological Community identified.

Plant Species (D – Dominant; C – codominant; A – associated; S – Suppressed)

Str.	Rel.	Scientific Name	Common Name
T1	D	<i>Eucalyptus brownii</i>	Reid River Box
	A	<i>Archidendropsis basaltica</i>	Dead Finish
	A	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
T2		<i>Eucalyptus brownii</i>	Reid River Box
		<i>Owenia acidula</i>	Emu Apple
		<i>Corymbia setosa</i>	Rough-leaved Bloodwood
		<i>Cassia brewsteri</i>	Leichhardt Bean
		<i>Archidendropsis basaltica</i>	Dead Finish
Shrub		<i>Corymbia setosa</i>	Rough-leaved Bloodwood
		<i>Carissa ovata</i>	Current Bush
		<i>Citrus glauca</i>	Limebush
		<i>Acacia harpophylla</i>	Brigalow
G		<i>Carissa ovata</i>	Currant Bush
		<i>Pennisetum ciliare</i>	Buffel Grass



Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Eucalyptus brownii</i>	Reid River Box	13.4 m	230 mm
<i>Eucalyptus brownii</i>	Reid River Box	10.7 m	300 mm
<i>Eucalyptus brownii</i>	Reid River Box	10.6 m	160 mm
<i>Eucalyptus brownii</i>	Reid River Box	11.1 m	280 mm
<i>Archidendropsis basaltica</i>	Dead Finish	6.5 m	150 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	10.8 m	260 mm



Photos: Vegetation Transect 1 Disney Quarry



Table 4: Vegetation Transect 2 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 – Observed RE 11.5.3

Site No.	2	Recorder:	Dr Andrew Davies / David Havill	Date:	12.03.2013
Purpose	Regional Ecosystem & Remnant Check within adjacent Endangered polygon				
Locality:	Lot 4 on SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	14.5 m	10.0 - 19.0 m	Medium
T2	5.5 m	4.0 - 9.0 m	Sparse
T3			
S1	1.3 m	1.0 - 3.0 m	Very Sparse
S2			
G	0.6 m	0.0- 1.0 m	Dense
Structural formation:	Woodland		
Ecologically dominant layer:	T1		

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:	MGA55	Transect length:	100 m
Start point:	Zone	5 5 E	496785.47	N 7588957.34
End point:	Zone	5 5 E	496722.40	N 758880.48

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.1 - 5.7 m	5.6 m	14.7 m	<i>Eucalyptus brownii</i>	Reid River Box
12.7 - 16.3 m	3.6 m	12.1 m	<i>Eucalyptus brownii</i>	Reid River Box
16.5 - 18.8 m	2.3 m	12.6 m	<i>Eucalyptus brownii</i>	Reid River Box
21.6 - 31.8 m	10.2 m	14.3 m	<i>Eucalyptus brownii</i>	Reid River Box
32.3 - 36.8 m	4.5 m	12.8 m	<i>Eucalyptus brownii</i>	Reid River Box
38.6 - 44.3 m	5.7 m	12.3 m	<i>Eucalyptus brownii</i>	Reid River Box
50.0 - 55.7 m	5.7 m	15.6 m	<i>Eucalyptus brownii</i>	Reid River Box
62.4 - 68.1 m	5.7 m	10.3 m	<i>Eucalyptus brownii</i>	Reid River Box



Interval	Intercept	Height	Scientific name	Common Name
80.8 - 85.1 m	4.3 m	13.1 m	<i>Eucalyptus brownii</i>	Reid River Box
91.8 - 97.3 m	5.5 m	15.1 m	<i>Eucalyptus brownii</i>	Reid River Box
97.3 - 100 m	2.7 m	13.0 m	<i>Eucalyptus brownii</i>	Reid River Box

Summary:

Minimum height of plants included in the transect table:	10.3 m
Intercept of EDL 0 - 50 m:	31.9 m
Intercept of EDL 50 - 100 m:	23.9 m
Measured crown cover % of EDL 0 - 100 m:	55.8 %
Structural formation:	Woodland

Conclusions/notes:

- *Eucalyptus brownii* (Reid River Box) was the dominant species recorded throughout the mapped Endangered polygon.
- No species consistent with Endangered RE11.4.8 or RE11.4.9 were recorded within the transect.
- No evidence of Land Zone4 was recorded throughout the mapped endangered polygon.
- Some cattle disturbance was recorded throughout the polygon.
- No Threatened Ecological Community identified.

Plant Species (*D – Dominant; C – codominant; A – associated; S – Suppressed*)

Str.	Rel.	Scientific Name	Common Name
T1	D	<i>Eucalyptus brownii</i>	Reid River Box
T2		<i>Eucalyptus brownii</i>	Reid River Box
		<i>Acacia salicina</i>	Sally Wattle
		<i>Atalaya hemiglauca</i>	Whitewood
		<i>Cassia brewsteri</i>	Leichhardt Bean
		<i>Terminalia oblongata</i>	Yellowwood
		<i>Pogonolobus reticulatus</i>	
Shrub		<i>Acacia salicina</i>	Sally Wattle
		<i>Carissa ovata</i>	Current Bush
		<i>Lysiphyllum carronii</i>	Bauhinia
		<i>Cassia brewsteri</i>	Leichhardt Bean
		<i>Terminalia oblongata</i>	Yellowwood
G		<i>Carissa ovata</i>	Currant Bush
		<i>Pennisetum ciliare</i>	Buffel Grass
		<i>Melinis repens</i>	Red Natal Grass



Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Eucalyptus brownii</i>	Reid River Box	14.7 m	270 mm
<i>Eucalyptus brownii</i>	Reid River Box	121.1 m	440 mm
<i>Eucalyptus brownii</i>	Reid River Box	12.6 m	150 mm
<i>Eucalyptus brownii</i>	Reid River Box	14.3 m	380 mm
<i>Eucalyptus brownii</i>	Reid River Box	12.8 m	240 mm
<i>Eucalyptus brownii</i>	Reid River Box	12.3 m	340 mm



Photo: Vegetation Transect 2 Disney Quarry



Table 5: Vegetation Transect 3 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 – Observed RE 11.5.3

Site No.	3	Recorder:	Dr Andrew Davies / David Havill	Date:	12.03.2013
Purpose	Regional Ecosystem & Remnant Check within adjacent Endangered polygon				
Locality:	Lot 4 on SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	15.0 m	10.0 - 23.0 m	Medium
T2	4.5 m	3.0 - 9.0 m	Sparse
T3			
S1	1.8 m	1.0 - 3.0 m	Very Sparse
S2			
G	0.5 m	0.0 - 1.0 m	Dense
Structural formation:		Woodland	
Ecologically dominant layer:		T1	

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:				MGA55	Transect length:		100 m
Start point:	Zone	5	5	E	496898.49		N	7588189.60
End point:	Zone	5	5	E	496850.35		N	7508102.08

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.5 - 6.1 m	5.6 m	14.5 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
19.0 - 26.6 m	5.6 m	11.2 m	<i>Eucalyptus brownii</i>	Reid River Box
38.1 - 50.0 m	11.9 m	14.6 m	<i>Eucalyptus brownii</i>	Reid River Box
52.3 - 61.2 m	8.9 m	11.4 m	<i>Eucalyptus brownii</i>	Reid River Box
66.7 - 68.5 m	1.8 m	10.7 m	<i>Eucalyptus brownii</i>	Reid River Box
86.2 - 89.3 m	3.1 m	10.1 m	<i>Eucalyptus brownii</i>	Reid River Box
92.6 - 96.5 m	3.9 m	10.0 m	<i>Eucalyptus brownii</i>	Reid River Box



Summary:

Minimum height of plants included in the transect table:	10.0 m
Intercept of EDL 0 - 50 m:	23.1 m
Intercept of EDL 50 - 100 m:	17.7 m
Measured crown cover % of EDL 0 - 100 m:	40.8%
Structural formation:	Woodland

Conclusions/notes:

- *Eucalyptus brownii* (Reid River Box) was the dominant species recorded throughout the mapped Endangered polygon.
- No species consistent with Endangered RE11.4.8 or RE11.4.9 were recorded within the transect.
- No evidence of Land Zone4 was recorded throughout the mapped endangered polygon.
- Some cattle disturbance was recorded throughout the polygon.
- No Threatened Ecological Community identified.

Plant Species (D – Dominant; C – codominant; A – associated; S – Suppressed)

Str.	Rel.	Scientific Name	Common Name
T1	D	<i>Eucalyptus brownii</i>	Reid River Box
	A	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
	A	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
	A	<i>Corymbia dallachiana</i>	Ghost Gum
	A	<i>Corymbia erythrophloia</i>	Variable Barked Bloodwood
T2		<i>Eucalyptus brownii</i>	Reid River Box
		<i>Melaleuca nervosa</i>	Paperbark
		<i>Grevillea pteridifolia</i>	Grevillea
		<i>Cassia brewsteri</i>	Leichhardt Bean
		<i>Erythroxylum australe</i>	Dogwood
		<i>Corymbia dallachiana</i>	Ghost Gum
		<i>Eucalyptus crebra</i>	Narrow leaf Ironbark
Shrub		<i>Grevillea pteridifolia</i>	Grevillea
		<i>Corymbia dallachiana</i>	Ghost Gum
		<i>Melaleuca nervosa</i>	Paperbark
		<i>Grewia retusifolia</i>	Dogs Balls
G		<i>Carissa ovata</i>	Currant Bush
		<i>Pennisetum ciliare</i>	Buffel Grass
		<i>Aristida latifolia</i>	Feathertop Wiregrass
		<i>Chrysopogon fallax</i>	Golden Beard Grass
		<i>Heteropogon contortus</i>	Black Speargrass
		<i>Melinis repens</i>	Red Natal Grass



Str.	Rel.	Scientific Name	Common Name
		<i>Tragus australianus</i>	Small Burrgrass
		<i>Chrysocephalum apiculatum</i>	Yellow Buttons
		<i>Calotis</i> sp.	Daisy Burr
		<i>Parthenium hysterophorus</i>	Parthenium Weed
		<i>Sida cordifolia</i>	Flannel Weed

Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Eucalyptus brownii</i>	Reid River Box	22.6 m	790 mm
<i>Eucalyptus brownii</i>	Reid River Box	11.2 m	160 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	12.3 m	220 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	12.3 m	270 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	14.5 m	300 mm
<i>Corymbia dallachiana</i>	Ghost Gum	11.8 m	240 mm
<i>Corymbia erythrophloia</i>	Variable Barked Bloodwood	17.8 m	490 mm



Photo: Vegetation Transect 3 Disney Quarry



4.3. Zone 2

The two relatively small polygons in Zone 2 are mapped as a composite RE comprised of Endangered RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10. Field assessment (Vegetation Transects 4, 5 & 6, below) demonstrated the presence of a Least Concern community consistent with RE 11.11.15.

No evidence of Land Zones 3 or 4 as mapped was observed within these two remnant polygons.

For transect data and imagery from Zone 2, please see the photo below and **Tables 6, 7 & 8**.



Photo: Zone 2 Vegetation



Table 6: Vegetation Transect 4 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 – Observed RE 11.11.15

Site No.	4	Recorder:	Dr Andrew Davies / David Havill	Date:	12.03.2013
Purpose	Regional Ecosystem & Remnant Check within adjacent Endangered polygon				
Locality:	Lot 4 on SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	14.0 m	8.0 - 16.0 m	Medium
T2	5.0 m	3.0 - 7.0 m	Very Sparse
T3			
S1	2.0 m	1.0 - 3.0 m	Very Sparse
S2			
G	0.9 m	0.0 - 1.0 m	Dense
Structural formation:	Woodland		
Ecologically dominant layer:	T1		

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:				MGA55	Transect length:	100 m	
Start point:	Zone	5	5	E	497054.85		N	7588843.43
End point:	Zone	5	5	E	497139.49		N	7588892.46

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.0 - 6.5 m	6.5 m	13.2 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
9.2 - 14.1 m	4.9 m	13.4 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
14.3 - 22.4 m	8.1 m	12.9 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
23.8 - 26.4 m	2.6 m	9.2 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
62.8 - 70.5 m	7.7 m	12.6 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
70.6 - 72.7 m	2.1 m	15.2 m	<i>Eucalyptus camaldulensis</i>	River Red Gum



Summary:	
Minimum height of plants included in the transect table:	9.2 m
Intercept of EDL 0 - 50 m:	22.1 m
Intercept of EDL 50 - 100 m:	9.8 m
Measured crown cover % of EDL 0 - 100 m:	31.9%
Structural formation:	Woodland
Conclusions/notes: <i>Corymbia clarksoniana</i> (Long Fruited Bloodwood) was the dominant species recorded throughout the mapped Endangered polygon. - Species diversity more suited to Least Concern RE 11.11.15. - No species consistent with Endangered RE11.4.8 or RE11.4.9 were recorded within the remnant polygon. - No evidence of Land Zone 4 was recorded throughout the mapped endangered polygon. - Some cattle disturbance was recorded throughout the polygon. - No Threatened Ecological Community identified. - Land Zone 3 drainage line is located outside of the mapped remnant polygon within the non-remnant area. - Current mapping incorrect – propose Least Concern Regional Ecosystem 11.11.15.	

Plant Species (D – Dominant; C – codominant; A – associated; S – Suppressed)

Str.	Rel.	Scientific Name	Common Name
T1	D	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
	CD	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
	A	<i>Corymbia dallachiana</i>	Ghost Gum
T2		<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
		<i>Terminalia oblongata</i>	Yellowwood
Shrub		<i>Terminalia oblongata</i>	Yellowwood
		<i>Corymbia dallachiana</i>	Ghost gum
G		<i>Carissa ovata</i>	Currant Bush
		<i>Pennisetum ciliare</i>	Buffel Grass
		<i>Aristida latifolia</i>	Feathertop Wiregrass
		<i>Chrysopogon fallax</i>	Golden Beard Grass
		<i>Heteropogon contortus</i>	Black Speargrass
		<i>Melinis repens</i>	Red Natal Grass
		<i>Chrysocephalum apiculatum</i>	Yellow Buttons
		<i>Panicum decompositum</i>	Umbrella Grass



Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	11.2 m	200 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	11.1 m	280 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	13.2 m	260 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	13.7 m	260 mm



Photo: Vegetation Transect 4 Disney Quarry



Table 7: Vegetation Transect 5 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 – Observed RE 11.11.15

Site No.	5	Recorder:	Dr Andrew Davies / David Havill	Date:	12.03.2013
Purpose	Regional Ecosystem & Remnant Check within adjacent Endangered polygon				
Locality:	Lot 4 on SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	11.0 m	10.0 - 16.0m	Medium
T2	5.0 m	3.0 - 9.0m	Sparse
T3			
S1	1.5 m	1.0 - 2.0m	Sparse
S2			
G	0.5 m	0.0 - 1.0m	Dense
Structural formation:	Woodland		
Ecologically dominant layer:	T1		

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:	MGA55	Transect length:	150 m
Start point:	Zone	5 5 E	497170.08	N 7588769.67
End point:	Zone	5 5 E	497312.41	N 7588733.56

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.0 - 8.4 m	8.4 m	10.1 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
8.4 - 14.1 m	5.7 m	11.5 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
14.1 - 19.4 m	5.3 m	14.0 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
22.3 - 28.9 m	6.6 m	10.2 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
45.1 - 50.0 m	4.9 m	13.0 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
50.0 - 52.9 m	2.9 m	13.0 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
61.4 - 65.4 m	4.0 m	10.0 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
65.4 - 69.9 m	4.5 m	14.5 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood



Interval	Intercept	Height	Scientific name	Common Name
110.1 - 116.5 m	6.4 m	4.0 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood

Summary:

Minimum height of plants included in the transect table:	10.0 m
Intercept of EDL 0 - 50 m:	30.9 m
Intercept of EDL 50 -100 m:	11.4 m
Intercept of EDL 100 -150 m:	6.4 m
Measured crown cover % of EDL 0 -100 m:	32.5%
Structural formation:	Woodland

Conclusions/notes:

- Corymbia clarksoniana* (Long Fruited Bloodwood) was the dominant species recorded throughout the mapped Endangered polygon.
- Species diversity more suited to Least Concern RE 11.11.15.
- No species consistent with Endangered RE11.4.8 or RE11.4.9 were recorded within the remnant polygon.
- No evidence of Land Zone 4 was recorded throughout the mapped endangered polygon.
- Some cattle disturbance was recorded throughout the polygon.
- No Threatened Ecological Community identified.
- Land Zone 3 drainage line is located outside of the mapped remnant polygon within the non-remnant area towards the North.
- Current mapping incorrect – propose Least Concern Regional Ecosystem 11.11.15.

Plant Species (*D – Dominant; C – codominant; A – associated; S – Suppressed*)

Str.	Rel.	Scientific Name	Common Name
T1	D	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
	CD	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
		<i>Corymbia erythrophloia</i>	Variable Barked Bloodwood
T2		<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
		<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
		<i>Alphitonia excelsa</i>	Soap Tree
		<i>Corymbia dallachiana</i>	Ghost Gum
		<i>Corymbia setosa</i>	Rough Leaved Bloodwood
Shrub		<i>Acacia excelsa</i>	Soap Tree
		<i>Dodonaea filifolia</i>	Hop Bush
		<i>Hovea longipes</i>	Brush Hovea
		<i>Alphitonia excelsa</i>	Soap Tree
		<i>Acacia decora</i>	Pretty Wattle
		<i>Corymbia setosa</i>	Rough Leaved Bloodwood
		<i>Breynia oblongifolia</i>	Coffee Bush



Str.	Rel.	Scientific Name	Common Name
		<i>Erythroxylum australe</i>	Dogwood
		<i>Carissa ovata</i>	Currant Bush
G		<i>Pennisetum ciliare</i>	Buffel Grass
		<i>Aristida latifolia</i>	Feathertop Wiregrass
		<i>Chrysopogon fallax</i>	Golden Beard Grass
		<i>Heteropogon contortus</i>	Black Speargrass
		<i>Melinis repens</i>	Red Natal Grass
		<i>Chrysocephalum apiculatum</i>	Yellow Buttons
		<i>Panicum decompositum</i>	Umbrella Grass

Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	14.5 m	220 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	15.0 m	250 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	12.5 m	280 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	12.0 m	210 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	13.0 m	230 mm



Photo: Vegetation Transect 5 Disney Quarry



Table 8: Vegetation Transect 6 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 – Observed RE 11.11.15

Site No.	6	Recorder:	Dr Andrew Davies / David Havill	Date:	13.03.2013
Purpose	Regional Ecosystem & Remnant Check within adjacent Endangered polygon				
Locality:	Lot 4 on SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	13.0 m	10.0 - 18.0 m	Medium
T2	6.5 m	3.0 - 9.0 m	Sparse
T3			
S1	2.0 m	1.0 - 3.0 m	Medium
S2			
G	0.9 m	0.0 - 1.0 m	Dense
Structural formation:	Woodland		
Ecologically dominant layer:	T1		

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:				MGA55	Transect length:		100 m
Start point:	Zone	5	5	E	497305.66		N	7589176.59
End point:	Zone	5	5	E	497290.76		N	7589102.70

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.1 - 7.1 m	7.1 m	12.8 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
7.1 - 15.7 m	8.6 m	13.4 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
32.3 - 39.4 m	7.1 m	10.0 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
63.8 - 71.2 m	7.4 m	10.0 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
89.5 - 92.9 m	3.4 m	10.0 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
97.1 - 100.0 m	2.9 m	11.0 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood



Summary:	
Minimum height of plants included in the transect table:	10.0 m
Intercept of EDL 0 – 50 m:	22.8 m
Intercept of EDL 50 -100 m:	13.7 m
Measured crown cover % of EDL 0 -100 m:	36.5 %
Structural formation:	Woodland
Conclusions/notes: <i>Corymbia clarksoniana</i> (Long Fruited Bloodwood) was the dominant species recorded throughout the mapped Endangered polygon. - Species diversity more suited to Least Concern RE 11.11.15. - No species consistent with Endangered RE11.4.8 or RE11.4.9 were recorded within the remnant polygon. - No evidence of Land Zone 4 was recorded throughout the mapped endangered polygon. - Some cattle disturbance was recorded throughout the polygon. - No Threatened Ecological Community identified. - Land Zone 3 drainage line is located outside of the mapped remnant polygon within the non-remnant area towards the South. - Current mapping incorrect – propose Least Concern Regional Ecosystem 11.11.15.	

Plant Species (D – Dominant; C – codominant; A – associated; S – Suppressed)

Str.	Rel.	Scientific Name	Common Name
T1	CD	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
	CD	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
T2		<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
		<i>Alphitonia excelsa</i>	Soap Tree
		<i>Pogonolobus reticulatus</i>	Pogonolobus
Shrub		<i>Grevillea decora</i>	Grevillea
		<i>Pogonolobus reticulatus</i>	Pogonolobus
		<i>Dodonaea filifolia</i>	Hop Bush
		<i>Hovea longipes</i>	Brush Hovea
		<i>Acacia decora</i>	Pretty Wattle
		<i>Erythroxylum australe</i>	Dogwood
G		<i>Pennisetum ciliare</i>	Buffel Grass
		<i>Aristida latifolia</i>	Feathertop Wiregrass
		<i>Triodia mitchellii</i>	Buck Spinifex
		<i>Heteropogon contortus</i>	Black Speargrass
		<i>Melinis repens</i>	Red Natal Grass
		<i>Chrysocephalum apiculatum</i>	Yellow Buttons
		<i>Themeda triandra</i>	Kangaroo Grass



Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	13.4 m	270 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	15.0 m	260 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	12.8 m	230 mm



Photo: Vegetation Transect 6 Disney Quarry



4.4. Zone 3

Vegetation in Zone 3 is mapped as least Concern RE 11.11.15. Species composition within uncleared sections of the remnant polygon is consistent with this mapping. Dominant species recorded included *Eucalyptus crebra* (Narrow Leaf Ironbark) and *Corymbia clarksoniana* (Long Fruited Bloodwood) with the occasional *Corymbia dallachiana* (Ghost Gum). Vegetation Transect 8 was conducted in remnant vegetation to the North-East of the proposed quarry and serves as a reference transect for this RE.

For transect data and imagery from Zone 3, please see the photo below and **Tables 9 & 10**.



Photo: Zone 3 Vegetation



Table 9: Vegetation Transect 7 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.11.15 – Observed RE 11.11.15

Site No.	7	Recorder:	Dr Andrew Davies / David Havill	Date:	13.03.2013
Purpose	Regional Ecosystem & Remnant Check within Least Concern RE 11.11.15 (Quarry Pit)				
Locality:	Lot 4 SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	15.0 m	10.0 - 17.0 m	Sparse
T2	5.0 m	3.0 - 9.0 m	Medium
T3			
S1	1.5 m	1.0 - 3.0 m	Sparse
S2			
G	0.8 m	0.0 - 1.0 m	Dense
Structural formation:	Woodland		
Ecologically dominant layer:	T1		

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:				MGA55	Transect length:		100 m
Start point:	Zone	5	5	E	496747.94		N	7589718.94
End point:	Zone	5	5	E	496703.55		N	7589806.75

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.0 - 10.1 m	10.1m	17.0 m	<i>Corymbia dallachiana</i>	Ghost Gum
10.1 - 14.4 m	4.3 m	16.1 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
33.6 - 38.4 m	4.8 m	14.0 m	<i>Corymbia dallachiana</i>	Ghost Gum
77.4 - 87.4 m	10.0 m	14.5 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood



Summary:

Minimum height of plants included in the transect table:	14.0 m
Intercept of EDL 0 - 50 m:	19.2 m
Intercept of EDL 50 - 100 m:	10.0 m
Measured crown cover % of EDL 0 - 100 m:	29.2%
Structural formation:	Woodland

Conclusions/notes:

- *Corymbia dallachiana* (Ghost Gum) was the dominant species within this Least Concern vegetation which includes species consistent with RE 11.11.15.
- Some cattle disturbance was recorded throughout the polygon as well as evidence of past clearing regimes A number of dead stags were observed throughout the vicinity of the transect.
- No *Acacia harpophylla* recorded within the vicinity of the transect or species consistent with the mapped adjacent RE 11.4.8 or RE 11.4.9. No Threatened Ecological Communities were recorded within the broader area.
- Vegetation consistent with current Regional Ecosystem maps.

Plant Species (D – Dominant; C – codominant; A – associated; S – Suppressed)

Str.	Rel.	Scientific Name	Common Name
T1	A	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
	A	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
	D	<i>Corymbia dallachiana</i>	Ghost Gum
T2		<i>Corymbia dallachiana</i>	Ghost Gum
		<i>Melaleuca nervosa</i>	Paperbark
		<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
		<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
		<i>Petalostigma pubescens</i>	Quinine Bush
		<i>Eucalyptus brownii</i>	Reid River Box
Shrub		<i>Corymbia dallachiana</i>	Ghost Gum
		<i>Melaleuca nervosa</i>	Paperbark
		<i>Erythroxylum australe</i>	Dogwood
G		<i>Pennisetum ciliare</i>	Buffel Grass
		<i>Aristida latifolia</i>	Feathertop Wiregrass
		<i>Triodia mitchellii</i>	Buck Spinifex
		<i>Heteropogon contortus</i>	Black Speargrass
		<i>Melinis repens</i>	Red Natal Grass
		<i>Heteropogon contortus</i>	Black Spear Grass
		<i>Sida cordifolia</i>	Flannel Weed
		<i>Chrysocephalum apiculatum</i>	Yellow Buttons



Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Corymbia dallachiana</i>	Ghost Gum	14.0 m	490 mm
<i>Corymbia dallachiana</i>	Ghost Gum	12.1 m	220 mm
<i>Corymbia dallachiana</i>	Ghost Gum	17.0 m	420 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	12.1 m	200 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	16.1 m	270 mm



Photo: Vegetation Transect 7 Disney Quarry



Table 10: Vegetation Transect 8 – Lot 4 SP116046 – Disney Quarry

Mapped RE 11.11.15 – Observed RE 11.11.15

Site No.	7	Recorder:	Dr Andrew Davies / David Havill	Date:	13.03.2013
Purpose	Regional Ecosystem & Remnant Check within Least Concern RE11.11.15 and Reference Transect				
Locality:	Lot 4 SP116046 Isaac Regional Council				

Vegetation Structure

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E			
T1	14.5 m	9.0 - 16.0 m	Medium
T2	5.0 m	3.0 - 7.0 m	Medium
T3			
S1	1.5 m	1.0 - 3.0 m	Medium
S2			
G	0.5 m	0.0 - 1.0 m	Medium
Structural formation:	Woodland		
Ecologically dominant layer:	T1		

Transect – Crown Cover Measured (Transect intercept method)

GPS coordinates:	Datum:	MGA55	Transect length:	100 m
Start point:	Zone	5 5 E	497003.34	N 7589932.39
End point:	Zone	5 5 E	497026.89	N 7589837.04

Interval	Intercept	Height	Scientific name	Common Name
T1 Transect Intercept				
0.0 - 8.5 m	8.5 m	14.0 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
11.2 - 15.1 m	3.9 m	14.5 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
22.4 - 25.6 m	3.2 m	12.5 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
31.0 - 41.5 m	10.5 m	15.5 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
50.3 - 60.7 m	10.4 m	12.1 m	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
87.5 - 92.4 m	4.9 m	10.9 m	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
98.8 - 100.0 m	1.2 m	10.0 m	<i>Corymbia clarksoniana</i>	Long Fruited bloodwood



Summary:

Minimum height of plants included in the transect table:	10.0 m
Intercept of EDL 0 - 50 m:	26.1 m
Intercept of EDL 50 - 100 m:	16.5 m
Measured crown cover % of EDL 0 - 100 m:	42.6%
Structural formation:	Woodland

Conclusions/notes:

- *Corymbia clarksoniana* (Long Fruited Bloodwood) and *Eucalyptus crebra* (Narrow Leaf Ironbark) were the dominant species within this Least Concern vegetation which includes species consistent with RE 11.11.15.
- Very little disturbance from cattle most likely due to the exposed rock and difficult terrain.
- Transect is used as a reference site for the two small patches of mapped Endangered RE towards the South.
- Vegetation consistent with current Regional Ecosystem maps.

Plant Species (D – Dominant; C – codominant; A – associated; S – Suppressed)

Str.	Rel.	Scientific Name	Common Name
T1	CD	<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
	D	<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
	A	<i>Acacia cambagei</i>	Stinking Wattle
T2		<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood
		<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark
		<i>Alphitonia excelsa</i>	Soap Tree
Shrub		<i>Grevillea decora</i>	Grevillea
		<i>Dodonaea filifolia</i>	Hop Bush
		<i>Erythroxylum australe</i>	Dogwood
		<i>Alphitonia excelsa</i>	Soap Tree
		<i>Acacia decora</i>	Pretty Wattle
		<i>Hovea longipes</i>	Purple Bush Pea
G		<i>Pennisetum ciliare</i>	Buffel Grass
		<i>Aristida latifolia</i>	Feathertop Wiregrass
		<i>Triodia mitchellii</i>	Buck Spinifex
		<i>Heteropogon contortus</i>	Black Speargrass
		<i>Melinis repens</i>	Red Natal Grass
		<i>Heteropogon contortus</i>	Black Spear Grass
		<i>Sida cordifolia</i>	Flannel Weed
		<i>Chrysocephalum apiculatum</i>	Yellow Buttons



Vegetation Heights & DBH

Scientific Name	Common Name	Height	DBH
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	10.0 m	220 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	9.5 m	200 mm
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	14.0 m	310 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	10.5 m	200 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	12.5 m	180 mm
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	15.0 m	220 mm



Photo: Vegetation Transect 8 (Reference Transect) Disney Quarry



5. Proposed PMAV

The changes requested to current Regional Ecosystem mapping are as follows: (Refer to **Plan 1** Proposed PMAV):

- Amendment of RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 in Zone 1 to RE 11.5.3 as a result of the existing Regional Ecosystem identified at the property scale.
- Amendment of RE 11.4.6 / 11.4.8 / 11.4.9 / 11.3.10 in Zone 2 to RE 11.11.15 as a result of the existing Regional Ecosystem identified at the property scale.
- Amendment of non-remnant cleared area in Zone 3 to Category X.

Please use the below email addresses to obtain relevant shape-files (.shp) for use in assessment.

Please also use the following contact details in relation to further questions and/or site visit arrangements.

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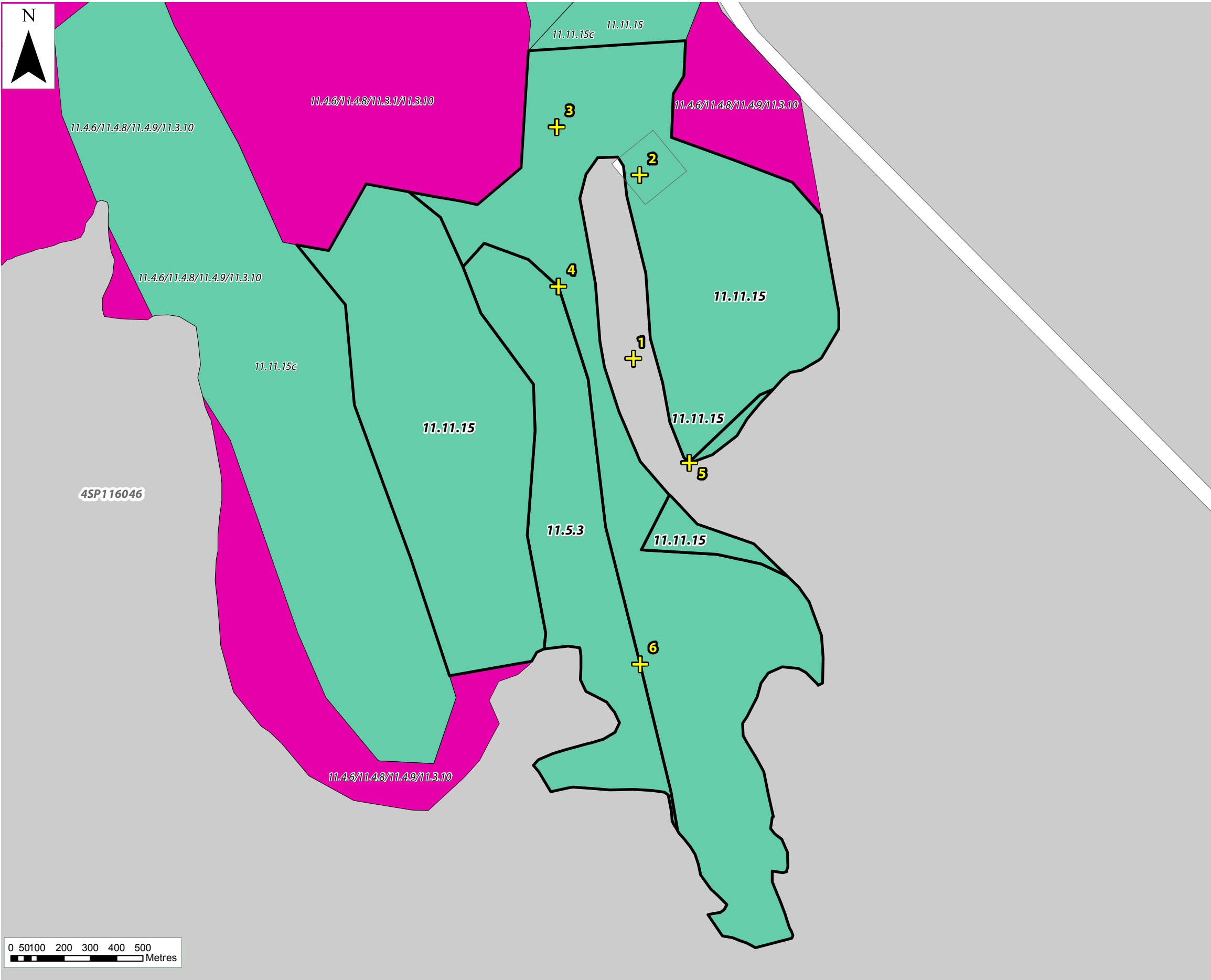
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Plan I

Proposed PMAV



PMAV Coordinate Table (GDA94 MGA z55)			
Id	Description	Longitude (m)	Latitude (m)
1	Previously Quarried Area	496941.588869	7589454.62685
2	Radio Tower	496991.859803	7590145.19073
3	Homestead Access Road	496687.588361	7590338.33695
4	Edge of 11.5.3 and 11.11.15	496669.795139	7589737.31029
5	Edge of 11.11.15 and non-remnant	497136.553569	7589056.17741
6	Edge of 11.5.3 and 11.11.15	496921.416895	7588304.15587

Legend

 PMAV Coordinates

 DCDB

Proposed PMAV Amendments

 Remnant vegetation containing Endangered REs (Cat. B)

 Remnant vegetation containing Of Concern REs (Cat. B)

 Remnant vegetation that is a Least Concern RE (Cat. B)

 Category X Area

Appendix C - Traffic and Transport Impact Assessment

**Carmichael Coal Mine Project
Disney Quarry Proposal
Traffic Engineering Report**

Adani

Reference: 12SCT0107/01D

24.04.2013

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Table of Contents

1.	Background	1
1.1	Introduction	1
1.2	Scope	1
1.3	Methodology	3
1.4	Proposed Development	3
2.	Existing Transport Infrastructure	5
2.1	Introduction	5
2.2	Flooding, Disaster & Relief Review	6
2.3	Public Transport	6
2.4	Road Safety	6
2.5	Road Planning & Scheduled Road Improvements	7
2.6	Development and Mine Planning	7
3.	Access Route Review	9
3.1	Gregory Development Road / Disney Access	9
3.2	Gregory Development Road	10
4.	Traffic Volumes	11
4.1	Existing Peak Hour Volumes	11
4.2	Future Year Traffic Growth	11
4.3	Existing ESA's	13
5.	Quarry Operations	14
5.1	Proposed Quarry Site Operations	14
5.2	Development Truck ESA Loading	14
5.2.1	Haul Vehicles	14
5.2.2	Service Vehicles	15
5.3	Site Truck Distribution	16
5.4	Site Staff	17
6.	Traffic Impact Assessment	19
6.1	Introduction	19
6.2	Road Corridor Capacity Assessment	19
6.2.1	Assessment Criteria	19
6.2.2	Study Area Operational Performance	20

6.3	Intersection Capacity Assessment	20
6.3.1	Assessment Requirements	20
6.3.2	Intersection Capacity Review	20
6.4	Access Route Intersection Review	21
6.4.1	Gregory Development Road / Disney Access	22
7.	Pavement Impact Assessment	24
7.1	Introduction	24
7.2	Access Route Pavement Condition Assessment	24
7.2.1	Gregory Development Road	24
8.	Site Access and Parking Arrangements	26
8.1	Site Access Arrangements	26
8.2	Parking Arrangements and On-site Manoeuvring	26
9.	Traffic Management & Maintenance Plan	27
10.	Developer Contributions	28
10.1.1	DTMR	28
11.	Summary	29
11.1	Existing Traffic Review	29
11.2	Development Traffic Generation and Distribution	29
11.3	Development Traffic Impacts	29
11.4	Developer Contributions	29
11.5	Road Safety School Route, Pedestrian and Cyclist Review	29
11.6	Conclusion	29

Table Index

Table 2.1: Road Hierarchy & Road Characteristics	5
Table 2.2: Crash History – Gregory Developmental Road (2005-2009)	6
Table 4.1: Existing ESAs within Study Area	13
Table 5.1: Estimated Daily & Peak Hour Haul Vehicle Generation	14
Table 5.2: Estimated Number of Service Vehicles For Site Set Up and Operation	15
Table 5.3: Key Service Vehicle Routes	17
Table 6.1: Two Lane Rural Road Capacity – Rolling Terrain Two-Way Flow	19
Table 6.2: Maximum AADT's for Various LOS on Two-Lane Two-Way Rural Roads	20
Table 7.1: Development ESA Impact	24
Table 7.2: Pavement Condition Summary	25

Figure Index

Figure 1.1: Site Location	2
Figure 1.2: Study Area – Disney Quarry	4
Figure 2.1: Elgin Road / Moray Carmichael Road Upgrade	8
Figure 3.1: Intersection Site Photographs	9
Figure 4.1: Study Area Peak Hour Traffic 2013	12
Figure 5.1: Study Area Road Sections – Disney Quarry	18
Figure 6.1: RPDM Chapter 13: Table 13.4	21
Figure 6.2: RPDM Chapter 13: Intersections at Grade: Table 13.5	21
Figure 6.3: Gregory Development / Disney Access: Warrants for Turn Treatments (2014)	22
Figure 6.4: Gregory Development / Disney Access: Warrants for Turn Treatments (2024)	22

1. Background

1.1 Introduction

TTM Consulting has been engaged by Adani undertake a Traffic and Pavement Impact Assessment in support of an Extension of Use application for an existing quarry. Disney Quarry is described as Lot 4 on SP116046 ('the site'), as shown in **Figure 1.1**. It is understood that a Development Application will be lodged with Isaac Regional Council (IRC), with the Department of Transport and Main Roads (DTMR) as a concurrence agency.

1.2 Scope

This report investigates the transport aspects associated with the proposed development. The scope of the transport aspects investigated includes:

- Identification of likely traffic volumes, distribution and composition from the future development;
- Identification of likely traffic impact of development on the public road network;
- Identification of likely pavement impact of development on the public road network;
- Road upgrades to be provided to mitigate the impact of the proposed development on the external road network, if any; and
- Access configuration to provide efficient and safe manoeuvring between the site and the public road network.

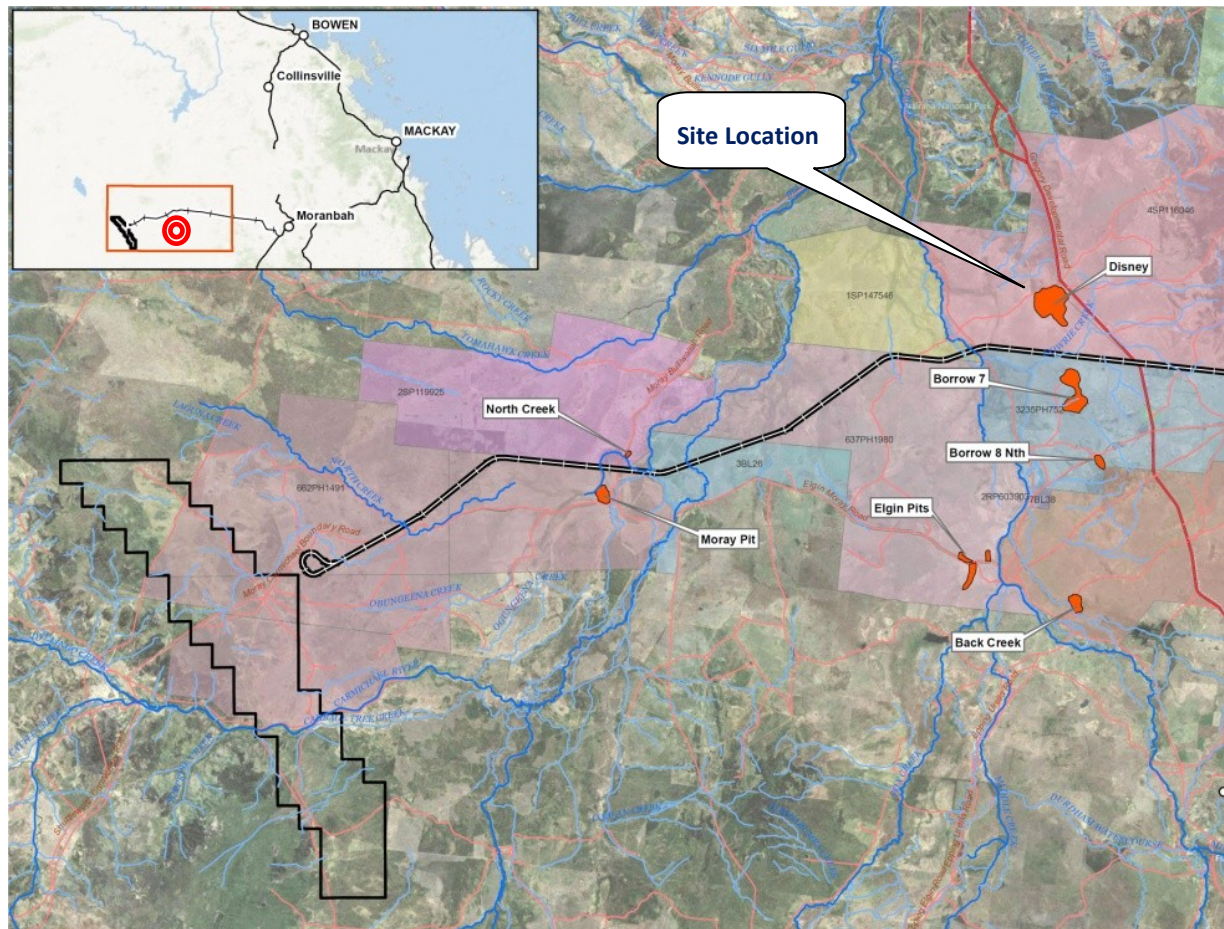


Figure 1.1: Site Location

This report investigates the transport aspects associated with the set up and on-site operations of Disney and associated quarries only. This report does not include an assessment of the following:

- Fuel requirements for haulage activities. Fuel for haulage activities will utilise a centrally located fuel farm which will be shared with other uses involved with mining and rail operations. This fuel farm will be assessed within the EIS for the Carmichael Coal Mine and Rail Project;
- Construction or use of haul road / rail maintenance road. This will be assessed with specific applications regarding the Carmichael Rail Project, including any interim use of a haulage facility crossing state or local roads;
- Use of Disney and associated quarries for commercial activities not related to the Carmichael Coal Mine and Rail Project. The use of these quarries is primarily for the construction of this project with a cumulative 1Mtpa of material required per year after this period; and
- The ultimate layout of the Gregory Development Road / Elgin Road intersection or alignment of Elgin Road.

To assess the proposed transport arrangements, the development plans have been assessed against the following guidelines and planning documents:

- Belyando Shire Planning Scheme;
- Department of Transport and Main Roads Road Planning and Design Manual; and
- Department of Transport and Main Roads Guidelines for Assessment of Road Impacts of Development (GARID).

1.3 Methodology

TTM have reviewed development traffic movements to obtain a 'Study Area'. Existing and proposed transport infrastructure within this study area was then investigated through desktop study, liaison with road authorities (IRC and DTMR) and a site visit on Tuesday 5th March 2013.

Data obtained from road authorities includes road volume and composition data, accident data, road maintenance and rehabilitation information among other information. The site visit included a basic road condition assessment, intersection movement surveys and a site distance assessment.

The traffic and pavement impacts of the proposed development within the study area were then assessed using principles in GARID.

1.4 Proposed Development

The development proposal is for new quarry operations to extract 10,500,000 tonnes per annum (tpa). Further information on the proposed quarry operations is provided in **Section 5**, with the site layout shown in **Appendix A**.

Disney Quarry will provide embankment fill and base material only for the rail component related to the proposed Carmichael Coal Mine and Rail Project.

A review of quarry vehicle generation has identified traffic movements from the Gregory Development Road to Disney Quarry. The study area as shown in **Figure 1.2** therefore incorporates the Gregory Development Road to the quarry access only.

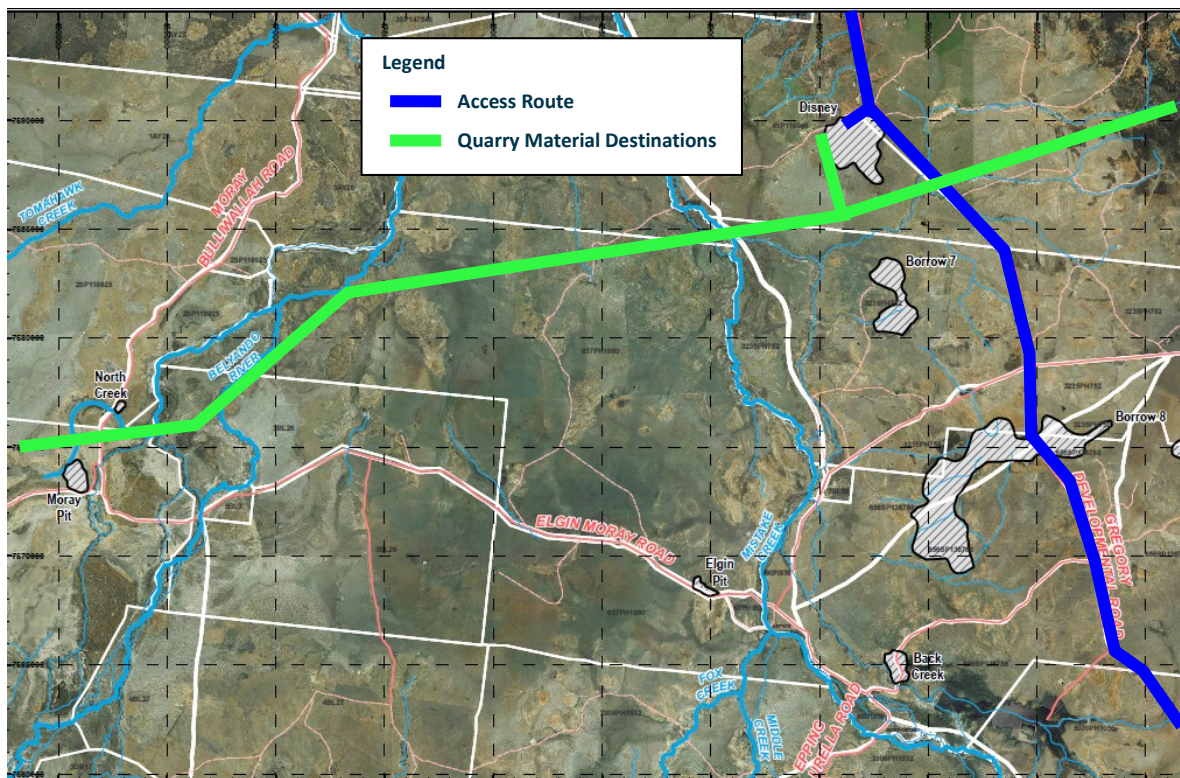


Figure 1.2: Study Area – Disney Quarry

2. Existing Transport Infrastructure

2.1 Introduction

This Chapter provides a review of the existing transport infrastructure adjacent to the proposed development site, with **Table 2.1** providing a summary of the key road characteristics.

Table 2.1: Road Hierarchy & Road Characteristics

Road	Posted Speed Limit	Road Characteristics	AADT (Source)	Road Authority and Status
Elgin Road (Elgin Moray Road)	80kph	Gravel, 8m with 2 Lanes	61 (IRC)	IRC controlled, Local Road
Bulliwallah Road (Moray Bulliwallah Road)	80kph	Gravel, 8m with 2 Lanes	10 (IRC)	IRC controlled, Local Road
Moray Carmichael Road (Moray Carmichael Boundary Road)	80kph	Gravel, 8m with 2 Lanes	56 (IRC)	IRC controlled, Local Road
Twin Hills Road	80kph	Gravel, 4-5m, 1 lane	2 (Survey)	IRC controlled, Local Road
Gregory Developmental Road (Belyando Crossing to Peak Downs Highway)	110kph	Sealed, 8m with 2 lanes	450 (DTMR)	DTMR controlled, State Strategic Road

The Council controlled roads do not have a posted speed limit and therefore 80kph has been adopted as the highest speed allowed on these gravel roads. Elgin Road is partially signed as 20kph in the vicinity of a homestead immediately south of the intersection with Bulliwallah Road. Elgin Road and Bulliwallah Road vary in carriageway width from 6m to 10m, however are generally around 8m wide. Twin Hills Road is generally one lane construction, however some sections allow vehicles to pass each other.

All intersections within the study area are 3 arm priority controlled intersections, with the exception of Gregory Development Road / Twin Hills Road / Avon Road intersection which is a four arm staggered intersection. The Elgin Road / Bulliwallah Road / Moray Carmichael Road intersection does not appear to have a specific priority route.

Section 3 reviews the access routes and intersections in more detail.

2.2 Flooding, Disaster & Relief Review

The Gregory Development Road crosses numerous floodplains and floodways, with instances of flooding close to the road at multiple locations for significant periods, which have caused multiple road closures. A 12km section of Gregory Development Road is included as part of the Reconstructing Mackay / Whitsunday – West Package. Works on this package started in April 2012 and are expected to be completed late 2013, however the specific section of Gregory Development Road to be reconstructed is unknown. DTMR identified that during significant rain events they may restrict load limits on this road to protect the pavement.

2.3 Public Transport

School bus routes may utilise roads within the study area, particularly Gregory Development Road. During the site visit however, TTM did not see evidence of school bus routes or stops on these roads. There are no dedicated foot or cycle paths within the study area.

2.4 Road Safety

A review of crash data was undertaken for the section of Gregory Developmental Road between Clermont and Belyando Crossing, approximately 158 km in length. A summary of this data is shown in **Table 2.2** with the data. The crash data reveals:

- A total of 39 accidents over a 5 year period (includes non serious crashes for 3.5 years only);
- 87% were single vehicle crashes, and 13% were multi-vehicle crashes;
- 46% of accidents were single vehicle accidents where the vehicle left the carriageway; and
- Fatigue was recorded as a contributing factor in 31% of the crashes, with driver inattention contributing to 18% of accidents.

Table 2.2: Crash History – Gregory Developmental Road (2005-2009)

Year	Single Vehicle	Multiple Vehicles	Fatal	Total
2007	6	1	1	7
2008	11	1	1	12
2009	9	1	-	10
2010	-	1	-	1
2011	4	-	1	4
2012	4	1	-	5
Total	34	5	3	39

Elgin Road experienced three single vehicle accidents during the above period which resulted in hospitalisations. No other vehicle accidents were recorded within the study area.

2.5 Road Planning & Scheduled Road Improvements

TTM have reviewed the Queensland Transport and Roads Investment Program 2012-13 to 2015-16 for the Mackay / Whitsunday region. It is understood that Gregory Development Road will be rehabilitated from 6km north of the Twin Hills Road intersection for a distance of approximately 71km in a southerly direction. It is further understood signage will be installed or replaced at the Gregory Development Road / Bowen Development Road intersection.

Following a review of Council's 2011-2012 budget, it is understood that the following roads were subject to being re-sheeted during this period:

- Twin Hills Road;
- Bulliwallah Road; and
- Avon Road.

2.6 Development and Mine Planning

TTM are also involved in five other quarry applications within the local region as part of development of the Carmichael Coal Mine and Rail Project. The cumulative impact of these quarries within the study area will also be reviewed. DTMR have advised that other developments such as other mine projects do not have to be included in the cumulative impact review.

It is understood that Elgin Road and Moray Carmichael Road will be upgraded, realigned and maintained by Adani as part of the Carmichael Coal Mine and Rail Project. This upgrade will also include the provision of turn treatments at the Gregory Development Road / Elgin Road intersection.

TTM have been advised that discussions relating to contributions with DTMR for the Carmichael Coal Mine and Rail Project are still ongoing and may be influenced by the conclusions in this report.

The ultimate layout of the upgraded Elgin Road is shown in **Figure 2.1**. It is understood that the Moray Carmichael Road / Bulliwallah Road intersection will be reconfigured for this upgrade with Bulliwallah Road forming the minor and northern leg of a standard T intersection.

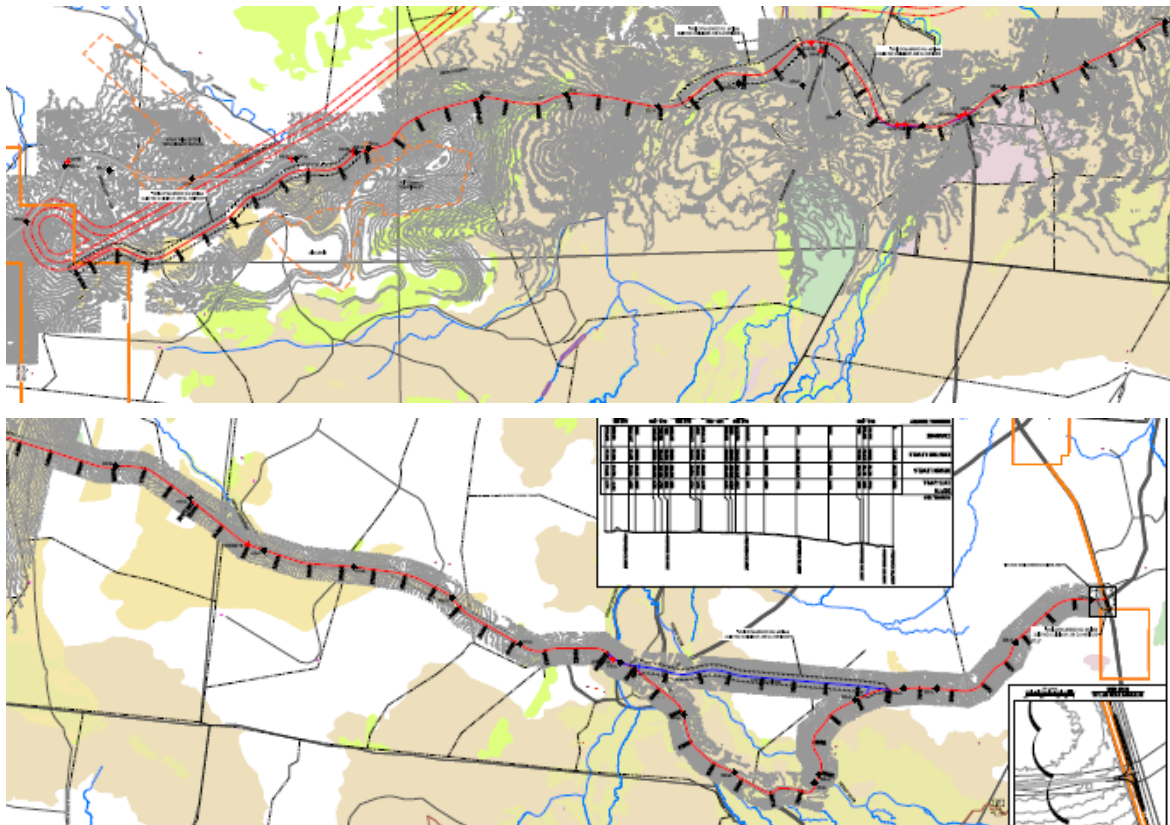


Figure 2.1: Elgin Road / Moray Carmichael Road Upgrade

3. Access Route Review

3.1 Gregory Development Road / Disney Access

The access intersection layout is a typical priority 3-arm rural highway access intersection as shown in **Figure 3.1**, with no turn treatments provided. This intersection has good visibility in both the north and south directions, with the following traffic and geometric attributes:

- A posted speed limit of 110km/hr;
- A 8 metre wide carriageway including 0.5m wide shoulders;
- Minimum 350m site distance in each direction;
- A wide 28 metre entry width to Elgin Road for large turning vehicles; and
- The access is gravel from Gregory Development Road.



Figure 3.1: Intersection Site Photographs

3.2 Gregory Development Road

This road is generally 8m wide with 3.5m wide lanes and 0.5m wide shoulders. The pavement is generally in good condition. The road is characterised by many long sections which are flat and straight with some gentle crests and curves.

4. Traffic Volumes

4.1 Existing Peak Hour Volumes

DTMR have provided 2012 Annual Average Daily Traffic (AADT) data for the Gregory Development Road. A summary of this traffic data is provided in **Appendix B**.

TTM conducted 24 hour intersection movement surveys at the following intersections on Tuesday 5th March 2013:

- Gregory Development Road / Elgin Road;
- Gregory Development Road / Twin Hills Road / Avon Road; and
- Elgin Road / Bulliwallah Road / Moray Carmichael Road .

The peak hours were generally found to be 9:15-10:15am and 3:30-4:30pm. The level of truck (i.e. non-car) content on the Gregory Development Road was found to be 29%. The peak hour results of these surveys are shown in **Figure 4.1**.

4.2 Future Year Traffic Growth

It has been agreed with DTMR that a 10% growth is suitable for the 10 year design horizon (till 2024) with a 5% growth rate for further assessment after this year.

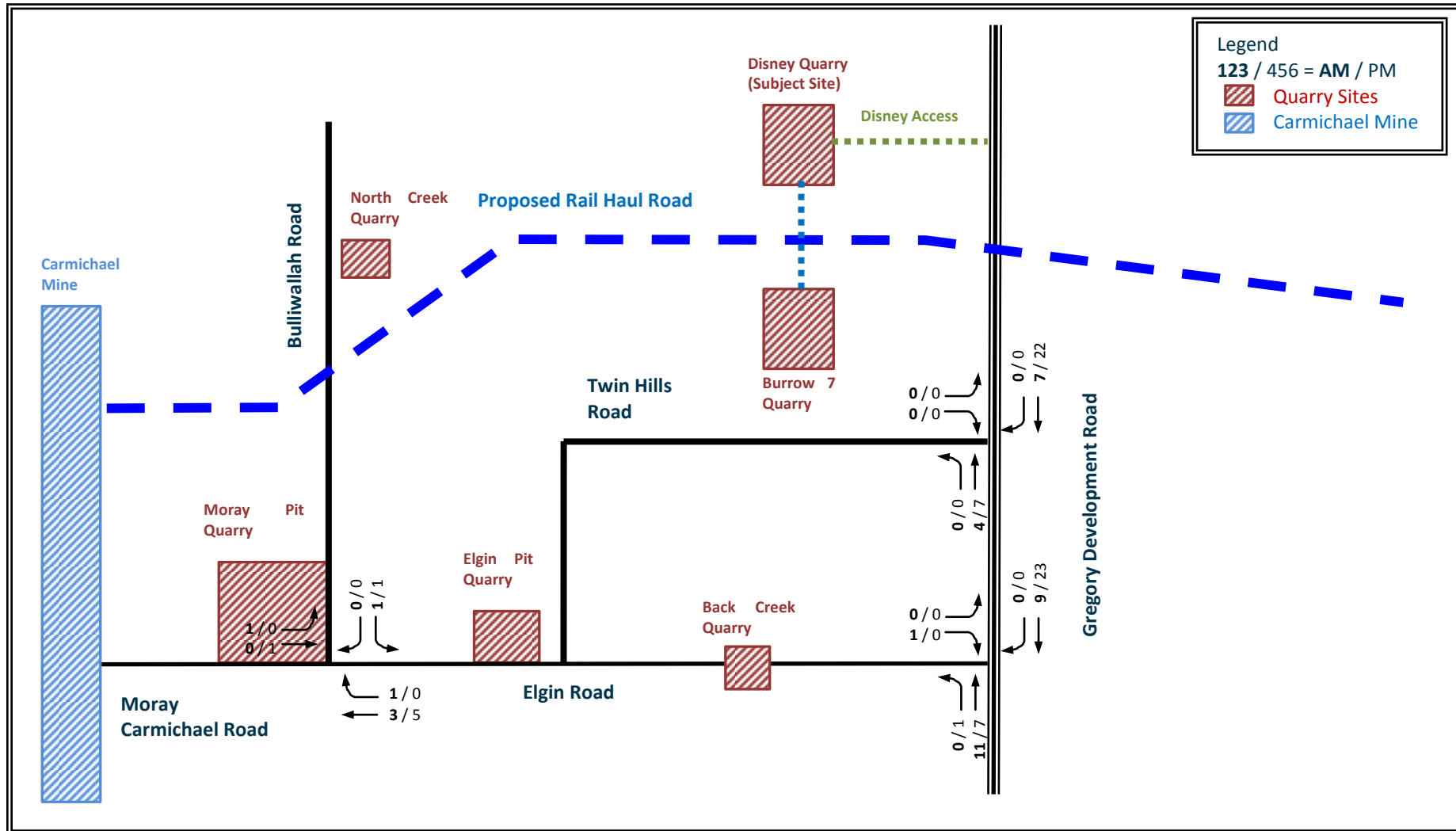


Figure 4.1: Study Area Peak Hour Traffic 2013

4.3 Existing ESA's

Advice from DTMR identifies an ESA value of 3.2 per heavy vehicle for all roads other than the Bruce Highway. This ESA value will be used for all existing heavy vehicles noted within the study area.

Table 4.1 provides the existing levels of ESAs on roads within the study area with the level of ESA's based on existing traffic data noted in **Table 2.1**, with heavy vehicle composition based on DTMR advice.

Table 4.1: Existing ESAs within Study Area

Road	Number of Vehicles per Class	ESA Total	
		Daily	Annual
Gregory Development Road	450vpd with 28.7%HV @ 3.2 ESA / HV	413	150,700

5. Quarry Operations

5.1 Proposed Quarry Site Operations

The following proposed operational parameters have been considered for the traffic and pavement impact assessments:

- The operations are intended for a short term period only (approx 2 years);
- The site will operate 24 hours;
- Typical annual quarry operations are 360 working days per year;
- An AB Triple vehicle with an average payload of 75t will be used;
- Truck movements will be split 50% in and 50% out during peak traffic periods;
- It is predicted that there will be 8-10 staff working on site; and
- The site peak traffic periods are between 07:00 and 08:00 and 16:00 and 17:00.

5.2 Development Truck ESA Loading

5.2.1 Haul Vehicles

It is likely that a typical AB Triple will haul the material from the quarry. The payload will be approximately 75t for each vehicle. TTM have reviewed the “Review of Heavy Vehicle Axle Load Data – Information Paper” (NTC Australia, July 2005). This document provides ESA values for an unloaded A Triple vehicle (1.67 ESA / vehicle) and an equation to derive ESA values for various loads (9.2 ESA / vehicle with a 75t payload).

The highest predicted annual haulage from Disney Quarry will be 10,500,000t. Haulage will be restricted to the local road network and a private haul road. As this quarry will provide material for the rail line on the west of the Gregory Development Road, some haulage movements will cross the state controlled road network. The operation of the Gregory Development Road / haul road intersection will be assessed by other parties through the planning process for the rail component of the project. The predicted daily level and peak hour number of trucks generated shown in **Table 5.1**.

Table 5.1: Estimated Daily & Peak Hour Haul Vehicle Generation

Tonnage/day	Average tonnes per load	Trucks in (load bearing)	Trucks out (non load bearing)	Total daily truck movements	Peak hour truck movements
Total Average: 18,650t	75	249 (2,291 ESA)	249 (416 ESA)	498 (2,707 ESA)	100
Total Peak Month: 50,344t	75	671 (6,173 ESA)	671 (1,121 ESA)	1,342 (7,294 ESA)	268
Crossing GDR Average: 15,380t	75	205 (1,886 ESA)	205 (342 ESA)	410 (2,228 ESA)	82
Crossing GDR Peak: 43,862t	75	585 (5,382 ESA)	585 (977 ESA)	1,170 (5,967 ESA)	234

Based on the assumptions shown in **Table 5.1** (combination of unloaded and loaded trips) the following calculations establish the daily and equivalent ESA's generated annually:

- Average Annual ESA: 498 daily two-way trucks = 974,520 ESA;
- Peak Annual ESA = 1,521,800 ESA (Maximum permissible haulage based on 10,500,000tpa); and
- An annual ESA value of 802,080 crossing the Gregory Development Road, with a peak of 1,170 daily movements and 234 peak hour movements.

5.2.2 Service Vehicles

TTM have been advised that service vehicles for site set up and operation will be as indicated in **Table 5.2**. Traffic Reports for other quarry applications should be reviewed for detail regarding service vehicle movements for other individual quarries.

Quarry operations may generate some additional minor and infrequent heavy vehicle movements, such as trucks collecting waste from site. These movements are however expected to be low in number and utilise smaller trucks, which would involve small ESA increases. **Table 5.2** includes conservative values for water and maintenance deliveries which should offset the non-inclusion of these other heavy vehicles.

Fuel requirements are based on 25,633L per week needed for Disney Quarry and 257,685L for all quarries collectively. Fuel will be transported in B-doubles with a 50,000L capacity, with a conservative ESA value of 8 per delivery accounting for entry (loaded) and exit (unloaded) movements of each vehicle. It is reiterated that this fuel is for the operation of the quarry / quarries only and does not include haulage activities, which will be serviced via a communal fuel farm and assessed through the EIS for the Carmichael Coal Mine and Rail Project.

Table 5.2: Estimated Number of Service Vehicles For Site Set Up and Operation

Service Vehicles	Disney Deliveries (in + out movements)	Disney Deliveries (ESA)	Disney (Annual ESA)	All Quarry Deliveries (in + out movements)	All Quarry Deliveries (ESA)	All Quarry (Annual ESA)
Site Set up	40	120	120	400	1,200	1,200
Operations: From Townsville	Fuel: 1 per week	Fuel: 4 per week	Fuel: 208	Fuel: 12 per week	Fuel: 48 per week	Fuel: 2,496
Operations: From Mackay	Water: 2 per week Maintenance: Negligible	Water: 6 per week Maintenance: Negligible	Water: 312	Water: 12 per week Maintenance: 14 per week Total: 26 per week	Water: 36 per week Maintenance: 42 per week Total: 78 per week	Water: 1,872 Maintenance: 2,184 Total: 4,056
Total (Annual)	196 trips		640 ESA	2,376 trips		7,752 ESA

5.3 Site Truck Distribution

TTM have consulted with Adani to determine likely distributions of quarry material. This includes not only the Disney Quarry, but also all other quarries related to the Carmichael Coal Mine and Rail Project. The defined study area for Disney Quarry includes the following road sections:

- Gregory Development Road from Peak Downs Highway to Belyando Crossing;
- Elgin Road;
- Moray Carmichael Road from Elgin Road to the Mine Site
- Bulliwallah Road; and
- Twin Hills Road from Elgin Road to Borrow 7 access.

The anticipated truck distributions from the Disney and associated quarries within this study area only are shown in **Table 5.3**. Route sections identified in this Table are shown in **Figure 5.1**. Heavy vehicles associated with site set up have been included in the route from the Peak Downs highway to provide a robust assessment (worst case scenario).

Table 5.3: Key Service Vehicle Routes

Haulage Routes		Disney Truck Distribution (VPD)	Annual Disney ESA's	All Quarry Truck Distribution (VPD)	All Quarry Annual ESA's
Key Routes	Study Ref				
Elgin Road (Gregory Development Road to Back Creek)	Section A	-	-	92% Service Vehicles (6.0)	7,112
Elgin Road (Back Creek to Twin Hills Road)	Section B	-	-	70% Service Vehicles (4.5)	5,394
Elgin Road (Twin Hills Road to Elgin Pits)	Section C	-	-	34% Service Vehicles (2.0)	2,670
Elgin Road (Elgin Pits to Bulliwallah Road)	Section D	-	-	15% Service Vehicles (0.6)	1,130
Moray Carmichael Road (Bulliwallah Road to Moray Pit)	Section E	-	-	7% Service Vehicles (0.5)	580
Twin Hills Road (Elgin Road to Borrow 7 Access)	Section F	-	-	35% Service Vehicles (2.5)	2,724
Bulliwallah Road (Elgin Road to North Creek)	Section G	-	-	7% Service Vehicles (0.5)	550
Gregory Development Road (Belyando Crossing to Disney)	Section H	33% Service Vehicles (0.1)	208	32% Service Vehicles (1.7)	2,496
Gregory Development Road (Disney to Haul Road)	Section I	67% Service Vehicles (0.4)	432	36% Service Vehicles (2.2)	2,810
Gregory Development Road (Haul Road to Elgin Road)	Section J	67% Service Vehicles (0.4)	432	36% Service Vehicles (2.2)	2,810
Gregory Development Road (Elgin Road to Peak Downs Highway)	Section K	67% Service Vehicles (0.4)	432	68% Service Vehicles (4.3)	5,256

5.4 Site Staff

It is anticipated that the quarry staff will be transferred by bus between the workers accommodation village and quarry site. The transfer route used will generally follow the proposed rail haulage route and then access the local road network towards each quarry site location.

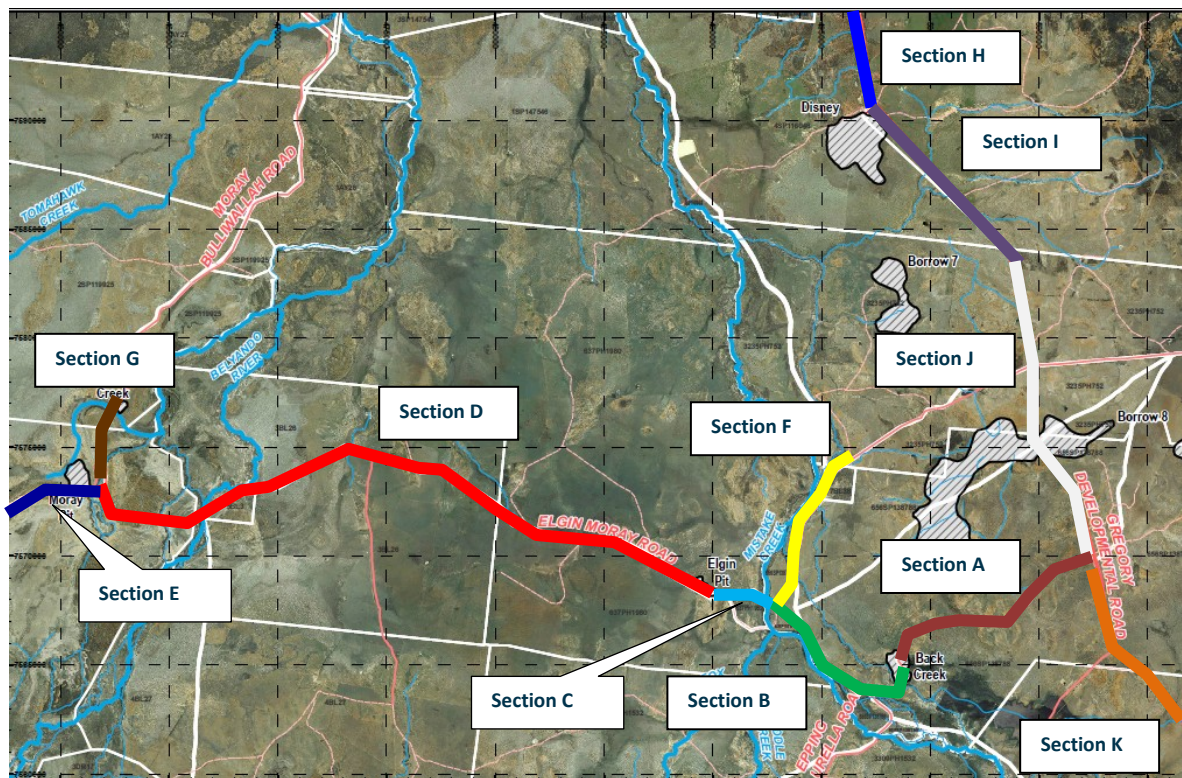


Figure 5.1: Study Area Road Sections – Disney Quarry

6. Traffic Impact Assessment

6.1 Introduction

This Chapter reviews the traffic operation and capacity performance within the study area.

6.2 Road Corridor Capacity Assessment

6.2.1 Assessment Criteria

The AUSTROADS Guide to Traffic Management indicates that two-lane rural highways have a capacity of 2,800 passenger cars per hour total for both directions of flow, under ideal conditions where there are no restrictive roadway, terrain or traffic conditions.

AUSTROADS defines level of service as a qualitative measure describing operational conditions within a traffic stream. The term Level of Service (LOS) and its characteristics for rural roads is defined in **Table 6.1**.

Table 6.1: Two Lane Rural Road Capacity – Rolling Terrain Two-Way Flow

LOS	Description	Rating
A	Free, unrestrictive flow	Very Good
B	Mostly free flow, few disruptions	Very Good
C	Stable flow	Good
D	Mostly stable flow, some delays	Acceptable
E	Congested flow, delays common	Bad
F	Forced flow	Bad

The volume and composition of traffic on a given road determines the level of interaction between vehicles and is measured as its LOS. LOS decreases with increasing traffic volumes. LOS 'A', LOS 'B', LOS 'C' in a rural context are satisfactory, with a LOS 'D' satisfactory in some circumstances.

In cases where traffic, terrain or geometric data may not be precisely known, the AUSTROADS Guide provides planning guidance on maximum AADT values that two-lane, two-way rural roads can accommodate under various terrain conditions.

Table 6.2 shows the values for various Levels of Service for a rural road in rolling terrain with varying ratios of design hour volume to AADT.

Table 6.2: Maximum AADT's for Various LOS on Two-Lane Two-Way Rural Roads

Design Hour Volume to AADT Ratio	Level of Service				
	A	B	C	D	E
0.10	1,100	2,800	5,200	8,000	14,800
0.11	1,000	2,500	4,700	7,200	13,500
0.12	900	2,300	4,400	6,600	12,300
0.13	900	2,100	4,000	6,100	11,400
0.14	800	1,480	3,700	5,700	10,600
0.15	700	1,800	3,500	5,300	9,900

6.2.2 Study Area Operational Performance

The highest volume road within the study area is Gregory Development Road which carries 450vpd. This volume is significantly less than the AADT threshold for a Level of Service 'A'.

Disney Quarry traffic is expected to increase traffic on the roads in the study area by no more than 10vpd vehicles during peak operations and as such the Level of Service 'A' is expected to be retained on all roads.

Up to 1,170vpd are predicted to cross the Gregory Development Road, however as previously mentioned this impact will be addressed through the planning process for the rail component of the Carmichael Coal Mine and Rail Project.

6.3 Intersection Capacity Assessment

6.3.1 Assessment Requirements

In a review of the GARID Guidelines Criteria 3: Traffic Operation Assessment, traffic operation impacts need to be considered for any section of a State Controlled Road (SCR) where the construction or operational traffic generated by the development equals or exceeds 5% of the existing AADT on the road section, intersection movements or turning movements.

6.3.2 Intersection Capacity Review

In a review of existing and future year traffic volumes at all intersections within the study area the highest trafficked road is Gregory Development Road with 31vph in the PM peak. TTM considers that all intersections within the study area will operate under uninterrupted flow conditions, which is based on guidance from the DTMR: Road Planning and Design Manual (RPDM) Chapter 13: Intersections at Grade: 13.5.4 Unsignalised Minor Road Intersections.

Table 13.4 Intersection Capacity - Uninterrupted Flow Conditions, is shown in **Figure 6.1**, with the level of peak hour traffic well below the criteria set in the table. TTM can therefore assume that uninterrupted flow conditions will occur, that the site access and local intersections will operate with nominal delays and queuing and no further capacity assessment is required.

**Table 13.4 Intersection Capacity –
Uninterrupted Flow Conditions**

Major Road Types ¹	Major Road Flow (vph) ²	Minor Road Flow (vph) ³
Two-Lane	400	250
	500	200
	650	100
Four-Lane	1000	100
	1500	50
	2000	25

Notes

1. Major road is through road i.e. has priority
2. Major road design volumes include through and turning movements
3. Minor road design volumes include through and turning volumes

Figure 6.1: RPDM Chapter 13: Table 13.4

6.4 Access Route Intersection Review

TTM have reviewed the sight distance of all intersections within the study area in accordance with DTMR requirements as shown in **Figure 6.2**. Assessment of the required turn treatments at all intersections are also included in this review.

Table 13.5 Intersection Sight Distance for Level Pavement

Design Speed (km/h)	Deceleration (g) ⁽¹⁾	Entering Sight Distance 1.15m to 1.15m (m) ⁽³⁾	ASD - Approach Sight Distance (1.15m to 0.0m)				SISD - Safe Intersection Sight Distance (1.15m to 1.15m)			
			Absolute Minimum 2.0 secs ⁽⁵⁾		Desirable 2.5 secs ⁽⁵⁾		Absolute Minimum 2.0 secs ⁽⁵⁾		Desirable 2.5 secs ⁽⁵⁾	
			m ⁽²⁾	min R ⁽⁴⁾	m ⁽²⁾	min R ⁽⁴⁾	m ⁽²⁾	min R ⁽⁴⁾	m ⁽²⁾	min R ⁽⁴⁾
40	0.56	100	33	500	39	700	66	500	72	600
50	0.52	125	47	1000	54	1300	89	900	96	1000
60	0.48	160	63	1800	71	2200	113	1400	121	1600
70	0.45	220	82	2900	91	3600	140	2200	149	2500
80	0.43	305	103	4600	114	5700	170	3200	181	3600
90	0.41	400	128	7200	140	8600	203	4500	215	5100
100	0.39	500	157	10800	170	12600	240	6300	253	7000
110	0.37	500	190	15700	205	18300	282	8700	297	9600
120	0.35	500	229	22800	245	26100	329	11800	345	13000

Notes:

1. Average deceleration adopted, given in terms of acceleration due to gravity (g).
2. For grade corrections to ASD and SISD, see Table 13.6.
3. Limiting values of ESD based on the assumption that drivers are unlikely to seek gaps greater than 500m.
4. Crest vertical curve radius (m).
5. Reaction times.

Figure 6.2: RPDM Chapter 13: Intersections at Grade: Table 13.5

6.4.1 Gregory Development Road / Disney Access

As noted in **Section 3.1**, the sight distance in each direction at this access intersection exceeds 350m as shown in **Figure 3.1**. This sight distance is higher than the 345m sight distance noted in **Figure 6.2** for a road with a 120kph design speed and is therefore considered suitable.

Figure 6.3 identifies required turn treatments at this intersection based on base and project movement volumes for the Gregory Development Road / Disney access intersection on opening day (2014). **Figure 6.4** shows the required turn treatments in 2024. For a conservative assessment, it has been assumed that all daily vehicles will arrive in a single peak hour with double the average daily deliveries during peak periods. Existing movements at this intersection have been increase by 10% pa as noted earlier in this report.

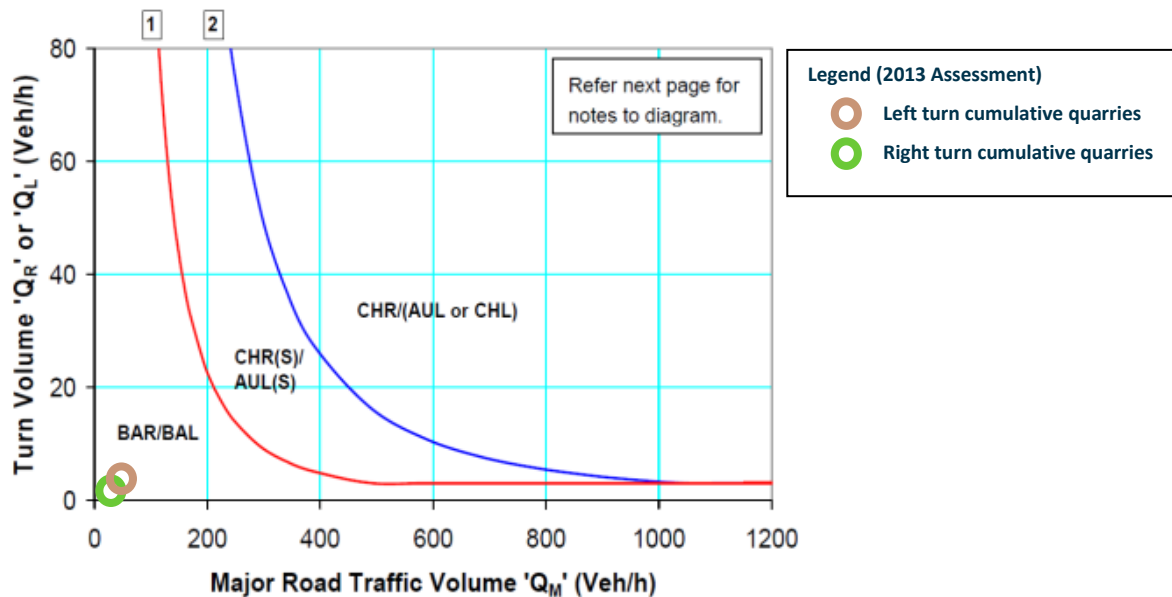


Figure 6.3: Gregory Development / Disney Access: Warrants for Turn Treatments (2014)

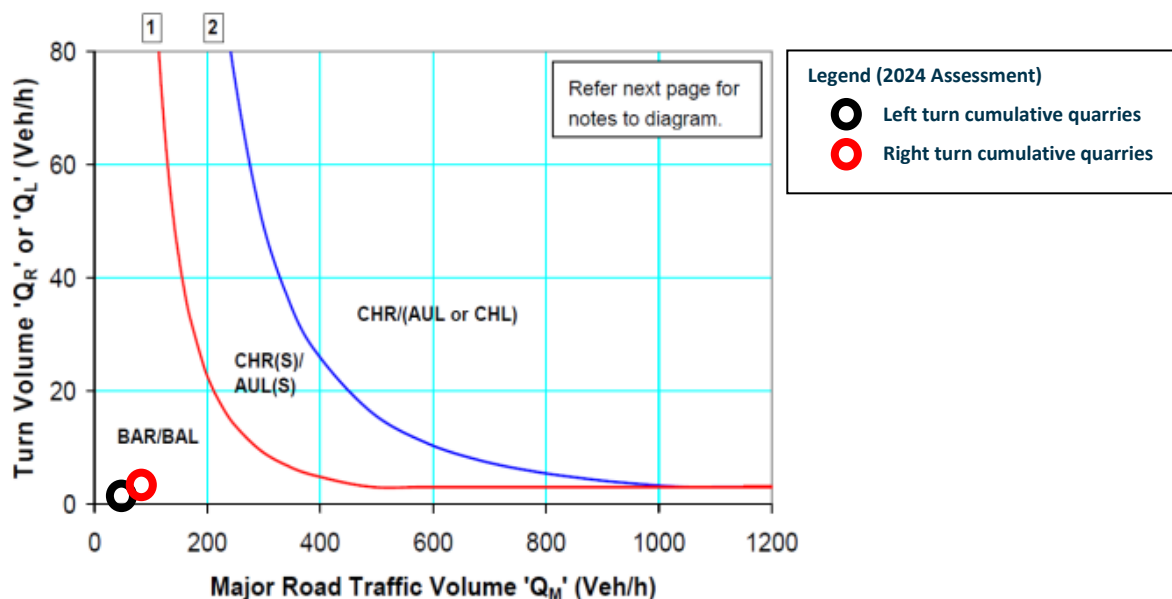


Figure 6.4: Gregory Development / Disney Access: Warrants for Turn Treatments (2024)

This analysis identifies that basic left (BAL) and basic right (BAR) turn treatment are required at the Gregory Development Road / Disney access intersection prior to quarry operations.

7. Pavement Impact Assessment

7.1 Introduction

The Department of Transport and Main Roads (DTMR) have produced Guidelines for Assessment of Road Impacts of Developments Proposals, which aids in the assessment of impacts on state controlled roads (SCR).

In general terms, DTMR considers that an impact on a road is insignificant if there is a less than 5% increase in traffic, measured either as annual average daily traffic (AADT) or equivalent standard axles (ESAs). Haulage from Disney Quarry will utilise a private haul road with some haul vehicles crossing the Gregory Development Road. The interim and ultimate use of this crossing facility will be address in the planning process for the rail line. As such only service vehicles identified in **Table 5.2** and **Table 5.3** will be assessed within this report.

Table 7.1 shows the anticipated impact on the Gregory Development Road relating to predicted quarry movements for Disney Quarry and the five other quarries related to the Carmichael Coal Mine and Rail Project.

Table 7.1: Development ESA Impact

Road Segment /Site AADT Survey Location	Existing Annual ESA's (2012)	Disney ESA	Disney ESA Impact (2014)	Cumulative Quarry ESA	Cumulative Quarry ESA Impact (2014)
Section H	150,700	208	0.1%	2,496	1.6%
Section I	150,700	432	0.3%	2,810	1.9%
Section J	150,700	432	0.3%	2,810	1.9%
Section K	150,700	432	0.3%	5,256	3.5%

This assessment is based on 2012 volumes on the Gregory Development Road. As such the impact of quarry operations on the state controlled road network is expected to reduce over time.

7.2 Access Route Pavement Condition Assessment

7.2.1 Gregory Development Road

TTM has sourced the existing pavement condition from two sources. TTM undertook a visual assessment in 5th March 2013. This assessment identified the existing pavement configuration and indicative current surface condition, with a road summary shown in **Table 7.2**.

Table 7.2: Pavement Condition Summary

Road	Section	Length	Width	Condition
Gregory Development Road	Clermont to Belyando Crossing	157.8km	8m	Good surface, with minor rutting / roughness

The Gregory Development Road is a sealed road with a good standard from Clermont through to Belyando Crossing. Sealed shoulders between 0.5-1.0m wide are provided along this length.

A Traffic Management and Maintenance Plan will be implemented as part of the Operational Works, as further noted in **Chapter 8**.

8. Site Access and Parking Arrangements

8.1 Site Access Arrangements

TTM understand that the site access arrangements will be designed in accordance with both Council and AUSTROAD's requirements and submitted as part of the Operation Works Application.

In developing a site access layout into the Disney from Twin Hills Road, TTM recommend the following access layout characteristics:

- The provision of a formal sealed access to the property boundary;
- A cattle grid at the property boundary to remove dust and gravel from vehicle tyres;
- Lane flares at the access to allow service vehicles to enter and exit simultaneously without conflict; and
- BAR / BAL treatments and shoulder provisions.

The sight distance at the existing Disney access appears to be in excess of 350m and as such the existing access location should be suitable.

The Disney access is located approximately 40m south of another access on the eastern side of the Gregory Development Road. The land owner of that lot should be consulted to determine an effective BAR treatment design, which may also incorporate a left turn provision into that site. Nevertheless, this access should be considered in the ultimate design of any upgrade to the Disney access intersection.

8.2 Parking Arrangements and On-site Manoeuvring

TTM recommend that formal parking areas are provided for vehicles that are required to wait on-site, including parking areas dedicated for the anticipated peak number of buses, private vehicles and service vehicles on site at any given time. Formal parking areas should also be kept clear of haul vehicle manoeuvring with a preference to segregate haul vehicle routes from other vehicle movements as soon as possible within the property boundary.

It is also recommend that on-site haul vehicle swept paths are reviewed to ensure for adequate internal manoeuvring and clearance zones between any pedestrian, operational and parking requirements.

TTM note that Adani will incorporate the above recommendations into their site plan for Disney Quarry.

9. Traffic Management & Maintenance Plan

TTM recommend for a Traffic Management and Maintenance Plan to be implemented for the duration of quarry haulage activities, which would be in place prior to any on-site activity. This plan will be developed in conjunction with both Council and DTMR and will likely to cover the following areas:

- Interim haulage of quarry material along Elgin Road, Moray Carmichael Road and Bulliwallah Road;
- Interim haulage of quarry material onto the Gregory Development Road;
- Construction of the Gregory Development Road overpass;
- Upgrade of Elgin Road / Moray Carmichael Road ;
- Construction of haul route intersections with local roads (Bulliwallah Road); and
- Maintenance Plan to be developed for designated quarry routes on both Local and State controlled roads.

10. Developer Contributions

10.1.1 DTMR

Table 7.1 indicates that the proposed operations of all quarries, including Disney Quarry, will not have a significant impact on the state controlled road network. As such no assessment of contributions is required. The upgrade of the Gregory Development Road / Disney access intersection should be at the cost of Adani.

11. Summary

The predicted development traffic has been reviewed, with capacity and pavement assessments undertaken, with the main assessment conclusions as follows:

11.1 Existing Traffic Review

The existing background traffic data has been reviewed, with existing peak hour and ESA values calculated.

11.2 Development Traffic Generation and Distribution

TTM has undertaken a detailed estimate of the likely development traffic generation and distribution, with the site predicted to generate a maximum daily traffic generation 1,342 vehicles (in / out).

11.3 Development Traffic Impacts

A detailed assessment of the development traffic impacts in accordance with the GARID guidelines has established that Disney Quarry and associated quarries will not have a significant or assessable pavement impact on the state controlled road network.

A minimum of BAR / BAL treatment should be provided at the Gregory Development Road / Disney access intersection prior to the commencement of quarry operations.

11.4 Developer Contributions

Adani will fully fund the upgrade of the Gregory Development Road / Disney access intersection which is considered suitable to mitigate impacts at this intersection.

11.5 Road Safety School Route, Pedestrian and Cyclist Review

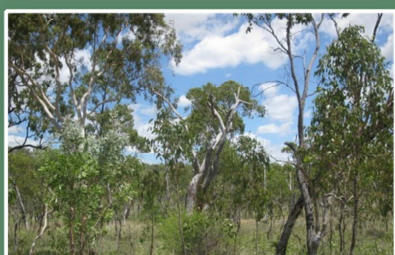
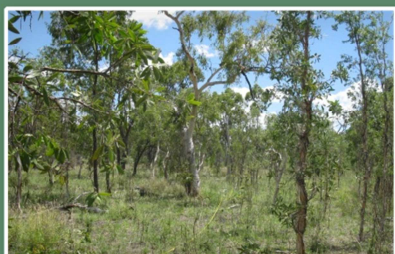
TTM consider that there will no school route, pedestrian or cyclist impacts associated with the development proposal.

11.6 Conclusion

From a review of this report, TTM are of the view that there are no traffic planning or engineering reasons why the proposed development should not proceed as planned.

Appendix D - Vegetation Clearing Report

environmental management



Material Change of Use Concurrence Agency
Policy Response

and

Regional Vegetation Management Code Response
Brigalow Belt and New England Tablelands Bioregion

Disney Quarry

Gregory Development Road, Clermont

6867

11 July 2013

Adani Mining Pty Ltd





Document Control

Title	Disney Quarry - MCU Policy and Regional Vegetation Management Code Response - Brigalow Belt and New England Tablelands Bioregion
Address	Gregory Development Road, Clermont
Job Number	6867
Client	Adani Mining Pty Ltd

Document Issue

Issue	Date	Prepared By	Checked By
Draft	26.04.2013	Renee Wallerstein	Dr Andrew Davies
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Final V2	09.07.2013	Tom Connor	Dr Andrew Davies
Final V3	11.07.2013	Ross Marshall	Ross Marshall

Disclaimer

This report has been prepared for **Adani Mining Pty Ltd**. **Saunders Havill Group** cannot accept responsibility for any use of or reliance upon the contents of this report by any third party.

Reports and/or Plans by Others

Reports and/or plans by others may be included within this Environmental Management report to support the document.



Table of Contents

1. Introduction	3
1.1. Key Site Details	3
1.2. Background	6
2. Flora Assessment	8
3. Response to Criteria Table F-2.	12
4. Response to the Regional Vegetation Management Code	14
5. Appendices	22

Figures

- Figure 1: Site Context
- Figure 2: Site Aerial
- Figure 3: Belyando Shire planning Scheme Zoning Map
- Figure 4: Regional Ecosystem Mapping
- Figure 5: Proposed PMAV

Tables

- Table 1: Property Summary
- Table 2: Criteria Table F-2
- Table 3: Part Xb: Requirements for clearing for an extractive industry in an area that is not a Key Resource Area

Plans

- Plan 1: Property Vegetation Management Plan



I. Introduction

The *Environmental Management Division* of the **Saunders Havill Group** was engaged by **Adani Mining Pty Ltd** to respond to the *2009 MCU Concurrence Agency Policy* for works associated with the Disney Quarry site on Gregory Development Road, Clermont. A Response to the Regional Vegetation Management Code (RVMC) to clear remnant vegetation associated with Extractive Industry that is not in a key resource area is provided with this application. The purpose of the quarry is to provide structural material for the Carmichael Coal Mine and Rail Project.

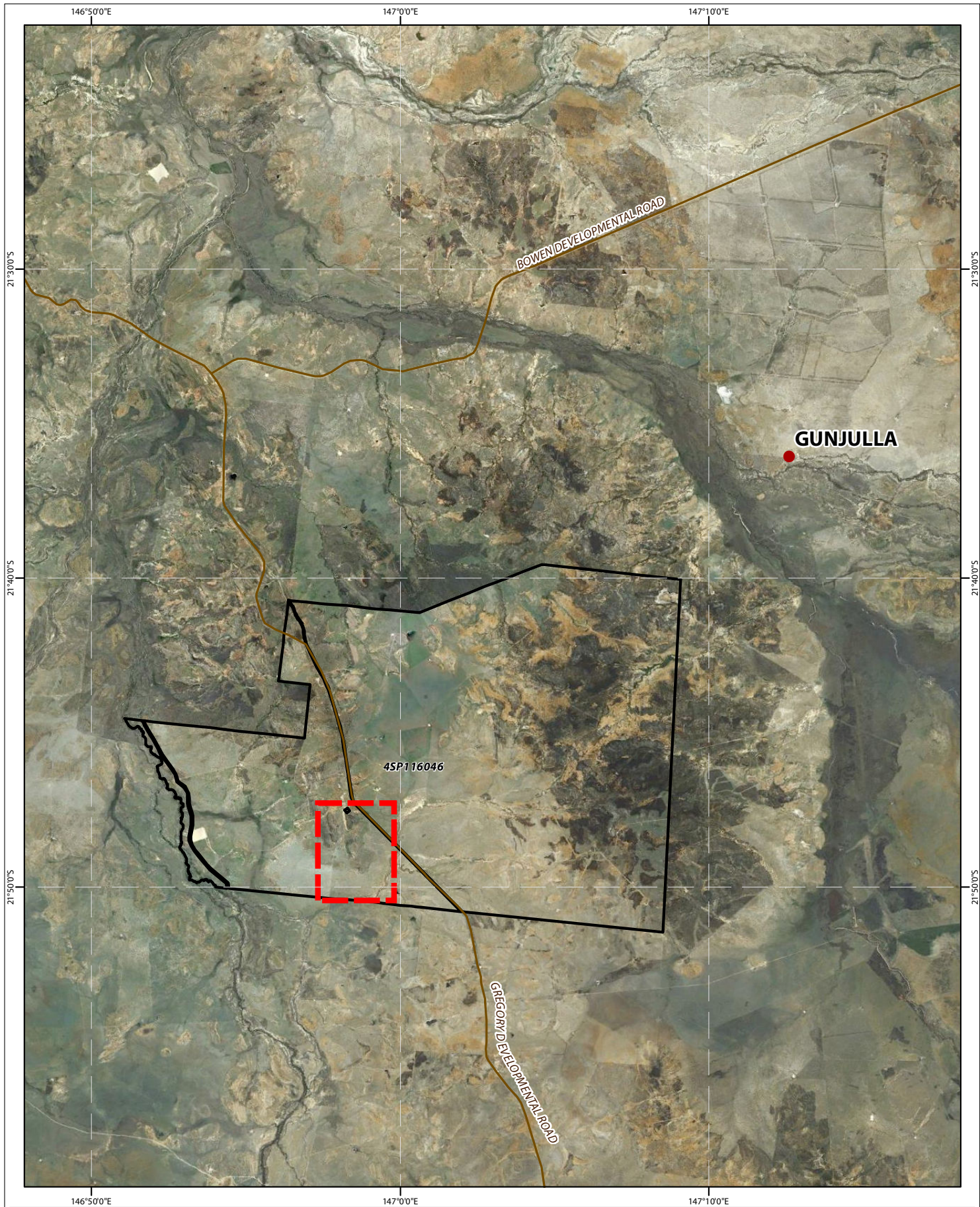
This report addresses Assessment Table F-2 (refer herein to **Table 2**) of the *Concurrence Agency Policy for Material Change of Use (MCU) – version 2, 2009*, as the proposed clearing is in Least Concern remnant vegetation. A response to Part Xb of the *Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregion* (refer herein to **Table 3**) is provided. Please see **Appendix A** for the Property Vegetation Management Plan.

The total area of disturbance is approximately 188 hectares. Contextually, the assessment site is located approximately 144 kilometres North-West of Clermont (refer to **Figures 1 & 2**). The surrounding land use is rural.

I.I. Key Site Details

Table 1: Property Summary

Address	Gregory Development Road, Clermont
RPD	Lot 4 on SP116046
Area	Approximately 188 ha (Quarry and access roads)
Local Government Area	Isaac Regional Council
Planning Scheme	<i>Belyando Shire Planning Scheme 2009</i>
Local Plan Zoning	Rural
Vegetation Management Act 1999 (VMA)	Least Concern RE 11.11.15, Least Concern RE 11.5.3 and non-remnant
Topography	Gentle Undulating Rise
Existing Land Use	Rangelands
Proposed Land Use	Quarry / Extraction
Land Tenure	Leasehold



Legend

- Town / Place Name
- Major Roads
- Lot 4 on SP116046

Figure 1 Site Context

File ref. 6550 E 01 Aerial Site Context B

Date 8/07/2013

Project Carmichael Coal Rail Project

0 1 2 4 6 8 10 km
Scale (A4): 1:300,000 [GDA 1994 MGA Z55]



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Legend

-  DCDB
-  Quarry disturbance extent

Figure 2 Site Aerial

File ref. 6550 E 01 Site Aerial B
Date 8/07/2013
Project Carmichael Coal Rail Project

0 100 200 400 600 800 1,000 m
 Scale (A4): 1:25,000 [GDA 1994 MGA Z55]



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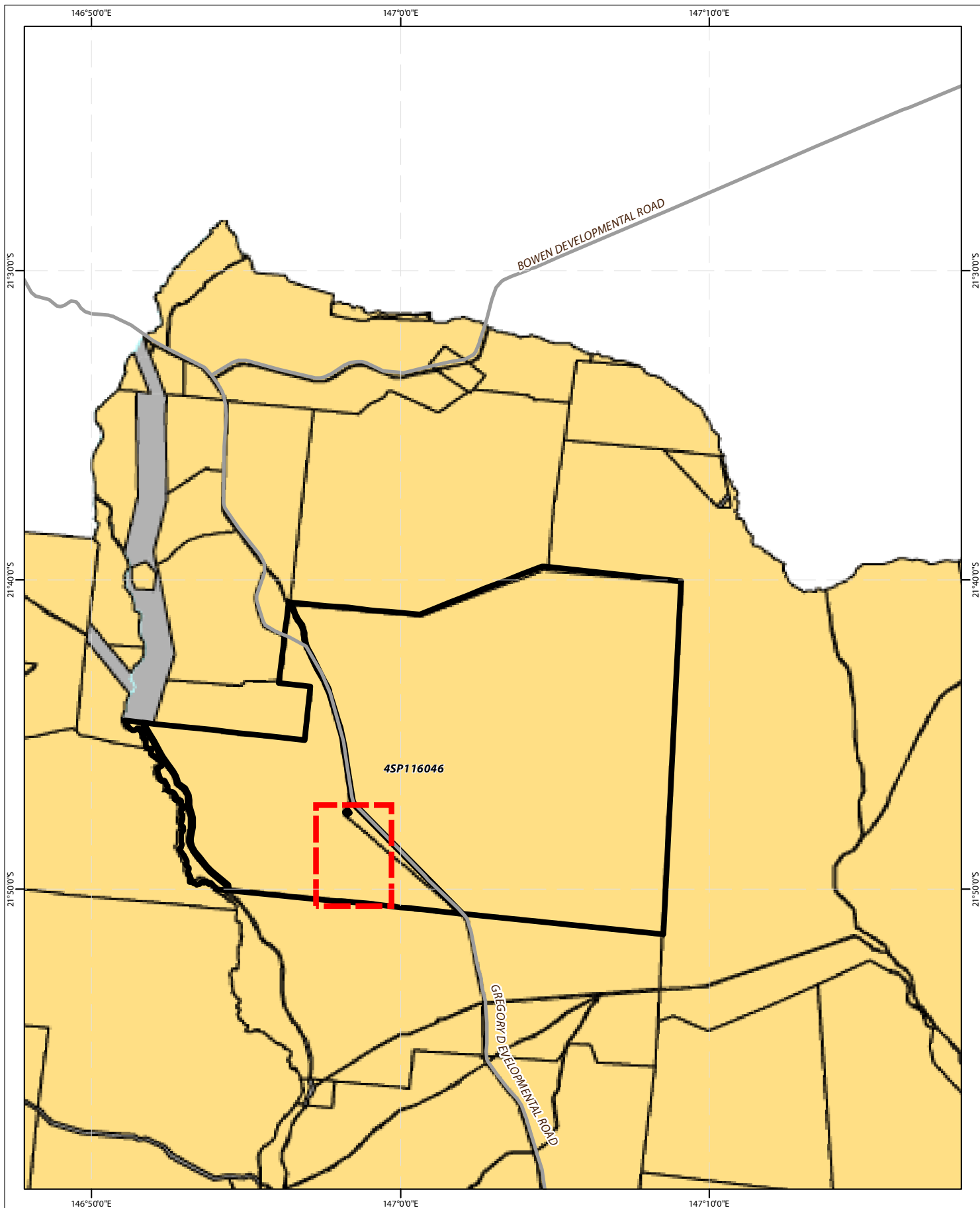
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1.2. Background

This application covers the proposed Disney Quarry and represents a site currently zoned Rural under the *Belyando Shire Planning Scheme 2009* (see **Figure 3**) where excavation cannot occur without clearing of vegetation protected under the VMA. The location and extent of the required quarry were determined post extensive geotechnical and environmental investigations across a range of potential sites. The Disney Quarry site is currently overlayed with remnant vegetation polygons by *Regional Ecosystem and Remnant Mapping Version 6.1* (see **Section 2** Flora Assessment). A Complex Property Map of Assessable Vegetation (PMAV) application has been prepared which reflects species identified on-ground (see **Section 2**). Ground-proofing supports a change from Endangered to Least Concern Regional Ecosystems in polygons bordering and within the proposed Quarry disturbance area (see **Section 2**). This Complex PMAV should be read in conjunction with this application.

From *Assessment Table 1* of the *Concurrence Agency Policy for Material Change of Use (MCU) – version 2, 2009*, clearing as a result of the MCU in an area to which a PMAV category does not apply - vegetation shown on a regional ecosystem or remnant map as remnant vegetation (1(b)) for Applications for any other purpose (e) requires assessment against *Criteria Table F-1 or F-2* of this Policy. As clearing is proposed in Least Concern vegetation only, a response to Table F-2 (Clearing as a result of the MCU involves clearing of least concern regional ecosystems) is provided (please see **Section 3** Response to Criteria Table F-2 and **Section 4** Response to the Regional Vegetation Management Code).



Legend:

ZONING

- Commercial
- Industry
- Open Space and Recreation
- Rural
- Urban

- Road
- Waterway

Figure 3 Belyando Shire Planning Scheme Zoning Map

File ref. 6550 E 03 Zoning B

Date 8/07/2013

Project Carmichael Coal Rail Project

0 1 2 4 6 8 10 km
Scale (A4): 1:300,000 [GDA 1994 MGA Z55]



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2. Flora Assessment

The majority of remnant vegetation within the proposed quarry site is characterised by a community dominated by *Eucalyptus crebra* (Narrow Leaf Ironbark) and *Corymbia clarksoniana* (Long Fruited Bloodwood). The understorey contains species including *Petalostigma pubescens* (Quinine Bush) and *Alphitonia excelsa* (Soap Tree); species consistent with Least Concern RE 11.11.15.

RE 11.11.15 – Least Concern

Description

Eucalyptus crebra +/- *Corymbia erythrophloia* +/- *E. populnea* +/- *E. melanophloia* +/- *C. tessellaris* +/- *C. clarksoniana* woodland often with a shrubby layer. *Eucalyptus exserta* and *E. platyphylla* present in central coastal part of bioregion. Occurs on undulating rises and low hills, often with distinct strike pattern formed on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics and Permian sediments. (BVG1M: 13c). Major vegetation communities include: 11.11.15a: *Eucalyptus crebra*, *E. exserta* woodland. (BVG1M: 13c). 11.11.15b: *Eucalyptus drepanophylla* and/or *E. platyphylla* woodland +/- vine thicket species. (BVG1M: 13c). 11.11.15c: Woodland with *Corymbia setosa* present to dominant, usually with *Corymbia clarksoniana*, *Eucalyptus melanophloia*, *Corymbia dallachiana* and *Eucalyptus crebra*, with occasional shrubs of *Petalostigma pubescens* and *Alphitonia excelsa*. (BVG1M: 13c). 11.11.15d: Woodland with *Corymbia setosa* present to dominant, usually with *Corymbia clarksoniana*, *Eucalyptus melanophloia*, *Corymbia dallachiana* and *Eucalyptus crebra*, with occasional shrubs of *Petalostigma pubescens* and *Alphitonia excelsa*. Occurs on low rises and short hills derived from Devonian-Carboniferous sediments (mainly conglomerates in Beresford Stn). Associated soils are hard gravelly to stony, (BVG1M: 13c).



Photo: Site vegetation consistent with RE 11.11.15



On-ground surveying verified the presence of Least Concern RE 11.11.15 within the quarry footprint, as per *Regional Ecosystem and Remnant Mapping Version 6.1* (**Figure 4**, next page). The species composition of Endangered Regional Ecosystem polygons mapped as bordering and within the proposed disturbance area refutes their status. A complex PMAV which accurately reflects vegetation communities on-ground and requests a change in status for these polygons from Endangered to Least Concern (**Figure 5**) has been prepared and should be read in conjunction with this application. As per the PMAV, Endangered Regional Ecosystems incorrectly mapped within the quarry footprint (**Figure 4**) are proposed as Least Concern Regional Ecosystems; RE 11.11.15 to the East and RE 11.5.3 to the West (**Figure 5**). Please see **Appendix B** for the full species list.

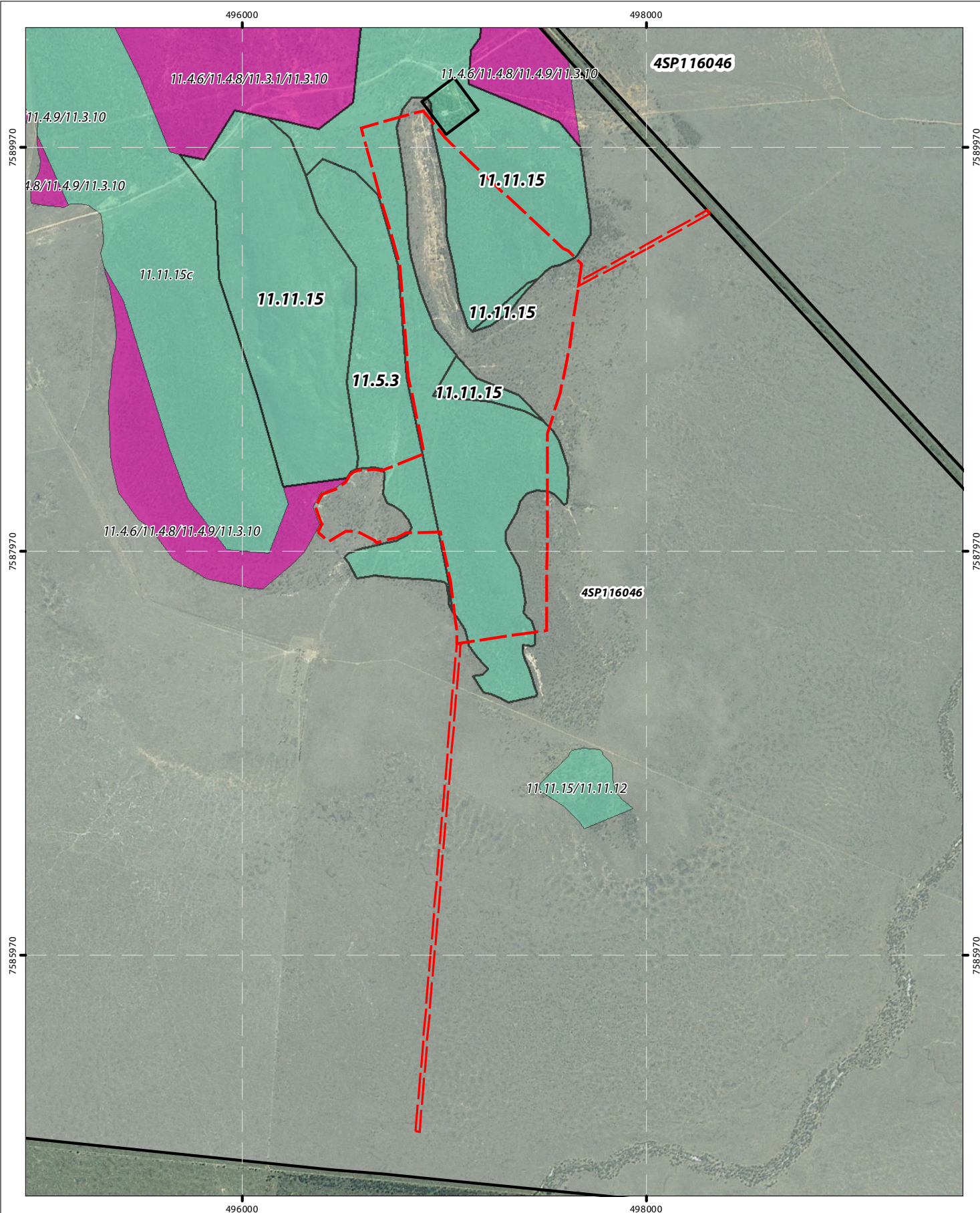
RE 11.5.3 – Least Concern

Description

Eucalyptus populnea +/- *E. melanophloia* +/- *Corymbia clarksoniana* +/- *C. dallachiana* and occasionally *E. cambageana* or *E. brownii* dominate the tree layer (14 m median height and 11-15 m range) woodland. Localised areas may be dominated by *E. melanophloia*, occasionally *E. crebra* and other canopy species. There is generally a distinctive low tree layer (8, 6-11 m high) dominated by species such as *Eremophila mitchellii*, *Geijera parviflora*, *Archidendropsis basaltica*, *Erythroxylum australe*, *Cassia brewsteri*, *Ventilago viminalis* and occasionally *Allocasuarina luehmannii* or *Callitris glaucophylla*. A low shrub layer (2-6 m high) dominated by species such as *Carissa ovata*, *Erythroxylum australe*, *Capparis lasiantha* is also often present. Occurs on flat to gently undulating plains formed from Cainozoic sediments. Associated soils are generally deep texture contrast with thick sandy surface horizons with some deep red earths. (BVG1M: 17a). Major vegetation communities include: 11.5.3a: *E. melanophloia* +/- *Corymbia clarksoniana* +/- *C. dallachiana* dominate the tree layer (14 m median height and 11-15m range) woodland. There is generally a low tree layer (8, 6-11 m high) present. (BVG1M: 17b). 11.5.3b: Palustrine wetland (e.g. vegetated swamp). *Eucalyptus populnea* on closed depressions Occurs on closed depressions in sandplains. (BVG1M: 17a).



Photo: Site vegetation consistent with RE 11.5.3



Legend

- | | |
|---------------------------|---|
| DCDB | Proposed PMAV REs |
| Quarry disturbance extent | Remnant vegetation containing Endangered REs |
| Category X Area | Remnant vegetation containing Of Concern REs |
| | Remnant vegetation that is a Least Concern RE |

Figure 5 Proposed PMAV

File ref. 6550 E 05 Disney PMAV B

Date 8/07/2013

Project Carmichael Coal Rail Project

0 100 200 400 600 800 1,000 m
Scale (A4): 1:25,000 [GDA 1994 MGA Z55]



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3. Response to Criteria Table F-2.

The following is a response to Criteria Table F-2. Performance requirements for 'clearing as a result of the MCU involves clearing of *least concern* regional ecosystems' as per *Concurrence Agency Policy for Material Change of Use (MCU) – version 2, 2009*

Table 2: Criteria Table F-2

Performance requirement
PR F1 To regulate the clearing of <u>vegetation</u> in a way that ensures the conservation of regional ecosystems, <u>clearing as a result of the MCU</u> only occurs where the applicant has demonstrated that the development has first avoided and minimised the impacts of the development. Response Extensive geotechnical and ecological surveys (including vegetation surveys) have been completed along and adjoining the alignment of Adani's Carmichael Coal Mine and Rail Project. This included the investigation of a large volume of properties for potential use to supply necessary quarry material for construction requirements of the rail and mine facility. Through constraint analyses and detailed geotechnical review these quarry areas have been refined to the most suited locations relative to where the rail and mine construction works are occurring. Through ground proofing, the Disney Quarry avoids clearing of remnant vegetation and where this is not possible clearing has been limited to confirmed Least Concern Communities. Substantially more suitable quarry material is available in areas which would have required clearing of Of Concern and Endangered communities, however, these have been avoided to minimise impacts. PR F1 is achieved.
PR F2 <u>Clearing as a result of the MCU</u> assessed under this Table may occur only where the MCU meets: a) Performance Requirements 2 to 10 of the <u>relevant code</u>, Part Xb for an extractive purpose



Response

Please see **Section 4** Response to the Regional Vegetation Management Code, below, which demonstrates how **PR F2 is achieved**.



4. Response to the Regional Vegetation Management Code

Table 3: Part Xb: Requirements for clearing for an extractive industry in an area that is not a Key Resource Area

Performance Requirement	Comment
PR Xb.2: Clearing is staged To regulate the clearing of vegetation in a way that conserves remnant vegetation that are regional ecosystems, does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes — clearing — a) is staged in line with operational needs that restricts clearing to the current operational area; and b) is limited to the area from which material will be extracted within the term of the permit; and c) cannot occur until all required permits are obtained.	Clearing will be staged in line with operational needs. Refer to Appendix 1 for detailed plans showing the proposed Quarry works. PR Xb 2 is achieved.

Performance Required	Acceptable Solutions	Comments
PR Xb.3: Wetlands To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes — assessable vegetation associated with any natural significant wetland and/or natural wetland is protected to maintain n— a) water quality by filtering sediments, nutrients	AS Xb.3 Xb.3.1 Clearing does not occur — a) in any natural wetland; and b) within 100 metres from any natural wetland; and	The site does not contain a wetland, nor is it in proximity to a wetland. PR Xb 3 is achieved.



Performance Required	Acceptable Solutions	Comments
and other pollutants; and b) aquatic habitat; and c) terrestrial habitat.	c) in any natural significant wetland; and d) within 200 metres from any natural significant wetland.	
PR Xb.4: 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 — assessable vegetation associated with any watercourse is protected to maintain — a) bank stability by protecting against bank erosion; and b) water quality by filtering sediments, nutrients and other pollutants; and c) aquatic habitat; and d) terrestrial habitat.	AS Xb.4 Xb.4.1 Clearing does not occur — a) in any watercourse; and b) within the relevant distance stipulated in Table 2, of each high bank of each watercourse.	The site does not contain a watercourse, nor is it in proximity to a watercourse. PR Xb 4 is achieved.



Performance Required	Acceptable Solutions	Comments
PR Xb.5: Connectivity To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes — areas of mapped remnant vegetation are retained that are — a) of sufficient size and configured in a way to maintain ecosystem functioning; and 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 mapped remnant vegetation on adjacent properties.	AS Xb.5 Xb.5.1 Where clearing is less than — a) 10 metres wide in the coastal subregions of the Brigalow Belt Bioregion; or b) 2 hectares in the coastal subregions of the Brigalow Belt Bioregion; or c) 25 metres wide in the non-coastal subregions of the Brigalow Belt and the New England Tableland Bioregion; or d) is less than 5 hectares in the non-coastal subregions of the Brigalow Belt and the New England Tableland Bioregion; clearing does not— i) reduce the width of mapped remnant vegetation to less than 200 metres; and ii) occur where the width of mapped remnant	Areas of on-site clearing involve the minor expansion of non-remnant areas via the removal of uneven edges of Least Concern remnant polygons. It is noted that site REs are not mapped as containing Essential Habitat for any threatened species. Areas retained occur around the periphery of the site where they combine with off-site mapped areas to make up a large polygon of sufficient size and configuration to ensure maintenance of ecosystem function and protection against threatening processes. Post Quarry rehabilitation will reinstate remnant communities in clearance locations. PR Xb 5 is achieved using an alternative solution.



Performance Required	Acceptable Solutions	Comments
	vegetation is less than 200 metres; OR Xb.5.2 Clearing does not — a) reduce areas of contiguous mapped remnant vegetation to less than 10 hectares in the coastal subregions of the Brigalow Belt Bioregion; and b) occur in areas of contiguous mapped remnant vegetation that are less than 10 hectares, in the coastal subregions of the Brigalow Belt Bioregion; and c) reduce areas of contiguous mapped remnant vegetation to less than 50 hectares in the non-coastal subregions of the Brigalow Belt and the New England Tableland Bioregion; and d) occur in areas of contiguous mapped remnant vegetation that are less than 50 hectares, in the non-coastal subregions of the Brigalow Belt	



Performance Required	Acceptable Solutions	Comments
	and the New England Tableland Bioregion; and e) reduce the width of mapped remnant vegetation to less than 200 metres; and f) occur where the width of mapped remnant vegetation is less than 200 metres; and reduce the total extent of mapped remnant vegetation to less than 30%; and h) occur where the total extent of mapped remnant vegetation is less than 30%.	
PR Xb.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 Xb.6 Xb.6.1 Where clearing is less than — a) 2 hectares; or b) 10 metres wide. OR Xb.6.2	Site investigations of the expansion area found no evidence of salt scalds, seepage or waterlogging in the area. Clearing in the quarrying expansion areas is not considered to cause any land degradation and will be managed through the construction, operational and rehabilitation phase via the site Integrated Environmental Management System. PR Xb 6 is achieved.



Performance Required	Acceptable Solutions	Comments
	Clearing does not occur— a) in any discharge area; and b) within 200 metres of any discharge area.	
PR Xb.7 Conserving remnant vegetation that are <i>endangered</i> regional ecosystems and of concern regional ecosystems To regulate the clearing of vegetation in a way that conserves remnant vegetation that are <i>endangered</i> regional ecosystems and <i>of concern</i> regional ecosystems — maintain the current extent of <i>endangered</i> regional ecosystems and <i>of concern</i> regional ecosystems.	AS Xb.7 Xb.7.1 Clearing — a) does not occur in an <i>endangered</i> regional ecosystem or an <i>of concern</i> regional ecosystem that is listed in Table 4; and b) in an <i>endangered</i> regional ecosystem or an <i>of concern</i> regional ecosystem that is not listed in Table 4 only occurs where the clearing is less than 10 metres wide or 0.5 hectares.	The site does not contain any <i>endangered</i> or <i>of concern</i> regional ecosystems and will not result in the clearing of these vegetation communities. PR Xb 7 is achieved.
PR Xb.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 Xb.8 Xb.8.1 Clearing does not occur in an area which is shown as essential habitat on the essential habitat map.	The regional ecosystems on site are not mapped as providing essential habitat. PR Xb 8 is achieved.



Performance Required	Acceptable Solutions	Comments
PR Xb.9: Conservation status thresholds To regulate the clearing of vegetation in a way that conserves remnant vegetation that are regional ecosystems and prevents the loss of biodiversity — maintain the current extent of regional ecosystems listed in Table 5.	AS Xb.9 Xb.9.1 Clearing in a regional ecosystem listed in Table 5, does not occur unless the clearing is less than 2 hectares.	The site is mapped as containing regional ecosystems 11.11.15 and 11.5.3, which are not listed in Table 5. PR Xb 9 is achieved.
PR Xb.10: Acid sulphate 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 Bioregion, and the Marlborough Plains subregion (11.14) — clearing activities do not result in disturbance of acid sulphate soils or changes to the hydrology of the location that will either- a) aerate horizons containing iron sulphides; or b) mobilise acid and/or metals.	AS Xb.10 Xb.10.1 In the coastal subregions of the Brigalow Belt Bioregion, and the Marlborough Plains subregion (11.14), clearing in land zone 1, land zone 2 or land zone 3 in areas below 5 metre Australian Height Datum— a) is carried out in accordance with an acid sulphate soils environmental management plan as outlined in the State Planning Policy 2/02 Guideline: Planning and Managing Development involving Acid Sulphate Soils; and b) follows management principles in accordance	Extractive resource activities will occur within Land Zones 5 & 11 and above AHD 5 m. PR Xb 10 is achieved.



Performance Required	Acceptable Solutions	Comments
	with the Soil Management Guidelines in the Queensland Acid Sulphate Soil Technical Manual.	



5. Appendices

Appendix A

Property Vegetation Management Plan

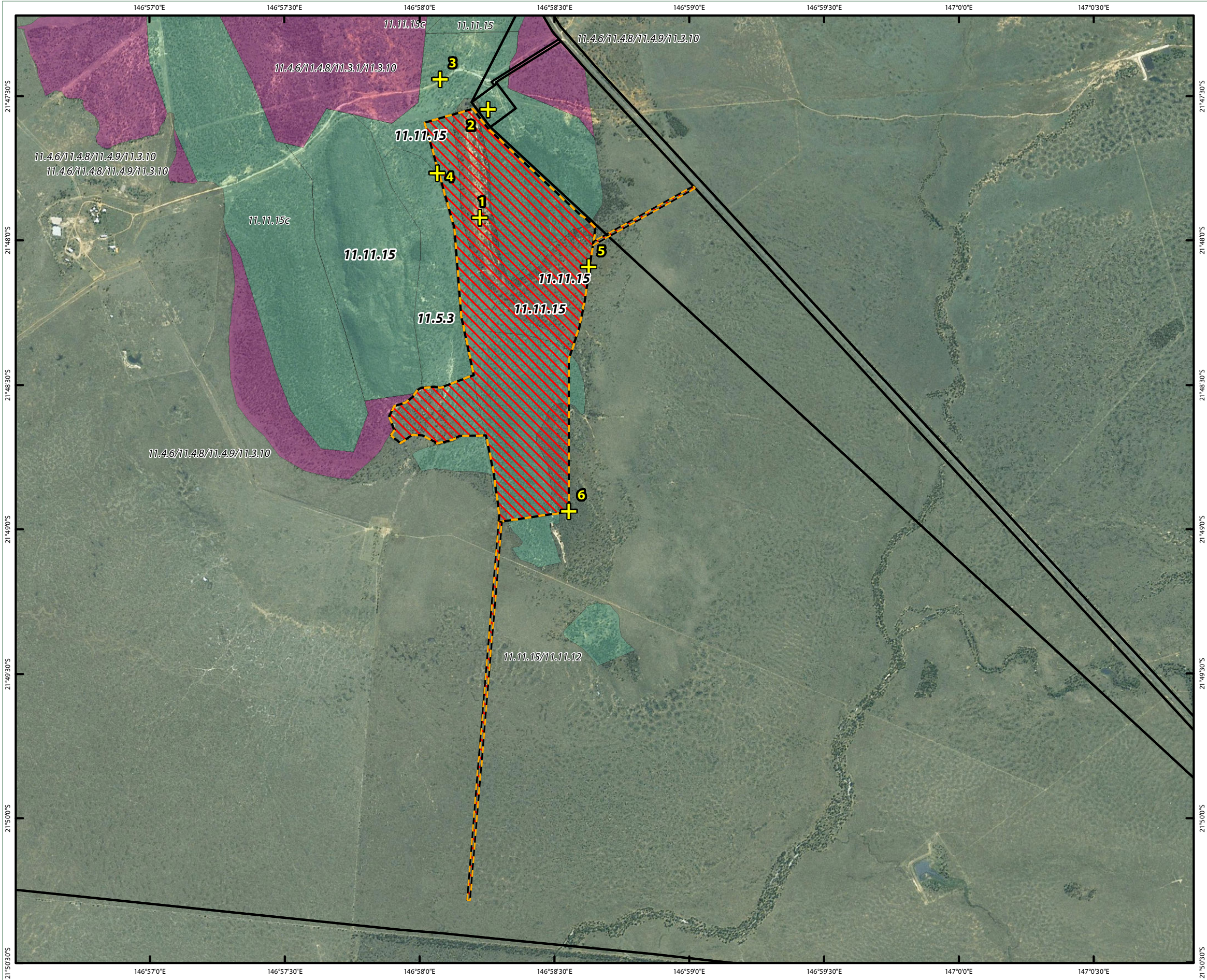
Appendix B

Species List



Appendix A

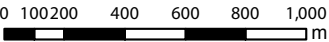
Property Vegetation Management Plan



PVMP Coordinate Table (GDA94 MGA z55)			
ID	Description	Longitude (m)	Latitude (m)
1	Previously Quarried Area	496941.588869	7589454.62685
2	Radio / Communications Tower	496991.859803	7590145.19073
3	Homestead Access Road	496687.588361	7590338.33695
4	Edge of clearing extent	496669.795139	7589737.31029
5	Edge of clearing extent	497636.245236	7589138.09408
6	Edge of clearing extent	497507.559136	7587578.29058

Legend

- DCDB
- PVMP Coordinates
- Quarry disturbance extent
- Area to be Cleared / Disturbed
- Proposed PMAV REs
 - Remnant vegetation containing Endangered REs
 - Remnant vegetation containing Of Concern REs
 - Remnant vegetation that is a Least Concern RE



Carmichael Coal Rail Project

Disney Quarry - Property Vegetation Management Plan

Date 8/07/2013
Scale 1:25,000 @ A3
Data Information:
Universal Transverse Mercator
GDA 1994 MGA Zone 56
Client Adani Mining Pty Ltd
Project Carmichael Coal Rail Project
Address/RPD Isaac Regional Council
Source DCBD (DNRM, 2012), Aerial (Google, 2012)
RE & HVR (EHP, 2013)

Plan 1

Of 1

SHG File
6550 E 01 Disney Quarry B

THESE PLANS HAVE BEEN PREPARED FOR THE EXCLUSIVE USE OF THE CLIENT. SAUNDERS HAVILL GROUP CANNOT ACCEPT RESPONSIBILITY FOR ANY USE OF OR RELIANCE UPON THE CONTENTS OF THESE DRAWINGS BY ANY THIRD PARTY.

CONFIRM ALL DIMENSIONS ON SITE PRIOR TO CONSTRUCTION AND DO NOT SCALE FROM THE DRAWINGS. ALL DIMENSIONS ARE IN MILLIMETRES. ANY DISCREPANCIES SHOULD BE CLARIFIED IN WRITING WITH SAUNDERS HAVILL GROUP PRIOR TO THE COMMENCEMENT OF WORK.

PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.

ISSUES:				
Issue	Date	Description	Drawn	Checked
A	9.01.2013	Prelim Draft	TC	RM



Appendix B

Species List



Scientific Name	Common Name	Conservation Status (NCA)	EPBCA Status
<i>Acacia decora</i>	Showy Wattle	Least Concern	Not Listed
<i>Acacia salicina</i>	Sally Wattle	Least Concern	Not Listed
<i>Alphitonia excelsa</i>	Red Ash	Least Concern	Not Listed
<i>Archidendropsis basaltica</i>	Dead Finish	Least Concern	Not Listed
<i>Aristida latifolia</i>	Feathertop Wiregrass	Least Concern	Not Listed
<i>Atalaya hemiglausa</i>	Whitewood	Least Concern	Not Listed
<i>Breynia oblongifolia</i>	Coffee Bush	Least Concern	Not Listed
<i>Calotis cuneata</i>	Blue-burr Daisy	Least Concern	Not Listed
<i>Capparis lasinatha</i>	Wait-A-While	Least Concern	Not Listed
<i>Carissa ovata</i>	Currant Bush	Least Concern	Not Listed
<i>Cassia brewsteri</i>	Leichhardt Bean	Least Concern	Not Listed
<i>Chrysocephalum apiculatum</i>	Yellow Buttons	Least Concern	Not Listed
<i>Citrus glauca</i>	Desert Lime	Least Concern	Not Listed
<i>Corymbia clarksoniana</i>	Long Fruited Bloodwood	Least Concern	Not Listed
<i>Corymbia dallachiana</i>	Ghost Gum	Least Concern	Not Listed
<i>Corymbia erythrophloia</i>	Variable-barked Bloodwood	Least Concern	Not Listed
<i>Dodonaea filifolia</i>	Hop Bush	Least Concern	Not Listed
<i>Erythroxylum australe</i>	Dogwood	Least Concern	Not Listed
<i>Eucalyptus brownii</i>	Reid River Box	Least Concern	Not Listed
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	Least Concern	Not Listed
<i>Grevillea decora</i>	Grevillea	Least Concern	Not Listed
<i>Grewia retusifolia</i>	Dogs Balls	Least Concern	Not Listed
<i>Heteropogon contortus</i>	Black Spear-grass	Least Concern	Not Listed
<i>Hovea longipes</i>	Hovea	Least Concern	Not Listed
<i>Lysiphyllum carronii</i>	Red Bauhinia	Least Concern	Not Listed
<i>Melaleuca nervosa</i>	Paperbark	Least Concern	Not Listed
<i>Melinis repens</i>	Red Natal Grass	Not Listed	Not Listed
<i>Panicum decompositum</i>	Native Millet	Least Concern	Not Listed
<i>Pennisetum ciliare</i>	Buffel Grass	Not Listed	Not Listed
<i>Petalostigma pubescens</i>	Quinine Bush	Least Concern	Not Listed
<i>Planchonia careya</i>	Cocky Apple	Least Concern	Not Listed
<i>Pogonolobus reticulatus</i>	Pogonolobus	Least Concern	Not Listed
<i>Sida cordifolia</i>	Flannel Weed	Not Listed	Not Listed
<i>Sporobolus caroli</i>	Fairy Grass	Least Concern	Not Listed
<i>Terminalia oblongata</i>	Yellowwood	Least Concern	Not Listed
<i>Themeda triandra</i>	Kangaroo Grass	Least Concern	Not Listed
<i>Triodia mitchellii</i>	Buck Spinifex	Least Concern	Not Listed

Appendix E - EHP Wildlife Online Search



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point

Species: All

Type: All

Status: All

Records: All

Date: All

Latitude: 21.7979

Longitude: 146.9691

Distance: 15

Email: kinnytp@cdmsmith.com

Date submitted: Monday 08 Apr 2013 10:57:01

Date extracted: Monday 08 Apr 2013 11:00:03

The number of records retrieved = 391

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	<i>Rhinella marina</i>	cane toad	Y			1
animals	amphibians	Hylidae	<i>Litoria rothii</i>	northern laughing treefrog		C		1
animals	amphibians	Hylidae	<i>Litoria inermis</i>	bumpy rocketfrog		C		2/2
animals	amphibians	Limnodynastidae	<i>Notaden bennettii</i>	holy cross frog		C		1
animals	birds	Acanthizidae	<i>Acanthiza chrysorrhoa</i>	yellow-rumped thornbill		C		3
animals	birds	Acanthizidae	<i>Gerygone albogularis</i>	white-throated gerygone		C		4
animals	birds	Acanthizidae	<i>Acanthiza apicalis</i>	inland thornbill		C		2
animals	birds	Acanthizidae	<i>Acanthiza nana</i>	yellow thornbill		C		1
animals	birds	Acanthizidae	<i>Smicromis brevirostris</i>	weebill		C		8
animals	birds	Accipitridae	<i>Haliastur sphenurus</i>	whistling kite		C		5
animals	birds	Accipitridae	<i>Accipiter fasciatus</i>	brown goshawk		C		1
animals	birds	Accipitridae	<i>Lophoictinia isura</i>	square-tailed kite		NT		2
animals	birds	Accipitridae	<i>Aquila audax</i>	wedge-tailed eagle		C		2
animals	birds	Accipitridae	<i>Hieraaetus morphnoides</i>	little eagle		C		1
animals	birds	Acrocephalidae	<i>Acrocephalus australis</i>	Australian reed-warbler		C		2
animals	birds	Aegothelidae	<i>Aegotheles cristatus</i>	Australian owl-nightjar		C		1
animals	birds	Anatidae	<i>Nettapus pulchellus</i>	green pygmy-goose		C		1
animals	birds	Anatidae	<i>Nettapus coromandelianus</i>	cotton pygmy-goose		NT		3
animals	birds	Anatidae	<i>Chenonetta jubata</i>	Australian wood duck		C		1
animals	birds	Anatidae	<i>Anas superciliosa</i>	Pacific black duck		C		3
animals	birds	Anatidae	<i>Aythya australis</i>	hardhead		C		1
animals	birds	Anatidae	<i>Anas gracilis</i>	grey teal		C		3
animals	birds	Apodidae	<i>Hirundapus caudacutus</i>	white-throated needletail		C		1
animals	birds	Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen night-heron		C		1
animals	birds	Ardeidae	<i>Ardea pacifica</i>	white-necked heron		C		1
animals	birds	Ardeidae	<i>Ardea modesta</i>	eastern great egret		C		1
animals	birds	Artamidae	<i>Artamus cinereus</i>	black-faced woodswallow		C		1
animals	birds	Artamidae	<i>Cracticus nigrogularis</i>	pied butcherbird		C		10
animals	birds	Artamidae	<i>Cracticus tibicen</i>	Australian magpie		C		5
animals	birds	Artamidae	<i>Artamus personatus</i>	masked woodswallow		C		3
animals	birds	Artamidae	<i>Strepera graculina</i>	pied currawong		C		1
animals	birds	Artamidae	<i>Cracticus torquatus</i>	grey butcherbird		C		3
animals	birds	Artamidae	<i>Artamus minor</i>	little woodswallow		C		3
animals	birds	Artamidae	<i>Artamus superciliosus</i>	white-browed woodswallow		C		1
animals	birds	Artamidae	<i>Artamus leucorhynchus</i>	white-breasted woodswallow		C		1
animals	birds	Cacatuidae	<i>Cacatua galerita</i>	sulphur-crested cockatoo		C		5
animals	birds	Cacatuidae	<i>Nymphicus hollandicus</i>	cockatiel		C		2
animals	birds	Cacatuidae	<i>Eolophus roseicapillus</i>	galah		C		5
animals	birds	Cacatuidae	<i>Calyptorhynchus banksii</i>	red-tailed black-cockatoo		C		1
animals	birds	Cacatuidae	<i>Calyptorhynchus funereus</i>	yellow-tailed black-cockatoo		C		2
animals	birds	Campephagidae	<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike		C		7
animals	birds	Campephagidae	<i>Lalage sueurii</i>	white-winged triller		C		4
animals	birds	Casuariidae	<i>Dromaius novaehollandiae</i>	emu		C		2
animals	birds	Charadriidae	<i>Vanellus miles</i>	masked lapwing		C		1
animals	birds	Charadriidae	<i>Elseyornis melanops</i>	black-fronted dotterel		C		1
animals	birds	Cisticolidae	<i>Cisticola exilis</i>	golden-headed cisticola		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Climacteridae	<i>Climacteris picumnus</i>	brown treecreeper		C		7
animals	birds	Columbidae	<i>Geopelia humeralis</i>	bar-shouldered dove		C		1
animals	birds	Columbidae	<i>Ocyphaps lophotes</i>	crested pigeon		C		3
animals	birds	Columbidae	<i>Phaps chalcoptera</i>	common bronzewing		C		4
animals	birds	Columbidae	<i>Geopelia striata</i>	peaceful dove		C		3
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	7/2
animals	birds	Coraciidae	<i>Eurystomus orientalis</i>	dollarbird		C		3
animals	birds	Corcoracidae	<i>Struthidea cinerea</i>	apostlebird		C		1
animals	birds	Corvidae	<i>Corvus sp.</i>					1
animals	birds	Corvidae	<i>Corvus coronoides</i>	Australian raven		C		2
animals	birds	Corvidae	<i>Corvus bennetti</i>	little crow		C		3
animals	birds	Corvidae	<i>Corvus orru</i>	Torresian crow		C		7
animals	birds	Cuculidae	<i>Scythrops novaehollandiae</i>	channel-billed cuckoo		C		3
animals	birds	Cuculidae	<i>Centropus phasianinus</i>	pheasant coucal		C		1
animals	birds	Estrildidae	<i>Taeniopygia guttata</i>	zebra finch		C		1
animals	birds	Estrildidae	<i>Taeniopygia bichenovii</i>	double-barred finch		C		10
animals	birds	Eurostopodidae	<i>Eurostopodus mystacalis</i>	white-throated nightjar		C		1
animals	birds	Eurostopodidae	<i>Eurostopodus argus</i>	spotted nightjar		C		1
animals	birds	Falconidae	<i>Falco berigora</i>	brown falcon		C		6
animals	birds	Falconidae	<i>Falco peregrinus</i>	peregrine falcon		C		1
animals	birds	Halcyonidae	<i>Todiramphus sanctus</i>	sacred kingfisher		C		3
animals	birds	Halcyonidae	<i>Dacelo leachii</i>	blue-winged kookaburra		C		3
animals	birds	Halcyonidae	<i>Dacelo novaeguineae</i>	laughing kookaburra		C		2
animals	birds	Jacanidae	<i>Irediparra gallinacea</i>	comb-crested jacana		C		1
animals	birds	Maluridae	<i>Malurus melanocephalus</i>	red-backed fairy-wren		C		6
animals	birds	Maluridae	<i>Malurus lamberti</i>	variegated fairy-wren		C		6
animals	birds	Megaluridae	<i>Cincloramphus mathewsi</i>	rufous songlark		C		2
animals	birds	Meliphagidae	<i>Entomyzon cyanotis</i>	blue-faced honeyeater		C		3
animals	birds	Meliphagidae	<i>Manorina flavigula</i>	yellow-throated miner		C		7
animals	birds	Meliphagidae	<i>Ptilotula plumulus</i>	grey-fronted honeyeater		C		1
animals	birds	Meliphagidae	<i>Gavicalis virescens</i>	singing honeyeater		C		7
animals	birds	Meliphagidae	<i>Lichmera indistincta</i>	brown honeyeater		C		9
animals	birds	Meliphagidae	<i>Philemon corniculatus</i>	noisy friarbird		C		9
animals	birds	Meliphagidae	<i>Philemon citreogularis</i>	little friarbird		C		6
animals	birds	Meliphagidae	<i>Conopophila rufogularis</i>	rufous-throated honeyeater		C		1
animals	birds	Meliphagidae	<i>Acanthagenys rufogularis</i>	spiny-cheeked honeyeater		C		3
animals	birds	Meliphagidae	<i>Melithreptus albogularis</i>	white-throated honeyeater		C		8
animals	birds	Meliphagidae	<i>Plectorhyncha lanceolata</i>	striped honeyeater		C		8
animals	birds	Meropidae	<i>Merops ornatus</i>	rainbow bee-eater		C		8
animals	birds	Monarchidae	<i>Grallina cyanoleuca</i>	magpie-lark		C		3
animals	birds	Monarchidae	<i>Myiagra rubecula</i>	leaden flycatcher		C		4
animals	birds	Nectariniidae	<i>Dicaeum hirundinaceum</i>	mistletoebird		C		9
animals	birds	Neosittidae	<i>Daphoenositta chrysoptera</i>	varied sittella		C		4
animals	birds	Otididae	<i>Ardeotis australis</i>	Australian bustard		C		7
animals	birds	Pachycephalidae	<i>Colluricincla harmonica</i>	grey shrike-thrush		C		4
animals	birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	rufous whistler		C		9

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Pardalotidae	<i>Pardalotus striatus</i>	striated pardalote		C		9
animals	birds	Petroicidae	<i>Microeca fascians</i>	jacky winter		C		9
animals	birds	Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	little black cormorant		C		1
animals	birds	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	little pied cormorant		C		1
animals	birds	Podargidae	<i>Podargus strigoides</i>	tawny frogmouth		C		6
animals	birds	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian grebe		C		2
animals	birds	Pomatostomidae	<i>Pomatostomus temporalis</i>	grey-crowned babbler		C		6
animals	birds	Psittacidae	<i>Platycercus adscitus</i>	pale-headed rosella		C		6
animals	birds	Psittacidae	<i>Aprosmictus erythropterus</i>	red-winged parrot		C		7
animals	birds	Psittacidae	<i>Trichoglossus haematodus moluccanus</i>	rainbow lorikeet		C		2
animals	birds	Ptilonorhynchidae	<i>Ptilonorhynchus maculatus</i>	spotted bowerbird		C		2
animals	birds	Rallidae	<i>Tribonyx ventralis</i>	black-tailed native-hen		C		1
animals	birds	Rallidae	<i>Fulica atra</i>	Eurasian coot		C		2
animals	birds	Rhipiduridae	<i>Rhipidura leucophrys</i>	willie wagtail		C		4
animals	birds	Rhipiduridae	<i>Rhipidura albiscapa</i>	grey fantail		C		2
animals	birds	Strigidae	<i>Ninox boobook</i>	southern boobook		C		2
animals	mammals	Canidae	<i>Canis lupus dingo</i>	dingo				1
animals	mammals	Dasyuridae	<i>Planigale maculata</i>	common planigale		C		2/1
animals	mammals	Emballonuridae	<i>Saccolaimus flaviventris</i>	yellow-bellied sheath-tail bat		C		1/1
animals	mammals	Felidae	<i>Felis catus</i>	cat	Y			2
animals	mammals	Leporidae	<i>Oryctolagus cuniculus</i>	rabbit	Y			1
animals	mammals	Macropodidae	<i>Macropus giganteus</i>	eastern grey kangaroo		C		7
animals	mammals	Macropodidae	<i>Macropus robustus</i>	common wallaroo		C		1
animals	mammals	Macropodidae	<i>Macropus rufus</i>	red kangaroo		C		3
animals	mammals	Macropodidae	<i>Macropus dorsalis</i>	black-striped wallaby		C		1
animals	mammals	Macropodidae	<i>Wallabia bicolor</i>	swamp wallaby		C		1
animals	mammals	Molossidae	<i>Mormopterus beccarii</i>	Beccari's freetail bat		C		4
animals	mammals	Molossidae	<i>Chaerephon jobensis</i>	northern freetail bat		C		1
animals	mammals	Muridae	<i>Pseudomys sp.</i>					1
animals	mammals	Potoroidae	<i>Aepyprymnus rufescens</i>	rufous bettong		C		1
animals	mammals	Pteropodidae	<i>Pteropus scapulatus</i>	little red flying-fox		C		1
animals	mammals	Suidae	<i>Sus scrofa</i>	pig	Y			3
animals	mammals	Vespertilionidae	<i>Scotorepens greyii</i>	little broad-nosed bat		C		5/1
animals	reptiles	Diplodactylidae	<i>Lucasium steindachneri</i>	Steindachner's gecko		C		2
animals	reptiles	Diplodactylidae	<i>Amolosa rhombifer</i>	zig-zag gecko		C		1
animals	reptiles	Diplodactylidae	<i>Strophurus williamsi</i>	soft-spined gecko		C		1
animals	reptiles	Gekkonidae	<i>Gehyra catenata</i>			C		4/1
animals	reptiles	Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's gecko		C		8/2
animals	reptiles	Gekkonidae	<i>Gehyra dubia</i>			C		3
animals	reptiles	Pygopodidae	<i>Delma tincta</i>			C		3/1
animals	reptiles	Pygopodidae	<i>Lialis burtonis</i>	Burton's legless lizard		C		2/1
animals	reptiles	Scincidae	<i>Lerista punctatovittata</i>			C		3/1
animals	reptiles	Scincidae	<i>Carlia pectoralis sensu lato</i>			C		4/1
animals	reptiles	Scincidae	<i>Cryptoblepharus metallicus</i>	metallic snake-eyed skink		C		1/1
animals	reptiles	Scincidae	<i>Ctenotus robustus</i>			C		4/2
animals	reptiles	Scincidae	<i>Menetia timlowi</i>			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	reptiles	Scincidae	<i>Cryptoblepharus pannosus</i>	ragged snake-eyed skink		C		9/2
animals	reptiles	Scincidae	<i>Carlia munda</i>			C		2/1
animals	reptiles	Scincidae	<i>Morethia taeniopleura</i>	fire-tailed skink		C		4/1
animals	reptiles	Scincidae	<i>Carlia rubigo</i>	orange-flanked rainbow skink		C		1/1
animals	reptiles	Scincidae	<i>Ctenotus pantherinus</i>			C		1/1
animals	reptiles	Scincidae	<i>Proablepharus tenuis</i>			C		2/1
plants	ferns	Adiantaceae	<i>Cheilanthes distans</i>	bristly cloak fern		C		1/1
plants	ferns	Adiantaceae	<i>Cheilanthes sieberi</i>			C		3
plants	ferns	Adiantaceae	<i>Cheilanthes tenuifolia</i>	rock fern		C		1
plants	ferns	Marsileaceae	<i>Marsilea hirsuta</i>	hairy nardoo		C		1/1
plants	higher dicots	Acanthaceae	<i>Acanthaceae</i>			C		1
plants	higher dicots	Acanthaceae	<i>Rostellularia adscendens</i>			C		1
plants	higher dicots	Amaranthaceae	<i>Alternanthera nodiflora</i>	joyweed		C		3/2
plants	higher dicots	Amaranthaceae	<i>Alternanthera denticulata</i> var. <i>micrantha</i>			C		2/2
plants	higher dicots	Amaranthaceae	<i>Gomphrena lanata</i>			C		1/1
plants	higher dicots	Amaranthaceae	<i>Gomphrena humilis</i>			C		1/1
plants	higher dicots	Apocynaceae	<i>Carissa ovata</i>	currantbush		C		6
plants	higher dicots	Apocynaceae	<i>Marsdenia</i>			C		1
plants	higher dicots	Apocynaceae	<i>Marsdenia microlepis</i>			C		1/1
plants	higher dicots	Apocynaceae	<i>Parsonsia lanceolata</i>	northern silkpod		C		2
plants	higher dicots	Apocynaceae	<i>Carissa lanceolata</i>			C		3/1
plants	higher dicots	Asteraceae	<i>Peripleura hispidula</i> var. <i>hispidula</i>			C		1/1
plants	higher dicots	Asteraceae	<i>Peripleura hispidula</i> var. <i>setosa</i>			C		1/1
plants	higher dicots	Asteraceae	<i>Parthenium hysterophorus</i>	parthenium weed	Y			2/2
plants	higher dicots	Asteraceae	<i>Pterocaulon serrulatum</i>			C		2
plants	higher dicots	Asteraceae	<i>Asteraceae</i>			C		2
plants	higher dicots	Asteraceae	<i>Sonchus oleraceus</i>	common sowthistle	Y			1/1
plants	higher dicots	Asteraceae	<i>Coronidium lanuginosum</i>			C		2/2
plants	higher dicots	Asteraceae	<i>Blumea diffusa</i>			C		1/1
plants	higher dicots	Byttneriaceae	<i>Keraudrenia collina</i>			C		1/1
plants	higher dicots	Byttneriaceae	<i>Waltheria indica</i>			C		2/2
plants	higher dicots	Cactaceae	<i>Harrisia martinii</i>		Y			3
plants	higher dicots	Cactaceae	<i>Opuntia tomentosa</i>	velvety tree pear	Y			4
plants	higher dicots	Caesalpiniaceae	<i>Senna coronilloides</i>			C		1
plants	higher dicots	Caesalpiniaceae	<i>Lysiphyllum carronii</i>	ebony tree		C		5/1
plants	higher dicots	Caesalpiniaceae	<i>Senna artemisioides</i>			C		1
plants	higher dicots	Caesalpiniaceae	<i>Senna</i>			C		1
plants	higher dicots	Caesalpiniaceae	<i>Lysiphyllum hookeri</i>	Queensland ebony		C		1
plants	higher dicots	Capparaceae	<i>Capparis umbonata</i>			C		1/1
plants	higher dicots	Capparaceae	<i>Capparis lasiantha</i>	nipan		C		6
plants	higher dicots	Capparaceae	<i>Capparis mitchellii</i>			C		1/1
plants	higher dicots	Capparaceae	<i>Apophyllum anomalum</i>	broom bush		C		4/1
plants	higher dicots	Caryophyllaceae	<i>Polycarpaea corymbosa</i> var. <i>minor</i>			C		1
plants	higher dicots	Celastraceae	<i>Denhamia oleaster</i>			C		1
plants	higher dicots	Chenopodiaceae	<i>Sclerolaena muricata</i> var. <i>muricata</i>			C		1/1
plants	higher dicots	Chenopodiaceae	<i>Maireana microphylla</i>			C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Chenopodiaceae	<i>Atriplex muelleri</i>	lagoon saltbush		C		1/1
plants	higher dicots	Chenopodiaceae	<i>Enchylaena tomentosa</i>			C		3
plants	higher dicots	Combretaceae	<i>Terminalia oblongata</i>			C		2
plants	higher dicots	Convolvulaceae	<i>Evolvulus alsinoides</i>			C		7/2
plants	higher dicots	Convolvulaceae	<i>Ipomoea brownii</i>			C		1/1
plants	higher dicots	Convolvulaceae	<i>Polymeria</i>			C		1/1
plants	higher dicots	Convolvulaceae	<i>Jacquemontia paniculata</i> var. <i>tomentosa</i>			C		1/1
plants	higher dicots	Cucurbitaceae	<i>Cucumis melo</i>			C		1/1
plants	higher dicots	Erythroxylaceae	<i>Erythroxylum australe</i>	cocaine tree		C		5
plants	higher dicots	Euphorbiaceae	<i>Euphorbia dallachyana</i>			C		1/1
plants	higher dicots	Euphorbiaceae	<i>Croton phebaloides</i>	narrow-leaved croton		C		2/1
plants	higher dicots	Euphorbiaceae	<i>Euphorbia drummondii</i>			C		1/1
plants	higher dicots	Euphorbiaceae	<i>Euphorbiaceae</i>	soft acalypha		C		1
plants	higher dicots	Euphorbiaceae	<i>Acalypha eremorum</i>			C		1
plants	higher dicots	Fabaceae	<i>Zornia</i>			C		1
plants	higher dicots	Fabaceae	<i>Tephrosia astragaloides</i> var. (<i>Belyando Crossing E.J.Thompson+ 139</i>)			C		3/3
plants	higher dicots	Fabaceae	<i>Fabaceae</i>	woolly glycine		C		1
plants	higher dicots	Fabaceae	<i>Galactia</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Tephrosia</i>			C		3/1
plants	higher dicots	Fabaceae	<i>Indigofera</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Hovea lanceolata</i>			C		1
plants	higher dicots	Fabaceae	<i>Hovea parvicalyx</i>			C		4/4
plants	higher dicots	Fabaceae	<i>Tephrosia juncea</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Zornia floribunda</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Glycine tomentella</i>			C		2/2
plants	higher dicots	Fabaceae	<i>Tephrosia leptoclada</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Jacksonia ramosissima</i>			C		6/3
plants	higher dicots	Fabaceae	<i>Tephrosia flagellaris</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Indigofera haplophylla</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Indigofera leucotricha</i>			C		1
plants	higher dicots	Fabaceae	<i>Desmodium campylocaulon</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Galactia tenuiflora</i> var. <i>lucida</i>			C		2/1
plants	higher dicots	Fabaceae	<i>Tephrosia filipes</i> subsp. <i>filipes</i>			C		3/3
plants	higher dicots	Fabaceae	<i>Sesbania cannabina</i> var. <i>cannabina</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Tephrosia</i> sp. (<i>Pannikan Springs A.R.Bean+ 5612</i>)			C		1/1
plants	higher dicots	Fabaceae	<i>Crotalaria novae-hollandiae</i> subsp. <i>novae-hollandiae</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Glycine</i>			C		1/1
plants	higher dicots	Goodeniaceae	<i>Goodenia armitiana</i>			C		1/1
plants	higher dicots	Goodeniaceae	<i>Goodenia hirsuta</i>			C		1/1
plants	higher dicots	Lamiaceae	<i>Basilicum polystachyon</i>			C		2/2
plants	higher dicots	Lamiaceae	<i>Clerodendrum floribundum</i>			C		1
plants	higher dicots	Loranthaceae	<i>Amyema quandang</i> var. <i>bancroftii</i>	broad-leaved grey mistletoe		C		2/1
plants	higher dicots	Loranthaceae	<i>Amyema</i>			C		1
plants	higher dicots	Loranthaceae	<i>Dendrophthoe homoplastica</i>	jerry-jerry		C		1/1
plants	higher dicots	Lythraceae	<i>Ammannia multiflora</i>			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Malvaceae	<i>Sida</i>			C		2
plants	higher dicots	Malvaceae	<i>Sida</i> sp. (Musselbrook M.B.Thomas+ MRS437)			C		1/1
plants	higher dicots	Malvaceae	<i>Abutilon</i>			C		1
plants	higher dicots	Malvaceae	<i>Malvaceae</i>			C		2
plants	higher dicots	Malvaceae	<i>Sida brachypoda</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Sida cordifolia</i>		Y			1/1
plants	higher dicots	Malvaceae	<i>Hibiscus sturtii</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Sida atherophora</i>			C		3/3
plants	higher dicots	Malvaceae	<i>Abutilon oxycarpum</i>			C		1
plants	higher dicots	Malvaceae	<i>Gossypium australe</i>			C		2/2
plants	higher dicots	Malvaceae	<i>Hibiscus leptocladus</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Hibiscus meraukensis</i>	Merauke hibiscus		C		1/1
plants	higher dicots	Malvaceae	<i>Malvastrum americanum</i>		Y			3
plants	higher dicots	Malvaceae	<i>Hibiscus krichauffianus</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Sida aprica</i> var. <i>aprica</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Abutilon oxycarpum</i> var. <i>subsagittatum</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Malvastrum americanum</i> var. <i>americanum</i>		Y			1/1
plants	higher dicots	Meliaceae	<i>Owenia acidula</i>	emu apple		C		1
plants	higher dicots	Menyanthaceae	<i>Nymphoides crenata</i>	wavy marshwort		C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia</i>			C		1
plants	higher dicots	Mimosaceae	<i>Acacia laccata</i>			C		1
plants	higher dicots	Mimosaceae	<i>Acacia cambagei</i>	gidgee		C		3
plants	higher dicots	Mimosaceae	<i>Acacia salicina</i>	doolan		C		1
plants	higher dicots	Mimosaceae	<i>Acacia shirleyi</i>	lancewood		C		1
plants	higher dicots	Mimosaceae	<i>Acacia fodinalis</i>			C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia lazaridis</i>			C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia ramiflora</i>			C	V	2/2
plants	higher dicots	Mimosaceae	<i>Acacia hyaloneura</i>			C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia melleodora</i>			C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia tenuissima</i>			C		3/1
plants	higher dicots	Mimosaceae	<i>Acacia harpophylla</i>	brigalow		C		3
plants	higher dicots	Mimosaceae	<i>Acacia stenophylla</i>	belalie		C		1
plants	higher dicots	Mimosaceae	<i>Acacia dietrichiana</i>			C		1
plants	higher dicots	Mimosaceae	<i>Acacia leptostachya</i>	Townsville wattle		C		5/3
plants	higher dicots	Mimosaceae	<i>Acacia multisiliqua</i>			C		4/2
plants	higher dicots	Mimosaceae	<i>Acacia sericophylla</i>			C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia argyrodendron</i>			C		1
plants	higher dicots	Mimosaceae	<i>Acacia excelsa</i> subsp. <i>excelsa</i>			C		1/1
plants	higher dicots	Myoporaceae	<i>Eremophila deserti</i>			C		2/1
plants	higher dicots	Myoporaceae	<i>Eremophila debilis</i>	winter apple		C		1
plants	higher dicots	Myoporaceae	<i>Myoporum acuminatum</i>	coastal boobialla		C		5/1
plants	higher dicots	Myoporaceae	<i>Eremophila longifolia</i>	berrigan		C		1/1
plants	higher dicots	Myoporaceae	<i>Eremophila mitchellii</i>			C		7
plants	higher dicots	Myrtaceae	<i>Corymbia dallachiana</i>			C		3
plants	higher dicots	Myrtaceae	<i>Melaleuca pallescens</i>			C		1/1
plants	higher dicots	Myrtaceae	<i>Eucalyptus drepanophylla</i>			C		6/6

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Myrtaceae	<i>Eucalyptus xanthoclada</i>	yellow-branched ironbark		C		2/2
plants	higher dicots	Myrtaceae	<i>Corymbia erythrophloia</i>	variable-barked bloodwood		C		1
plants	higher dicots	Myrtaceae	<i>Corymbia brachycarpa</i>			C		1/1
plants	higher dicots	Myrtaceae	<i>Eucalyptus coolabah</i>	coolabah		C		2
plants	higher dicots	Myrtaceae	<i>Eucalyptus brownii</i>	Reid River box		C		2
plants	higher dicots	Myrtaceae	<i>Corymbia lamprophylla</i>			C		5/4
plants	higher dicots	Myrtaceae	<i>Eucalyptus persistens</i>			C		3/2
plants	higher dicots	Myrtaceae	<i>Melaleuca nervosa</i>			C		1
plants	higher dicots	Myrtaceae	<i>Corymbia clarksoniana</i>			C		3/2
plants	higher dicots	Oleaceae	<i>Jasminum didymum</i>			C		3
plants	higher dicots	Onagraceae	<i>Ludwigia octovalvis</i>	willow primrose		C		1/1
plants	higher dicots	Pentapetaceae	<i>Melhania ovata</i>			C		1/1
plants	higher dicots	Pentapetaceae	<i>Melhania oblongifolia</i>			C		2/2
plants	higher dicots	Phyllanthaceae	<i>Phyllanthus</i>			C		2
plants	higher dicots	Phyllanthaceae	<i>Flueggea leucopyrus</i>			C		2
plants	higher dicots	Phyllanthaceae	<i>Phyllanthus collinus</i>			C		1/1
plants	higher dicots	Phyllanthaceae	<i>Phyllanthus fuernrohrrii</i>			C		1
plants	higher dicots	Phyllanthaceae	<i>Phyllanthus maderaspatensis</i>			C		1/1
plants	higher dicots	Phyllanthaceae	<i>Phyllanthus</i> sp. (Pentland R.J.Cumming 9742)			C		1/1
plants	higher dicots	Pittosporaceae	<i>Bursaria incana</i>			C		2/1
plants	higher dicots	Polygonaceae	<i>Muehlenbeckia</i>			C		1
plants	higher dicots	Polygonaceae	<i>Polygonum plebeium</i>	small knotweed		C		1/1
plants	higher dicots	Portulacaceae	<i>Calandrinia pickeringii</i>			C		1/1
plants	higher dicots	Proteaceae	<i>Persoonia falcata</i>			C		1
plants	higher dicots	Proteaceae	<i>Grevillea hilliana</i>			C		2
plants	higher dicots	Proteaceae	<i>Grevillea parallela</i>			C		1
plants	higher dicots	Proteaceae	<i>Grevillea decora</i> subsp. <i>decora</i>			C		4/4
plants	higher dicots	Proteaceae	<i>Grevillea striata</i>	beefwood		C		1
plants	higher dicots	Proteaceae	<i>Grevillea decora</i>			C		1/1
plants	higher dicots	Rhamnaceae	<i>Ventilago viminalis</i>	supplejack		C		2/1
plants	higher dicots	Rubiaceae	<i>Oldenlandia mitrasacmoides</i> subsp. <i>trachymenoides</i>			C		1/1
plants	higher dicots	Rubiaceae	<i>Psydrax johnsonii</i>			C		3/1
plants	higher dicots	Rubiaceae	<i>Oldenlandia mitrasacmoides</i> subsp. <i>mitrasacmoides</i>			C		1/1
plants	higher dicots	Rubiaceae	<i>Psydrax attenuata</i>			C		1
plants	higher dicots	Rutaceae	<i>Geijera parviflora</i>	wilga		C		1
plants	higher dicots	Rutaceae	<i>Geijera salicifolia</i>	brush wilga		C		2
plants	higher dicots	Rutaceae	<i>Flindersia dissosperma</i>			C		1/1
plants	higher dicots	Rutaceae	<i>Citrus glauca</i>			C		1
plants	higher dicots	Santalaceae	<i>Santalum lanceolatum</i>			C		1
plants	higher dicots	Sapindaceae	<i>Alectryon oleifolius</i> subsp. <i>elongatus</i>			C		1/1
plants	higher dicots	Sapindaceae	<i>Atalaya hemiglauca</i>			C		7/1
plants	higher dicots	Sapindaceae	<i>Dodonaea malvacea</i>			C		1/1
plants	higher dicots	Sapindaceae	<i>Dodonaea lanceolata</i> var. <i>subsessilifolia</i>			C		1/1
plants	higher dicots	Sapindaceae	<i>Dodonaea stenophylla</i>			C		1
plants	higher dicots	Sapindaceae	<i>Alectryon diversifolius</i>	scrub boonaree		C		1
plants	higher dicots	Sapindaceae	<i>Dodonaea dodecandra</i>			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Scrophulariaceae	<i>Stemodia glabella</i>			C		1/1
plants	higher dicots	Solanaceae	<i>Solanum esuriale</i>	quena		C		1/1
plants	higher dicots	Solanaceae	<i>Solanum cleistogamum</i>			C		1/1
plants	higher dicots	Solanaceae	<i>Solanum ellipticum</i>	potato bush		C		2/2
plants	higher dicots	Sparrmanniaceae	<i>Grewia latifolia</i>	dysentery plant		C		2
plants	higher dicots	Vitaceae	<i>Clematicissus opaca</i>			C		1
plants	higher dicots	Zygophyllaceae	<i>Tribulus micrococcus</i>	yellow vine		C		1/1
plants	lower dicots	Menispermaceae	<i>Tinospora smilacina</i>	snakevine		C		2
plants	lower dicots	Nymphaeaceae	<i>Nymphaea gigantea</i>			C		1/1
plants	monocots	Commelinaceae	<i>Commelina lanceolata</i>			C		1/1
plants	monocots	Cyperaceae	<i>Schoenoplectus dissachanthus</i>			C		1/1
plants	monocots	Cyperaceae	<i>Cyperus isabellinus</i>			C		1/1
plants	monocots	Cyperaceae	<i>Cyperus dactylotes</i>			C		1/1
plants	monocots	Cyperaceae	<i>Cyperus difformis</i>	rice sedge		C		1/1
plants	monocots	Cyperaceae	<i>Cyperus gilesii</i>			C		1/1
plants	monocots	Cyperaceae	<i>Scleria</i>			C		1
plants	monocots	Orchidaceae	<i>Cymbidium canaliculatum</i>			C		2
plants	monocots	Poaceae	<i>Sporobolus</i>			C		2
plants	monocots	Poaceae	<i>Hyparrhenia</i>			C		1
plants	monocots	Poaceae	<i>Paspalidium</i>			C		4
plants	monocots	Poaceae	<i>Panicum simile</i>			C		1
plants	monocots	Poaceae	<i>Panicum effusum</i>			C		4
plants	monocots	Poaceae	<i>Triodia pungens</i>			C		2/2
plants	monocots	Poaceae	<i>Dinebra ligulata</i>			C		2/2
plants	monocots	Poaceae	<i>Themeda triandra</i>	kangaroo grass		C		2/1
plants	monocots	Poaceae	<i>Astrebla lappacea</i>	curly mitchell grass		C		1/1
plants	monocots	Poaceae	<i>Cenchrus ciliaris</i>		Y			6
plants	monocots	Poaceae	<i>Digitaria diffusa</i>			C		1/1
plants	monocots	Poaceae	<i>Entolasia stricta</i>	wiry panic		C		1
plants	monocots	Poaceae	<i>Sporobolus caroli</i>	fairy grass		C		1/1
plants	monocots	Poaceae	<i>Thellungia advena</i>	coolibah grass		C		1/1
plants	monocots	Poaceae	<i>Triodia longiceps</i>	giant grey spinifex		C		1/1
plants	monocots	Poaceae	<i>Aristida latifolia</i>	feathertop wiregrass		C		1/1
plants	monocots	Poaceae	<i>Chrysopogon fallax</i>			C		1
plants	monocots	Poaceae	<i>Eriachne mucronata</i>			C		5/1
plants	monocots	Poaceae	<i>Leptochloa digitata</i>			C		1/1
plants	monocots	Poaceae	<i>Paspalidium gracile</i>	slender panic		C		1/1
plants	monocots	Poaceae	<i>Cymbopogon refractus</i>	barbed-wire grass		C		1
plants	monocots	Poaceae	<i>Iseilema macratherum</i>			C		1/1
plants	monocots	Poaceae	<i>Tripogon loliiformis</i>	five minute grass		C		1
plants	monocots	Poaceae	<i>Alloteropsis cimicina</i>			C		2/2
plants	monocots	Poaceae	<i>Cymbopogon bombycinus</i>	silky oilgrass		C		3
plants	monocots	Poaceae	<i>Digitaria breviglumis</i>			C		1/1
plants	monocots	Poaceae	<i>Elytrophorus spicatus</i>			C		1/1
plants	monocots	Poaceae	<i>Heteropogon contortus</i>	black speargrass		C		3/1
plants	monocots	Poaceae	<i>Iseilema membranaceum</i>	small flinders grass		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	<i>Sporobolus mitchellii</i>	rat's tail couch		C		2/2
plants	monocots	Poaceae	<i>Aristida caput-medusae</i>			C		1/1
plants	monocots	Poaceae	<i>Bothriochloa ewartiana</i>	desert bluegrass		C		1/1
plants	monocots	Poaceae	<i>Enneapogon lindleyanus</i>			C		3/1
plants	monocots	Poaceae	<i>Enneapogon polyphyllus</i>	leafy nineawn		C		1/1
plants	monocots	Poaceae	<i>Enteropogon acicularis</i>	curly windmill grass		C		1
plants	monocots	Poaceae	<i>Paspalidium jubiflorum</i>	warrego grass		C		1/1
plants	monocots	Poaceae	<i>Thyridolepis xerophila</i>			C		1/1
plants	monocots	Poaceae	<i>Sporobolus actinocladus</i>	katoora grass		C		1
plants	monocots	Poaceae	<i>Enneapogon robustissimus</i>			C		1/1
plants	monocots	Poaceae	<i>Eriochloa pseudoacrotricha</i>			C		2/2
plants	monocots	Poaceae	<i>Hyparrhenia rufa subsp. rufa</i>		Y			1/1
plants	monocots	Poaceae	<i>Dinebra decipiens var. decipiens</i>			C		1/1
plants	monocots	Poaceae	<i>Leptochloa</i>			C		2
plants	monocots	Poaceae	<i>Eragrostis</i>			C		2
plants	monocots	Poaceae	<i>Eriochloa</i>			C		1
plants	monocots	Poaceae	<i>Digitaria</i>			C		3
plants	monocots	Poaceae	<i>Aristida</i>			C		7
plants	monocots	Poaceae	<i>Triodia</i>			C		8
plants	monocots	Poaceae	<i>Poaceae</i>			C		3
plants	monocots	Poaceae	<i>Chloris</i>			C		1
plants	monocots	Poaceae	<i>Panicum</i>			C		1
plants	monocots	Pontederiaceae	<i>Monochoria cyanea</i>			C		1/1
plants	monocots	Potamogetonaceae	<i>Potamogeton tricarinatus</i>	floating pondweed		C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.

Appendix F - Conservation Significant Species

Four categories were used to classify the likelihood of a species being present. Categories were defined as:

1. Known – confirmed during field assessments;
2. Likely – suitable good quality habitat observed during field assessments and desktop records from the area;
3. Potential – possibility of suitable habitat and records of the species occurring within the wider Project area; and
4. Unlikely – no suitable habitat or not known to occur within the local region.

Table 8-1 Predicted conservation significant fauna species and potential to occur on Disney Quarry site

Scientific name	Common name	EPBC Act ¹	NC Act ²	Preferred habitat	Potential to occur
EVNT fauna species					
<i>Ctenotus capricorni</i>	Capricorn Ctenotus		NT	Occurs in semi-arid sandy areas with Spinifex associated with woodland communities.	Potential - as suitable habitat occurs in east of quarry site. Single WildNet record only.
<i>Egernia rugosa</i>	Yakka Skink	V	V	Occurs in a variety of dry sclerophyll woodlands largely in the Brigalow Belt. Constructs burrows in a variety of soil types.	Potential - as suitable habitat (intact woodland with fallen timber) occurs. However, no survey or database records. EPBC online search only.
<i>Antairosepens warro</i>	Robust Burrowing Snake		NT	Secretive burrowing species. Prefers loose soils in tropical woodlands with tussock grass.	Potential - as suitable habitat occurs on both sites. Two WildNet records.
<i>Denisonia maculata</i>	Ornamental Snake	V	V	Prefers seasonally inundated areas on deep cracking clay soils and adjacent habitat. Feeds exclusively on frogs. Rare to absent where Cane Toads are abundant.	Unlikely - Individual recorded on Borrow 7 but no habitat on Disney Quarry site. Single WildNet record and EPBC online search.
<i>Furina dunmali</i>	Dunmall's Snake	V	V	Rarely encountered. Forests to woodlands, associated with Brigalow scrub.	Unlikely - Species at the edge of predicted range in quarry area. Habitat generally highly degraded. No survey or database records. EPBC online search only.
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose	M	NT	May occur on a variety of waterbodies but prefers those with abundant floating vegetation which it feeds on.	Known - At least 30 individuals observed on large farm dam. Also WildNet records.

Scientific name	Common name	EPBC Act ¹	NC Act ²	Preferred habitat	Potential to occur
<i>Stictoneeta naevosa</i>	Freckled Duck		NT	Occurs on large well-vegetated swamps.	Unlikely - Quarry area not in species normal range. Single WildNet record is likely rare vagrant occurrence.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	V	V	Occurs in dry woodland. Generally on sandy soils close to water.	Known - Five individuals recorded at two sites. Potential to occur on site however substrate is generally unsuitable (rocky) and no permanent water observed nearby. Also GHD (2012a;b) and WildNet records. EPBC online search
<i>Erythroriorchis radiatus</i>	Red Goshawk	V	V	Prefers areas close to the coast featuring extensive open forest and woodland with a mosaic of vegetation types. Nests in tall emergent trees close to water.	Unlikely - No survey or database records. EPBC online search only. Landscape throughout Quarry area is predominantly cleared.
<i>Lophoictinia isura</i>	Square-tailed Kite		NT	Occurs in a variety of forested habitats where it forages on birds and eggs.	Potential - Species may occur although forested habitat is limited in area. Two WildNet records.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork		NT	Large species that occurs on a variety of wetlands. Carnivorous feeding on a variety of vertebrates, crustaceans, mollusks and invertebrates.	Known - Individual observed on large farm dam. Also GHD (2012a) and WildNet records.
<i>Rostratula australis</i>	Australian Painted Snipe	V, M	V	Prefers temporary shallow wetlands. Nests in freshly flooded wetlands with low vegetation.	Potential - May to occur on wetlands in area but no database records. EPBC online search only.
<i>Grantiella picta</i>	Painted Honeyeater		V	Occurs in a variety of forests/woodlands that contain mistletoes. Winter visitor to Queensland.	Potential - May sporadically occur wherever there are mistletoes. Single WildNet record.
<i>Poephila cincta cincta</i>	Black-throated Finch (southern)	E	E	Occurs in grassy open woodlands near water. Prefers areas of intact woodlands.	Unlikely - No suitable habitat on site Many records in mine area to west by GHD (2012a) and several WildNet records. EPBC online search.
<i>Neochmia ruficauda ruficauda</i>	Star Finch (eastern)	E	E	Occurs in grassy flats/woodlands near water.	Unlikely - Species present range is much further north. No database records. EPBC online search only.
<i>Phascolarctos cinereus</i>	Koala	V	S	Occurs in a variety of eucalypt woodlands and open forest.	Potential - may occur on Disney where evidence of potential presence (scratches) observed. Habitat within remaining sites in relatively poor condition or cleared. Also GHD (2012a) and six WildNet database records within 50 km radius of quarry area.

Scientific name	Common name	EPBC Act ¹	NC Act ²	Preferred habitat	Potential to occur
<i>Chalinolobus picatus</i>	Little Pied Bat		NT	Occurs in a variety of dry woodland forest types including mallee, eucalypt, <i>Callitris</i> and <i>Casuarina</i> .	Potential - May roost on Disney where suitable hollows occur. Recorded by GHD (2012a;b) and WildNet records.
<i>Lasiornis krefftii</i>	Northern Hairy-nosed Wombat	E	E	Occurs in sandy, grassy woodland.	Unlikely - Species almost entirely restricted to Epping Forest south of quarry area. Single Wildnet record.
Migratory species					
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	M	S	Occurs in coastal areas including beaches, estuaries and lagoons, but may range well inland on larger rivers. Predominantly feeds on fish.	Unlikely - No suitable habitat in quarry area or surrounds. No database records. EPBC search only.
<i>Apus pacificus</i> <i>Hirundapus caudacutus</i>	Fork-tailed Swift White-throated Needletail	M	S	Aerial foraging species that occur over a variety of landscapes including highly modified environments.	Known - White-throated Needletail occurs in area. Both species may seasonally occur over the area.
<i>Ardea modesta</i>	Eastern Great Egret	M	S	Eastern Great Egret occurs on a variety of wetlands and intertidal habitats.	Known - Occurs in area. Several individuals observed on large farm dam. Three WildNet records. EPBC online search.
<i>Ardea ibis</i>	Cattle Egret	M	S	Cattle Egret prefers damp grassy areas for feeding, particularly pasture.	Potential - may occur in paddocks after heavy rains. Single database record. EPBC online search.
<i>Plegadis falcinellus</i>	Glossy Ibis	M	S	Prefers shallow freshwater habitats. Sometimes occurs in intertidal habitat.	Known - Several individuals observed on large farm dam.
<i>Tringa stagnatilis</i>	Marsh Sandpiper	M	S	May be found in both freshwater and estuarine habitats.	Potential - may occur on wetlands in area. Single database record.
<i>Gallinago hardwickii</i>	Latham's Snipe	M	S	Occurs in generally low numbers in a variety of permanent or ephemeral wetlands across eastern Australia.	Potential - may occur on wetlands in area. Single database record. EPBC online search.
<i>Merops ornatus</i>	Rainbow Bee-eater	M	S	Widespread species that may occur in a variety of habitats. Nests in burrows in sandy banks.	Known - Recorded on site. Common in area at time of survey. Also GHD (2012a;b) and database records
<i>Rhipidura rufifrons</i>	Rufous Fantail	M	S	Prefers dense habitats including rainforest, riparian habitats and vine-thicket.	Potential - may occur in area. Unlikely to occur on quarry site where habitat is generally poor. Two database records.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M	S	Prefers dense habitats. Generally migrates through coastal forests where it may occur in more open habitats.	Potential - may occur in area. Unlikely to occur on quarry site where habitat is generally poor. Also GHD (2012a) and single database record.

¹ EPBC Act: E = Endangered; V = Vulnerable; M = Migratory.

² NC Act: E = Endangered; V = Vulnerable; NT = Near Threatened; S = Special least concern.

Appendix G - Conceptual Erosion and Sediment Control Plan

Disney Quarry

Conceptual Erosion and Sediment Control Plan

1.1 Introduction

CDM Smith Australia Pty Ltd (CDM Smith) has been engaged by Adani Mining Pty Ltd (Adani) to prepare the development application and relevant supporting documentation for Disney Quarry. As part of the supporting documentation, a Conceptual Erosion and Sediment Control Plan (ESCP) has been prepared to outline proposed environmental management measures regarding water runoff and erosion prevention.

Disney Quarry is a new quarry proposed to be located on Lot 4 SP116046. The site is located adjacent to the Gregory Development Road, within the Isaac Regional Council (IRC) area. The lot is zoned Rural under the *Belyando Shire Planning Scheme 2009* and is primarily used for agricultural activities.

1.2 Scope

This Conceptual ESCP applies to the single stage of vegetation clearing, overburden stripping and extraction for the quarry, associated with the proposed Carmichael Coal Mine and Rail Project. This Conceptual ESCP has been prepared as an overview to demonstrate possible Erosion and Sediment Control (ESC) Planning options and is not intended as a final design.

1.3 Purpose

The purpose of this Conceptual ESCP is to characterise the risk of erosion during construction and operation of the Disney Quarry, and demonstrate that water management and erosion and sediment control requirements of the quarry can be met within the proposed quarry site. The main objectives of the Conceptual ESCP are to:

- Identify the likely need for the construction of sediment basins;
- Identify that adequate space has been made available for the construction and operation of major sediment traps and essential flow diversion systems;
- Demonstrate to the regulatory authority that there is a feasible means of constructing the project while still protecting key environmental values;
- Identify problem soil areas including dispersive soils, acid sulphate soils, areas of potential mass movement; and
- Identify protected environmental features on the site such as protected vegetation.

This Conceptual ESCP will assist the preparation of the Adani Site Based Management Plan (SBMP) and subsequent detailed construction phase ESCPs. This Conceptual ESCP has been prepared in reference to the Best Practice Erosion and Sediment Control, International Erosion Control Association (Australasia) (IECA, 2008).

1.4 Relevant Legislation

This Conceptual ESCP has been prepared to satisfy environmental management requirements for new developments under the:

- *Environmental Protection Act 1994*; and
- *Belyando Shire Planning Scheme 2009*.

1.5 Hazard and Risk Definitions

- Soil erosion hazard is a prediction of the susceptibility of a parcel of land to erosion, based on the predicted rainfall, soil type and gradient. Wind erosion is considered in dry areas.
- Soil erosion risk is the likelihood of environmental harm occurring due to disturbance activities occurring for the quarry.

Both erosion hazard and erosion risk have been considered in this assessment to determine appropriate controls to be implemented as part of the Disney Quarry construction and operation works.

1.6 Erosion Hazard Assessment

There are a number of different methodologies available to assess erosion hazard within the IECA Guidelines, however no single method considers all of the parameters which may influence the erosion hazard, due to the inherent complexity of erosion hazard assessment. Over the course of the quarry operating life the areas of the site are likely to change in shape, slope and ground cover, and rainfall hazard constantly changes throughout the year. This section discusses the main aspects of erosion hazard.

Slope steepness, slope length, soil type, rainfall erosivity and ground cover type are the main determinants of erosion. To overcome this limitation, site parameters have been assessed by adopting different methodologies from various best practice guidelines including the Sunshine Coast Regional Council (SCRC) Guidelines. This approach allows for the consideration of the site's soil type, slope as well as seasonal changes in rainfall erosivity and wind erosion potential.

1.6.1 Soil Erosion Hazard

Soil erosion hazard for an exposed soil surface is a function of surface roughness, infiltration rate, soil chemistry, and soil particle size. The Geological Survey of Queensland Interactive Resource Tenure Map broadly indicates that pockets of different soils exist locally. The dominant soil types present local to the Back Creek area include:

- Uniform clays – non-cracking to heavy cracking with potentially a sandy crust and variable quantity of mulch;
- Duplex soils – hard setting sandy loams; and
- Deep uniform sandy materials – loose to firm and predominant in sand.

In the absence of detailed soil data for the site, particularly exchangeable sodium percentage, Emerson Class Testing and particle size, it has been assumed that the soils are dispersive and highly erodible. This assumption increases predicted erosion rates and, subsequently, increases the size and cost of sediment basins and other erosion and sediment controls. If a soil survey is completed before the Construction ESCP is developed, detailed soil data can be used to refine the design details for sediment controls.

There is an extremely low chance of encountering acid sulphate soils in the quarry area. Acid sulfate soils are rarely encountered away from coastal areas.

Given the relatively low slopes in the area, the risk of mass movement outside the confines of the quarry pit is low. Soil and rock movement within the quarry is a geotechnical consideration and outside the scope of this document.

1.6.2 Slope and Rainfall Erosivity Erosion Hazard

Figure 1, sourced from SCRC (2008), provides a tool to classify the erosion hazard of the site based on slope and rainfall erosivity. Rainfall erosivity is applicable to all climates. The adopted rainfall erosivity (R factor) for the quarry area is 1804 (Emerald – in the absence of comprehensive Clermont data) with a typical slope ranging from <1% to 15% equating to a medium to low erosion hazard for slopes below 12% and a high to very high erosion hazard for slopes above 12%, as defined by the 'A' line.

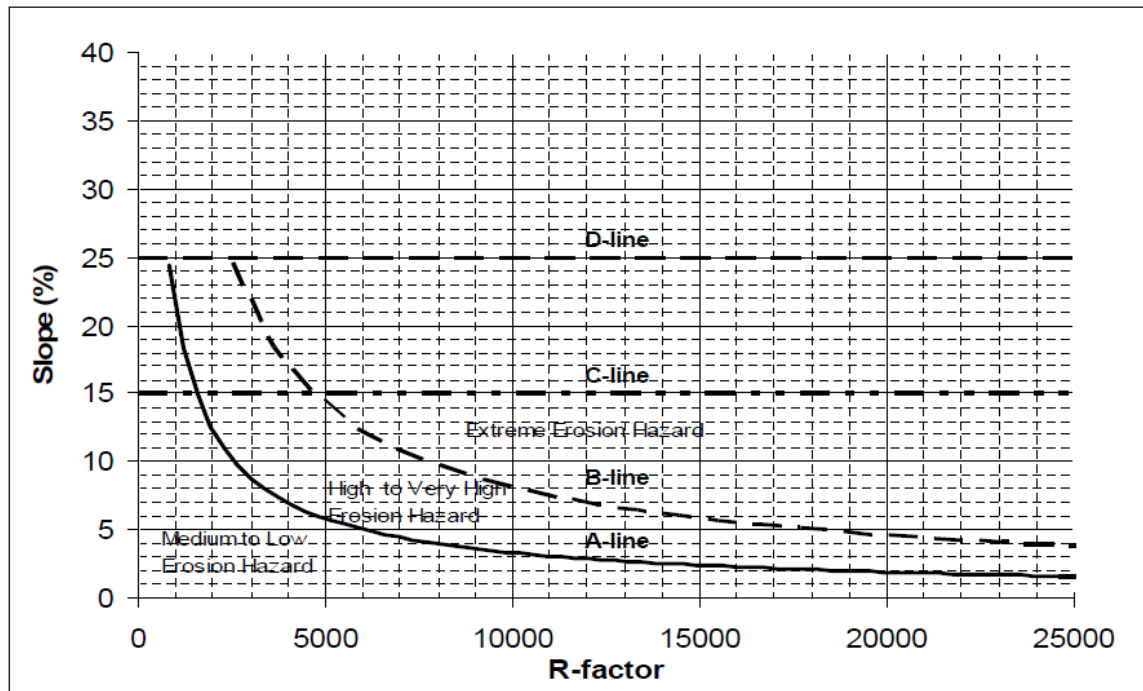


Figure 1 Slope and Rainfall Erosivity Erosion Hazard

1.6.3 Seasonal Erosion Hazard

Table 1, sourced from IECA 2008, illustrates the seasonal change in erosion hazard experienced within the Charters Towers region, based on monthly rainfall erosivity. The Charters Towers data was chosen as it is the closest available in IECA 2008 and provides similar climate and rainfall erosivity. Construction works occurring in the dry season, (April to November) when rainfall is unlikely, have an erosion hazard rating of very low. Construction works occurring in the wet season, (December to March) when rainfall is likely, have an erosion hazard of moderate to high.

Table 1 Erosion Hazard Based on Monthly Rainfall Erosivity

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	High	High	Low	V low	V low	V low	V low	V low	V low	Low	Mod

Wind erosion is a key contributor to dust generation, which has the potential to impact on the construction workforce on the quarry, vegetation communities and local sensitive receptors. Areas of the site that have exposed soil that are susceptible to wind erosion must be covered using a soil binder, mulch or vegetation to achieve 75% cover. Maintaining 75% cover on exposed soils reduces the wind erosion hazard to very low in the dry season and, depending on the technique chosen will also reduce the water erosion hazard.

If construction activities associated with the excavation of the foundations and service trenches is undertaken onsite these will have a moderate wind erosion hazard if conducted in the dry season.

1.6.4 Summary of Erosion Hazard Assessments

Taking into account the various different erosion hazard assessment methods based on soil characteristics, slope, rainfall erosivity and seasonality experienced at the site, the erosion hazard assessment is summarised as follows:

- A low hazard for land disturbance activities which occur within the dry season;
- A moderate to high hazard for land disturbance activities which occur within the wet season;
- A medium to low hazard rating for most areas based on slope, with small isolated areas of high hazard; and
- A moderate wind erosion hazard for construction activities associated with excavation during construction and operation.

Based on the hazard assessment erosion protection required for dry season construction works can be significantly less than if construction occurs during the wet season.

1.7 Erosion Risk

Erosion risk is a function of the likelihood and intensity of expected rainfall, the estimated rate of soil loss and the anticipated period of soil disturbance.

For this assessment the TASK method has been adopted (IECA 2008). The TASK method is a modification of the Revised Universal Soil Loss Equation (RUSLE) and is preferred because it is the simplest and most easily understood method.

TASK considers soil loss rates by calculating the soil erosivity (K Factor), slope factor together with the area of disturbance and the amount of time the area is to be disturbed. The method categorises disturbances as either a low erosion risk (TASK number < 200) or a high erosion risk (TASK Number > 200). The formula for calculating the erosion risk using the TASK method is:

$$H = TASK$$

Where:

H= Numerical Value of the TASK number

T = Duration of soil disturbance (months)

A = Total area of soil disturbance (m²)

S = Slope factor (Table F2 or Equation F3 IECA 2008)

K = Soil erosivity factor (RUSLE K-factor)

The assessment has been undertaken on the six catchment areas proposed to be disturbed at the Disney Quarry site and refers to sediment ponds and sediment sumps¹;

1. Rip Area 1 North (RA1N);
2. Rip Area 1 South (RA1S);
3. Rip Area 2 East (RA2E);
4. Rip Area 2 West (RA2W);
5. Rip Area 13 (RA3); and
6. Processing and Stockpiling Area (PSA).

¹ A sump is a hollow or depression in which liquid collects especially on the floor of a mine or cave (Oxford Dictionary 2013)

Table 2 provides a summary of the TASK parameters adopted to determine the subsequent erosion risk for both catchment areas. Both catchment areas are considered to be classified as high risk.

Table 2 Erosion Risk Assessment per Catchment Area

H= TASK	RA1N	RA1S	RA2E	RA2W	RA3	PSA
T – Duration (months)	18	18	18	18	18	18
A – Disturbance area (Ha)	37.5	26.2	24.5	0.6	3.1	10.5
S – Slope factor	0.7285	0.6046	0.8486	0.7285	0.6046	0.3454
K - Soil erosivity factor	0.066	0.066	0.066	0.066	0.066	0.066
H Number	324547	35913	65529	145397	22266	34878

1.8 Sediment Control Requirements

RUSLE is used as the primary method for determining sediment control standard and sediment basin size (IECA 2008, section 4.5 and section E3).

IECA (2008) recommends the use of Type 1 sediment traps with a catchment area exceeding 2,500m² and an estimated soil loss rate that exceeds the equivalent of 150 t/ha/yr (refer to Table 3).

All catchment areas are greater than 2,500 m² and an estimated soil loss exceeds 150 t/ha/yr, with exception to RA3 (105 t/ha/yr) indicating that sediment basins are warranted for the Disney Quarry construction activities. Type 1 sediment control devices will be adopted to manage the erosion risk of each catchment area. The indicative volume of each basin is provided in the Conceptual ESCP drawing attached.

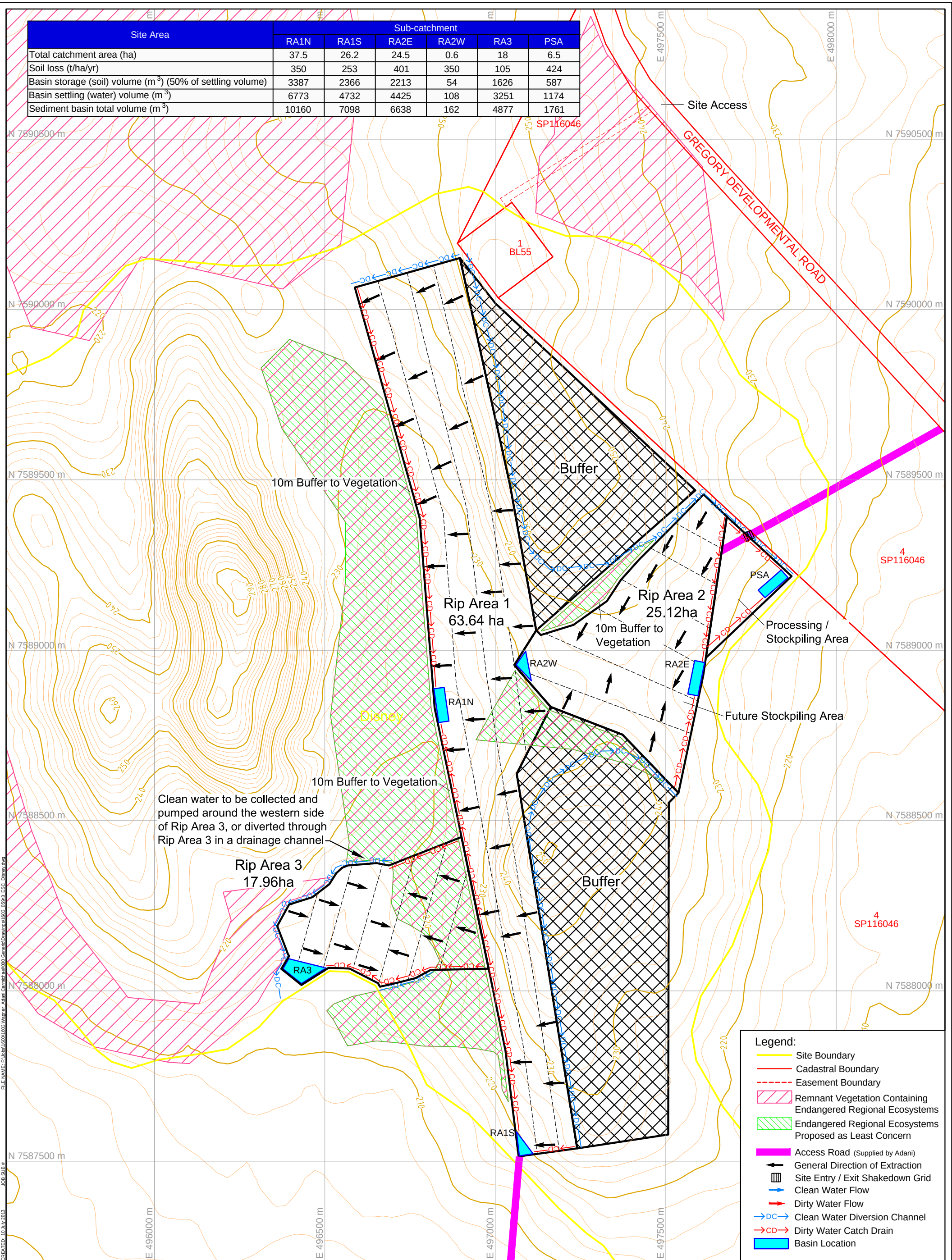
Table 3 RUSLE Calculation

RUSLE Parameters	RA1N	RA1S	RA2E	RA2W	RA3	PSA	Comments
Rainfall erosivity (R-factor)	1804	1804	1804	1804	1804	1804	IECA 2008 Table E1 (Emerald)
Soil erodibility (K-factor)	0.066	0.066	0.066	0.066	0.066	0.066	IECA 2008 Table E4
Slope length (m)	250	250	200	250	300	350	
Slope gradient (%)	5	4	6	5	2	5	
Length/gradient (LS-factor)	2.26	1.63	2.59	2.26	0.68	2.74	IECA 2008 Table F2 or Equation F3
Erosion control practice (P-factor)	1.3	1.3	1.3	1.3	1.3	1.3	IECA 2008 E11
Ground cover (C-factor)	1	1	1	1	1	1	IECA 2008 Table E6
Soil Loss (t/ha/yr)	350	253	401	350	105	424	

1.9 Conclusion

The Conceptual ESCP for Disney Quarry indicates that;

- Sediment basins will be required;
- Adequate space is available for the sediment basins. At this stage of planning the size and location of basins is indicative, and can be adjusted in the Construction ESCP to suit site requirements when further detail becomes available;
- Based on the information available, all ESC requirements can be adequately managed in the Construction ESCP;
- Problem soils are likely in this area, and the assumptions used in this report reflect a worst case scenario. Acid sulfate soils are unlikely to occur, and mass movement of soil is likely to be contained within the quarry pit; and
- The ESC devices can be accommodated without impacting on protected vegetation or other environmental constraints as identified in Section 4 of the overarching Development Application.



Site Area	Sub-catchment					
	RA1N	RA1S	RA2E	RA2W	RA3	PSA
Total catchment area (ha)	37.5	26.2	24.5	0.6	18	6.5
Soil loss (t/ha/yr)	350	253	401	350	105	424
Basin storage (soil) volume (m ³) (50% of settling volume)	3387	2366	2213	54	1626	587
Basin settling (water) volume (m ³)	6773	4732	4425	108	3251	1174
Sediment basin total volume (m ³)	10160	7098	6638	162	4877	1761

REV	DESCRIPTION	DATE	BY
1	Revised pit design and stormwater controls	21/06/13	LT
2	Added Adani Eastern access road and moved processing area	09/07/13	LT
3	Expanded Rip Area 3 and southern buffer footprint	10/07/13	LT

Data Sources:

Photography: 1s SRTM 2008 DEM-S © Commonwealth of Australia (Geoscience Australia) 2012

Cadastral: 10/07/13

Ecosystem: LT

Other:

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PROJECT: Carmichael Coal Project

CLIENT: Wagner Quarries Pty Ltd

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Appendix H - AMU Summary

AMU summary sheets 4

Read this in conjunction with a set of the green sheets

The following sheets provide summary information about each AMU, and its associated land use suitability and management. Soil and site descriptions presented here are directly relevant to decisions on land use and management. A set of limitations to land use have been deduced from these descriptions. Recommendations are given for crop suitability, land conservation practices and stocking rates.

AMU information

The sheets provide photographs of the landscape and a representative soil profile for each AMU. These are accompanied by summary information on the representative soil's characteristics and chemical and physical properties.

Site description: summarises the environmental characteristics that relate to the AMU. The landscape photograph shows a typical example of the AMU landscape in as close to its natural state as possible.

Representative soil profile: it must be stressed that this comprises a photograph and description of a *representative* soil within the range of soils of the named AMU. The representative soil is usually the most commonly occurring within the AMU.

The soil description is simplified from the profile descriptions contained in Appendix III of the *Resource Information*, but is detailed enough to identify the soil. Soil colour, structure and types of inclusions are defined in the Glossary.

Distinguishing soil properties: briefly summarises the chemical and physical attributes of the soil which are relevant to land use.

Chemical properties

Statements are made on the natural availability of the three major nutrient elements (nitrogen - N, phosphorus - P and potassium - K) in the top 10 cm of the soil. The availability of micronutrients is also mentioned if they are significant. The general ratings used for the interpretation of soil chemical analyses are given in Table 4.1.

A measure of soil acidity or alkalinity is given as pH for the surface soil. pH 7 is neutral, less than 7 is acid and greater than 7 is alkaline. The pH trend with an increase in depth is also given. Further explanation of pH is given in the Glossary.

Salinity and sodicity within the profile are based on the chemical analyses of the soil samples taken for each representative soil. Salinity is based on the electrical conductivity (EC) value and relates to inherent salinity (that is, presence of salts in the profile). Sodicity relates to the exchangeable sodium percentage (ESP) value. The terms are defined in the Glossary.

Physical properties

Statements are made on the following if relevant:

- surface condition - the character of the topsoil in its natural, uncultivated state;
- workability - the ease or otherwise of working the soil with machinery;
- infiltration and permeability - how readily water enters the top soil and moves through the profile;
- effective rooting depth - depth to which most plant feeder roots will penetrate;
- PAWC - Plant Available Water Capacity, or the ability of the soil to retain moisture for use by the crop or pasture within the rooting zone.

- drainage
 - how freely water moves through and out of, the soil; the drainage categories are defined in the Glossary and are given as:
 - very poorly drained
 - poorly drained
 - imperfectly drained
 - moderately well drained
 - well drained
 - rapidly drained

Table 4.1. Ratings used for interpretation of soil analyses

		Ratings				
Soil Test	Units	Very low	Low	Medium	High	Very high
EC	(dS/m)	<0.1 5.	0.15-0.45	0.45-0.90	0.90-2.0	>2.0
Cl	(%)	<0.01	0.01-0.03	0.03-0.06	0.06-0.20	>0.20
P	(mg/kg)	<10	10-20	20-40	40-100	>100
Extr. K	(m.eq%)	<0.1	0.1-0.2	0.2-0.5	0.5-1.0	>1.0
Total N	(%)	<0.05	0.05-0.15	0.15-0.25	0.25-0.50	>0.50
Total P	(%)	<0.005	0.005-0.02	0.02-0.05	0.05-0.10	>0.10
Total K	(%)	<0.1	0.1-0.5	0.5-1.0	1.0-3.0	>3.0
PAWC	(%)	<5	5.1-8.0	8.1-12	12.1-15	>15

Source: Bruce and Rayment, 1982 (chemical analyses) Reid et al, 1979 (physical analyses)

¹ See reference list in Resource Information

Land use information	Land use suitability:	suitability for irrigated or dryland cropping and sown pastures is presented; commonly recommended crops and pastures are listed.
	Land use limitations:	includes aspects important to soil management.
	Land conservation:	includes statements on water erosion hazard and surface runoff; this information is provided because of the erratic nature of the rainfall, its short duration and high intensity.

Soils are identified as *suitable*, of *limited suitability*, or *unsuitable* for conservation structures, strip cropping and dams. Soil conservation structures are otherwise classed as not applicable (*n.a.*) where soils are not suitable for cropping. This information is for guidance only - local DPI Land Conservation Officers should be consulted for more detailed advice.

Stocking rates: recommendations are given for cattle in Adult Equivalents (AE) which represents a 450 kg live weight, non-lactating bovine, and are guidelines only, as rates will vary depending on such factors as the intensity of management, pasture type, browse availability and seasonal conditions.

Estimated stocking rates are given for native pastures in both cleared and uncleared states, as well as sown legume and grass pastures. These estimates are the best figures that can be provided as general recommendations given current knowledge. Graziers should seek advice concerning stocking in specific areas.

Where a grazing management system is not practised for the given AMU the stocking rate is stated as being not applicable (*n.a.*).

Management recommendations: lists important recommendations for responsible land management which allow optimal land use with minimum land degradation.

These recommendations are based on the known inherent properties of the soils and the limitations they present to any land use.

AMU summary sheets



Land use suitability

Irrigated (all types) cropping	: <i>all crops and pastures</i>
Dryland cropping	: <i>sorghum, sunflower, mungbeans, wheat, cotton, chickpea, safflower</i>
Forage cropping	: <i>all forage sorghums, oats, dolichos, cowpea</i>
Grazing native pastures	: <i>low productivity of bluegrasses and annuals under scrub; reasonable productivity when cleared</i>
Grazing sown pastures	: <i>highly productive purple pigeon</i>

Land use limitations

- flooding
- brigalow, yellowwood, coolibah regrowth
- waterlogging
- frost

Land conservation

Water erosion hazard	: medium
Surface runoff	: medium
Contour banks	: broad based
Waterways	: suitable, grass with African Star grass or purple pigeon, angleton, creeping and native bluegrasses
Strip cropping	: suitable
Diversion banks	: suitable
Dams	: suitable (some sand lenses)

Stocking rates

Uncleared native pasture	: 25 to 50 ha / AE
Cleared native pasture	: 10 to 12 ha / AE
Sown pasture	: 3 to 5 ha / AE

Management recommendations

- When spelling cultivation, sown pastures are needed because native pastures won't regenerate
- Use minimum tillage techniques to retain stubble
- Rotate crops
- Use press-wheels to assist establishment
- Contour banks and waterways necessary on cultivation greater than 0.5% slope

AMU description:

Self-mulching, dark or grey cracking clay of brigalow / coolabah scrub with yellowwood on alluvial plains

Site description

Landform

Wide, level, alluvial plains of major drainage lines. Low lying clay plains and interchannel areas are prone to flooding. Characterised by low local relief and slopes below 1%.

Vegetation

Extensively cleared for farming. Dense brigalow scrub with coolibah and yellowwood and associated wilga and belah.



Representative soil profile

Depth (m)	Description
0 to 0.05	Brownish grey, heavy clay; self-mulching surface; strong, fine blocky structure; abrupt change to:
0.05 to 0.35	Greyish brown, heavy clay; strong blocky structure; a few carbonate nodules; gradual change to:
0.35 to 1.5	Greyish brown, heavy clay; strong lenticular structure; a few carbonate nodules.

Distinguishing soil properties

Chemical

- N: low to medium K: very high
- P: low to very high
- surface pH 7.5, tending more alkaline with depth
- sodic below 1.2 m
- low salinity below 1.2 m

Physical

- self-mulching to weak crusting surface; heavy clay difficult to work when wet
- effective rooting depth greater than 1.0 m
- high to very high PAWC
- imperfectly drained

AMU description:

Coarse self-mulching or crusting, grey and brown cracking and non-cracking clays on alluvial plains and levees

Site description**Landform**

Elevated levees, terraces and relict alluvial plains often in small, localised occurrences.

Vegetation

Shrubby woodlands of brigalow, poplar box, silver leaved ironbark, sandalwood and Dawson gum.

**Representative soil profile**

Depth (m)	Description
0 to 0.05	Greyish brown, heavy clay; cracking surface; moderate, coarse blocky structure; abrupt change to:
0.05 to 0.25	Greyish brown, heavy clay; strong, coarse blocky structure; gradual change to:
0.25 to 0.8	Dull brown, heavy clay; strong blocky structure; some soft and nodular carbonate; gradual change to;
0.8 to 1.5	Dull brown, heavy clay; lenticular structure; a few carbonate nodules.

Distinguishing soil properties**Chemical**

- N: low to very low P: very low
K: medium
- surface pH 7.5, tending acid by 1.0 m depth
- high sodicity below 0.3 m to 0.5 m
- high salinity below 0.4 m

Physical

- either coarse mulching, crusting or hard setting surface; coarse cloddy surface with tillage, poor workability
- restricted infiltration and low permeability
- effective rooting depth 0.2 m to 0.4 m
- low PAWC
- poor drainage
- high dispersion below 0.2 m

Land use suitability

Irrigated (all types) cropping	: <i>all crops</i>
Dryland cropping	: <i>all types</i>
Forage cropping (short term)	: <i>all forage sorghums</i>
Grazing native pastures	: <i>reasonably productive bluegrasses and other natives in uncleared state; highly productive when cleared</i>
Grazing sown pastures	: <i>highly productive buffel grass</i>

Land use limitations

- crusting and sealing surface
- sodic and saline
- narrow moisture range for successful cultivation (poor workability)
- low PAWC
- restricted effective rooting depth
- very low P

Land conservation

Water erosion hazard	: low
Surface runoff	: medium to high
Contour banks	: n.a.
Waterways	: n.a.
Strip cropping	: n.a.
Diversion banks	: suitable
Dams	: suitable

Stocking rates

Uncleared native pasture	: 15 to 20 ha / AE
Cleared native pasture	: 5 to 10 ha /AE
Sown pasture	: 5 to 6 ha / AE

Management recommendations

- Largely unsuitable for dryland cropping
- Requires more frequent irrigation than other cracking clay soils
- Use minimum tillage techniques on irrigated land
- Sow pasture seed after clearing when using for grazing

Land use suitability

Grazing native pastures : *highly productive bluegrasses, bull mitchell and others*

Land use limitations

- low fertility
- salinity
- very coarse surface
- low PAWC
- waterlogging
- frost

Land conservation

Water erosion hazard : low
Surface runoff : medium to high
Contour banks : n.a.
Waterways : n.a.
Strip cropping : n.a.
Diversion banks : suitable
Dams : unsuitable (saline and sodic soil)

Stocking rates

Native pasture : 6 to 7 ha / AE

Management recommendations

- Do not cultivate
- Do not overgraze

AMU description:

Coarse cracking grey clays on level plains with tussock grasslands and clumps of stunted brigalow and coolibah

Site description

Landform

Level plains in the north-west.

Vegetation

Tussock grasslands with occasional clumps of stunted brigalow and coolibah.



Representative soil profile

Depth (m)	Description
0 to 0.05	Greyish brown, heavy clay; crusting and cracking surface; very coarse, blocky structure; abrupt change to:
0.05 to 0.3	Greyish brown, heavy clay; strong, coarse blocky structure; gradual change to:
0.3 to 1.3	Greyish brown, heavy clay; strong lenticular structure; some gypsum below 0.8 m; diffuse change to:
1.3 to 1.5	Greyish brown, heavy clay; distinct red and grey mottles.

Distinguishing soil properties

Chemical

- N: very low P: very low
- K: very low
- low zinc
- surface pH 7.0, acid below 0.5 m
- strongly sodic below 0.3 m
- high salinity below 0.3 m to 0.6 m

Physical

- coarse self-mulching surface; very cloddy if cultivated, poor workability
- restricted infiltration and low permeability
- effective rooting depth 0.3 m to 0.6 m
- low PAWC
- very poor drainage and high dispersion below 0.3 m

AMU description:

Deep, red and yellow sandy earths and duplex soils with a deep A horizon of plateaus, rises and fans

Site description

Landform

Elevated plateaus, tablelands and rises of relict streams and old land surfaces. Slopes generally between 1% and 4%.

Vegetation

Tall open woodlands comprising bloodwood, silver leaved ironbark, Moreton Bay ash, ghost gum and poplar box with areas of cypress pine, yellowjack and bonewood scrub. Wide range of understorey shrubs including desert oak and various wattles.



Representative soil profile

Depth (m)	Description
0 to 0.25	Dull reddish brown, coarse sandy loam; firm to hard setting surface; massive structure; clear change to:
0.25 to 0.6	Dark reddish brown, coarse sandy clay loam; massive structure; gradual change to:
0.6 to 1.2	Red, coarse sandy clay; diffuse change to:
1.2 to 1.8	Red, coarse sandy clay, rounded quartz gravel common.

Distinguishing soil properties

Chemical

- N: very low P: low
- K: medium to high
- surface pH 5.0, tending alkaline with depth
- non sodic and non saline

Physical

- coarse sandy, firm to hard setting surface; quite abrasive on tillage implements
- effective rooting depth greater than 1.0 m
- very high infiltration and permeability
- low to medium PAWC
- well drained

Land use suitability

Irrigated (all types) cropping	: <i>peanuts, horticultural crops and pastures</i>
Forage cropping (short term)	: <i>all forage sorghums</i>
Grazing native pastures	: <i>reasonably productive speargrass, desert bluegrasses, other native grasses in uncleared state; highly productive when cleared</i>
Grazing sown pastures	: <i>reasonable productive buffel grass, stylo</i>

Land use limitations

- very low fertility
- excessive regrowth
- low to medium PAWC
- sensitive recharge area for groundwater
- weed infestation
- surface sealing

Land conservation

Water erosion hazard	: medium to low
Surface runoff	: low to medium
Contour banks	: narrow based
Waterways	: suitable, grass with buffel grass and native grasses
Strip cropping	: n.a.
Diversion banks	: suitable
Dams	: generally suitable

Stocking rates

Uncleared native pasture	: 12 to 15 ha / AE
Cleared native pasture	: 8 ha /AE
Sown pasture	: 8 ha / AE

Management recommendations

- Not suitable for dryland cropping
- P supplementation usually required, particularly if using stylos for production gains
- Do not destroy trees if on groundwater intake area
- Do not clear if shrubby understorey present
- Marginally suitable for improved pasture grasses

Land use suitability**Forage cropping (short term)**: *all forage sorghums, oats***Grazing native pastures**: *low producing bluegrasses, speargrass, wiregrasses and other native grasses in uncleared state; reasonably productive when cleared***Grazing sown pastures**: *reasonably productive buffel grass, stylo***Land use limitations**

- low fertility
- very low PAWC
- sodic subsoil
- poorly drained
- hard setting surface
- excessive regrowth

Land conservation**Water erosion hazard**

: extremely high

Surface runoff

: high

Contour banks

: unsuitable

Waterways

: With buffel grass

Strip cropping

: unsuitable

Diversion banks

: suitable if subsoil not exposed

Dams

: generally suitable

Stocking rates

Uncleared native pasture

: 40 ha / AE

Cleared native pasture

: 10 to 15 ha / AE

Sown pasture

: 7 to 8 ha / AE

Management recommendations

- Cultivate only in short-term to control regrowth
- Do not expose subsoil because of erodibility hazard
- Topsoil dam walls to prevent piping and gully erosion

AMU description:

Thin, sandy-surfaced yellow-brown duplex soils; hard setting surface overlies coarse, impervious clay subsoils under brigalow/eucalypt scrub

Site description

Landform

Undulating plains of low local relief with most slopes below 1%.

Vegetation

Brigalow scrub with emergent eucalypts (Dawson gum, poplar box, yapunyah) and understorey of currant bush and sandalwood.



Representative soil profile

Depth (m)	Description
0 to 0.18	Dark brown, sandy clay loam; hard setting surface; weak, blocky to massive structure; abrupt change to:
0.18 to 0.2	Sandy clay loam; bleached A2 horizon; massive structure; abrupt change to:
0.2 to 0.5	Brown, sandy medium clay; strong, medium columnar structure; gradual change to:
0.5 to 1.25	Brown, sandy medium clay; strong, coarse prismatic structure; soft carbonate; a few orange mottles; clear change to:
1.25 to 1.5	Greyish red, sandy medium heavy clay.

Distinguishing soil properties

Chemical

- N: very low P: low to medium
- K: medium
- low zinc
- surface pH 6.5, tending alkaline with depth
- strongly sodic below 0.2 m
- low salinity

Physical

- hard setting structureless surface, highly susceptible to plough pan development; poor workability; surface seals and sets hard after rain
- very low infiltration and permeability
- very poor drainage
- effective rooting depth less than 0.2 m
- very low PAWC
- highly dispersive below 0.2 m

AMU description:

Red to brown duplex soils which are moderately structured and well drained under brigalow scrub

Site description**Landform**

Undulating and gently undulating plains of low local relief with slopes generally less than 2% but can be greater than 20%.

Vegetation

A range including brigalow with associated bauhinia, ooline, Dawson gum, yapunyah; silver leaved ironbark, gidgee and bonewood scrub.

**Representative soil profile**

Depth (m)	Description
0 to 0.3	Dark reddish brown, clay loam; firm surface; weak, fine blocky structure; clear change to:
0.3 to 0.55	Dark reddish brown, medium clay; moderate prismatic structure; gradual change to:
0.55 to 1.0	Dull reddish brown, medium clay; strong prismatic structure; few yellow and grey mottles; clear change to:
1.0 +	Weathered basalt.

Distinguishing soil properties**Chemical**

- N: low P: medium K: medium
- low zinc
- surface pH 7.0, tending alkaline with depth
- non sodic
- low salinity

Physical

- firm to hard setting surface; seals with rain after tillage
- infiltration and permeability restricted below 0.5 m
- effective rooting depth 0.5 m to 0.8 m
- medium PAWC
- moderate dispersion below 0.5 m

Land use suitability

Irrigated (all types) cropping	: <i>all crops and pastures</i>
Dryland farming (small areas only)	: <i>winter crop only, wheat, chickpea, safflower</i>
Forage cropping	: <i>oats</i>
Grazing native pastures	: <i>very low producing wiregrasses and speargrasses in uncleared state; reasonably productive when cleared</i>
Grazing sown pastures	: <i>highly productive buffel grass, rhodes grass, stylo, green panic</i>

Land use limitations

- low N
- medium PAWC
- hard setting surface
- excessive regrowth

Land conservation

Water erosion hazard	: medium
Surface runoff	: medium to high
Contour banks	: narrow based
Waterways	: suitable, grass with buffel grass, Katambora rhodes, native grasses
Strip cropping	: n.a.
Diversion banks	: suitable
Dams	: suitable

Stocking rates

Uncleared native pasture	: 40 ha / AE
Cleared native pasture	: 10 to 12 ha / AE
Sown pasture	: 3 to 5 ha / AE

Management recommendations

- Do not overgraze because of susceptibility to wind erosion
- Control regrowth
- Do not clear bonewood scrub and slopes greater than 20%

Land use suitability

Grazing native pastures : *very low producing black speargrass, bluegrasses and other native grasses*

Land use limitations

- very low PAWC
- restricted effective rooting depth
- shallow soil
- hard setting surface

Land conservation

Water erosion hazard : medium
Surface runoff : high
Contour banks : n.a.
Waterways : n.a.
Strip cropping : n.a.
Diversion banks : suitable
Dams : unsuitable

Stocking rates

Uncleared native pasture : 50 ha / AE
 Cleared native pasture : n.a.
 Sown pasture : n.a.

Management recommendations

- Do not develop
- Maintain timber for property use, wildlife abd catchment protection

AMU description:

Shallow, gravelly soils on rugged uplands and dissected ridges

Site description

Landform

Mountains, hills and dissected plateaus.

Vegetation

Eucalypt woodlands or open forest (narrow leaved ironbark, silver leaved ironbark, yapunyah, lemon scented gum) and a range of understorey vegetation including lancewood, bendee, rosewood and other wattles.



Representative soil profile

Depth (m)	Description
0 to 0.35	Reddish brown, sandy clay loam; massive structure; large amount of rock and gravel; diffuse change to:
0.35+	Fresh rock (variable).

Distinguishing soil properties

Chemical

- N: very low P: very low
- K: very low
- neutral pH trend
- non sodic and non saline

Physical

- firm to hard setting; often very gravelly
- high infiltration and permeability
- very shallow rooting depth less than 0.3 m
- very low PAWC

AMU description:

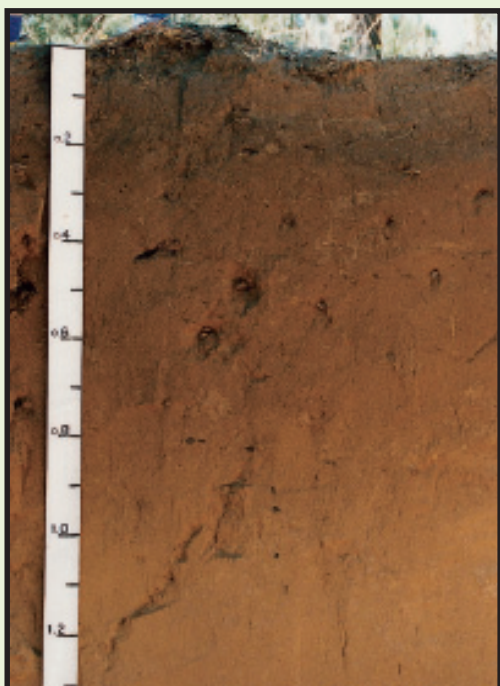
Deep, coarse and medium textured soils associated with alluvial levees and interchannel areas

Site description**Landform**

Narrow levees and alluvial plains of low relief associated mainly with major streams.

Vegetation

Tall woodlands of blue gum and Moreton Bay ash.

**Representative soil profile**

Depth (m)	Description
0 to 0.1	Brownish grey, sandy clay loam; firm surface; weak blocky structure; clear change to:
0.1 to 0.6	Brownish black, sandy clay loam; weak blocky structure; gradual change to:
0.6 to 1.45	Brown, sandy loam; clear change to:
1.45+	Brownish grey, sandy light medium clay.

Distinguishing soil properties**Chemical**

- N: very low P: high
- K: medium
- neutral pH trend
- non sodic and non saline

Physical

- loose to firm, deep sandy surface
- very high infiltration and permeability
- effective rooting depth greater than 1.0 m
- low to medium PAWC
- well drained

Land use suitability

- Grazing native pastures** : *moderately productive native grasses in uncleared state; highly productive when cleared*
- Grazing sown pastures** : *highly productive green panic, buffel grass and stylo*

Land use limitations

- flooding
- low to medium PAWC
- access because of wetness
- weed invasion
- frost

Land conservation

- Water erosion hazard** : low
- Surface runoff** : low
- Contour banks** : n.a.
- Waterways** : n.a.
- Strip cropping** : n.a.
- Diversion banks** : n.a.
- Dams** : n.a.

Stocking rates

- Uncleared native pasture : 8 to 10 ha / AE
- Cleared native pasture : 6 to 8 ha / AE
- Sown pasture : 5 to 6 ha / AE

Management recommendations

- Do not develop for cropping
- Add stylos to native pasture
- Stock conservatively to prevent weed invasion, particularly by parthenium
- Observe clearing guidelines with respect to distances from creeks and rivers

Land use suitability

- Grazing native pastures** : *highly productive bluegrasses and others in uncleared state; highly productive when cleared*
- Grazing sown pastures** : *moderately productive purple pigeon*

Land use limitations

- shallow soil depth
- low to medium PAWC

Land conservation

- Water erosion hazard** : high
- Surface runoff** : medium to high
- Contour banks** : n.a.
- Waterways** : suitable, grass with African Star grass, purple pigeon, creeping bluegrass or angelton
- Strip cropping** : n.a.
- Diversion banks** : suitable
- Dams** : unsuitable

Stocking rates

- Uncleared native pasture : 7 to 15 ha / AE
- Cleared native pasture : 6 to 10 ha / AE
- Sown pasture : 6 to 10 ha / AE

Management recommendations

- Do not develop

AMU description:

Shallow cracking and non-cracking clays on undulating open downs formed on basalt

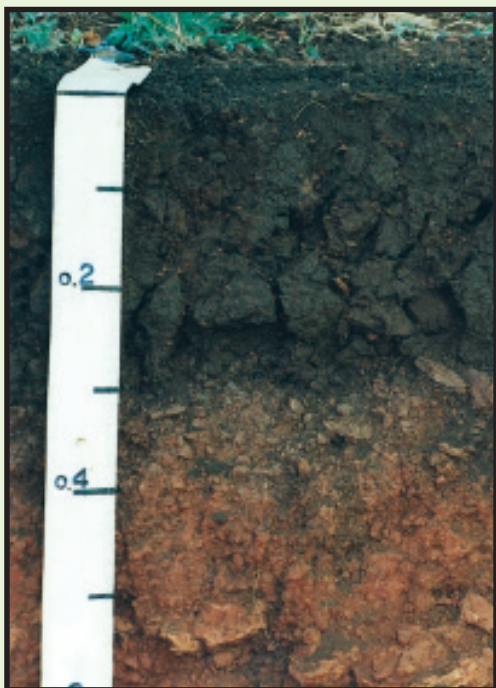
Site description

Landform

Often occurs within Orion or Kia-Ora AMUs on ridgelines and crests of gently undulating open downs.

Vegetation

Open woodlands of mountain coolibah, silver leaved ironbark or bloodwood. Ground cover of bluegrass, mitchell grass, black speargrass and wiregrass.



Representative soil profile

Depth (m)	Description
0 to 0.05	Brownish black, medium heavy clay; strong blocky structure; self-mulching and cracking; abrupt change to:
0.05 to 0.3	Brownish black, medium heavy clay; strong blocky structure; some carbonate concretions; clear change to:
0.3+	Weathered basalt.

Distinguishing soil properties

Chemical

- N: low to medium
- P: low to medium
- K: high
- low copper
- surface pH 7.5, tending slightly more alkaline with depth
- non sodic and non saline

Physical

- self-mulching surface, often stony
- moderate infiltration and permeability
- effective rooting depth less than 0.45 m
- low to medium PAWC

AMU description:

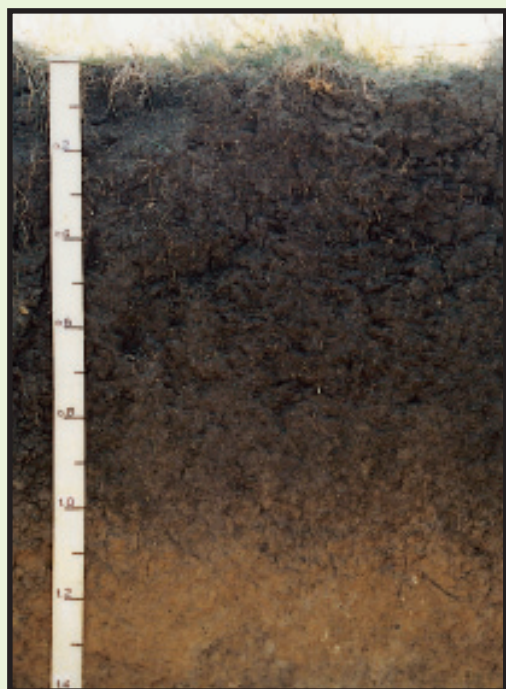
Black cracking clays with a strong fine granular surface mulch on undulating open downs formed on shales

Site description**Landform**

Undulating plains in the south-west on generally higher slopes (>1.5%) than Orion AMU.

Vegetation

Bluegrass tussock grasslands.

**Representative soil profile**

Depth (m)	Description
0 to 0.2	Dark grey brown, medium heavy clay; strong, medium granular structure; self-mulching and cracking surface; abrupt change to:
0.2 to 0.8	Brownish black, heavy clay; strong blocky structure; gradual change to:
0.8 to 1.1	Brownish black, heavy clay; a few carbonate nodules; clear change to:
1.1 to 1.4	Brown, medium heavy clay; large amounts of soft carbonate (lime); abrupt change to:
1.4+	Weathered shale.

Distinguishing soil properties**Chemical**

- N: medium P: very high
- K: high
- low zinc
- surface pH 8.0, tending more alkaline with depth
- non sodic and non saline

Physical

- strong and fine mulching surface, sealing in places with moderate to good workability
- moderate infiltration and permeability
- effective rooting depth 0.45 m to 1.5 m
- high to very high PAWC

Land use suitability

Irrigated (all types) cropping	: <i>all crops and pastures</i>
Dryland cropping	: <i>sorghum, sunflower, chickpea, mungbeans, wheat, safflower, cotton</i>
Forage cropping	: <i>all forage sorghums, oats, dolichos, cowpea</i>
Grazing native pastures	: <i>very highly productive bluegrasses, and other native grasses</i>
Grazing sown pastures	: <i>highly productive buffel grass, rhodes grass, purple pigeon</i>

Land use limitations

- soil erosion
- surface sealing

Land conservation

Water erosion hazard	: high
Surface runoff	: medium to high
Contour banks	: broad based
Waterways	: suitable, grass with African Star grass, Indian bluegrass, purple pigeon, buffel grass, Katambora rhodes, creeping bluegrass, angleton and native grasses
Strip cropping	: suitable
Diversion banks	: suitable
Dams	: suitable

Stocking rates

Uncleared native pasture	: 4 to 5 ha / AE
Cleared native pasture	: n.a
Sown pasture	: 5 ha / AE

Management recommendations

- Contour banks on cultivated land over 0.5%
- Use minimum tillage techniques
- Rotate crops
- Waterways stabilisation requires care
- When spelling cultivation, sown pastures are needed because native pastures won't regenerate

Land use suitability

- Grazing native pastures** : *low to very low producing black speargrass, desert bluegrass and other native grasses uncleared; moderate grass production when cleared*
- Grazing sown pastures** : *low producing buffel grass and stylo*

Land use limitations

- very low to low PAWC
- low fertility
- sodic subsoil
- very high erodibility of subsoil
- excessive regrowth
- hard setting surface

Land conservation

- Water erosion hazard** : extremely high
- Surface runoff** : high
- Contour banks** : unsuitable
- Waterways** : suitable if topsoil intact, grass with buffel grass
- Strip cropping** : n.a.
- Diversion banks** : unsuitable
- Dams** : generally suitable

Stocking rates

- Uncleared native pasture : 15 to 20 ha / AE
- Cleared native pasture : 15 ha / AE
- Sown pasture : 12 to 15 ha / AE

Management recommendations

- Do not mechanically clear
- Use chemical treatment to selectively clear areas
- Do not expose sodic soils

AMU description:

Hard setting, yellow-brown sandy duplex soils with hard, impervious clay subsoils

Site description

Landform

Undulating plains of low local relief with slopes generally less than 1%.

Vegetation

Woodlands of poplar box, narrow leaved ironbark and silver leaved ironbark, with understorey of sandalwood, currant bush and wattles (occasionally without shrubby understorey).



Representative soil profile

Depth (m)	Description
0 to 0.2	Yellowish brown, sandy loam; hard setting surface; very coarse, massive structure; clear change to:
0.2 to 0.3	Sandy loam; conspicuous bleach; massive structure; abrupt change to:
0.3 to 0.8	Yellowish brown, medium heavy clay; strong, coarse columnar structure; gradual change to:
0.8 to 1.5	Yellowish brown, medium clay; strong blocky structure; carbonate nodules common.

Distinguishing soil properties

Chemical

- N: very low P: very low to medium
K: medium
- low to medium copper and zinc
- surface pH 6.5, tending alkaline with depth
- strongly sodic below 0.4 m to 0.6 m
- low salinity below 0.5 m

Physical

- hard setting sandy surface; seals and sets hard with rain following tillage
- initial high infiltration but tends to waterlog once wetting front encounters subsoil clay layer
- effective rooting depth 0.2 m to 0.5 m
- very low to low PAWC
- highly dispersive below 0.4 m to 0.6 m

AMU description:

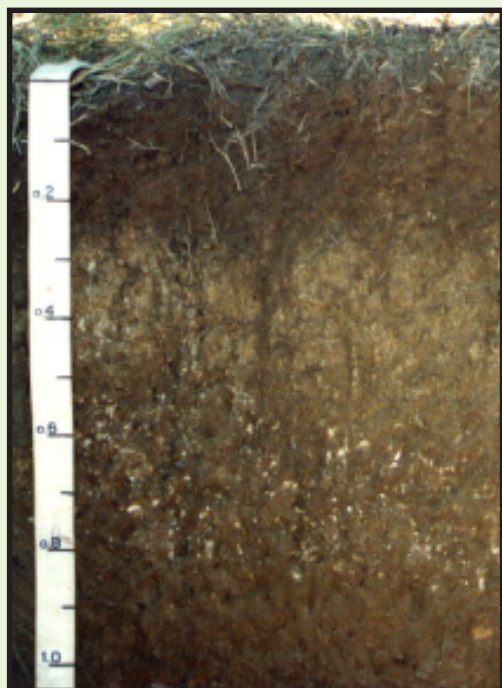
Melonholed grey and brown clays on brigalow scrub plains

Site description**Landform**

Level or gently undulating plains with melonhole gilgai.

Vegetation

Brigalow scrub which may include yapunyah. Areas of blackwood and gidgee occur to the north of the area.

**Representative soil profile**

Depth (m)	Description (gilgai mound)
0 to 0.05	Brown, light clay; moderate granular structure; self-mulching and cracking surface; clear change to:
0.05 to 0.3	Brown, medium clay; moderate blocky structure; some soft carbonate; clear change to:
0.3 to 0.85	Yellow-brown, medium heavy clay; moderate prismatic structure; soft carbonate common; gradual change to:
0.85 to 1.5	Brown, heavy clay; strong blocky structure; grey and red mottles common.

Distinguishing soil properties**Chemical**

- N: low P: low
- K: medium to high
- low zinc
- surface pH 8.0, tending acidic below 0.2 m
- strongly sodic below 0.2 m (mounds); 0.6 m (depressions)
- salinity below 0.3 m (mounds); 0.6 m (depressions)

Physical

- gilgais over 0.4 m deep; mounds are sandy crusting; depressions are coarse mulching, remaining waterlogged for extended periods
- very low infiltration and permeability
- very poorly drained
- effective rooting depth 0.2 m mounds; 0.6 m depressions
- medium PAWC (depressions); very low PAWC (mounds)
- highly dispersive below 0.2 m mounds; 0.6 m depressions

Land use suitability

- Grazing native pastures** : *very low producing bluegrasses and other native grasses when uncleared; low producing when cleared*
- Grazing sown pastures** : *moderately productive purple pigeon, buffel grass, rhodes grass and para grass*

Land use limitations

- gilgais
- coarse self-mulching surface
- high salinity and sodicity
- shallow effective rooting depth

Land conservation

- Water erosion hazard** : low
- Surface runoff** : low to medium
- Contour banks** : n.a.
- Waterways** : n.a.
- Strip cropping** : n.a.
- Diversion banks** : suitable
- Dams** : suitable

Stocking rates

- Uncleared native pasture : 40 to 50 ha / AE
- Cleared native pasture : 15 to 20 ha / AE
- Sown pasture : 6 to 10 ha / AE

Management recommendations

- Develop only for sown pasture
- Gilgais may support para grass

Land use suitability

Irrigated (all types) cropping	: <i>all crops</i>
Dryland cropping	: <i>sorghum, sunflower, wheat, mungbeans, chickpea, safflower, cotton</i>
Forage cropping	: <i>all forage sorghums, oats, dolichos, cowpea</i>
Grazing native pastures	: <i>highly productive bluegrasses and other native grasses uncleared; highly productive when cleared</i>
Grazing sown pastures	: <i>highly productive purple pigeon</i>

Land use limitations

- flooding
- salinity
- frost

Land conservation

Water erosion hazard	: medium
Surface runoff	: medium
Contour banks	: broad based
Waterways	: suitable, grass with African Star grass, purple pigeon, Indian bluegrass, creeping bluegrass, angleton or native grasses
Strip cropping	: suitable
Diversion banks	: suitable
Dams	: suitable

Stocking rates

Uncleared native pasture	: 12 to 15 ha / AE
Cleared native pasture	: 4 to 6 ha / AE
Sown pasture	: 3 to 5 ha / AE

Management recommendations

- Do not clear black tea tree
- Use minimum tillage techniques to retain stubble
- Rotate crops
- Use press wheels to assist establishment
- Contour banks and waterways necessary on cultivated slopes over 0.5%
- When spelling cultivation, sown pastures are needed because native pastures won't regenerate

AMU description:

Deep red, brown to grey uniform clays on broad to narrow, occasionally deeply incised, alluvial plains draining basalt landscapes

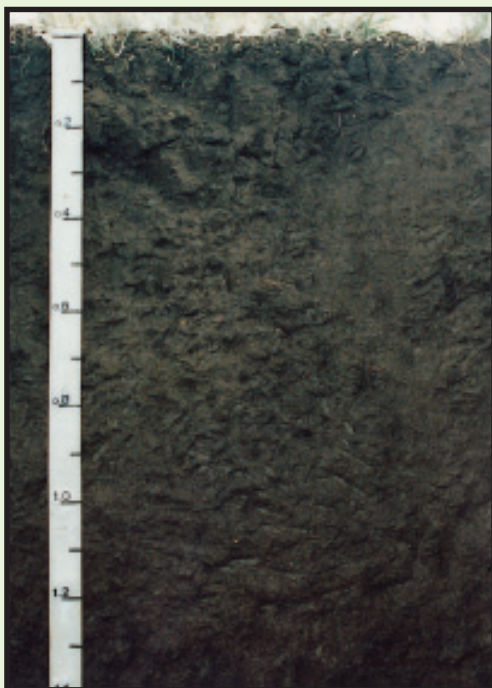
Site description

Landform

Alluvial plains along streams draining the basalt areas.

Vegetation

Tall open woodlands of coolibah with associated black tea tree, brigalow and yellowwood.



Representative soil profile

Depth (m)	Description
0 to 0.2	Grey brown, medium heavy clay; strong, fine granular structure; self-mulching surface; gradual change to:
0.2 to 0.4	Grey brown, medium heavy clay; strong, medium blocky structure; gradual change to:
0.4 to 1.5+	Grey brown, medium heavy clay; strong lenticular structure; a few carbonate nodules.

Distinguishing soil properties

Chemical

- N: low P: very low to low
- K: medium
- low zinc
- surface pH 7.5, tending more alkaline with depth
- non sodic
- occasional high salinity below 0.5m; otherwise very low salinity apart from seepage areas

Physical

- fine self-mulching surface; good workability
- moderate infiltration and permeability;
- moderately well drained
- effective rooting depth greater than 1.0 m
- high PAWC

AMU description:

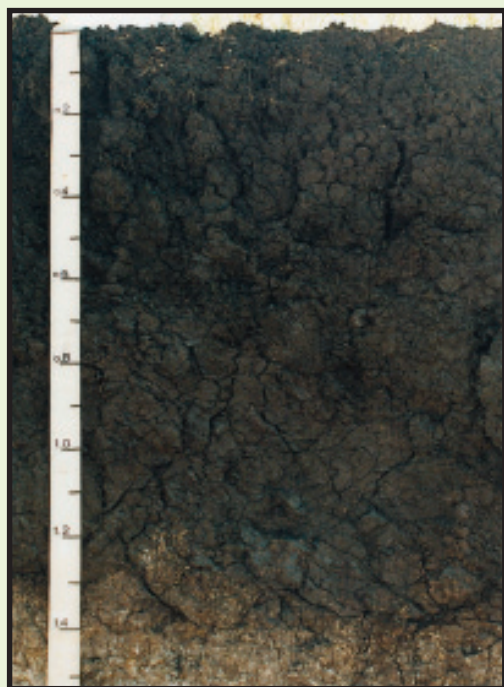
Deep, cracking dark clays on undulating downs on basalt

Site description**Landform**

Undulating plains and rises on basalt.

Vegetation

Open grasslands of bluegrass, mitchell grass, black speargrass and wiregrass with scattered mountain coolibah, bloodwood, silver leaved ironbark and wattles.

**Representative soil profile**

Depth (m)	Description
0 to 0.05	Brownish black, medium clay; self mulching and cracking surface; strong blocky structure; clear change to:
0.05 to 0.35	Brownish black, heavy clay; strong blocky structure; gradual change to:
0.35 to 1.3	Brown, heavy clay; strong lenticular structure; a few carbonate nodules; gradual change to:
1.3+	Weathered basalt.

Distinguishing soil properties**Chemical**

- N: low P: very low to low K: medium to high
- low zinc
- surface pH 7.5, tending more alkaline with depth
- non sodic and non saline

Physical

- strong self-mulching surface; surface stone can occur
- heavy clay difficult to work when wet
- low to moderate infiltration and permeability
- imperfect drainage
- effective rooting depth greater than 0.45 m (governed by depth to parent material)
- high PAWC

Land use suitability

Irrigated (all types) cropping	: <i>all crops and pastures</i>
Dryland cropping	: <i>sorghum, sunflower, wheat, mungbeans, chickpea, safflower, cotton</i>
Forage cropping	: <i>all forage sorghums, oats, dolichos, cowpea</i>
Grazing native pastures	: <i>very highly productive bluegrasses and other native grasses</i>
Grazing sown pastures	: <i>highly productive purple pigeon</i>

Land use limitations

- soil erosion
- fertility
- coarse and thin surface mulch
- surface sealing
- surface stone
- variability of depth and PAWC

Land conservation

Water erosion hazard	: high
Surface runoff	: medium to high
Contour banks	: broad based
Waterways	: suitable, grass with African Star grass, purple pigeon, Indian bluegrass, creeping bluegrass, and native grasses
Strip cropping	: suitable
Diversion banks	: suitable
Dams	: unsuitable

Stocking rates

Uncleared native pasture	: 4 to 5 ha / AE
Cleared native pasture	: n.a.
Sown pasture	: 5 ha / AE

Management recommendations

- Contour banks on cultivation over 0.5% slope
- Use minimum tillage techniques
- Rotate crops
- Do not clear black tea tree
- Waterways stabilisation requires care
- Use press wheels to assist crop establishment

Land use suitability

- Irrigated (all types) cropping** : *all crops and pastures*
- Dryland cropping** : *sorghum, sunflower, wheat, mungbeans, chickpea, safflower, cotton*
- Forage cropping** : *all forage sorghums, oats, dolichos, cowpea*
- Grazing native pastures** : *low producing bluegrasses and scrub grasses when uncleared; moderately productive when cleared*
- Grazing sown pastures** : *highly productive buffel grass, rhodes grass and purple pigeon*

Land use limitations

- soil erosion
- surface sealing

Land conservation

- Water erosion hazard** : high
- Surface runoff** : medium to high
- Contour banks** : broad based
- Waterways** : suitable, grass with African Star grass, buffel grass, purple pigeon, Indian bluegrass, Katambora rhodes, creeping bluegrass, angleton and native grasses
- Strip cropping** : suitable
- Diversion banks** : suitable
- Dams** : suitable

Stocking rates

- Uncleared native pasture : 25 ha / AE
- Cleared native pasture : 13 ha / AE
- Sown pasture : 3 to 4 ha / AE

Management recommendations

- Contour banks on cultivated land over 0.5%
- Use minimum tillage techniques
- Rotate crops

AMU description:

Deep red, brown to grey cracking clays under brigalow, softwood scrub or gidgee scrub

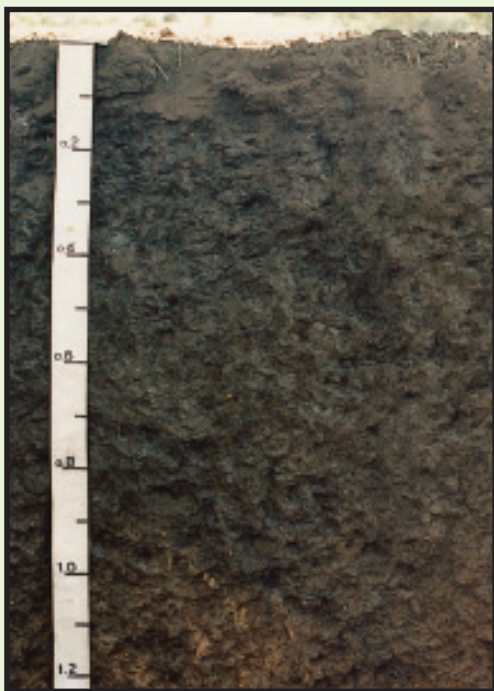
Site description

Landform

Level to undulating plains.

Vegetation

Fairly dense scrub consisting of brigalow, yellowwood and associated softwood species or gidgee; mostly cleared for cultivation.



Representative soil profile

Depth (m)	Description
0 to 0.1	Brown, medium clay; strong, fine granular structure; self-mulching and cracking surface; abrupt change to:
0.1 to 0.35	Brown, medium heavy clay; strong, medium blocky structure; gradual change to:
0.35 to 1.0	Greyish brown, medium heavy clay; strong lenticular structure; a few carbonate nodules; a gradual change to:
1.0 to 1.5+	Yellow-brown, medium heavy clay; soft carbonate common; basalt often encountered before 2 m.

Distinguishing soil properties

Chemical

- N: medium P: medium to high
- K: medium to high
- low zinc
- surface pH 8.0, tending more alkaline with depth
- possible medium sodicity below 1.2 m
- possible medium salinity below 1.2 m

Physical

- strong granular self-mulching surface; easy workability; occasional tendency to seal following cultivation
- moderate infiltration and permeability
- imperfect drainage below 0.5 m
- effective rooting depth greater than 0.9 m
- high to very high PAWC

AMU description:

Deep, cracking grey to brown clays formed from highly weathered sediments under brigalow / eucalypt scrub

Site description**Landform**

Level and lower sloping areas of undulating plains. Includes areas of normal gilgai with less than 0.4 m vertical interval.

Vegetation

Commonly brigalow and Dawson gum scrub with areas of gidgee and blackwood to the north.

**Representative soil profile**

Depth (m)	Description
0 to 0.05	Greyish brown, heavy clay; crusting and cracking surface; moderate, fine granular structure; clear change to:
0.05 to 0.3	Greyish brown, heavy clay; moderate blocky structure; some soft carbonate; gradual change to:
0.3 to 1.2	Dull brown, heavy clay; strong lenticular structure; a few carbonate nodules and manganese veins; gradual change to:
1.2 to 1.5	Dull brown, heavy clay.

Distinguishing soil properties**Chemical**

- N: very low to medium
- P: very low to medium
- K: high
- surface pH 8.0, tending acid below 0.6 m
- sodic below 0.5 m
- very low to medium salinity below 0.5 m

Physical

- crusting to coarse mulching; often gilgais less than 0.4 m deep with depressions remaining wet for extended periods
- slow infiltration and permeability
- poorly drained
- effective rooting depth 0.5 m
- medium to high PAWC
- moderately dispersive below 0.5 m

Land use suitability

Irrigated (all types) cropping	: <i>all crops and pastures</i>
Dryland cropping (short term)	: <i>sorghum, wheat, chickpea</i>
Forage cropping	: <i>forage sorghums, oats, dolichos, cowpea and millets</i>
Grazing native pastures	: <i>low producing bluegrasses, wire-grasses and other native grasses uncleared; moderately productive when cleared</i>
Grazing sown pastures	: <i>moderately productive buffel grass, rhodes grass and purple pigeon</i>

Land use limitations

- sodic and salinity
- gilgais
- coarse surface mulch
- regrowth

Land conservation

Water erosion hazard	: low to medium
Surface runoff	: low to medium
Contour banks	: broad based
Waterways	: suitable, grass with African Star grass, buffel grass, Katambora rhodes, purple pigeon, Indian bluegrass, creeping bluegrass, angleton and native grasses
Strip cropping	: unsuitable
Diversion banks	: suitable
Dams	: suitable

Stocking rates

Uncleared native pasture	: 25 ha / AE
Cleared native pasture	: 10 to 15 ha / AE
Sown pasture	: 7 to 8 ha / AE

Management recommendations

- Contour banks on cultivated land over 0.5%
- Rotate forage crops
- Use minimum tillage techniques
- Land levelling required insome areas

Land use suitability

- Irrigated (all types) cropping** : all crops and pastures
- Forage cropping** : all forage sorghums, oats, dolichos, cowpea, millets
- Grazing native pastures** : very low producing bluegrass and scrub grasses when uncleared; moderately productive when cleared
- Grazing sown pastures** : highly productive buffel grass, green panic and rhodes grass

Land use limitations

- restricted soil depth
- low to moderate PAWC
- sodic subsoil
- soil erosion
- workability; crusting and sometimes hard setting surface

Land conservation

- Water erosion hazard** : medium
- Surface runoff** : medium to high
- Contour banks** : broad based
- Waterways** : suitable, grass with African Star grass, buffel grass, Indian bluegrass, Katambora rhodes, creeping bluegrass, angleton and native grasses
- Strip cropping** : unsuitable
- Diversion banks** : suitable
- Dams** : suitable

Stocking rates

- Uncleared native pasture : 30 to 40 ha / AE
- Cleared native pasture : 10 to 12 ha / AE
- Sown pasture : 4 to 5 ha / AE

Management recommendations

- Contour banks on cultivated land over 0.5%
- Use minimum tillage techniques
- Rotate forage crops
- Retain all organic matter to reduce soil structural damage

AMU description:

Red to brown cracking and non-cracking clays usually on upper slopes of undulating scrub country

Site description

Landform

Mid and upper sloping areas of undulating landscapes in association with Turkey Creek AMU.

Vegetation

Woodlands or scrub with a range of species including brigalow, bonewood, wilga, belah, bendee, yellowwood, gidgee, silver leaved ironbark, Dawson gum and bottle tree.



Representative soil profile

Depth (m)	Description
0 to 0.2	Dull reddish brown, medium clay; moderate, fine to medium blocky structure; abrupt change to:
0.2 to 0.4	Dull reddish brown, medium heavy clay; coarse blocky structure; a few carbonate nodules; clear change to:
0.4 to 1.4	Reddish brown, medium heavy clay; coarse blocky structure; a few carbonate nodules; clear change to:
1.4+	Weathered basalt.

Distinguishing soil properties

Chemical

- N: low to medium
- P: low to medium K: medium
- low zinc
- surface pH 8.0, tending more alkaline
- strongly sodic below 0.5 m
- low to medium salinity below 0.6 m

Physical

- crusting to hard setting surface; cloddy after cultivation
- slow infiltration and permeability
- poorly drained below 0.5 m
- effective rooting depth 0.4 to 1.0 m (often quite variable)
- low to medium PAWC
- high dispersion below 0.5 m

AMU description:

Grey to brown duplex soils with thin sandy surfaces on undulating brigalow scrub country

Site description**Landform**

Midslope positions of undulating landscapes in association with Springton and Picardy AMUs.

Vegetation

Brigalow, belah, Dawson gum and yellow-wood scrub.

**Representative soil profile**

Depth (m)	Description
0 to 0.05	Brown, sandy clay loam; weak granular structure; clear change to:
0.05 to 0.25	Grey brown, medium clay; strong, medium blocky structure; gradual change to:
0.25 to 1.5+	Grey brown, heavy clay; strong lenticular structure; a few carbonate nodules.

Distinguishing soil properties**Chemical**

- N: low to medium K: medium
- P: very low to medium
- low copper and zinc (in virgin state)
- surface pH 8.0, tending more alkaline with depth
- medium sodicity below 0.7 m
- low salinity below 0.7 m

Physical

- hard setting sandy surface becoming a sandy clay following tillage; vulnerable to plough pan formation
- moderate infiltration and permeability
- imperfect drainage
- effective rooting depth 0.6 m to 1.0 m
- medium to high PAWC
- slight tendency for clay dispersion below 0.6 m

Land use suitability

- Irrigated (all types) cropping** : *all crops and pastures*
- Dryland cropping** : *sorghum, sunflower, cotton, mungbeans, wheat, chickpea, safflower*
- Forage cropping** : *all sorghum forages, oats, dolichos,*
- Grazing native pastures** : *very low producing bluegrass and other native grasses uncleared; moderately productive when cleared*
- Grazing sown pastures** : *highly productive buffel grass, green panic, rhodes grass and purple pigeon*

Land use limitations

- rapid nutrient decline
- plough pan development
- weed infestation

Land conservation

- Water erosion hazard** : high
- Surface runoff** : medium
- Contour banks** : broad based
- Waterways** : suitable, grass with African Star grass, buffel grass, Katambora rhodes, purple pigeon and native grasses
- Strip cropping** : n.a.
- Diversion banks** : suitable
- Dams** : suitable

Stocking rates

- Uncleared native pasture : 40 ha / AE
- Cleared native pasture : 10 to 15 ha / AE
- Sown pasture : 3 to 4 ha / AE

Management recommendations

- Contour banks on cultivated land over 0.5%
- Practice reduced tillage techniques on all cultivation
- Good weed control is vital (particularly parthenium)
- When spelling cultivation, sown pastures are needed because native pastures won't regenerate

Appendix I - EMR/CLR Search



Department of Environment and Heritage Protection (EHP)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.ehp.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

Tim Kinny
21 McLachlan Street
Fortitude Valley QLD 4006

Transaction ID: 49050806 EMR Site Id: 27 February 2013
Cheque Number:
Client Reference:

This response relates to a search request received for the site:

Lot: 4 Plan: SP116046
CHARTERS TOWERS Road
CLERMONT

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

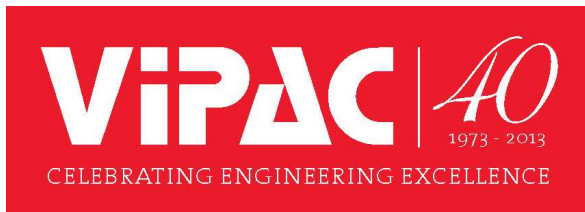
ADDITIONAL ADVICE

From the 1st August 2012, the price of an EMR/CLR search will increase to \$41.55 per lot for internet based searches and \$48.85 per lot for EMR/CLR searches done by means other than the internet.

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Registrar
Administering Authority

Appendix J - Air Quality Impact Assessment



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CDM Smith Australia Pty Ltd

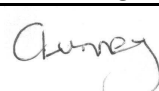
Disney Quarry Air Quality Assessment



Report No. 70Q-12-0427-TRP-514168-6

10 July 2013

DOCUMENT CONTROL

Disney Quarry Air Quality Assessment		
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EXECUTIVE SUMMARY

Vipac Engineers & Scientists Ltd (Vipac) was commissioned to prepare an air quality assessment for the proposed quarry known as Disney Quarry. The Disney Quarry is proposed to be developed over 92.57 ha of generally disturbed land (grazing and quarry activities), approximately 144 km north-west of Clermont in Central Queensland. The Disney Quarry, a new embankment material quarry proposed to be located on Lot 4 SP116046. The site is located adjacent to the Gregory Development Road, within the Isaac Regional Council (IRC) area.

The purpose of this report is to evaluate the potential impacts of dust generated from various activities and to provide recommendations to mitigate and minimise any potential impacts that might have an effect on the surrounding community.

This assessment has used the worst-case output month, May 2015 and modelled the impacts over a full year to ensure compliance during the life of the quarry. Extraction of the rock is designed to occur in two stages and will principally occur through ripping of the softer surface material by a large bulldozer. Vipac has been advised that no blasting will not occur at the proposed Disney Quarry.

The emission factors for various quarrying activities were derived from US EPA AP42 and Environment Australia (2012) National Pollutant Inventory (NPI) - *Emissions Estimation Technique (EET) Manual for Mining*.

The modelling has predicted no exceedences of the Queensland Department of Environmental and Heritage (EPP (Air)) objectives at the Disney Homestead (2.2 km west). High background levels dominate the dust deposition and TSP rather than emissions from the various quarry activities, whereas the smaller particles, PM₁₀ and PM_{2.5} are a direct result of the quarry activities.

The Disney Quarry will be a short-term operation commencing in early 2014 and operating until construction of the Rail Project is completed, which is anticipated to be the end of 2016. The highest contribution for all pollutants is the emissions from haul truck movements; these movements are based on the highest output in May 2015 and will be lower during all other months of the quarry life. As such, the emissions from vehicle movements will be lower as less material will be transported from the quarry. The duration of the maximum output, upon which this assessment is based on is only one month and therefore, the levels presented are the worst case for one month and it can therefore be concluded that the impacts during this phase will be less than presented within this report.

The Disney Quarry is one of five (5) proposed quarries as part of the development of the Carmichael Coal Mine and Rail Project. The cumulative impacts of the Borrow 7 and the Disney Quarry are not expected to exceed the relevant criteria at the Disney Receptor.

The distances between the other quarries and the Disney Quarry are so great, that cumulative impacts of dust will not occur at the closest receptor to the Disney Quarry, the Disney Homestead. For this reason, cumulative impacts of these other quarries upon the Disney Homestead have not been predicted.

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λYlJl-Ōŭăŏ

The modelling results have identified that the criteria will not be exceeded at the Disney Homestead during the life of the quarry for dust deposition, TSP PM₁₀ or PM_{2.5} concentrations. Best practice mitigation recommendations to suppress dust dispersal be employed to ensure compliance with the criteria at all times.

To conclude, this assessment has determined that the operation of this site as a quarry will not adversely impact nearby sensitive receptors and is suitable for development.

TABLE OF CONTENTS

1. INTRODUCTION	6
2. PROJECT DESCRIPTION	6
2.1 OVERVIEW	6
2.2 EXTRACTION METHODS	7
2.3 SITE ACITIVITES.....	7
2.3.1 Equipment	7
2.3.2 Operational Hours.....	8
2.3.3 Transportation	8
2.3.4 Production Schedule	8
3. SITE DESCRIPTION	9
3.1 LOCAL METEOROLOGY	9
3.2 TERRAIN	9
3.3 SENSITIVE RECEPTOR	10
4. AIR QUALITY - ACTIVITITES & SIGNIFICANCE.....	11
4.1 ACTIVITIES.....	11
4.2 SIGNIFICANCE	11
5. REGULATORY FRAMEWORK & PROJECT CRITERIA	12
5.1 NATIONAL LEGISLATION	12
5.2 STATE LEGISLATION.....	12
5.3 PROJECT CRITERIA	12
6. EXISTING AIR QUALITY	13
7. METHODOLOGY	14
7.1 MODELLING.....	14
7.2 EMISSION RATES	14
8. IMPACT ASSESSMENT	15
8.1 CUMULATIVE IMPACTS.....	16
9. MITIGATION	17
10. CONCLUSION	18
11. REFERENCES	19
APPENDIX A : MONITORING DATA	20
APPENDIX B : CONTOUR PLOTS	22

1. INTRODUCTION

Vipac Engineers & Scientists Ltd (Vipac) was commissioned to prepare an air quality assessment for the proposed quarry known as Disney Quarry. The purpose of this report is to evaluate the potential impacts of dust generated from various activities and to provide recommendations to mitigate and minimise any potential impacts that might have an effect on the surrounding community.

2. PROJECT DESCRIPTION

2.1 OVERVIEW

To facilitate development of the Carmichael Coal Mine and Rail Project, a quarry, referred to as Disney is to be developed to provide material for the embankment fill for the rail corridor.

The Disney Quarry is to be located approximately 144 km north-west of Clermont in Central Queensland and 720 m west of the Gregory Development Road. At its closest, the Disney Quarry approximately 1.6 km north of the proposed rail line, which will service the Carmichael Coal Mine. A location map is shown in Figure 2-1.

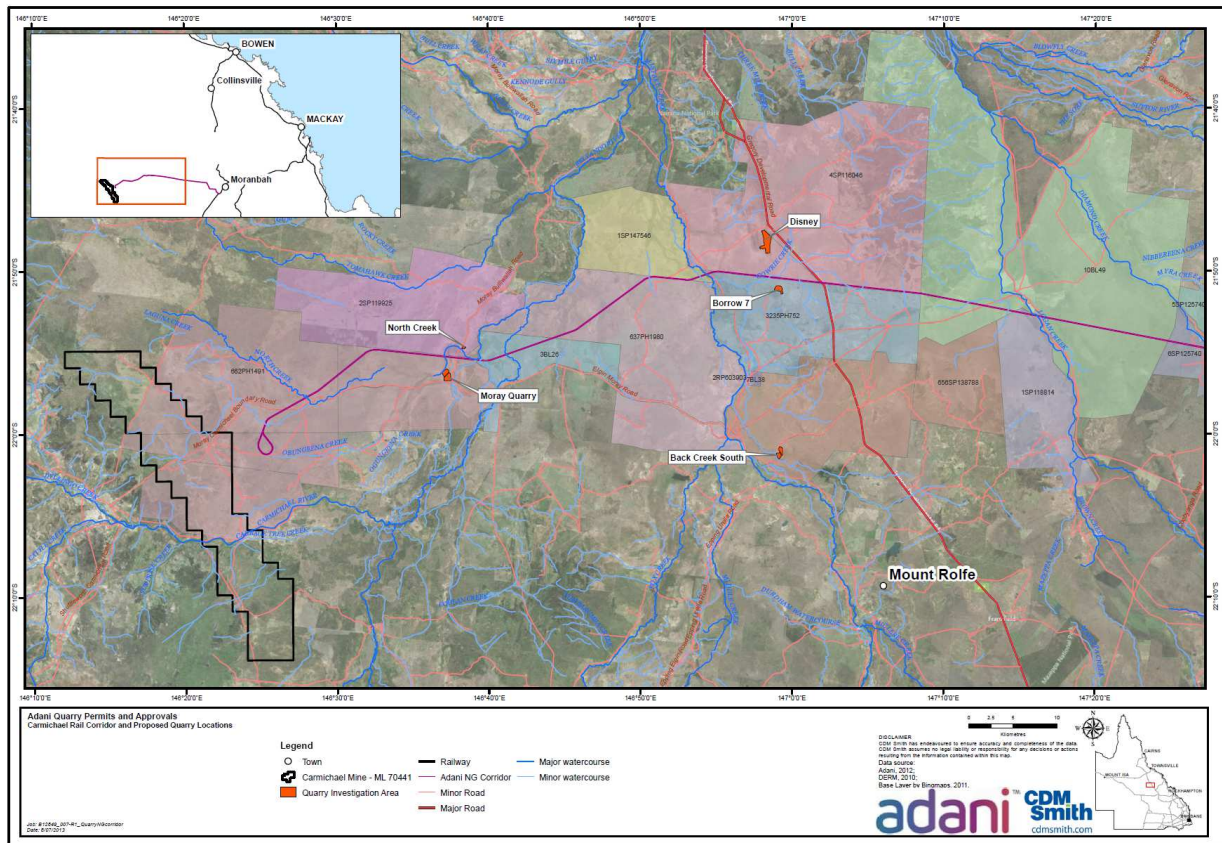


Figure 2-1: Location of Quarries

2.2 EXTRACTION METHODS

Extraction of the rock is designed to occur in two stages and will principally occur through ripping of the softer surface material by a large bulldozer. Vipac has been advised that no blasting will not occur at the proposed Disney Quarry.

The quarry is likely to produce material ranging from <20 CBR to CBR 80+. The extraction for this Project area is recommended to start by development of a series of linear rip faces with the dozer ripping and pushing material to a stockpile which will then be loaded via loader/excavator either straight into a truck or through a screening plant dependent upon the material quality.

The site layout is shown in Figure 2-2.

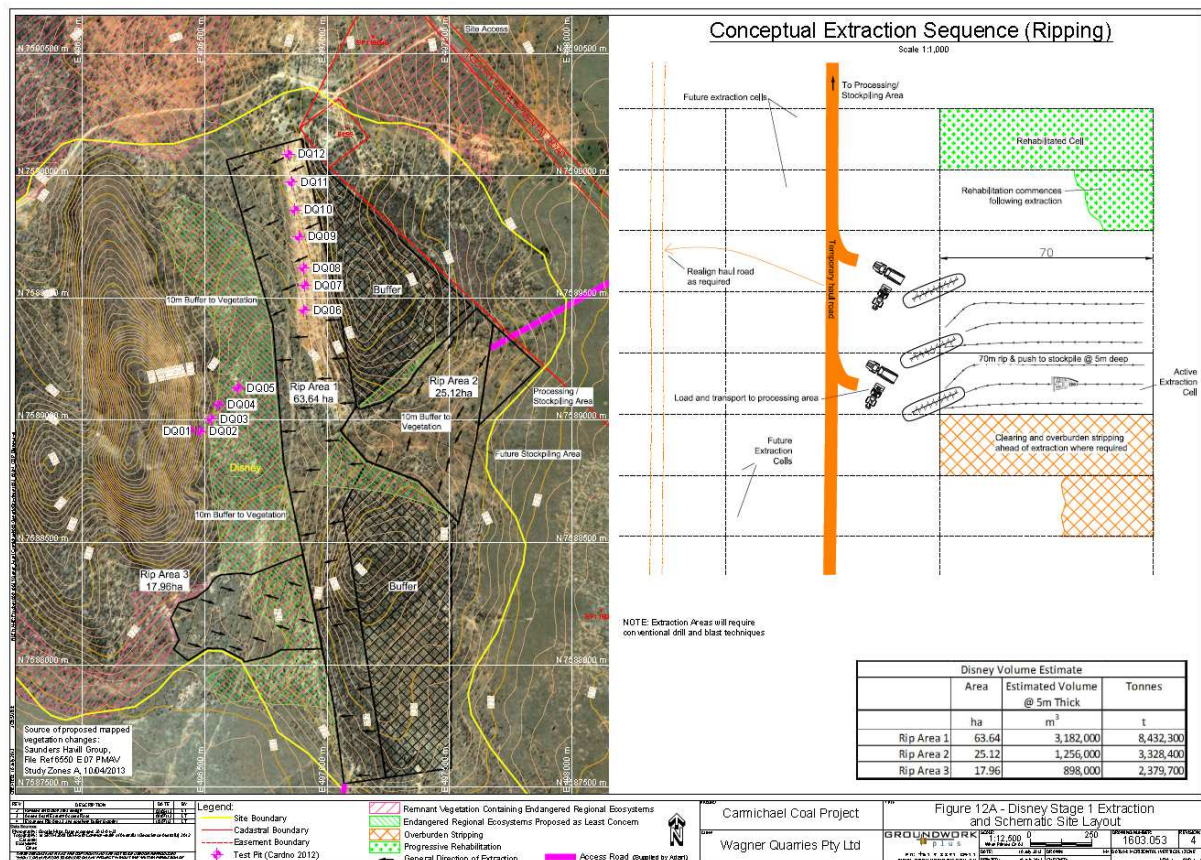


Figure 2-2: Site Layout

The height of the stockpile has been calculated to be seven metres high, based on the 'just in time' principle to accommodate the amount of material quarried during peak production.

2.3 SITE ACTIVITIES

2.3.1 Equipment

The following equipment will be used at the Disney Quarry:

- 2x Bull dozers (D10T);
- 1x Excavators (CAT 349DL);
- 2x Loaders (CAT980H);

- 1x Water truck (Mack 8x4 Wheeler);
- 2x light vehicles (Ford Ranger);
- 1x 10 kVA Genset;
- 7 x ALLIGHT plants; and
- 15 x 75 tonne AB triple trucks (road trains).

All the equipment listed above shall be used at the extraction site, with the exception of the haul trucks, which will travel to and from the extraction site.

2.3.2 Operational Hours

The Disney Quarry will operate 24 hours a day, Monday to Sunday and all operational activities will occur during these times. The quarry will operate 360 days per year and there is a wet weather contingency in the schedule.

2.3.3 Transportation

Seventy five tonne triple trailer haul trucks will be required during peak production. The number of trucks has been determined from the distance travelled and expected turn-around times of loading/unloading.

2.3.4 Production Schedule

The expected output is 11,750,000 tonnes over a 24-month operational life. The monthly output is shown in Figure 2-3, with the highest extraction of 1,510,309 tonnes expected to occur in May 2015. This schedule is subject to change with the construction schedule, delays in approvals or other factors impacting construction, which may extend the operating period of the Disney Quarry.

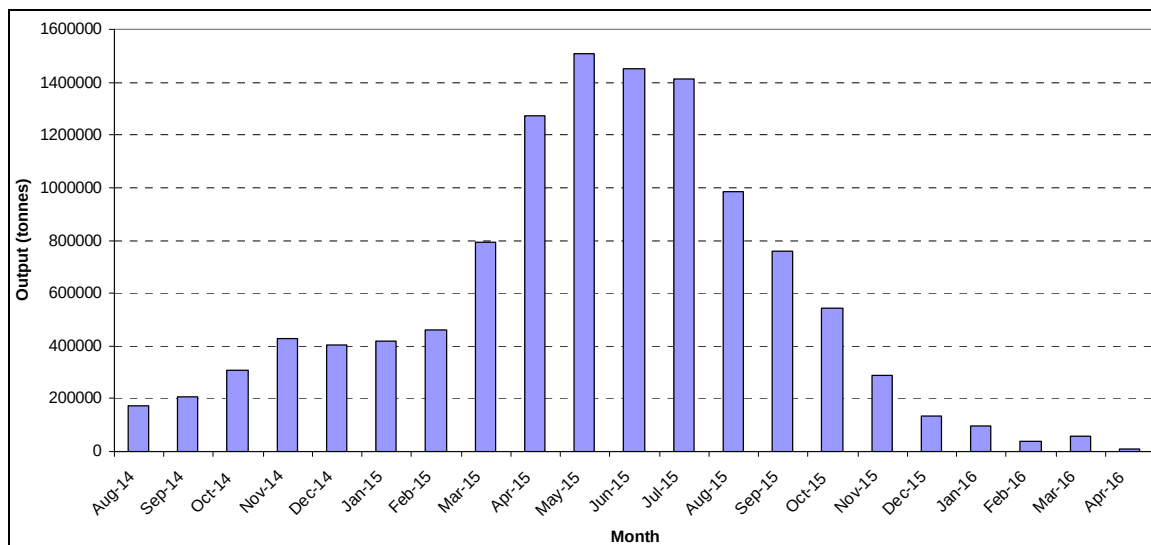


Figure 2-3: Expected Quarry Output by Month

3. SITE DESCRIPTION

3.1 LOCAL METEOROLOGY

Local meteorology has been generated for the Disney Quarry using the 2006 database from The Air Pollution Model (TAPM), which is a 3-dimensional prognostic model developed and verified for air pollution studies by the CSIRO (Figure 3-1).

Winds occur predominantly from the north east during spring and summer, often no greater than 5 m/s (18 km/h). In autumn and winter, the dominant winds occur from the south east with the highest wind speed of 8 m/s (28 km/h). The cooler, drier air is characteristic of the dominant southeast winds of moderate strength, usually with long calm periods in the winter.

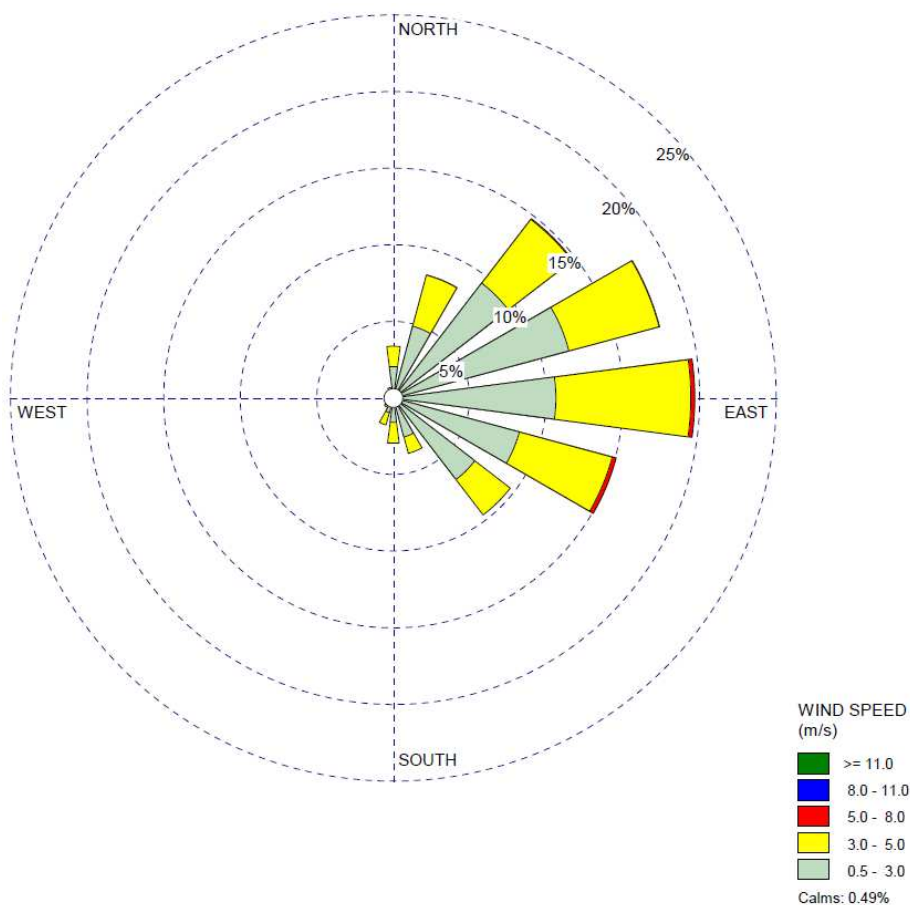


Figure 3-1: Annual Wind Rose (2006)

3.2 TERRAIN

The topography of the terrain between the receptor Disney located at 494429.60 mE, 7589482.77 mS and the Quarry is shown in Figure 3-2. The height range around the Disney Quarry is 190-280 m.

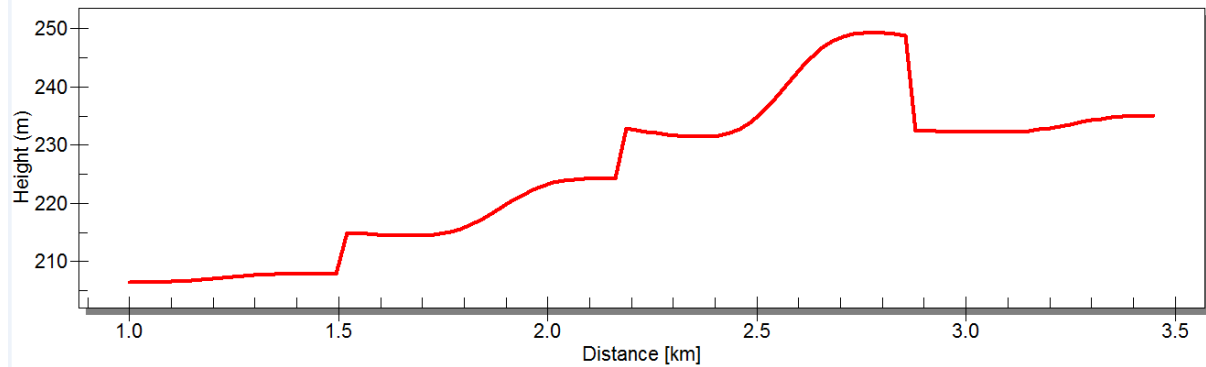


Figure 3-2: Terrain Elevations from Disney Homestead (1 km) to Quarry (2.9-3.4 km)

3.3 SENSITIVE RECEPTOR

The nearest sensitive receptor to the quarry is the Disney Homestead, located 2.2 km west of the quarry, as shown in Figure 3-3.



Figure 3-3: Sensitive Receptor near Disney Quarry

4. AIR QUALITY - ACTIVITIES & SIGNIFICANCE

The total suspended particulates (TSPs) consist of coarse and fine particles. In the atmosphere particles range in size from 0.1 to 50 μm ; the size of the particles determines how far into the respiratory system the particles penetrate. Particles with an aerodynamic diameter greater than 10 μm are screened out in the upper respiratory tract while particles smaller than 10 μm (PM_{10}) may penetrate into the lower respiratory tract.

4.1 ACTIVITIES

Activities that can generate dust include ripping, stockpiling, loading and unloading, and haulage. The relevance of each of these activities is influenced by quantity, duration and location, as well as site topography, meteorology and proximity of local receptors.

4.2 SIGNIFICANCE

Larger particles are associated with public nuisance, being particularly noticeable on clean surfaces such as cars, windows and window ledges, or surfaces that are usually expected to remain free of dust. Deposition may impact dust-sensitive locations such as schools, retirement homes, and hospitals and deter the use of amenity areas by local residents.

The potential significance of dust is influenced by the size of particles:

- Large dust particles (greater than 30 μm) make up the greatest proportion of dust and largely deposit within 100 metres of the source;
- Intermediate sized particles (10 to 30 μm) are likely to travel 200 to 500 metres; and
- Smaller dust particles (less than 10 μm , also known as PM_{10}) make up a smaller proportion of the dust and remain airborne for longer, dispersing more widely and depositing more slowly over a wider area, although impacts beyond 1 km are unlikely.

5. REGULATORY FRAMEWORK & PROJECT CRITERIA

5.1 NATIONAL LEGISLATION

In 1998, the National Environment Protection Council (NEPC) made Australia's first national ambient air quality standards as part of the National Environment Protection Measure for Ambient Air Quality (known as 'Air NEPM'). The Air NEPM sets national standards for the key air pollutants; carbon monoxide, ozone, sulphur dioxide, nitrogen dioxide, lead and particles (PM₁₀ and PM_{2.5}). The Air NEPM requires the state governments to monitor air quality and to identify potential air quality problems.

5.2 STATE LEGISLATION

The *Environmental Protection Act (1994)* has an extremely broad objective "to achieve ecologically sustainable development in Queensland", however in practice the legislation concentrates primarily on point-source pollution and land contamination. This is partly due to the existence of a range of other legislation that deals with protection of other aspects of the environment.

Subordinate to the *Environmental Protection Act 1994* is the Queensland *Environmental Protection (Air) Policy 2008* (EPP Air). Section 7 of the EPP (Air) states "*The environmental values of the air environment to be enhanced or protected under this policy are the qualities of the air environment that are conducive to suitability for the life, health and wellbeing of humans.*"

Ambient air quality goals relevant to this Project are prescribed by the EPP. Provided are criteria for PM₁₀ (particulate matter less than 10 microns in diameter), PM_{2.5} (particulate matter less than 2.5 microns in diameter). The most critical of these is the PM₁₀ criterion as the fraction of PM_{2.5} against PM₁₀ emissions from mining operations is small (typically less than 10%).

Deposited dust is commonly used as a measure of the potential for dust nuisance. If present at high levels deposited dust can reduce the amenity of an area. No formal criteria for dust deposition exist within Queensland, however the Department of Environment and Heritage Protection (EHP) has recommended a nuisance guideline of 120 mg/m²/day.

5.3 PROJECT CRITERIA

From all of the regulations, the strictest applicable criteria have been selected for this assessment and are presented in Table 5-1.

Table 5-1: Project Air Quality Goals

Pollutant	Basis	Criteria	Averaging Time	Exceedences*
TSP	Human Health	90 µg/m ³	1-year	-
PM ₁₀	Human Health	50 µg/m ³	24-hour	Five days per year
PM _{2.5}	Human Health	25 µg/m ³	24-hour	-
Dust deposition	Amenity	120 mg/m ² /day	30 days	-

* Allowance intended for natural events such as dust storms or bushfires

6. EXISTING AIR QUALITY

In line with common practice, to assess the impact of a quarry the incremental impact is quantified and added to existing background pollutant concentrations. Monitoring was conducted for particulate matter (PM₁₀) for a period of six (6) days and the daily averages derived for comparison to long term monitoring conducted by DERM in similar locations.

The weather observations during the monitoring period were obtained from the Bureau of Meteorology for the Emerald, located on Emerald Airport (station number 035264). During this time no rainfall was recorded as shown below in Table 6-1.

Table 6-1: Weather Observations During Monitoring Period

Date	9:00 AM			3:00 PM			Daily
	Temp (°C)	Direction	Speed (km/h)	Temp (°C)	Direction	Speed (km/h)	Rainfall (mm)
27/3/2013	24.9	ESE	17	30.8	ENE	19	0
28/3/2013	24.9	ESE	17	30.9	E	17	0
29/3/2013	24.2	NNE	11	30.8	ESE	17	0
30/3/2013	25.5	E	7	31.0	NE	15	0
31/3/2013	24.8	N	13	31.3	NNE	15	0
1/4/2013	21.8	ESE	13	26.5	NE	9	0

The existing levels of particulate matter were monitored at Disney Homestead between the 27th March and 1st April 2013. This receiver was chosen, in order to measure regional concentrations. The monitoring was carried out using an environmental dust monitor, which records a particulate matter value every five minutes. Analysis of the data determined the background PM₁₀ concentration to be 10 µg/m³, which is the 70th Percentile, in line with common practice and the Environmental Impact Statement for the Carmichael Coal Mine and Rail Project.

The chart of the monitoring data is shown in Appendix A.

The PM₁₀ concentration has been used to derive appropriate background concentrations for PM_{2.5} and TSP. The Australian Coal Review states that an average of 40% of TSP was found to consist of particles in the size range of PM₁₀. Particles in the size range of PM_{2.5} were found to comprise only 4% of TSP or equivalently 10% of PM₁₀.

The following estimates of background levels of dust will be used:

- Annual average concentration of TSP of 30 µg/m³;
- 24-hour average concentration of PM₁₀ of 10 µg/m³;
- 24-hour average concentration of PM_{2.5} of 1 µg/m³; and
- Dust deposition of 50 mg/m²/day.

7. METHODOLOGY

7.1 MODELLING

A 3-dimensional dispersion wind field model, CALPUFF, has been used to simulate the impacts from the quarry. CALPUFF is an advanced non-steady-state meteorological and air quality modelling system developed and distributed by Earth Tech, Inc. The model has been adopted by the U.S. Environmental Protection Agency (U.S. EPA) in its 'Guideline on Air Quality Models' as the preferred model for assessing near-field applications involving complex meteorological conditions such as calm conditions.

To generate the broad scale meteorological inputs to run CALPUFF, this study has used the model The Air Pollution Model (TAPM), which is a 3-dimensional prognostic model developed and verified for air pollution studies by the CSIRO.

The default TAPM databases for terrain, land use and meteorology were used in the model. The meteorological modelling year was 2006 and four nested grid domains were used with grid spacing of 30 km, 10 km, 3 km and 1 km.

7.2 EMISSION RATES

The emission rates for individual quarrying activities were obtained from Environment Australia (2012)-National Pollutant Inventory (NPI)- *Emissions Estimation Technique (EET) Manual for Mining*. The EET for mining contains emission factors covering a range of mining and extraction activities and the NPI emission factors are derived from the USEPA AP-42. These emission rates were then implemented into the CALPUFF model taking into consideration the phases of the quarry and the emission area (m²) for representative predictions.

Table 7-1 lists the emission rates for the equipment and activities associated with the Disney Quarry with an output of 1.51 million in May 2015.

Table 7-1: Emission Factors for Disney Activities (g/second)

Source	NPI based Emission Factor (gram/second)			Controls Assumed
	TSP	PM ₁₀	PM _{2.5}	
Bulldozer - Ripping	1.975	0.373	0.207	None Applied
Loader CAT 980H	0.352	0.091	0.037	None Applied
Excavator	2.233	0.800	0.234	None Applied
Water Truck	0.195	0.050	0.021	Watering – 2 litres/m ² /hour
Stockpile Wind Erosion	0.00037	0.00019	0.00004	None Applied
Wind Erosion (RIP 1 & 2)	0.051	0.026	0.005	None Applied
Haul Trucks	31.269	7.254	3.283	Watering – 2 litres/m ² /hour
Railway Deposition	6.767	2.425	0.710	None Applied

The emission rates for dust and PM₁₀ from various quarrying activities are listed in Table 7-1. These emission factors are derived from the NPI and shown here in grams per second. It can be seen from the Table that the haul road movements and maintenance generates the greatest TSP, PM₁₀ and PM_{2.5} emissions per second.

8. IMPACT ASSESSMENT

This section details the quantitative assessment of dust deposition, TSP, PM₁₀ and PM_{2.5} concentration impacts for each scenario, as described below, of the quarry activities upon the Disney Homestead.

Whilst the outputs may change significantly, the majority of the activities will remain the same, with the number and frequency of the haul trucks changing to reflect the output rates.

Activities associated with the initial construction phase are not expected to be a source of dust or particulate emissions therefore this phase has not been modelled. In order to predict the worst-case scenario only the maximum output of 1.51 million tonnes in May 2015 and modelled the impacts over a full year. The chart in Figure 2-3 identifies that for the majority of the quarry's life, the output will be significantly less and thus the impacts will be lower than the predictions in this Section.

The TSP, PM₁₀, PM_{2.5} and dust deposition results for the Disney Homestead are detailed in Table 8-1 and the modelling plots are shown in Appendix A.

Table 8-1: Disney Quarry Dust Results at Disney Homestead

Pollutant	Background Levels	Quarry Related Activities	Total	Criteria	Compliance
Dust Deposition (mg/m ² /day)	50	25.79	75.79	120 mg/m ² /day (30 days)	✓
TSP (µg/m ³)	30	17.68	47.68	90 µg/m ³ (1-year)	✓
PM ₁₀ (µg/m ³)	10	31.89	41.89	50 µg/m ³ (24-hour)	✓
PM _{2.5} (µg/m ³)	1	18.26	19.26	25 µg/m ³ (24-hour)	✓

It can be seen from Table 8-1 that there are no predicted exceedences of the Queensland Department of Environmental and Heritage (EPP (Air)) objectives. High background levels dominate the dust deposition and TSP rather than emissions from the various quarry activities, whereas the smaller particles, PM₁₀ and PM_{2.5} are a direct result of the quarry activities.

The highest contribution for all pollutants is the emissions from haul truck movements; these movements are based on the highest output in May 2015 and will be lower during all other months of the quarry life. As such, the emissions from vehicle movements will be lower as less material will be transported from the quarry. The duration of the maximum output, upon which this assessment is based is only one month therefore, the levels presented in Table 8-1 are the worst case for one month and it can therefore be concluded that the impacts at during this phase will be less than presented within this report.

Traffic movements of the staff vehicles arriving and leaving site were not available at the time of writing this report, however, these emissions will be negligible compared to the haul road emissions. As such, these were not modelled. The ambient air monitoring data suggests that the existing air quality at the Project location is good. This assessment has incorporated conservative background concentrations in the model to incorporate other emission sources.

The Victorian EPA has defined buffer guidelines for a variety of industries as a risk management tool. It is acknowledged that separation distances provide an additional level of protection by allowing more distance and space in which emissions may dissipate without adversely affecting sensitive receptors.

Applying the guidelines assesses the suitability of proposed development locations and the potential impacts of development. These guidelines assume a good standard of dust management is carried out on site. The recommended buffer distances for quarrying material without blasting is 200 m.

The distance between the quarry and the Disney Homestead is significantly greater than the recommended buffer distances; therefore impacts from the quarry upon the Disney Homestead are not expected.

8.1 CUMULATIVE IMPACTS

During the excavation of the Disney Quarry, activities associated with Back Creek South, Borrow 7, Moray, and North Creek quarries will also be occurring at the same time. The distances between the Disney Quarry and the other quarries are significant, as shown in Table 8-2.

Table 8-2: Other Quarry Distances from Disney Quarry

Quarry	Distance from Disney Quarry	Distance from Disney Homestead
Back Creek	22.1 km	24.8 km
Borrow 7	4.1 km	7 km
Moray	39 km	37 km
North Creek	35.8 km	33.7 km

During the excavation of the Borrow 7, activities associated with the Disney Quarry will also be occurring. The assessments for both quarries were based on peak output, with these peak outputs occurring in May 2015 for Disney Quarry and in November 2015 for Borrow 7. In order to consider the cumulative impacts, two things need to be taken into account:

- 1) The main contribution from the Disney Quarry is from the haul road movements that are related to output. The output of the Disney Quarry in November 2015 will be 287,277 tonnes, which is five times lower than the maximum output, therefore the concentrations from the Disney Quarry significantly reduced; and
- 2) The Disney Quarry is located east whereas the Borrow 7 is located south east of the Disney Homestead. As the wind cannot flow in two directions simultaneously throughout the day, the receptor will receive emissions from either the Disney Quarry or the Borrow 7, but not emissions from both at the same time.

As such, the combined emissions from these two quarries are not expected to exceed the relevant criteria at the Disney Receptor.

With the distances between other quarries and the Disney Quarry cumulative impacts of dust will not occur at the closest receptor to the Disney Quarry, the Disney Homestead. For this reason, cumulative impacts of these other quarries upon the Disney Homestead and surrounding environment will not be predicted.

For this assessment, only the impacts upon the Disney Homestead will be predicted, as it is closest to the Quarry. Additionally, cumulative air quality impacts may result from increased dust generation and emissions from agricultural activities such as cropping and grazing which may all be sources of cumulative air quality impacts.

9. MITIGATION

The modelling results have identified that the criteria will not be exceeded at the Disney Homestead during the life of the quarry for dust deposition, TSP PM₁₀ or PM_{2.5} concentrations. It is recommended that best practice mitigation measures to suppress dust dispersal be employed to ensure compliance with the criteria at all times.

Best practice mitigation measures described in this section will further minimise the potential for health issues and nuisance from an air quality perspective:

- Minimising the extent of clearing which bares earth;
- Water trucks should be summoned based on visual dust inspection;
- As a good management practice, on haul and access roads moderate level watering ($>2\text{L/m}^2/\text{h}$) to be adopted wherever there is a potential for emissions to exceed the criteria limits such as during high winds;
- Where it is apparent moderate watering frequency is not being effective high level watering ($\sim 4\text{L/m}^2/\text{h}$) is to be adopted or operations reduced or ceased;
- Water sprays should be used for excavation activities where necessary;
- Water spraying of stockpiles should be done on a frequent basis in order to keep the raw material moist to suppress fugitive dust release. The frequency of watering will depend on weather conditions;
- Light and heavy vehicle speed restriction of 60 km/hour should be imposed on unpaved surfaces within the quarry;
- Using sealed roads where the option exists for the purpose of transporting materials;
- Public sealed roads used by the Project should be regularly cleaned and swept;
- Worked areas should be stabilised as soon as possible after earthworks have been completed (example: re-vegetation, paving, mulch);
- General awareness of minimising dust levels and it's benefits should be instructed to workforce personnel;
- Where appropriate public consultation processes should be implemented that inform residents of the potential duration and extent of impacts, thereby allowing them to take appropriate action (such as not hanging out their washing on those days); and
- Complaint management processes that ensure complaints are readily registered and rapidly addressed.

This report has evaluated the potential impacts of dust generated from various activities and has provided recommendations to mitigate and minimise any potential impacts that might have an effect on the surrounding community.

The emission factors for various quarrying activities were derived from US EPA AP42 and Environment Australia (2012) National Pollutant Inventory (NPI) - *Emissions Estimation Technique (EET) Manual for Mining*.

The highest contribution for all pollutants is the emissions from haul truck movements; these movements are based on the highest output in May 2015 and will be lower during all other months of the quarry life. As such, the emissions from vehicle movements will be lower as less material will be transported from the quarry. The duration of the maximum output, upon which this assessment is based is only one month therefore, the levels presented are the worst case for one month and it can therefore be concluded that the impacts at during this phase will be relatively low.

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To conclude, this assessment has determined that the operation of this site as a quarry will not adversely impact nearby sensitive receptors and is suitable for development.

11. REFERENCES

Department of Environment and Resource Management. (2008). *'National Environment Protection Measure for Ambient Air Quality'*.

Environment Australia. (1999c). *'NPI Emission Estimation Techniques for Aggregated Emissions from Paved and Unpaved Roads'*. Department of Sustainability, Environment, Water, Population and Communities; Canberra.

Environment Australia 2012, *'NPI Emission Estimation Techniques (EET) Manual for Mining'*. Department of Sustainability, Environment, Water, Population and Communities; Canberra.

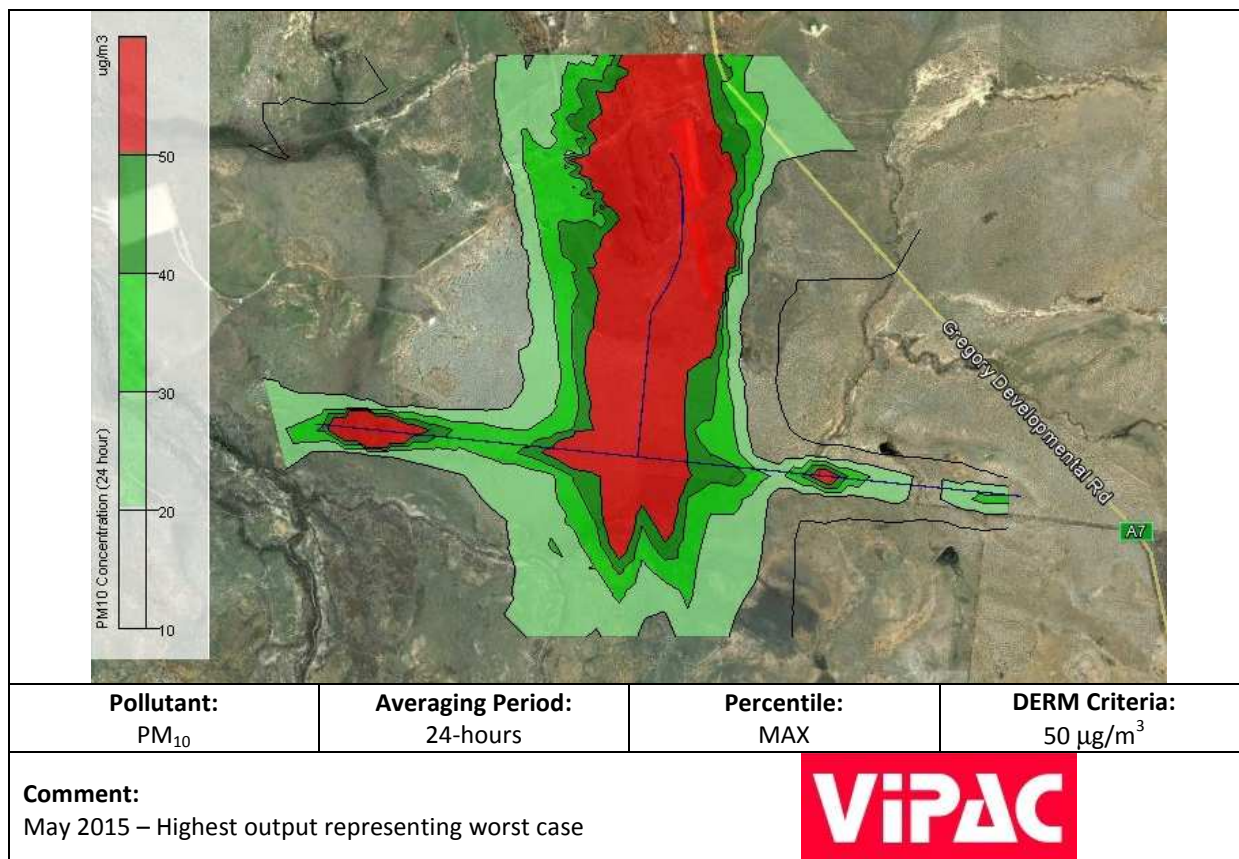
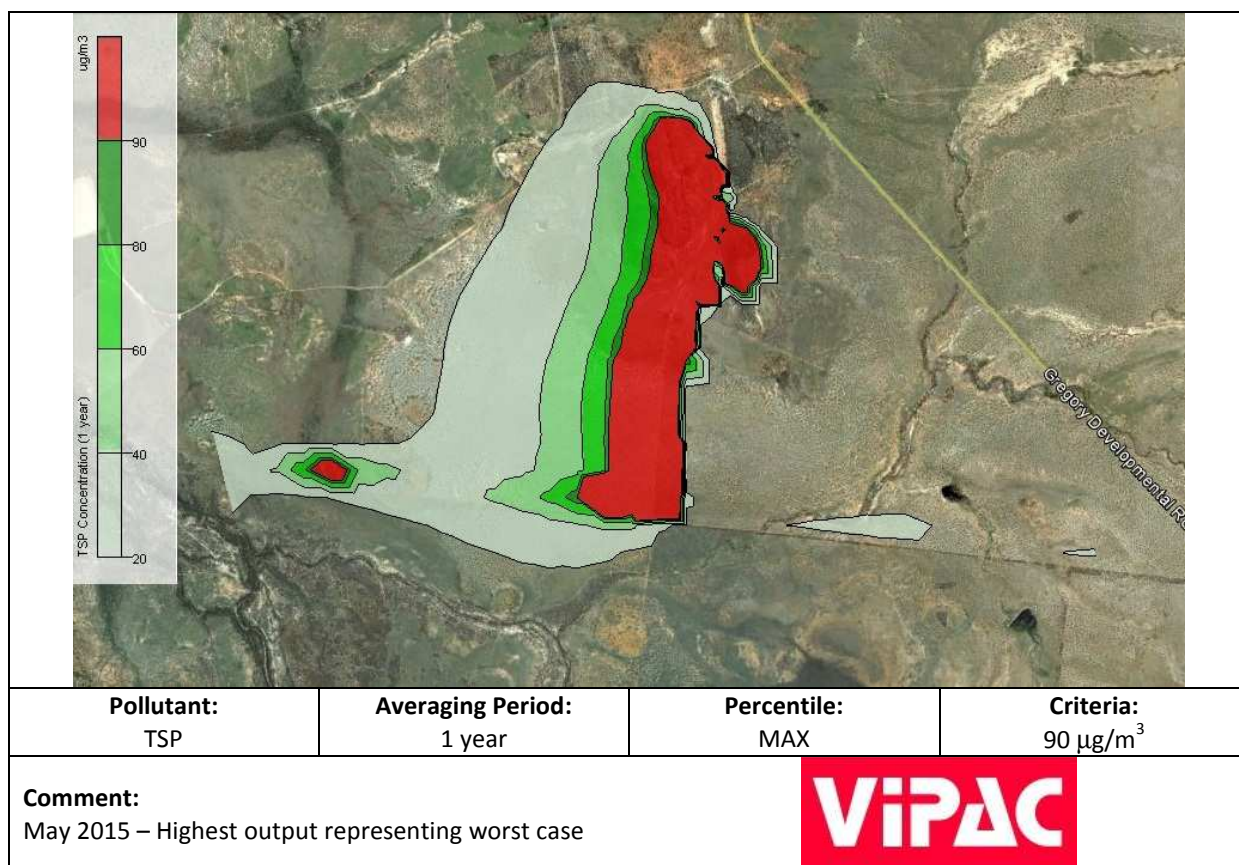
NSW Minerals Council. (2000) *'Particulate Matter & Mining'*. NSW Minerals Council; Sydney.

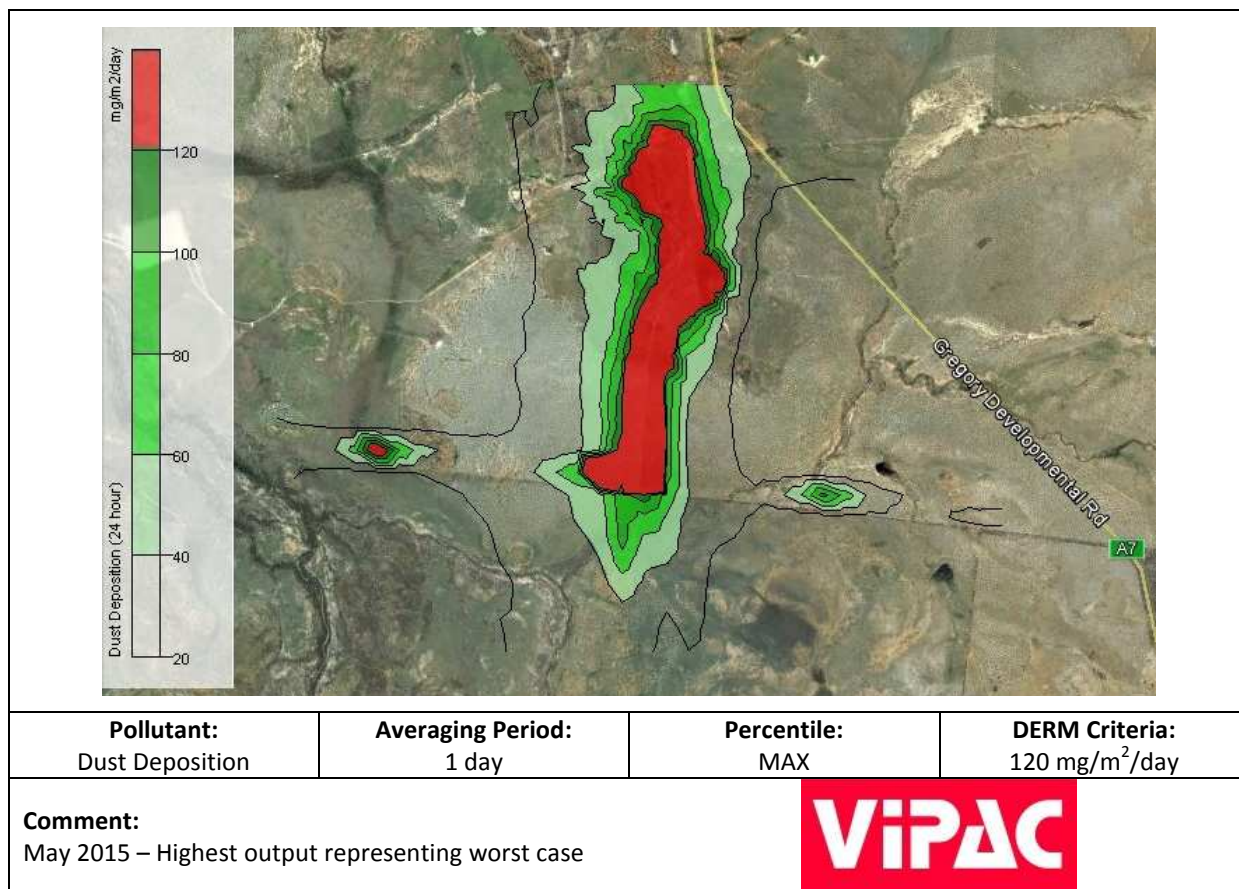
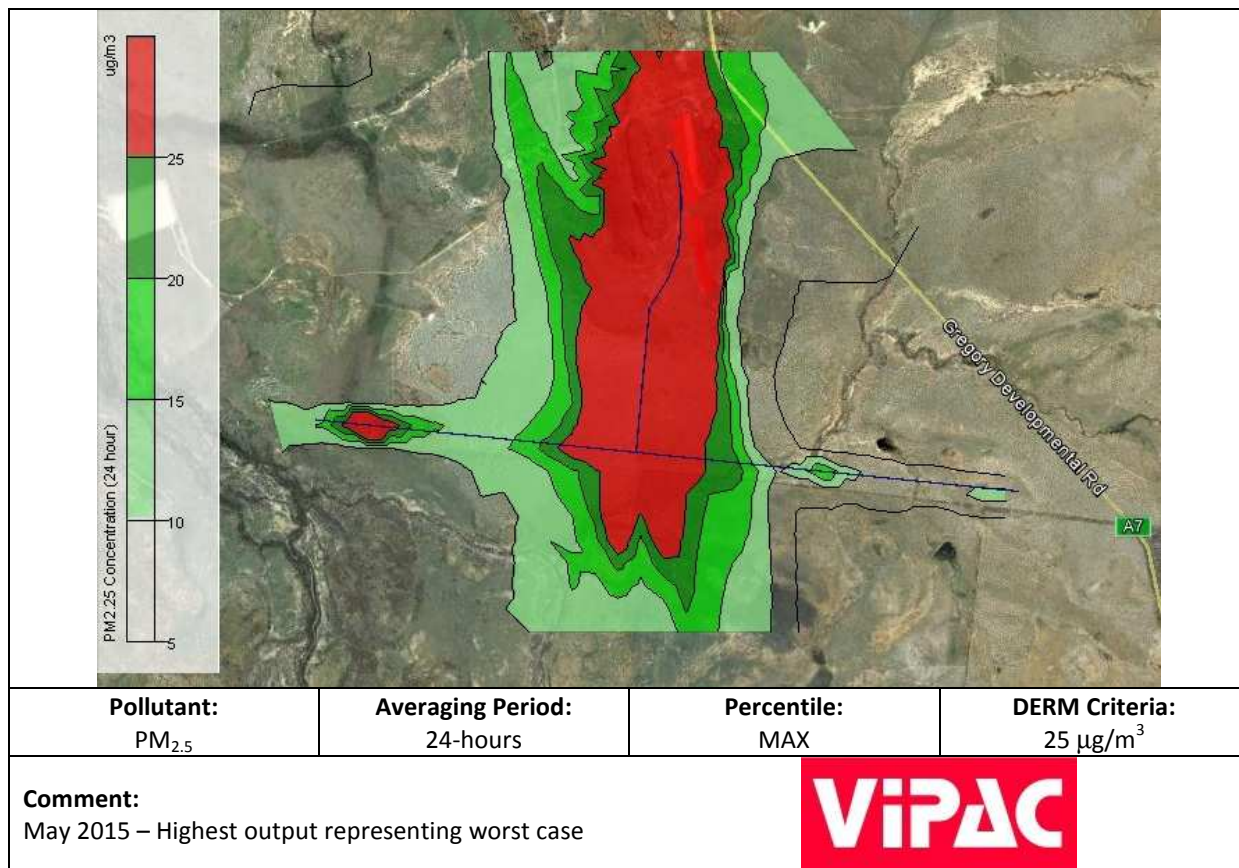
Environmental Protection Agency. (2008). *'Environmental Protection (Air) Policy'* Environmental Protection Agency. SL No. 208. Queensland Government; Brisbane.

APPENDIX A: MONITORING DATA

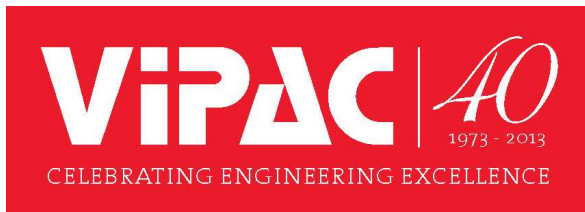


APPENDIX B: CONTOUR PLOTS





Appendix K - Noise Impact Assessment



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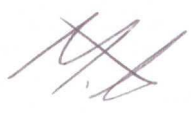
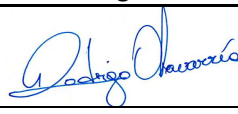
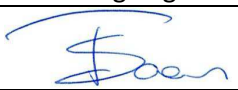
Disney Quarry Noise Assessment



Report No. 70Q-12-0427-TRP-514157-5

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EXECUTIVE SUMMARY

Vipac Engineers & Scientists Ltd (Vipac) was commissioned to prepare a noise assessment for the proposed quarry known as Disney Quarry. The Disney Quarry is proposed to be developed over 92.57 ha of generally disturbed land (grazing and quarry activities), approximately 144 km north-west of Clermont in Central Queensland. The Disney Quarry, a new embankment material quarry proposed to be located on Lot 4 SP116046. The site is located adjacent to the Gregory Development Road, within the Isaac Regional Council (IRC) area.

The purpose of this report is to evaluate the potential impacts of noise generated from various activities and to provide recommendations to mitigate and minimise any potential noise impacts that might have an effect on the surrounding community.

The Acoustic Quality Objectives used in the assessment are the Dwelling (indoors) night time criteria of 30 dB $L_{Aeq,adj,1hr}$ and 40 dB $L_{A1,adj,1hr}$. These noise levels are indoor levels. In order to predict the external levels, a façade transmission loss of 7 dB has been applied. As such, the adjusted external night time criteria of 37 dB $L_{Aeq,adj,1hr}$ and 47 dB $L_{A1,adj,1hr}$ are applied.

The prediction of noise has been predicted using SoundPLAN noise modelling software. For this assessment, the CONCAWE prediction methodology has been used to take into consideration the weather conditions at the site. The construction and operational noise sources used for this assessment have been obtained from Vipac's own database of noise emissions based on the type and number of noise generating equipment and plant advised by Adani Mining Pty Ltd.

The existing noise environment has been determined through unattended ambient noise monitoring between 27th March and 4th April 2013. The noise monitoring locations have been identified as Disney Receptor (2.2 Km west) and Old Twin Hills Receptor (10.4 km south-west).

Whilst the quarry extraction output may change significantly, the majority of the activities will remain the same, with the number and frequency of the haul trucks changing to reflect the output rates. The Disney Quarry will be a short-term operation commencing in early 2014 and operating until construction of the Rail Project is completed, which is anticipated to be the end of 2016.

The worst-case scenario of 1.51 million tonnes extracted and hauled from the site is expected to comply with the external night time noise criteria of 37 dB(A) $L_{Aeq,adj,1hr}$ during neutral weather conditions. The highest noise level is predicted to be 37 dB(A) at the Disney Receptor for May 2015 when the extraction rate is 1.51 million.

The combined noise levels of quarrying activities and haul road movements show that the noise levels are driven by the extraction activities, primarily dozer and excavator. During adverse weather conditions the noise levels may increase up to 3 dB(A) at the Disney receptor.

The cumulative impact assessment of the Disney Quarry and Borrow 7 have identified that during peak production of 209,906 tonnes from Borrow 7 in November 2015, the Disney receptor will experience a noise level of 31 $L_{Aeq,Adj,1hr}$. Combining this level with the highest noise level for the Disney receptor, the cumulative noise levels are expected to increase up to 38 $L_{Aeq,Adj,1hr}$ for Disney. As the noise level used for the cumulative assessment is the worst case noise level from the Borrow 7 activities and the expected noise level as adjusted for lower output of 120,500 tonnes in May 2015 will not be as high; therefore exceedances are expected to be minimal.

A conservative L_{Amax} noise level was calculated for adverse weather conditions to compare with the $L_{A1,adj,1hr}$ Acoustic Quality Objective outdoors. Under the worst-case noise propagation, the maximum noise levels are expected to comply with the 47 dB(A) $L_{A1,adj,1hr}$ noise criterion at the Disney receptor.

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Overall, the Disney Quarry will have an intensive use for a limited period of time to produce materials for road upgrades and the Carmichael Coal Mine and Rail. As such, noise impacts will be temporary.

TABLE OF CONTENTS

1. INTRODUCTION	6
2. PROJECT DESCRIPTION	6
2.1 OVERVIEW	6
2.2 EXTRACTION METHODS	7
2.3 SITE ACTIVITIES.....	7
2.3.1 Equipment	7
2.3.2 Operational Hours.....	8
2.3.3 Transportation	8
2.3.4 Production Schedule	8
3. SITE DESCRIPTION	9
3.1 LOCAL METEOROLOGY	9
3.2 TERRAIN	9
3.3 SENSITIVE RECEPTOR.....	10
4. REGULATORY FRAMEWORK & PROJECT CRITERIA	11
4.1 CONSTRUCTION AND OPERATION	11
5. METHODOLOGY	12
5.1 NOISE PREDICTION SOFTWARE.....	12
5.2 METEOROLOGICAL CONDITIONS	12
5.3 MODELLED SOUND POWER LEVELS	12
6. EXISTING ENVIRONMENT	13
6.1 EQUIPMENT.....	13
6.2 WEATHER CONDITIONS.....	15
6.3 NOISE MONITORING DATA	15
7. NOISE IMPACT ASSESSMENT	16
7.1 SCENARIOS MODELLED	16
7.2 EXTRACTION ACTIVITIES ONLY	16
7.3 HAUL ROAD MOVEMENTS.....	17
7.4 COMBINED NOISE LEVELS	17
7.5 $L_{A1,ADJ,1HR}$ NOISE ASSESSMENT.....	18
7.6 CUMULATIVE IMPACTS.....	18
7.7 SUMMARY OF RESULTS OF DISNEY QUARRY	19
8. NOISE MITIGATION	20
8.1 GENERAL NOISE CONTROL MEASURES	20
8.2 NOISE MANAGEMENT	20
9. CONCLUSION.....	21
APPENDIX A : GLOSSARY	22
APPENDIX B : NOISE MONITORING DATA.....	24
B.1 TWIN HILLS NOISE MONITORING DATA	25
B.2 DISNEY NOISE MONITORING DATA	25
B.3 TIME HISTORY GRAPHS.....	26
APPENDIX C : NOISE CONTOURS.....	28

1. INTRODUCTION

Vipac Engineers & Scientists Ltd (Vipac) was commissioned to prepare a noise assessment for the proposed quarry known as Disney Quarry. The purpose of this report is to evaluate the potential impacts of noise generated from various activities and to provide recommendations to mitigate and minimise any potential noise impacts that might have an effect on the surrounding community.

2. PROJECT DESCRIPTION

2.1 OVERVIEW

To facilitate development of the Carmichael Coal Mine and Rail Project, a quarry, referred to as Disney is to be developed to provide material for the embankment fill for the rail corridor.

The Disney Quarry is to be located approximately 144 km north-west of Clermont in Central Queensland and approximately 720 m west of the Gregory Development Road. At its closest, the Disney Quarry is approximately 1.6 km north of the proposed rail line, which will service the Carmichael Coal Mine. A location map is shown in Figure 2-1.

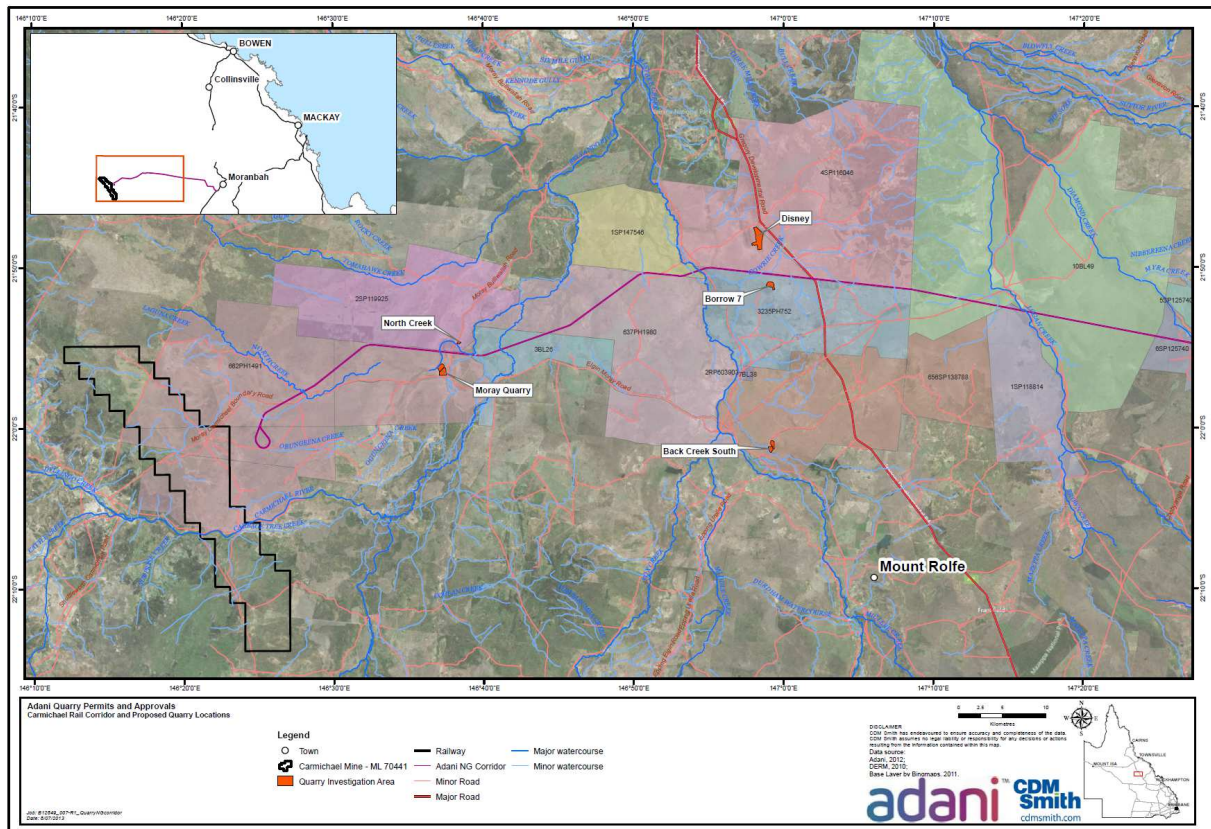


Figure 2-1: Location of Quarries

2.2 EXTRACTION METHODS

Estimated volumes of the Disney Quarry are based on a rippable thickness of five metres, so it is probable that additional volumes of material exist below this, albeit the feasibility of ripping this material is unknown and accordingly further test work will help delineate the depth of rippable resources. Extraction for this Project area is to start by development of a series of linear rip faces with dozer ripping and pushing material to a stockpile which will then be loaded via loader/excavator either straight into a truck or through a screening plant dependent upon the material quality. No blasting activities have been specified.

The site layout is shown in Figure 2-1.

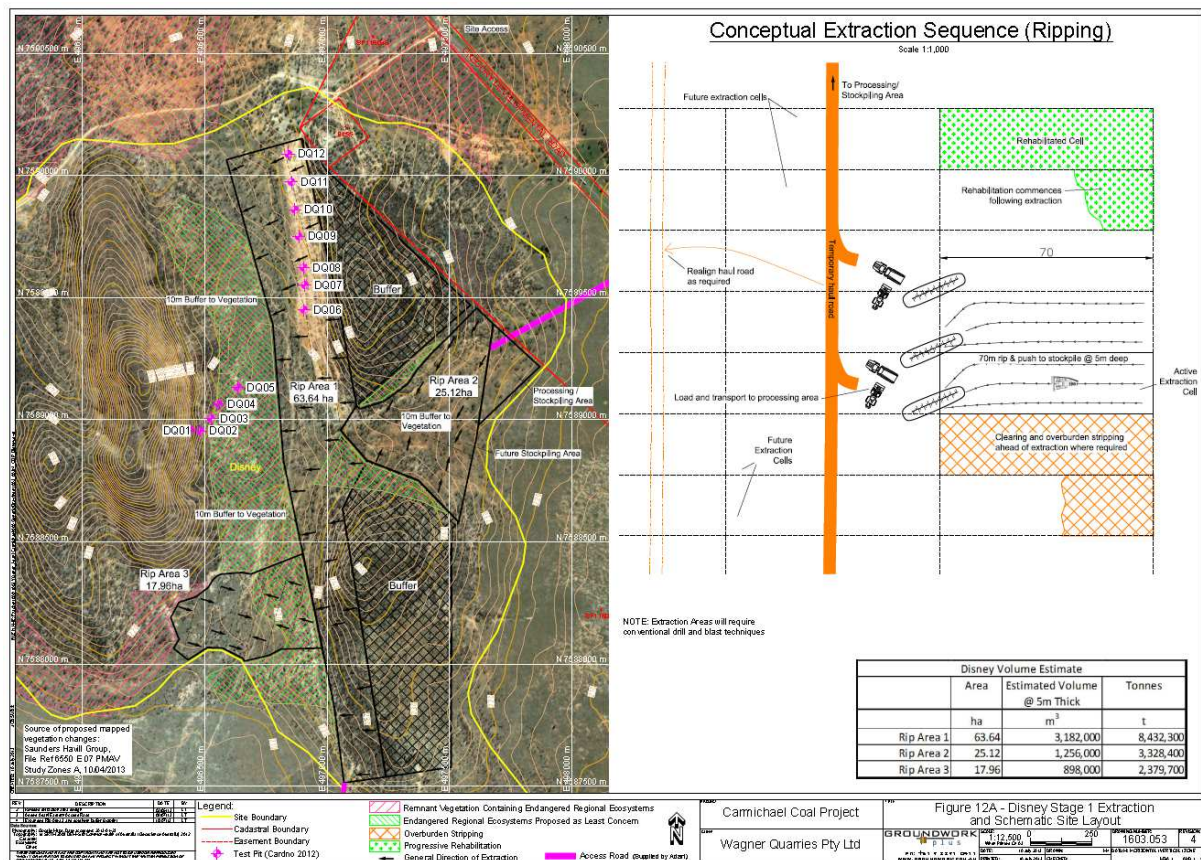


Figure 2-2: Site Layout

The height of the stockpile has been calculated to be seven metres high, based on the 'just in time' principle to accommodate the amount of material quarried during peak production.

2.3 SITE ACTIVITIES

2.3.1 Equipment

The following equipment will be used at the Disney Quarry:

- 2x Bull dozers (D10T);
- 1x Excavators (CAT 349DL);
- 2x Loaders (CAT980H);

- 1x Water truck (Mack 8x4 Wheeler);
- 2x light vehicles (Ford Ranger);
- 1x 10 kVA Genset;
- 7 x ALLIGHT plants; and
- 15 x 75 tonne AB triple trucks (road trains).

All the equipment listed above shall be used at the extraction site, with the exception of the triple trucks, which will travel to and from the extraction site.

2.3.2 Operational Hours

The Disney Quarry will operate 24 hours a day, Monday to Sunday and all operational activities will occur during these times. The quarry will operate 360 days per year and there is a wet weather contingency in the schedule.

2.3.3 Transportation

The number of trucks has been determined from the distance travelled and expected turn-around times of loading/unloading. A haul road will be used to transport the material to the rail line. No public roads shall be used for this purpose.

2.3.4 Production Schedule

The expected output is 11,750,000 tonnes over a 24-month operational life. The monthly output is shown in Figure 2-3, with the highest extraction of 1,510,309 tonnes expected to occur in May 2015. This schedule is subject to change with the construction schedule, delays in approvals or other factors impacting construction which may extend the operating period of the Disney Quarry.

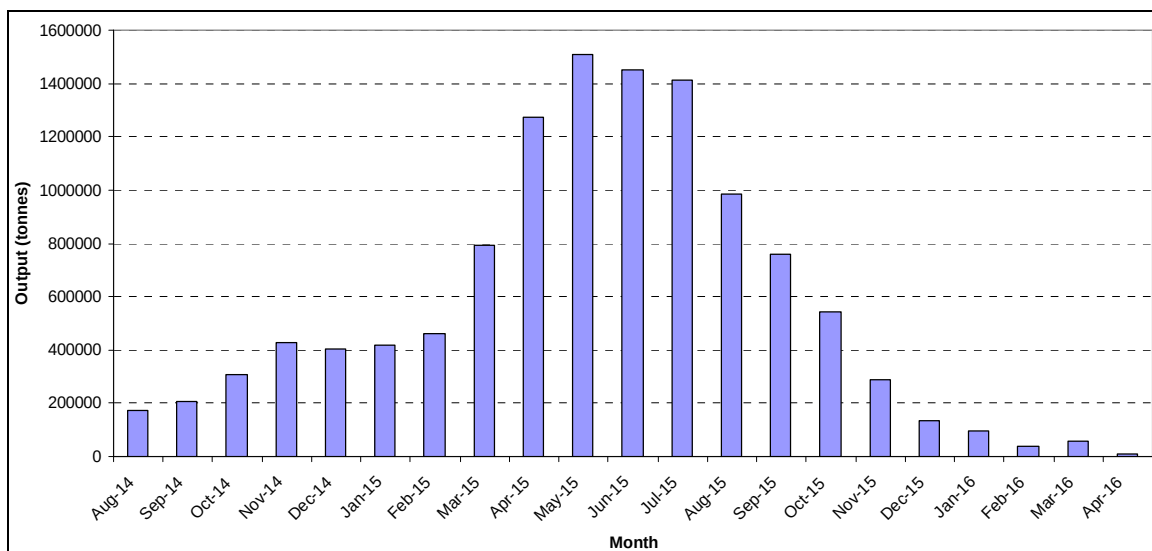


Figure 2-3: Expected Quarry Output by Month

3. SITE DESCRIPTION

3.1 LOCAL METEOROLOGY

Local meteorology has been generated for the Disney Quarry using the 2006 database from The Air Pollution Model (TAPM), which is a 3-dimensional prognostic model developed and verified for air pollution studies by the CSIRO (Figure 3-1).

Winds occur predominantly from the northeast during spring and summer, often no greater than 5 m/s (18 km/h). In autumn and winter, the dominant winds occur from the southeast with the highest wind speed of 8 m/s (28 km/h). The cooler, drier air is characteristic of the dominant southeast winds of moderate strength, usually with long calm periods in the winter.

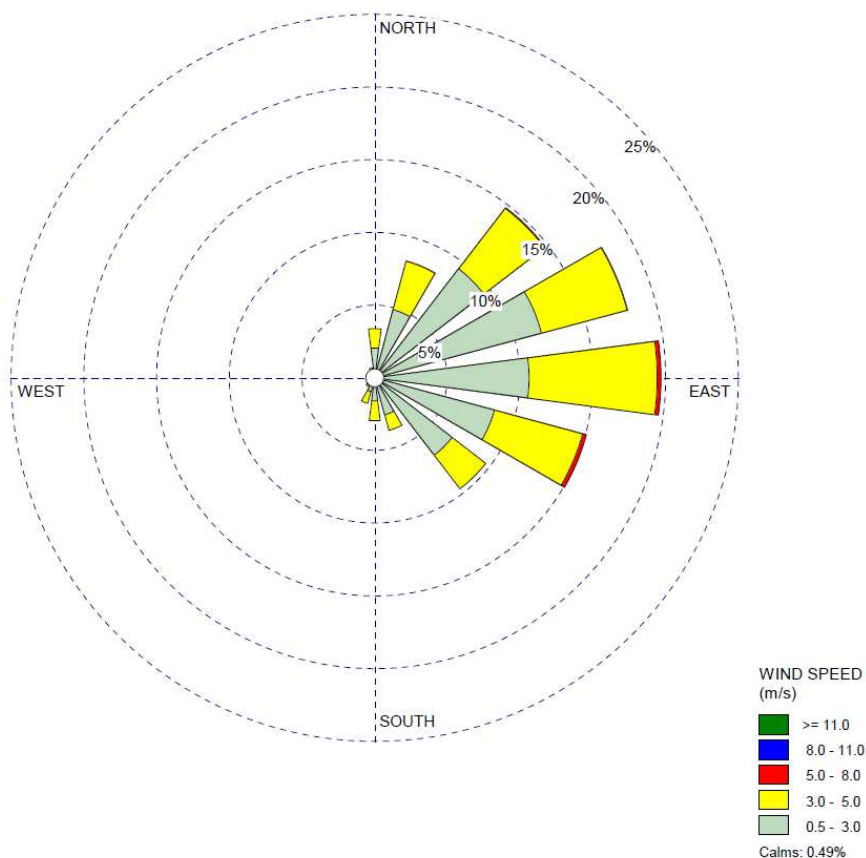


Figure 3-1: Annual Wind Rose (2006)

Local meteorology used in the modelling methodology is discussed in Section 5.2.

3.2 TERRAIN

The topography of the terrain between the receptor Disney located at 494429.60 mE, 7589482.77 and the Quarry is shown in Figure 3-2. The height range around the Disney Quarry is 190-280 m.

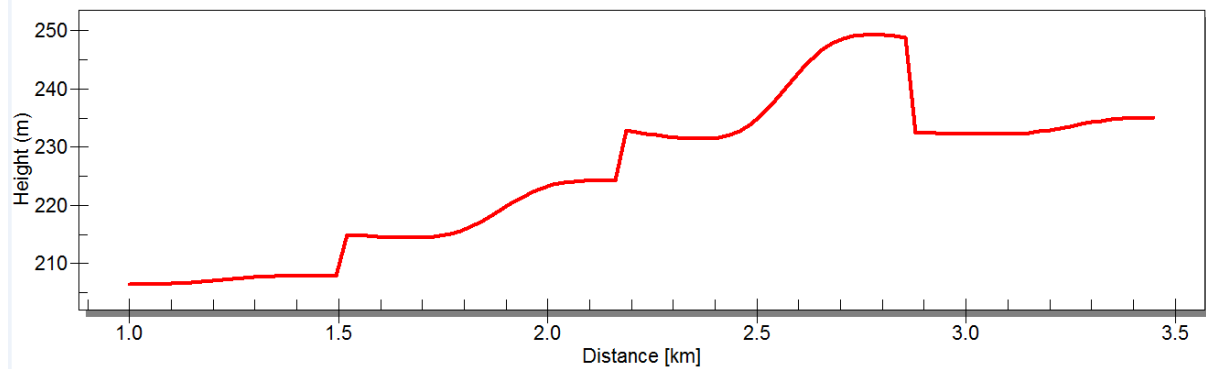


Figure 3-2: Terrain Elevations from Disney Receptor (1 km) to Quarry (2.9-3.4 km)

3.3 SENSITIVE RECEPTOR

The nearest sensitive receptor to the quarry is the Disney Homestead, located 2.2 km west of the quarry, as shown in Figure 3-3.



Figure 3-3: Sensitive Receptors near Disney Quarry

4. REGULATORY FRAMEWORK & PROJECT CRITERIA

When determining noise level criteria, the Isaac Regional Council refer to the Mackay, Isaac and Whitsunday Regional Plan (2012), which lists the following legislative documents and guidelines:

- *Environmental Protection Act 1994;*
- *Environmental Protection Regulation 2008;*
- *Environmental Protection (Noise) Policy 2008 (EPP); and*
- *State Planning Policy 5/10: Air, Noise and Hazardous Materials.*

4.1 CONSTRUCTION AND OPERATION

The *Environmental Protection (Noise) Policy 2008* (EPP Noise) is designed to protect the acoustic environment for health and well-being. Section 8 and Schedule 1 of the EPP (Noise) outlines these acoustic quality objectives as shown in Table 4-1.

Table 4-1: EPP (Noise) Acoustic Quality Objectives for Dwellings

Sensitive Receptor	Time of Day	Acoustic Quality Objectives (measured at receptor) dB(A)			Environmental Value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,hr}$	$L_{A1,adj,1hr}$	
Dwelling (outdoors)	Daytime & evening	50	55	65	Health & Wellbeing
Dwelling (indoors)	Daytime & evening	35	40	45	Health & Wellbeing
	Night-time	30	35	40	Sleeping

The time periods referred to in the EPP (2008) are defined as: Day: 7 am to 6 pm, Evening: 6 pm to 10 pm, Night: 10 pm to 7 am

The strictest Acoustic Quality Objectives applicable to this Project are the Dwelling (indoors) values. In order to predict the outdoors levels, a façade transmission loss of 7 dB has been applied. As such, the noise limits applicable to the projects are presented in Table 4-2.

Table 4-2: Noise Criteria Applicable to the Project

Sensitive Receptor	Time of Day	Noise limit (measured at the receptor) dB(A)			Environmental Value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,hr}$	$L_{A1,adj,1hr}$	
Dwelling (outdoors)	Daytime & evening	50	55	65	Health & Wellbeing
Dwelling (outdoors noise level to comply with indoor Acoustic Quality Objective)	Daytime & evening	42	47	52	Health & Wellbeing
	Night-time	37	42	47	Sleeping

The $L_{Aeq,Adj,1hr}$ and the $L_{A1,Adj,1hr}$ acoustic parameters described in the Acoustic Quality Objectives are appropriate for considering the noise emissions associated with continuous noise sources and time-varying noise sources respectively.

5. METHODOLOGY

5.1 NOISE PREDICTION SOFTWARE

The prediction of noise will be modelled using SoundPLAN noise modelling software. For this assessment, the CONCAWE prediction methodology has been used to take into consideration the weather conditions at the site. The frequency of temperature inversions has been determined by obtaining the weather conditions at the proposed Project site from The Air Pollution Model (TAPM), which uses detailed meteorological data from the Bureau of Meteorology (BOM), land use and terrain data to produce complex wind fields that account for large and short scale meteorological effects.

5.2 METEOROLOGICAL CONDITIONS

The weather conditions for the site at night-time (18:00-07:00 hours) during the winter months and annual conditions have been analysed. It was determined that the worst-case conditions (Stability Class F) occur for 30% of the time during the year.

The wind roses for each season were analysed and for the whole year and it has been determined that wind speeds do not occur at or below 3 m/s for more than 30% in any season or full year between any source-to-receiver. As a result, wind was not included in the prediction methodology, as it is not considered to be a feature at this site.

5.3 MODELLED SOUND POWER LEVELS

The significant construction and operational noise sources used for this assessment are identified in Table 5-1. The noise sources have been obtained from Vipac's own database of noise emissions.

Table 5-1: Sound Power (L_w) of the Noise Sources used in Noise Modelling

Noise source	Sound Power Level, L_w in dB(A) / $L_{A_{Max}}$
CAT D10T bull dozer	121 / 125
CAT 349DL excavator	125 (breaking rock) / 127
CAT 980H front end loader	117
Mack 8x4 wheeler water truck	115
10kVA enclosed genset	87
ALLIGHT mobile lighting towers	107
75 tonne AB triple trucks (road trains)	112 (travelling)
	118 (dumping load)

6. EXISTING ENVIRONMENT

The existing noise environment has been determined through unattended ambient noise monitoring between 27th March and 4th April 2013. The noise monitoring locations have been identified as Disney Receptor and Old Twin Hills Receptor.

6.1 EQUIPMENT

Noise measurements at Disney receptor were carried out using a Larson Davis 831 environmental noise logger whilst a 01db-Metravib DUO was utilised for the noise monitoring at Twin Hills. The monitoring locations are shown in

Table 6-1: Equipment Parameters

Measurement Details	DUO	LD831
Weighting	A	A
Measurement Parameters	60 minute	60 and 15 minute
Microphone height	1.5 m	1.5 m
Location & Position	-21° 57.012, 146° 57,026	-21° 47.990, 146° 56,907
	Free field – mixture of soft and hard ground	Free field – mixture of soft and hard ground
Last Date of Lab Calibration	23/9/2011	7/12/2011
Site Calibration	94 dB(A) pre/post measurement	94 dB(A) pre/post measurement

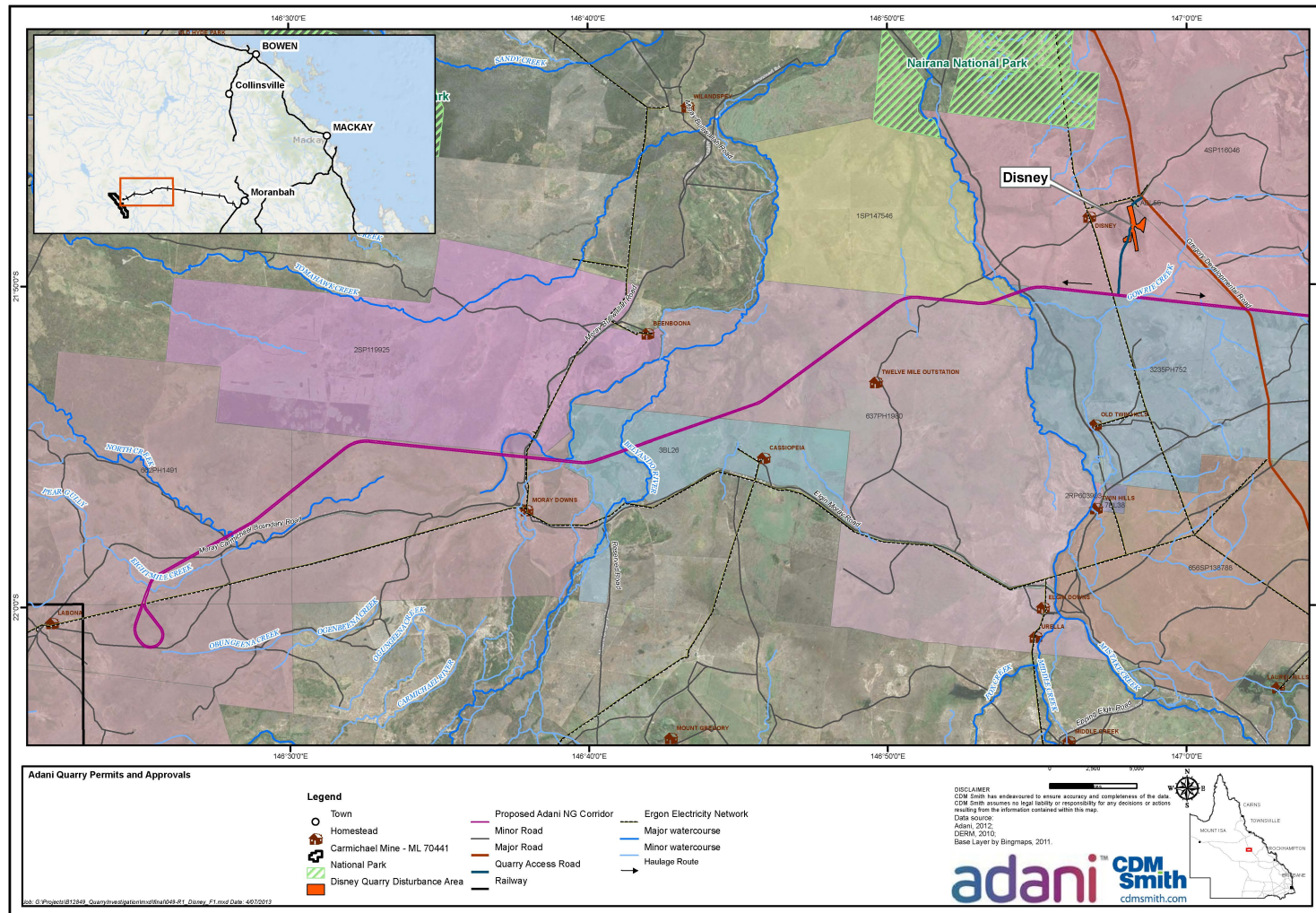


Figure 6-1: Location of Sensitive Receptors and Noise Monitors

6.2 WEATHER CONDITIONS

The weather observations during the noise monitoring period were obtained from the Bureau of Meteorology station located on Emerald Airport (station number 035264). During this time no rainfall was recorded, as shown below in Table 6-2.

Table 6-2: Weather Observations During Monitoring Period

Date	9:00 AM			3:00 PM			Daily
	Temp (°C)	Direction	Speed (km/h)	Temp (°C)	Direction	Speed (km/h)	Rainfall (mm)
27/3/2013	24.9	ESE	17	30.8	ENE	19	0
28/3/2013	24.9	ESE	17	30.9	E	17	0
29/3/2013	24.2	NNE	11	30.8	ESE	17	0
30/3/2013	25.5	E	7	31.0	NE	15	0
31/3/2013	24.8	N	13	31.3	NNE	15	0
1/4/2013	21.8	ESE	13	26.5	NE	9	0
2/4/2013	24.6	SE	20	30.0	E	15	0
3/4/2013	24.6	SSE	13	30.5	ENE	11	0
4/4/2013	24.1	ESE	15	30.3	E	11	0

The Pasquill stability classes during the monitoring period could not be accurately determined, as cloud cover data is not collected during the night-time period.

6.3 NOISE MONITORING DATA

Table 6-3 provides the noise monitoring results for all of the days captured at each location. It should be noted that all of the noise monitoring locations are free-field positions. The noise monitoring data for individual days is shown in tabulated and graphical form in Appendix B.

Table 6-3: Summary of Noise Monitoring Results

Noise Descriptor	Twin Hills			Disney		
	Day (07:00-18:00)	Evening (18:00-22:00)	Night (22:00-07:00)	Day (07:00-18:00)	Evening (18:00-22:00)	Night (22:00-07:00)
L _{Aeq} (Average)	43.5	43.8	32.5	41.5	42.3	37.3
L _{Aeq, 1 Hour} (Max)	47.4	47.1	38.4	47.0	45.2	43.2
L _{A90} (Average)	32.8	33.5	24.5	29.2	35.7	28.1
L _{Amax} (24 hour)	76.3			76.3		

7. NOISE IMPACT ASSESSMENT

The predicted noise levels contained within this Section are based on various output rates per month to reflect the changing activities associated with the quarry. As the quarry is a 24-hour operation and the noise criteria is more stringent during the night-time period, only the night-time predictions have been assessed.

7.1 SCENARIOS MODELLED

Whilst the outputs may change significantly, the majority of the activities will remain the same, with the number and frequency of the haul trucks changing to reflect the output rates. The scenarios included:

- Maximum monthly output – 1.51 million tonnes per month based on May 2015 scheduled output;
- Two-thirds maximum monthly output - 1 million tonnes per month based on August 2015-scheduled output;
- Half of maximum monthly output - 800,000 tonnes per month based on March 2015 scheduled output; and
- One-third maximum monthly output - 500,000 tonnes per month – based on April 2015-scheduled output.

Table 7-1 shows the monthly output for each scenarios and the percentage of occurrence of each output tonnages.

Table 7-1: Output Quantity & Frequency of Occurrence

Scenario	Monthly Output (tonnes)		Month of Occurrence	Duration of Project (%)***
	Monthly*	Daily**		
Maximum	1.51 million	48,719	May 2015	4.86%
Two Thirds of maximum	1 million	31,733	August 2015	24%
Half of Maximum	800,000	25,635	March 2015	33%
One-Third of Maximum	500,000	16,556	April 2015	38%

* Rounded to nearest 100,000

** Actual daily average of monthly output from production schedule

*** This is the duration of the two-year project, where the output quantity occurs.

From Table 7-1 it can be seen that for 38% of the Project life, the amount of material extracted is below the 500,000 tonnes per month.

7.2 EXTRACTION ACTIVITIES ONLY

Regardless of the quarry output, the majority of noise sources will remain operational throughout the life of the Carmichael Coal Mine and Rail Project. These noise sources will be around the quarry and generally be operating for 100% of the time. As such, the noise from these activities has been predicted separately to provide a worst-case scenario for the extraction activities.

The predicted external façade noise levels are presented in Table 7-2.

Table 7-2: Predicted Noise Levels for Extraction Activities Only

Sensitive Receptor	Noise Criteria (external)*	Predicted Noise Levels (dB L _{Aeq,Adj,1hour})
Disney	37	36
Old Twin Hills	37	16
Twin Hills	37	<15

* Transmission loss of 7 dB(A) taken into consideration to evaluate the external noise level based on the night time criteria of 30 dB(A).

It can be seen from Table 7-2 that based solely on the extraction activities, the external night time criteria of 37 dB(A) is not expected to be exceeded at any of the receptors under stable weather conditions. The highest predicted noise level is 36 dB(A), which will occur at the Disney Receptor.

7.3 HAUL ROAD MOVEMENTS

Figure 2-3 shows the proposed output schedule for the Disney Quarry the highest extraction rate is 1.51 million tonnes in May 2015 and the lowest is 7,403 tonnes in April 2016. As such, the haul truck movements during this time will vary as discussed in Section 7.1. The predicted noise levels for varying output tonnages under stable weather conditions have been predicted for three receptors; Disney, Old Twin Hills and Twin Hills are shown in Table 7-3.

Table 7-3: Predicted Noise Levels for Haul Roads Based on Output (Tonnes)

Sensitive Receptor	Noise Criteria (external)*	Predicted Noise Levels (dB L _{Aeq,Adj,1hour}) for Output (tonnes)			
		1.5 million	1 million	800,000	500,000
Disney	37	30	29	28	26
Old Twin Hills	37	17	16	15	13
Twin Hills	37	12	11	10	<10

* Transmission loss of 7 dB(A) taken into consideration to evaluate the external noise level based on the night time criteria of 30 dB(A).

The predicted noise levels for the haul road movements have determined that there will be no exceedences of the night time noise criteria of 37 dB(A) expected throughout the life of the Disney Quarry from the haul road movements. The highest predicted noise level will occur at the Disney Receptor during May 2015 when 1.51 million tonnes will be hauled from the quarry site.

7.4 COMBINED NOISE LEVELS

To understand the full potential impact from the operation of the Disney Quarry, the predicted noise levels from the extraction activities and the varying haul road noise levels have been combined and the results are shown in Table 7-4.

Table 7-4: Predicted Noise Levels for Extraction Activities & Haul Roads

Sensitive Receptor	Noise Criteria (external)*	Predicted Noise Levels (dB L _{Aeq,1hour}) for Output (tonnes)			
		1.5 million	1 million	800,000	500,000
Disney	37	37	37	37	36
Old Twin Hills	37	36	36	36	36
Twin Hills	37	36	36	36	36

* Transmission loss of 7 dB(A) taken into consideration to evaluate the external noise level based on the night time criteria of 30 dB(A).

Table 7-4 identifies that the worst-case scenario of 1.51 million tonnes extracted and hauled from the Disney Quarry will comply with the external night time noise criteria of 37 dB(A) during stable weather conditions. The highest noise level is predicted to be 37 dB(A) at the Disney Receptor for May 2015 when the extraction rate is 1.51 million.

The combined noise levels also show that the noise levels are driven by the extraction activities, primarily from the dozer and excavator. During unstable weather conditions the noise level may increase up to 3 dB(A) at the Disney receptor.

7.5 $L_{A1,ADJ,1HR}$ NOISE ASSESSMENT

A conservative L_{Amax} noise level was calculated for adverse weather conditions to compare with the $L_{A1,adj,1hr}$ Acoustic Quality Objective outdoors. The results are shown in Table 7-5.

Table 7-5: Predicted Noise Levels During Temperature Inversion

Sensitive Receptor	$L_{A1,adj,1hr}$ Noise Criteria (outdoor)*		Predicted Results		
			$L_{A1,adj,1hr}$ **	Source with Highest Noise Level	Complies with $L_{A1,adj,1hr}$ Criteria
Disney	Day	Night	39	Dozer	YES

* A facade transmission loss of 7dB(A) taken into consideration to evaluate the outdoors noise level based on indoors Acoustic Quality Objectives

** Conservative L_{Amax} descriptor used instead of L_{A1} in the assessment

Table 7-5 shows that under the worst-case noise propagation, the maximum noise levels would comply with the noise criteria.

7.6 CUMULATIVE IMPACTS

During the excavation of the Disney Quarry, activities associated with Back Creek South, Borrow 7, Moray, and North Creek quarries will also be occurring at the same time. The distances between the Disney Quarry and the other quarries are significant, as shown in Table 7-6.

Table 7-6: Other Quarry Distances from Disney Quarry

Quarry	Distance from Disney Quarry	Distance from Disney Receptor
Back Creek South	22.1 km	24.8 km
Borrow 7	4.11 km	7 km
Moray	39 km	37 km
North Creek	35.8 km	33.7 km

The only cumulative noise emissions will occur from activities associated with Borrow 7. In May 2015, the output from Borrow 7 will be 120,500 tonnes. The cumulative impacts of the Disney Quarry and Borrow 7 have identified that during peak production of 209,906 tonnes from Borrow 7 in November 2015, the Disney receptor will experience a noise level of 31 $L_{Aeq\ 22:00-07:00}$. Combining this level with the highest noise level for the Disney receptor as shown in Table 7-4, the cumulative noise levels are expected to increase up to 38 $L_{Aeq\ 22:00-07:00}$ for Disney¹.

¹ Note this is the combined noise levels for the maximum production from both quarries

Whilst the cumulative noise level exceed the criteria of 37 dB(A) at the façade during the night time period, the noise level used for the cumulative assessment is the worst case noise level from the Borrow 7 activities and the expected noise level as adjusted for lower output of 120,500 tonnes in May 2015 will not be as high; therefore exceedences are expected to be minimal.

Overall, the operational life of the Disney Quarry is two years and the maximum output will be for May 2015 only, therefore any perceived impacts would be temporary in nature.

7.7 SUMMARY OF RESULTS OF DISNEY QUARRY

This assessment has reviewed the activities of the Disney Quarry reflecting the changes in output. The results have shown that compliance with the acoustic objectives for the night-time period has been achieved at all receptors during peak output in neutral conditions. During adverse weather conditions the noise level may increase up to 3 dB(A) at the Disney receptor.

8. NOISE MITIGATION

This section outlines the potential mitigation options available to reduce noise at sensitive receptors.

8.1 GENERAL NOISE CONTROL MEASURES

There are many general measures that can reduce noise levels at the source such as:

- Avoiding unnecessary revving of engines and switch off equipment when not required;
- Keeping haul routes well maintained and avoid steep gradients;
- Ensure that all operators of plant and haul trucks do not drive aggressively and horn use is limited;
- Minimise the drop heights of materials;
- Start up plant and vehicles sequentially rather than all together;
- Audible reversing warning systems on mobile plant and vehicles should be of a type which, whilst ensuring that they give proper warning, have a minimum noise impact on persons outside sites. When reversing, mobile plant and vehicles should travel in a direction away from sensitive receptors whenever possible;
- As far as reasonably practicable, sources of significant noise should be enclosed. The extent to which this can be done depends on the nature of the machine or process to be enclosed and their ventilation requirements;
- Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise sensitive areas. Where possible, loading and unloading should also be carried out away from such areas;
- Machines that might have intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and wastes energy;
- Plant from which the noise generated is known to be particularly directional should, wherever practicable, be orientated so that the noise is directed away from noise-sensitive areas; and
- Acoustic covers to engines should be kept closed when the engines are in use and idling.

8.2 NOISE MANAGEMENT

Whilst the noise predictions identify that exceedances are not expected during neutral weather conditions, it is recommended that noise monitoring is carried out if a noise complaint is received.

9. CONCLUSION

The noise predictions were completed to determine the potential impact from the Disney Quarry activities based on the worst-case scenario of 1.51 million tonnes of material being extracted in May 2015. The noise assessment has separated the quarry and extraction activities from the haul road activities in order to determine the impact from varying outputs of material. The combined noise levels for the worst-case scenario has confirmed that the external adjusted criteria of 37 dB(A) are not expected to be exceeded during neutral weather conditions from the Disney Quarry.

The noise levels during temperature inversions were predicted and during these nights, the noise level can increase by up to 3 dB(A) at the Disney receptor.

A conservative L_{Amax} noise level was calculated for adverse weather conditions to compare with the $L_{A1,adj,1hr}$ Acoustic Quality Objective outdoors. Under the worst-case noise propagation, the maximum noise levels are expected to comply with the 47 dB $L_{A1,adj,1hr}$ noise criterion at the Disney receptor.

The cumulative impact assessment of the Disney Quarry and Borrow 7 have identified that during peak production of 209,906 tonnes from Borrow 7 in November 2015, the Disney receptor will experience a noise level of 31 $L_{Aeq\ 22:00-07:00}$. Combining this level with the highest noise level for the Disney receptor, the cumulative noise levels are expected to increase up to 38 $L_{Aeq\ 22:00-07:00}$ for Disney. As the noise level used for the cumulative assessment is the worst case noise level from the Borrow 7 activities and the expected noise level as adjusted for lower output of 120,500 tonnes in May 2015 will not be as high; therefore exceedences are expected to be minimal.

In addition, the equipment used at the Disney Quarry is expected to be second hand on previous sites rather than new. It is therefore unknown if any plant will have noise control options, for example if the haul trucks will have low-noise tyre tread designs or high performance silencers or if the excavators will have sound absorbing panels around the power house or if they have primary/secondary silencers. Without this knowledge, the sound power levels used in the model are very conservative and the sources were located at the closest position within the source area (i.e. quarry footprint and stockpile) in order to create a very conservative approach to modelling the worst-case impacts.

Overall, the operational life of the quarry is two years and any perceived impacts will be temporary in nature.

APPENDIX A: GLOSSARY

Ambient noise – the totally encompassing noise in a given situation at a given time; it is usually composed of noise from many sources, near and far.

Attenuation – a general term used to indicate the reduction of noise or vibration, by whatever method or for whatever reason, and the amount in decibels, by which it is reduced.

A-weighting – a frequency weighting devised to attempt to take into account the fact human response to sound not equally sensitive to all frequencies.

dB(A) – the A-weighted sound pressure level.

Decibel (dB) – the logarithmic-scaled unit used to report the level or magnitude of sound.

Hertz (Hz) - the unit of frequency.

L (Level) – the sound pressure level (SPL); it implies the use of decibels related to the ratio of powers or the power related quantities such as sound intensity or sound pressure.

L₁₀ – level that is equal to or exceeded for 10% of the time interval considered in the absence of the noise under investigation. The L₁₀ is considered to be representative of road traffic noise. The A-weighted background level is denoted as L_{A10}.

Loudness – the measure of the subjective impression of the magnitude or strength of a sound.

Noise descriptors – A noise descriptor is a measure of noise used to define a specific characteristic of noise, e.g. average energy, variation (maximum and minimum) and annoyance. Noise descriptors are based on measurements of the sound pressure level. Common noise descriptors are provided below:

L _{Aeq,T}	Time-average A-weighted sound pressure level
L _{A90,T}	Background A-weighted sound pressure level
Max L _{pA,T}	A-weighted maximum instantaneous sound pressure level, obtained using time weighting F
Min L _{pA,T}	A-weighted minimum instantaneous sound pressure level, obtained using time weighting F
L _{Amax,T}	Maximum A-weighted sound pressure level, obtained by arithmetically averaging of the maximum levels of the noise under investigation -
L _{Amax,adj,T}	A-weighted sound pressure level, obtained using time-weighting F, and arithmetically averaging the maximum levels of the noise under investigation, during time interval 'T' and adding adjustments for tonality and impulsiveness
L _{Amin,T}	Minimum A-weighted sound pressure level, obtained by arithmetic averaging of the minimum levels of the noise under investigation
L _{Abg,T}	A-weighted sound pressure level, obtained using time weighting F and arithmetically averaging the lowest levels of the ambient sound pressure level, during time interval T

Noise limit – a maximum or minimum value imposed on a noise index e.g. a legal purpose.

Sound power – the sound energy radiated per unit time by a sound source, measured in watts.

Vibration – oscillating motion of matter about a fixed equilibrium position.

APPENDIX B: NOISE MONITORING DATA

B.1 TWIN HILLS NOISE MONITORING DATA

Descriptor	Date								
	27/3/13	28/3/13	29/3/13	30/3/13	31/3/13	1/4/13	2/4/13	3/4/13	4/4/13
LA10, 18hr (6am to 12am)	-	40.5	41.9	43.0	42.1	42.6	42.8	42.6	45.1
LA90, 8hr (10pm to 6am)	23.2	23.4	22.6	24.7	24.5	27.0	27.1	23.3	24.3
LAm _{ax} (24hr)	-	75.3	71.4	76.7	84.8	82.6	73.6	67.1	79.1
LA _{eq} ,Avg(7am to 6pm)	-	42.3	41.9	43.3	45.7	42.9	43.3	42.7	46.0
LA _{eq} ,Avg (6pm to 10pm)	39.1	36.7	40.5	41.2	39.9	52.8	40.2	41.6	62.5
LA _{eq} ,Avg (10pm to 7am)	34.0	30.8	32.3	34.0	31.2	33.1	36.7	32.4	28.3
LA _{eq} ,Max 1hr (7am to 6pm)	-	45.4	45.9	46.8	52.2	48.4	45.8	45.5	49.5
LA _{eq} ,Max 1hr (6pm to 10pm)	42.4	40.2	42.6	42.5	41.1	58.3	43.6	44.7	68.5
LA _{eq} ,Max 1hr(10pm to 7am)	41.5	37.3	38.4	38.3	35.7	39.7	43.1	38.7	32.7
LA90,Avg,1hr (7am to 6 pm)	-	32.2	30.3	31.9	32.0	30.6	35.3	34.6	35.5
LA90,Avg , 1hr(6 pm to 10pm)	32.6	30.9	33.3	36.1	32.8	31.5	33.7	36.4	34.6
LA90,Avg, 1hr(10pm to 7am)	23.3	23.6	22.7	25.4	25.1	26.9	26.8	23.3	23.7

B.2 DISNEY NOISE MONITORING DATA

Descriptor	Date								
	27/3/13	28/3/13	29/3/13	30/3/13	31/3/13	1/4/13	2/4/13	3/4/13	4/4/13
LA10, 18hr (6am to 12am)	-	42.1	43.7	42.3	38.9	37.9	38.6	38.3	40.8
LA90, 8hr (10pm to 6am)	29.4	30.0	30.9	27.9	29.2	28.3	25.3	25.5	23.6
LAm _{ax} (24hr)	-	72.5	69.3	65.8	95.8	67.3	75.2	70.4	94.3
LA _{eq} ,Avg(7am to 6pm)	-	38.3	38.1	39.2	49.9	36.1	37.5	38.2	54.4
LA _{eq} ,Avg (6pm to 10pm)	38.6	48.0	50.6	54.3	37.1	38.5	38.7	36.6	38.1
LA _{eq} ,Avg (10pm to 7am)	35.9	42.9	45.7	37.1	35.5	35.9	33.8	36.9	31.7
LA _{eq} ,Max 1hr (7am to 6pm)	-	42.6	41.8	42.0	60.1	40.0	41.0	43.8	64.7
LA _{eq} ,Max 1hr (6pm to 10pm)	40.0	51.9	53.4	59.9	37.9	41.1	41.6	40.6	40.6
LA _{eq} ,Max 1hr(10pm to 7am)	41.4	48.6	53.3	43.6	38.1	42.8	40.6	44.3	36.4
LA90,Avg,1hr (7am to 6 pm)	-	30.1	28.4	30.4	28.6	26.3	29.1	28.5	32.1
LA90,Avg , 1hr(6 pm to 10pm)	35.1	40.5	42.4	40.8	34.0	30.8	34.1	31.7	32.1
LA90,Avg, 1hr(10pm to 7am)	29.6	30.3	30.7	28.5	29.4	28.7	25.8	26.2	24.2

B.3 TIME HISTORY GRAPHS

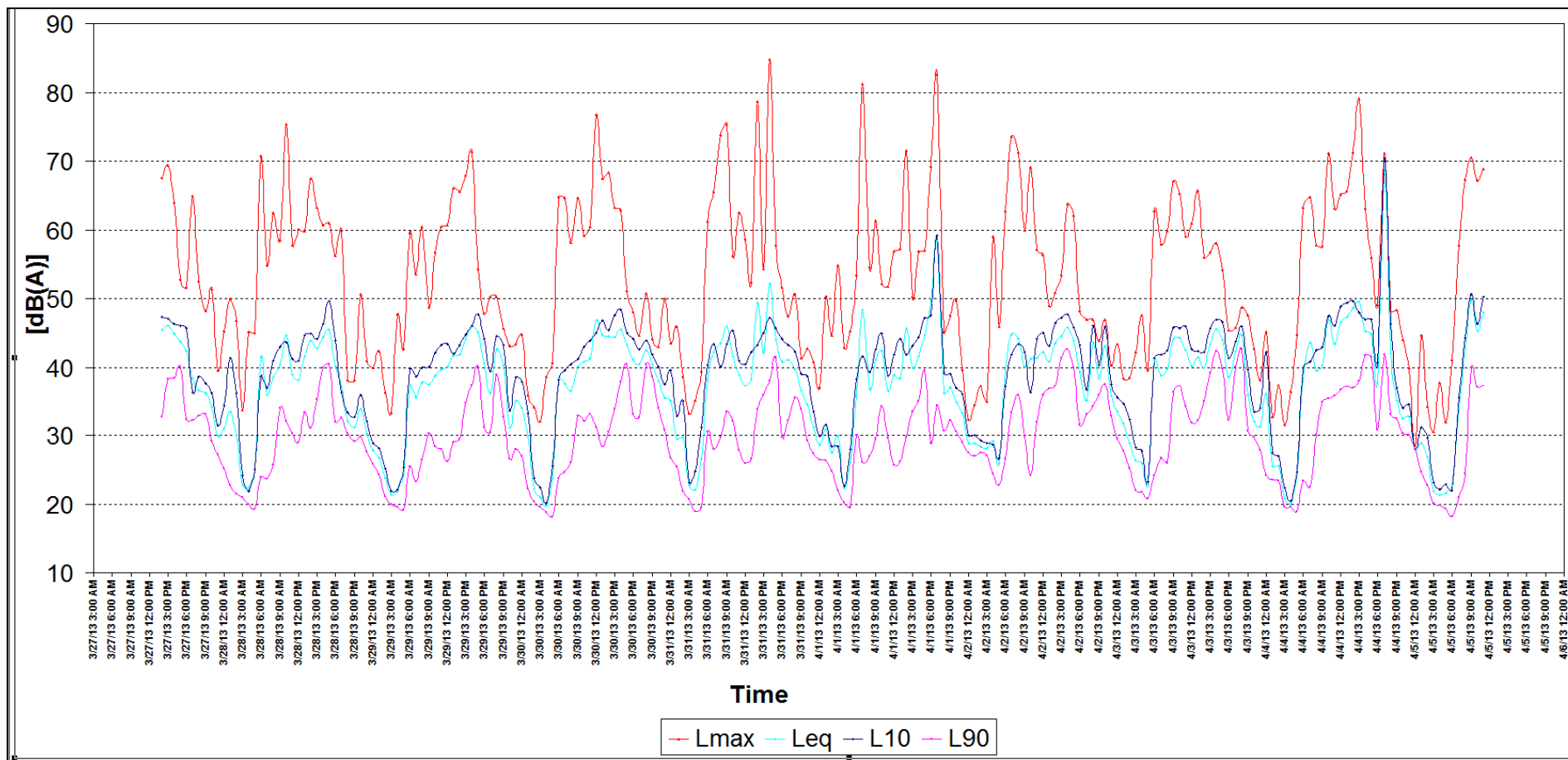


Figure B-1: Twin Hills Noise Monitoring Data

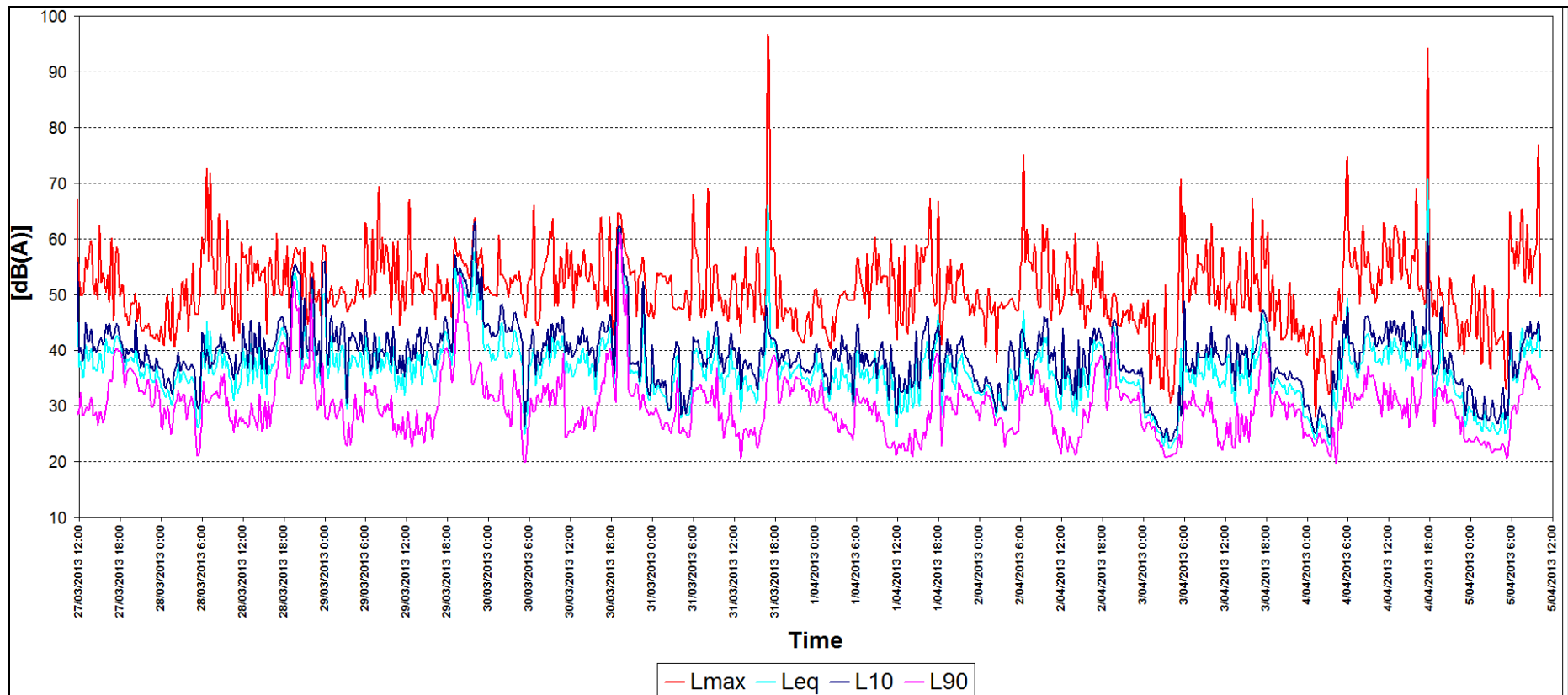


Figure B-2: Disney Noise Monitoring Data

APPENDIX C: NOISE CONTOURS

Adani Disney Quarry - Noise Impact Assessment
LAeq,night (22:00-07:00) noise descriptor - Noise level at 1.5m above the ground

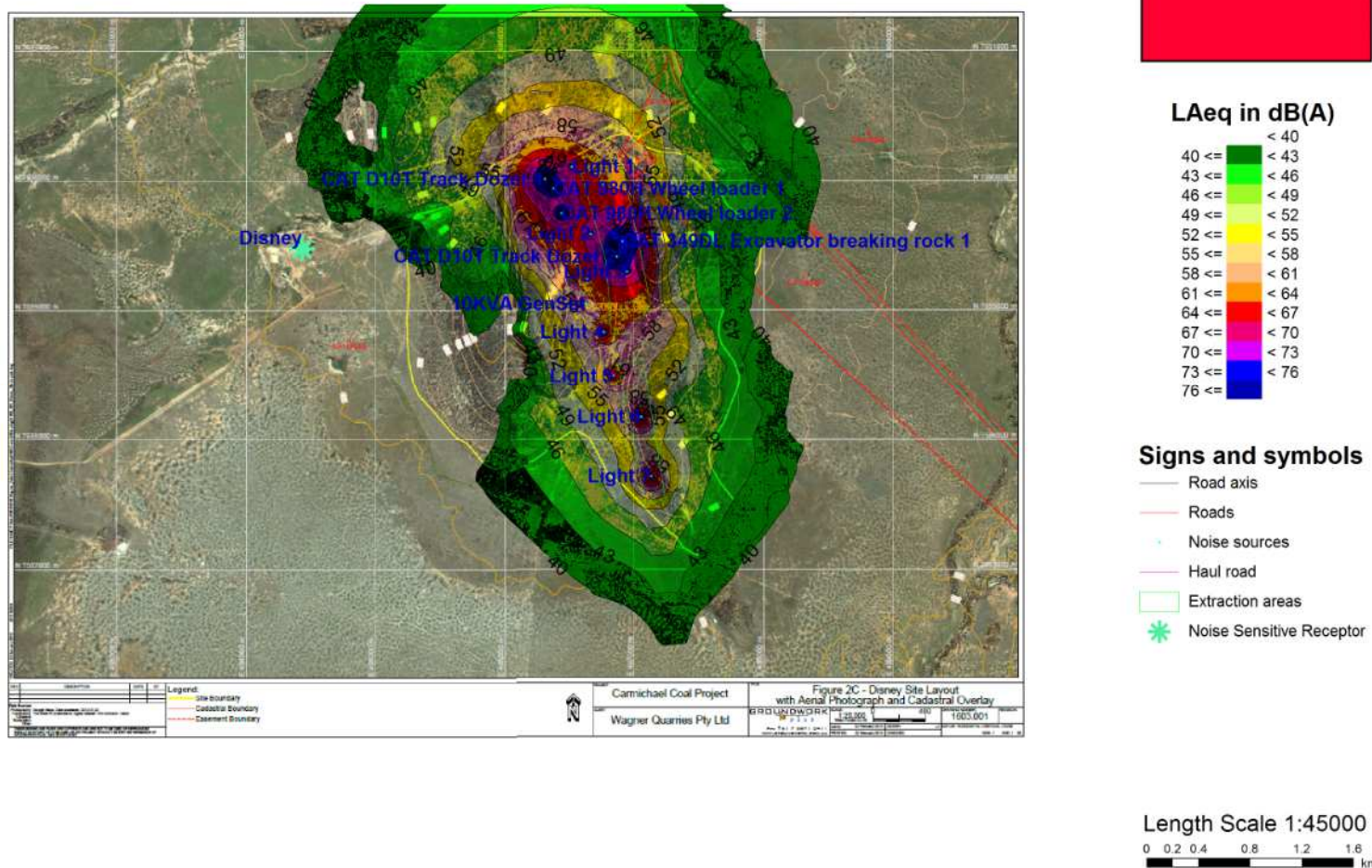
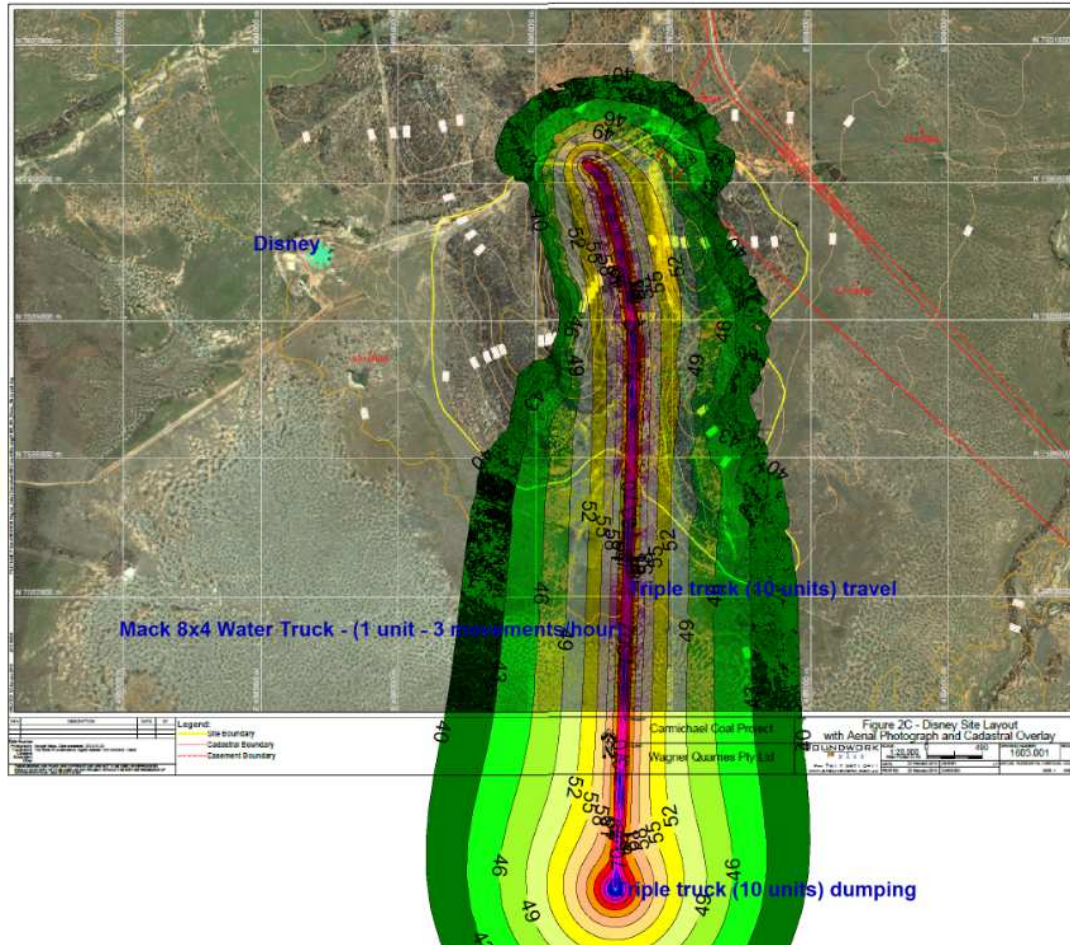


Figure C-1: All Disney Quarry Activities except Haul Road

Adani Disney Quarry - Noise Impact Assessment
LAeq,night (22:00-07:00) noise descriptor - Noise level at 1.5m above the ground



LAeq in dB(A)

40 <=	< 43
43 <=	< 46
46 <=	< 49
49 <=	< 52
52 <=	< 55
55 <=	< 58
58 <=	< 61
61 <=	< 64
64 <=	< 67
67 <=	< 70
70 <=	< 73
73 <=	< 76
76 <=	< 79

Signs and symbols

- Road axis
- Roads
- * Noise sources
- Haul road
- Extraction areas
- * Noise Sensitive Receptor

Length Scale 1:45000

