

G | Cumulative Impacts



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Appendix G Cumulative Impacts

Executive Summary

The cumulative impacts are considered at a local and regional level, accumulating over time and to the exacerbation of impacts in intensity or scale, frequency or duration, and in either isolation or combination with other known existing or planned impacts.

The cumulative impact assessment was carried out for each environmental value using the methodology outline in Section G.3. The results of the cumulative impact assessment are summarised in Table G-1.

The cumulative impacts identified were generally low. This was mainly due to the environmental management strategies proposed to be implemented by the Alpha Coal Project or geographical separation between the projects assessed.

There are some cumulative impacts assessed as medium and high. These can be managed by the application of strict mitigation measures and targeted monitoring programs.

Table G-1 Summary of Cumulative Impacts – Alpha Coal Project

Environmental Value	Alpha Coal Project (Mine)	Alpha Coal Project (Rail)
Land	Medium	Medium
Land Use	Medium	Medium - Low
Landscape Character	Low	Low
Nature Conservation	Low	Low
Surface Water	High	Low
Groundwater	Medium	Low
Air Quality	Medium	Low
Greenhouse Gas	Medium	Low
Noise and Vibration	Low	Low
Solid Waste	Low	Low
Traffic and Transport	Medium	Low
Non Indigenous Cultural Heritage	Medium	Low
Indigenous Cultural Heritage	Low	Low
Social and Community	High	Low – Medium
Hazard and Risk	*	Low
Economics	High	Low

* Not assessed as all of the hazard and risk issues were contained on site and not applicable to a cumulative impacts assessment.

G.1 Introduction

The Terms of Reference (TOR) for the Alpha Coal Project (the Project) Environmental Impact Statement (EIS) require that direct, indirect and cumulative impacts be identified and assessed with respect to environmental values and potential extent of impacts.

The potential environmental, social and economic impacts of the mine and railway components of the Project are assessed in Volume 2 and Volume 3 of the Alpha Coal Project EIS, respectively. Where possible, adverse impacts are avoided or mitigated via implementation of sound environmental protection and management criteria.

Cumulative effects may occur due to the compounding and synergistic interactions arising from other developments, occurring in the same area or over similar time frames to the project being assessed. Environmental values may be impacted as a result of a geographic overlap of project areas, scheduling overlap or using the same infrastructure, services and resources. Many of the cumulative effects associated with the Project are derived on a broader scale from transport, economic and social interactions between the Alpha Coal Project and other existing or proposed projects within the project vicinity. Closer to the Project site cumulative effects associated with the Project may include air quality (dust), groundwater, surface water, noise etc.

The Project cumulative impact report (Volume 4, Appendix G) assesses the cumulative impacts of both the development of the proposed mine and rail components of the Alpha Coal Project. The cumulative impact assessment is based on the best information publicly available when this EIS was prepared, which was limited to the development stages of other projects.

G.2 Objective

The objective of the cumulative impact assessment is to present clear and concise information on the cumulative impacts on specific environmental values that could occur as a consequence of the Project operating in conjunction with any other existing or proposed developments.

The cumulative impacts are to be considered at a local and regional level, accumulating over time and to the exacerbation of impacts in intensity or scale, frequency or duration, and in either isolation or combination with other known existing or planned impacts.

The requirements of relevant State Planning Policies, Environmental Protection Policies, National Environmental Protection Measures and other strategies and regulations are addressed in assessing the cumulative impacts of the Project on the existing environment.

G.3 Methodology

The methodology used to assess the Project's cumulative impacts consisted of the following tasks.

- Identify the impacts of the Alpha Coal Project in isolation using existing baseline conditions, which include the impacts from existing projects and activities in the sphere of influence of the Project. These impacts have been described in detail in the relevant sections of the Volume 2 and Volume 3 of the EIS.
- Identify relevant projects within the sphere of influence of the Alpha Coal Project that are either proposed or approved but not yet operational which could generate impacts that could potentially interact with similar impacts from the Project.

- Identify appropriate spatial boundaries for the analysis of cumulative impacts. Where potentially interacting projects are not located close enough for the relevant impacts to overlap, cumulative impacts are less likely. The extent of the assessment boundaries will vary according to the nature of the impact being assessed.
- Identify appropriate temporal boundaries for the analysis of cumulative impacts. Where the schedules of potentially interacting projects do not overlap (primarily for construction activities), cumulative impacts are less likely. The extent of the assessment boundaries will vary according to the nature of the impact being assessed.
- Assess the cumulative impacts for each project component i.e. mine and rail.
- Assess the significance of the cumulative impacts with respect to beneficial or detrimental effects.

In assessing the significance of potential cumulative impacts, the extent of compliance with established standards or guidelines was used where the impacts could be expressed quantitatively.

Where the impacts were expressed qualitatively, the probability, duration, and magnitude/intensity of the impacts were considered as well as the sensitivity and value of the receiving environmental conditions.

The significance of the impact was then determined on according to the assessment matrix given in Table G-2.

Table G-2: Assessment Matrix

Aspect	Relevance Factors		
	Low	Medium	High
Probability of impact	1	2	3
Duration of impact	1	2	3
Magnitude / Intensity of impact	1	2	3
Sensitivity of receiving environment	1	2	3

The most appropriate relevance factor for each aspect was selected on the basis of professional judgement, detailed project understanding and past experience with similar concurrent developments. The sum of the relevance factors determined the significance of the impact.

The resultant impact significance and corresponding consequence are summarised in Table G-3

Table G-3: Impact Significance

Impact Significance	Sum of Relevance Factors	Consequence
Low	1-5	Negative impacts need to be managed by standard environmental management practices. Special approval conditions unlikely to be necessary. Monitoring to be part of general project monitoring program.
Medium	6-9	Mitigation measures likely to be necessary and specific management practices to be applied. Specific approval conditions are likely. Targeted monitoring program required.
High	10-12	Alternative actions will be considered and/or mitigation measures applied to demonstrate improvement. Specific approval conditions required.

Using the methodology outlined above, the cumulative impact assessment was completed for each environmental value relevant to the development of the mine and rail components of the Alpha Coal Project.

G.4 Relevant Projects

G.4.1 Selection Criteria

As discussed in Section G.2, the TOR (DIP, 2009) requires this assessment to consider cumulative impacts both in isolation and in combination with other known, existing or proposed projects (where details of such projects are publicly announced or communicated to the Proponent by DIP).

Projects relevant to the cumulative impact assessment were identified on the basis of the following criteria.

- Projects listed on the DIP website and currently being assessed under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) for which an Initial Advice Statement (IAS) or an EIS are available.
- Projects listed on the Queensland Department of Environment and Resource Management (DERM) website and currently being assessed under the SDPWO Act for which an IAS or an EIS are available.
- Other projects in the region identified online/communicated by DIP.

The existing and proposed (and discounted) projects considered are described in Section G.4.2.

For the rail component, the following considerations were applied when selecting relevant existing and proposed projects:

- Existing major linear infrastructure projects within the Burdekin catchment which are under construction or were constructed within the past five years (2006-2010 inclusive);
- Major linear infrastructure projects within the Burdekin catchment that are currently in the feasibility/environmental impact assessment stage; and
- Other major projects within close proximity to the rail alignment.

Current, proposed and discounted projects in relation to the rail component are considered in Section G.4.3.

G.4.2 Relevant Projects (Mine)

Based on the criteria listed in Section G.4.1, the existing projects included in the cumulative impact assessment for the Alpha Coal Project (Mine) are listed in Table G-4. The locations of these existing projects are shown on Figure G-1.

Table G-4: Existing projects relevant to the Alpha Coal Project (Mine)

Project	Location	Description	Project Status
Blackwater, BMA	Blackwater	Open cut coal mining operation producing 11 Million tonnes per annum (Mtpa) and employing 1,570 personnel.	30 year mine life remaining.
Blair Athol, Rio Tinto Coal Australia Ltd	Clermont	Open cut coal mine operation producing 11 Mtpa with 290 employees.	5 year mine life remaining.
Clermont, Rio Tinto Coal Australia Ltd	Clermont	Open cut coal mine operation producing 12 Mtpa with 360 employees.	7 year mine life remaining.

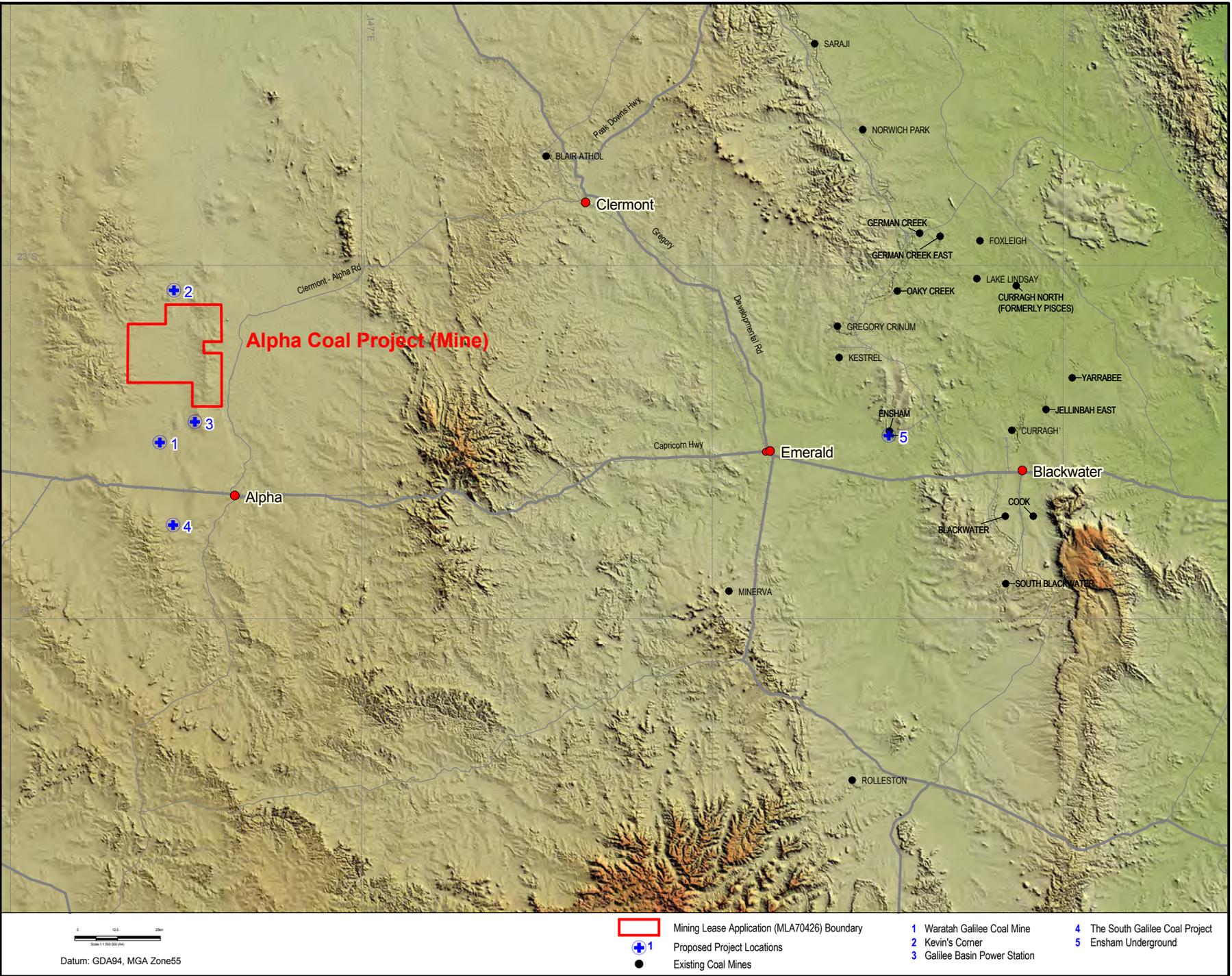
Project	Location	Description	Project Status
Cook, Caledon Resources PLC	Blackwater	Underground coal mine operation producing 12 Mtpa with 360 employees.	At least 10 year mine life remaining.
Crinum, BMA	Tieri	Underground coal mine operation producing 4 Mtpa with 420 employees (live in Emerald).	15 year mine life remaining.
Curragh, Wesfarmers Ltd	Blackwater	Open cut coal mine producing 7 Mtpa.	Curragh operations employ 1,530 staff, in total.
Curragh North, Wesfarmers Ltd	Blackwater	Open cut coal mine producing 3 Mtpa.	
Ensham, Ensham Resources Ltd	Emerald	Open cut coal mine producing 7 Mtpa with 600 employees.	At least 20 year mine life remaining.
Gregory, BMA	Tieri	Open cut coal mine producing 2 Mtpa with 225 employees (live in Emerald).	Only two years of mining remaining.
Jellinbah East, Jellinbah Resources Ltd	Blackwater	Open cut coal mine producing 4 Mtpa with 380 employees.	At least 10 years of mine life remaining.
Kestrel, Rio Tinto Coal Australia Ltd	Tieri	Underground coal mine producing 4 Mtpa with 515 employees (live in Emerald).	At least 20 year mine life remaining.
Yarrabee, Yancoal Australia Ltd	Blackwater	Open cut coal mine producing 2 Mtpa with 220 employees.	15 year mine life remaining.

Based on the criteria listed in Section G.4.1, the proposed projects included in the cumulative impact assessment for the Alpha Coal Project (Mine) are listed in Table G-5. The locations of these projects are shown on Figure G-1.

Table G-5: Proposed projects relevant to the Alpha Coal Project (Mine)

Project	Location	Description	Project Status
Alpha Coal Project, Hancock Prospecting Pty Ltd	Alpha, 50 km north-west.	Open cut coal mine producing 30 Mtpa. Maximum personnel – 2,300.	EIS in progress
Galilee Basin Power Station, Galilee Power Pty Ltd (fully owned subsidiary of Waratah Galilee Coal Pty Ltd)	Alpha, 30 km north-west, immediately to the east of Waratah Galilee Coal Mine.	Coal-fired power station producing 900 MW (net). Maximum personnel – 1,000	IAS completed
Waratah Galilee Coal Mine, Waratah Coal Inc. (China First)	Alpha, 13 km west and 35 km north.	Open cut mine with export capacity of 25 Mtpa and capability to expand to more than 50 Mtpa. Maximum personnel – 2,200	EIS in progress
Kevin's Corner, Hancock Galilee Pty Ltd (HGPL)	Alpha, 56 km to north.	Open cut and underground mining operation with final capacity of 30 Mtpa. Maximum personnel – 2,500	EIS in progress
South Galilee Coal Project (SGCP), joint venture of AMCI (Alpha) Pty Ltd and Alpha Coal Pty Ltd.	Alpha, immediately south-west.	15-20 Mtpa open cut and underground mining operation and associated infrastructure. Maximum personnel – 1,500	IAS completed
Ensham Underground 1 and 2, Ensham	Emerald	Underground mine expansion. Maximum personnel – 1200	Supplement EIS submitted

Resources			
Powerlink power transmission line	-	Transmission lines from Lilyvale substation to a new Galilee Hub substation (during construction phase). Maximum personnel – 500	-
SunWater raw water line	-	Water pipeline from Moranbah to a raw water dam within Alpha Coal Project MLA (during construction phase). Maximum personnel – 500	-



- Mining Lease Application (MLA70426) Boundary
- + 1 Proposed Project Locations
- Existing Coal Mines
- + 1 Waratah Galilee Coal Mine
- + 2 Kevin's Corner
- + 3 Galilee Basin Power Station
- + 4 The South Galilee Coal Project
- + 5 Ensham Underground

0 12.5 25m
Scale 1:100,000
Datum: GDA94, MGA Zone55

Source: See Copyright Details below and for full disclosure Please Refer to the EIS Volume 4 - References

HANCOCK PROSPECTING PTY LTD
Alpha Coal Project
Environmental Impact Statement



**LOCATION OF
RELEVANT PROJECTS**

Job Number | 4262 6580
Revision | A
Date | 24-09-2010
Figure: G-1

File No: 42626580-9-4001 wor
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A number of projects were identified but were discounted on the basis of location or lack of available information. The identified existing projects were discounted due to their distance from the Project site. These discounted projects are identified in Table G-6.

Table G-6: Discounted projects not relevant to the Alpha Coal Project

Project	Location	Project Status
Minerva, Yancoal Australia Ltd	Springsure	Existing
Oaky Creek, Xstrata Coal Qld	Tieri	Existing
Rolleston, Xstrata Coal Queensland	Rolleston	Existing
Arcadia, Bandanna Energy Ltd	Rolleston	Resource delineation
Arcturus, Bandanna Energy Ltd	Rolleston	Scoping Study
Athena, Yancoal Aust. Ltd	Springsure	Resource delineation
Humboldt, DJ Mining Ltd	Rolleston	Resource delineation
Kennedy-Blackwater South, BMA	Rolleston	Scoping Study
Carmichael, Adani	Clermont	Scoping Study
North Alpha, Vale Australia Ltd	Alpha	Scoping Study
Rocklands, Rocklands Richfield Ltd	Rolleston	MDL application, Resource delineation
Springsure Creek, Bandanna Energy Ltd	Springsure	Resource delineation
Taraborah, Shinelia Holdings	Emerald	Resource delineation
Togara North, Xstrata Coal Queensland	Comet	NTA pending, On-hold
Togara South, BHP Billiton	Rolleston	Pre-feasibility, On-hold
Valeria, Rio Tinto Coal Australia Ltd	Capella	Idle
Washpool, Aquila Resources Ltd	Blackwater	Feasibility Study in progress
West Rolleston, Macarthur Coal	Rolleston	Resource delineation
Yamala, Northern Energy Corp. Ltd	Comet	MDL application, pre-feasibility in progress
Avoca Zeolite, N/A	Near Alpha	N/A
Alpha Shale Oil, N/A	Southeast of Alpha	N/A

G.4.3 Relevant Projects (Rail)

Based on the criteria listed in Section G.4.1, the existing projects included in the cumulative impact assessment for the Alpha Coal Project (Rail) are listed in Table G-7.

Table G-7: Current and proposed projects relevant to the Alpha Coal Project (Rail)

Project	Location	Description	Project Status
Galilee Coal Project rail line	Galilee basin (Jericho) to Abbot point	Heavy coal rail line connecting mine to Abbot Point	EIS and feasibility Construction 2011-2013
Water for Bowen	Burdekin River to Abbot Point SDA	Infrastructure to convey water from Burdekin River to Abbot Point and Bowen.	Final stages of EIS Construction 2010-2012 – awaiting demand trigger
Northern Missing Link	Heavy rail (coal)	Goonyella to Newlands	Construction to mid-2012
Goonyella to Abbot Point expansion	Heavy rail (coal)	Newlands to Abbot point (via Collinsville)	Construction to 2012

Project	Location	Description	Project Status
Burdekin Highway Realignment/Burdekin Bridge	Home Hill, Ayr, Brandon	Highway realignment to bypass Ayr and new bridge over Burdekin River	Construction 2010-2014
Powerlink power transmission line	Transmission lines from Lilyvale substation to a new Galilee Hub substation (during construction phase of the project).		
Ross-Strathmore 275 kV transmission line	Ross substation near Townsville) to Strathmore substation (near Collinsville)	275 kV transmission line	Construction to early 2011
Drake Coal Mine	17 km south of Collinsville	Open cut coal mine, up to 250 employees during operation	Early stages of EIS (TOR available)
Sonoma Coal Mine			
North Goonyella/EagleField	36 km north of Moranbah	5 Mtpa (ROM) open cut and underground coal mine	9 year mine life remaining
Eaglefield expansion project	36 km north of Moranbah	18 Mtpa (ROM) Expand mine life by about 11 years	EIS in preparation
Burdekin to Moranbah Water Pipeline	Gorge Weir, Burdekin River to Moranbah		Completed 2007

A number of projects were identified but were discounted on the basis of location or available information. The identified existing projects were discounted due to their distance from the project site. These discounted projects are identified in Table G-8.

Table G-8: Discounted projects not relevant to the Alpha Coal Project (Rail)

Project	Location	Reason for Discounting
Copper String HV Transmission Line	Townsville-Cloncurry	Feasibility Study in progress – no information available Not likely to cross Burdekin catchment
IsaLink HV Transmission Line	Rockhampton-Mt Isa	On hold
Surat Basin Rail Project	Wandoan-Banana	EIS in preparation, too distant from Alpha Coal Project rail alignment to contribute to cumulative impacts
ZeroGen	Emerald-Rolleston-Springsure	Early stages of EIS and feasibility studies, no information available
Adani coal mine and rail	South west of Charters Towers	Very early stages of feasibility study, no information available
North Queensland Gas Project	Moranbah-Townsville	Completed 2004. Residual impacts unlikely.
Ingham to Tully 138kV transmission line upgrade	Ingham to Tully	Remote from Alpha Coal Project rail component

Project	Location	Reason for Discounting
Lancewood coal mine	South of Wollombi-Suttor Creek mine	No information available.
Wards Well coal mine	South of Wollombi-Suttor Creek mine	No information available.

G.5 Mine Cumulative Impacts

G.5.1 Overview

The Alpha Coal Project (Mine) is a proposed open cut coal mine with capacity of 30 Mtpa located within a well known thermal coal deposit in the Galilee Basin, Queensland. Water and power supply infrastructure to service the mine are necessary components of the proposed development.

Cumulative impacts that may impact on specific environmental values are identified in. It is important to note that the matrix in Table G-9 does not show which environmental values are affected by each of the proposed projects. It shows the values that could be adversely or beneficially affected as a result of the proposed projects being developed in close proximity to, or at a similar time as, the Alpha Coal Project (Mine).

The projects in Table G-9 are grouped into classifications of predominantly local impacts and predominantly regional impacts. The projects classed as local are those in close proximity to the Project with the remainder being classed as regional.

The proposed projects located adjacent to the Alpha Coal Project (Mine) that have the potential to have a significant cumulative impact particularly on social and environmental values in the local area include:

- Kevin's Corner Project (Kevin's Corner), a proposed 30 Mtpa open cut and underground coal mine located on mining lease application (MLA) 70425, immediately north and adjoining the Alpha MLA;
- Waratah Galilee Coal Mine (Waratah), which is a proposed 25 Mtpa open cut coal mine adjoining Alpha MLA to the south;
- Galilee Basin Power Station, a proposed coal-fired power station producing 900 MW (net) immediately to the south of the Alpha MLA;
- Powerlink power transmission line, a proposed transmission lines from Lilyvale substation to a new Galilee Hub substation (during construction phase) to supply power to the Project; and
- SunWater raw water line, a proposed water pipeline from Moranbah to a raw water dam within Alpha Coal Project MLA.

Table G-9: Potential Cumulative Impacts – Alpha Coal Project (Mine)

Project	Environmental Value													
	Land	Land Use	Landscape Character	Nature Conservation	Surface Water	Groundwater	Air Quality	Greenhouse Gas	Noise	Waste	Traffic and Transport	Cultural Heritage	Social and Community	Economics
Local														
Galilee Basin Power Station			•		•		•	•	•		•		•	•
Waratah Galilee Coal Mine (China First)	•	•	•	•	•	•	•	•	•		•	•	•	•
Kevin's Corner	•	•	•	•	•	•	•	•	•		•	•	•	•
South Galilee Coal Project	•	•	•				•	•					•	•
Regional														
Powerlink transmission line								•			•		•	•
SunWater raw water line											•		•	•
Ensham Underground 1 & 2								•					•	•
Blackwater Mine								•					•	•
Blair Athol Mine								•					•	•
Clermont Mine								•					•	•
Cook Colliery								•					•	•
Crinum Mine								•					•	•
Curragh Mine								•					•	•
Curragh North Mine								•					•	•
Ensham Mine								•					•	•
Gregory Mine								•					•	•
Jellinbah East Mine								•					•	•
Kestrel Mine								•					•	•
Yarrabee Mine								•					•	•

A conservative approach to the cumulative impact assessment was taken by assuming simultaneous construction of all projects. However, this is unlikely to be the case as some projects may be deferred or some may even be cancelled.

On this basis, the nature and extent of the potential cumulative impacts are summarised in the following sections. The assessment of the significance of the impact is based on the methodology described in Section G.3.

G.5.2 Mine Cumulative Impacts on Environmental Values

G.5.2.1 Land

Mining by nature typically results in the disturbance of large areas of land resulting in altered landforms and the potential for soil erosion and resultant degradation of the receiving water bodies.

In addition to the Alpha Coal Project (Mine) the two adjacent proposed projects (Kevin's Corner and Waratah) have the potential to have a cumulative impact on the environmental value - Land. All three of these coal mining projects will have a potentially large disturbance area associated with their construction and operational activities. The Alpha Coal Project (Mine) will be mined solely as an open cut operation with an overall disturbance area of approximately 22,000 hectares (ha). It is understood that the Kevin's Corner project will be a combination of open cut and underground operations and the Waratah project will be open cut. The open cut mining operation has the highest potential to result in increased erosion rates post disturbance, however subsidence as a result of underground mining can also impact on the erosion rates of the surface soils.

Each of the projects mentioned above, including the Alpha Coal Project (Mine), will have to be approved through the EIS and subsequent approval processes prior to commencement. Included in the anticipated approvals for these projects will be requirements for adequate planning of mining sequence and progressive rehabilitation via management plans to control and limit the potential for erosion of disturbed soils on the project site.

It is expected that the other development projects will include some or all of the proposed mitigation measures in relation to land impacts proposed for the Alpha Coal Project (Mine). By utilising these mitigation measures, it is anticipated that there will be a minimal cumulative impact on the surrounding environment.

The other projects assessed as part of this cumulative impact section (particularly those mining projects) would have the potential to impact on the environment through soil erosion. Due to their distance from the Alpha Coal Project (Mine) they have been deemed not to have a cumulative impact on land in relation to this Project.

Based on the assessment methodology outlined in Section G.3, the significance of the overall cumulative impact on land is assessed as medium.

G.5.3 Land Use

Within the local area of the Alpha Coal Project (Mine) site cattle grazing is the predominant land use. Cropping, including irrigated and dryland cropping, occurs around more fertile areas within the region however there is no cropping undertaken on the Project site or known to occur within the immediate surrounds.

Development of mine infrastructure and the operation of the mine on the Project site will in the medium term prevent the existing land uses from continuing. As part of the rehabilitation strategy being developed for the site, the Proponent will be aiming to wherever possible return the site at the end of the project life to the same land use that existed prior to development. For the Alpha Coal Project (Mine) site this is expected to be a mixture of cattle grazing and bushland. It is expected that this temporary interruption to the land use will similarly occur at all mine sites in the local and regional

vicinity of the Alpha Coal Project (Mine) site. Considering this it is reasonable to say that in the short term there will be a high impact on a localised level to the land use at these sites, however if properly managed and rehabilitated, the long terms impacts are expected to be low.

It should be noted that while a detailed assessment of good quality agricultural land (GQAL) is only known to have been undertaken for the Alpha Coal Project (Mine) site to date, it is expected to be reasonably representative of the proposed adjacent mining project areas of Kevin's Corner and Waratah. This assumption is supported by Barcaldine Regional Council GQAL mapping which indicates no Class A or B GQAL within these tenements. Considering this it is expected that a percentage of the GQAL (Class C1 and C2) in each project area will be affected by the proposed developments, however, the extent and impact of this cannot be quantified until the project footprints and extent of GQAL have been assessed.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on land use is assessed as medium.

G.5.3.1 Landscape Character

Cumulative landscape and visual impacts may result from changes to the landscape or visual amenity caused by the Alpha Coal Project (Mine) in conjunction with similar existing or proposed mine developments. The degree of intervisibility between different projects depends upon intervening topography, distance and the influence of screening vegetation as well as the nature of direct and indirect impacts.

'Direct' cumulative visual impacts may occur where two or more mines, or power station, have been constructed within the same locality, and may be viewed from the same sensitive view location either simultaneously, or within the same overall viewshed.

'Indirect' cumulative visual impacts may also arise as a result of multiple mines being observed at different locations during the course of a journey (e.g. from a vehicle travelling along a highway or from a network of local roads), which may form an impression of greater magnitude within the construct of short term memory.

There are no existing operational mines within the immediate viewshed of the Alpha Coal Project (Mine). Therefore there are unlikely to be any 'direct' cumulative impacts that result from views toward multiple mine projects from the sensitive view locations identified in the EIS visual assessment.

The Blair Athol Mine is the nearest existing open cut mine located approximately 120 km north-east of the Alpha Coal Project. The distance between the existing mine and the Alpha Coal Project, and the generally indirect road connections suggest that there are unlikely to be any significant 'indirect' cumulative impacts.

The closest proposed open cut mines are Kevin's Corner immediately to the north and Waratah immediately to the south of the Project. These proposed mines, currently subject to the preparation of EIS's, would extend the visibility of mining activities within the immediate vicinity of the Project; however given the very low level of visual impact associated with the Project, the 'direct' and 'indirect' cumulative impact of both mines on surrounding sensitive view locations is likely to remain low.

Based on the assessment methodology outlined in Section G.3, the significance of the overall cumulative impact on landscape character is assessed as low.

G.5.4 Nature Conservation

G.5.4.1 Terrestrial Ecology

As part of the Alpha Coal Project (Mine) EIS, no environmentally sensitive areas, essential habitat, important habitat for *Nature Conservation Act 1992* (NC Act) listed species, *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed vegetation communities or Endangered Regional Ecosystems (EREs) were identified on the Project site. One EPBC Act listed species, the Squatter Pigeon (Southern) (*Geophaps scripta scripta*), and one NC Act listed species, the Little Pied Bat (*Chalinolobus picatus*) were identified on the Project site. There were no NC Act protected areas identified within or adjacent to the Project site.

As no EREs, EPBC listed vegetation communities or other sensitive ecosystems were identified on site, the construction and operational activities of the Project will not impact on these values. It is possible that projects located within the local and regional area may impact on these values and result in a cumulative impact. This impact will, however, be in isolation to the Alpha Coal Project (Mine). Nonetheless, it is likely that the Project will result in the clearing of vegetation and a reduction in fauna habitat during the life of the operation. It is expected that this will also occur at the adjacent proposed mines and so could result in an impact to the existing habitat corridors in the local area. While the extent of the habitat corridors on the site and in the surrounding area are already heavily impacted by clearing and associated grazing activities, the Alpha Coal Project's (Mine) commitment to progressive rehabilitation of disturbed areas (including bushland) will aid in or potentially enhance the habitat corridors on the site.

During the EIS assessment weed and pest species were identified on the Alpha Coal Project (Mine) site. The prevalence of these species is expected to be similar on surrounding tenements. As part of the EIS the Proponent has committed to the effective control and management of pest and weed species. It is expected that projects in the local and regional area will have or already have similar commitments which would be expected to limit any increase in potential negative cumulative impact.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on terrestrial ecology is assessed as low.

G.5.4.2 Aquatic Ecology

Overall, the aquatic environment for the water courses located on the Alpha Coal Project (Mine) site were assessed to be of reduced environmental value. This assessment was based on observations of moderate grazing pressure, associated bank erosion, in-stream benthic degradation and basic habitat structure offering limited options for aquatic inhabitants.

Furthermore water quality results show that water within these water courses exceeds the trigger values provided in the ANZECC (2000) Aquatic Ecosystems Guidelines at one or more monitored sites for a number of parameters. These exceedances are possibly due to runoff associated with upstream pastoral land-use.

The main watercourse that crosses the Alpha Coal Project (Mine) site is Lagoon Creek. This water course flows in a south to north direction, originating on the Waratah tenement and merging with Sandy Creek near the Kevin's Corner tenement. Sandy Creek then flows across the Kevin's Corner tenement to the Belyando River and onto the Burdekin River system. Considering this, any surface water impact from one or all of the Alpha Coal Project (Mine), Kevin's Corner or Waratah projects

could impact on the aquatic ecosystem of the receiving water courses. All of the water courses on the Alpha Coal Project (Mine), Kevin's Corner or Waratah project tenements are ephemeral.

As discussed in the surface water section below (Section G.5.5), each of the projects, if they were to proceed, would be expected to have strict surface water quality release commitments and license conditions. The largest potential impact to the local aquatic ecology would be the reduction in stream flows and the disturbance of the stream environment as a result of stream diversions resulting from mining activities. The immediate impacts to the aquatic ecology as a result of stream diversion activities are expected to be short term as the diversions would be expected to replicate the existing stream environment. The reduction in stream flow will be dependant on the dirty water catchment areas of the local projects and their proposed water release methodology.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on aquatic ecology is assessed as low.

G.5.5 Surface Water

The Alpha Coal Project (Mine) construction and operational activities have the potential to impact on downstream water quality, flood levels and environmental stream flows. When rock and soil is exposed to rainfall, the resultant runoff carries sediments and salts, metals, trace elements, and/or organic compounds that may impact on surface water quality. The alteration of the stream geomorphology primarily through creek diversions will change the baseline flooding profile of the area and the responsible management of the dirty water generated in the Project disturbed areas will result in a lower environmental stream flow in the receiving watercourses.

The designated watercourses that will be impacted the most by the Project are Lagoon and Sandy Creeks (Volume 2, Section 11). Both of these creek systems would also be expected to be impacted, to a degree, by the proposed projects located to the north and south of the Alpha Coal Project (Mine), namely the Kevin's Corner and Waratah projects.

All three of these projects are located within the Sandy Creek catchment, forming the south-westerly portion of the Belyando River system, which is part of the Burdekin Basin. At a local level the cumulative impact of these three proposed projects will directly impact on the above mentioned watercourses. The degree of cumulative impact from these projects will be dependant on the following:

- Mine planning resulting in reduction of watercourse catchment areas;
- Dirty water management techniques and the potential to discharge water meeting the project license conditions; and
- Number and/or size of diversions and levees that will alter the floodplain and so change the flood flow characteristics and height.

At a regional level, mining activities will have a certain cumulative impact on the Belyando and Burdekin River systems; however this impact is not in isolation and would be expected to be less than the impact from other land uses in the catchments, in particular agriculture.

As part of this EIS the Proponent has committed to numerous mitigation and control strategies to promote the diversion of clean water around the Project's disturbance areas, control and manage dirty water and engineer appropriate diversions. It is expected that the other local mining projects within the Sandy Creek catchment will implement similar control and mitigation measures. It will however not be possible to determine some of the geomorphological and associated flooding cumulative impacts until

the other projects have progressed. As the Alpha Coal Project (Mine) is expected to be the first of these mines to commence it is suggested that subsequent mines in the catchment consider the Alpha Coal Project (Mine) in their surface water management designs.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on surface water is assessed as high.

G.5.6 Groundwater

In addition to the Alpha Coal Project (Mine) there are two adjacent proposed projects (Kevin's Corner and Waratah) that have the potential to impact groundwater and so produce a cumulative impact in the local area.

To date, no regional groundwater modelling has been carried out to assess the potential impact of these combined projects on aquifers and the subsequent impact on the environment and surrounding landowners who use this resource. The Proponent will develop a regional groundwater model to assess the combined impact of the Alpha and Kevin's Corner project as part of the Kevin's Corner EIS process.

The regional groundwater model will consider the cumulative impacts (i.e. drawdown in groundwater levels) of the Alpha and Kevin's Corner projects with respect to:

- Drawdown in the area between the mining operations (i.e. where the cones of depression from each operation overlap);
- The extent of drawdown along geological strike (i.e. to the north and south of the Alpha and Kevin's Corner mines) as well as to the east and west of the operations (where the extent of drawdown is anticipated to be limited by hydrogeological boundaries);
- Cumulative impacts on defined springs to the north of the Kevin's Corner MLA;
- Impacts on existing groundwater users; and
- Definition of a final zone of influence. The final zone of influence will be developed for the completion of the Alpha Coal Project, following rebound of groundwater levels to a pseudo steady-state for the aquifers that are dewatered or depressurised by the mine, and for deeper aquifers that are expected to be the target of bores drilled under make-good water supply agreements.

No details are known of the dewatering requirements of the Waratah project as the EIS has not yet been completed, therefore the regional groundwater model will present basic drawdown contours for the area of this proposed mine.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on groundwater is assessed as medium.

G.5.7 Air

G.5.7.1 Air Quality

The activities associated with open cut mining have a high potential to generate dust particles that can potentially impact on the sensitive receptors in close proximity to the Project.

Based on the geographic location of the sensitive receptors and proposed mining operations including Alpha Coal Project (Mine), Waratah Coal Project and Kevin's Corner Coal Project, possible cumulative impacts on the 24-hour average concentration of PM₁₀ at current sensitive receptor locations may include (but may not be limited to) the following:

- Impacts from dust generating activities located within a similar band of wind directions will be additive. Thus when the wind is from the west (for example), dust sources to the west of a receptor will be additive.
- Impacts from activities located within different bands of wind directions will not be additive. Thus when the wind is from the west (for example), dust sources to the south of a receptor are not likely to have a significant impact on dust levels at that location.
- Even if worst-case impacts from two or more dust emissions sources are not additive at a particular sensitive receptor location, as mining increases within the airshed, the frequency of elevated levels of PM₁₀ is likely to increase.

Thus, worst-case 24-hour average concentrations of PM₁₀ due to dust-generating activities from emission sources in the region are not additive during any given 24-hour period as worst-case meteorological conditions for each significant emission source (such as wind speed and wind direction) differ depending on the geographic location of the significant dust emission source(s) to the receptor.

With respect to the annual average of PM_{2.5}, TSP, and monthly dust deposition, impacts will be cumulative.

The cumulative impacts from the proposed mines (Kevin's Corner and Waratah) have not been modelled as part of this assessment due to the lack of available information. It is suggested that subsequent projects in the local area utilise the Alpha Coal Project (Mine) air dispersion modelling information when undertaking their own cumulative assessments.

Generally speaking the activity of mining, particularly open cut mining will add particulates to the regional airshed. The impact from this increase in particulates is more likely to be noticeable at a local level and in relation to the Alpha Coal Project (Mine) it will be most noticeable at the homesteads to the north, south and east of the site. It should be noted that the receptors modeled as having the highest potential dust impacts from the Alpha Coal Project (Mine) are located within the expected footprint of the adjoining proposed projects and so if those projects went ahead they would be expected to be removed or relocated.

As part of the Alpha Coal Project (Mine) a system of dust control and mitigation measures as well as monitoring is proposed. These measures are designed to reduce as much as practicable the dust emission sources and to monitoring the effectiveness of the system and undertake continuous improvement as appropriate. It is expected that any new projects in the local area will implement similar control and monitoring measures so reducing the potential cumulative impacts on the local sensitive receptors.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on air quality is assessed as medium.

G.5.7.2 Greenhouse Gas

The major sources of Scope 1 and 2 greenhouse gases (GHG) from the Alpha Coal Project (Mine) include the following:

- Fugitive emissions of coal seam gas (CSG) from the mining of coal (Scope 1);
- Diesel combustion in vehicles (Scope 1);
- Diesel combustion for stationary energy (i.e. pumps) (Scope 1);
- Diesel combustion for explosives (Scope 1); and
- Electricity consumption (Scope 2).

Similar sources can be expected from the other coal mining projects within the local and regional area of the Project site.

When viewed in an Australian or Queensland context the Scope 1 and 2 emissions from the Project are considered materially relevant given the Project emissions are 16.97% of the Queensland mining sector at the peak emission rate (Volume 2, Section 14). This GHG emission percentage is calculated as a baseline of the mining projects currently in operation and does not take into account the commencement of new projects such as those listed in Table G-5. If any or all of the projects listed in Table G-5 commence it will be likely (due to their size) that the Alpha Coal Project (Mine) percentage contribution to the Australian or Queensland GHG emission will decrease significantly. There still will be however a cumulative increase of GHG released to the atmosphere. Due to the lack of available data from other projects this increase has not been quantified.

The Proponent has committed to preparing an energy conservation and GHG management plan for the next phase of the Project to assist in identifying all sources of emissions and quantifying and controlling these where possible during project engineering and design.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on GHG is assessed as medium.

G.5.8 Noise and Vibration

Noise levels generated by the proposed Alpha Coal Project (Mine) construction and operation are predicted to be within the established noise limits at all receptor locations outside the Project site boundary under all meteorological conditions.

Similarly, full compliance with the Department of Main Roads' Road Traffic Noise Management code of practice criteria is predicted for all construction and operational stages. Due to the relative increase in vehicle volumes, however, noticeably increased noise levels are likely to be perceived by the most affected receptors. It is likely with the development of the projects adjacent to the Alpha Coal Project (Mine) site, (namely Kevin's Corner and Waratah) that this noise level will increase with the increase in traffic volumes.

With the exception of those receptors potentially impacted by traffic noise the sensitive receptors (homesteads) to the east of the Project site are not expected to experience increased noise impacts due to the cumulative effects of additional mine sites. The homesteads currently situated to the north and the south of the Project site do, however, have the potential to be impacted by cumulative noise and vibration effects. It should however be noted, that it is likely that for these other projects to

proceed these potentially affected homesteads will have to be removed or relocated due to their position within the expected project disturbance areas.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on noise and vibration is assessed as low.

G.5.9 Solid Waste

The Alpha Coal Project (Mine) will generate a variety of solid wastes, many of which will be reused or recycled. However there will also be selected wastes that will be disposed of in the on-site landfill or local licensed waste management facilities. While it is not yet known what the other proposed local projects will do, it is expected that their waste management practices will be similar.

The increase in mining activity within the region is expected to result in an increase in the demand for recycling services for items such as waste oil, oil filters, tyres etc. This increase in demand is expected to be met by an increase in services as a factor of market forces.

The other Project waste stream (generated as a by product of coal mining and processing) will be overburden and coal rejects and tailings. On the Alpha Coal Project (Mine) site these waste materials will be characterised and monitored through the life of the Project to enable the implementation of appropriate management techniques. Through the appropriate management of this waste material the potential for impacts on the environment will be minimised. It should be noted that while a large amount of geochemical characterisation of the mining waste streams has been undertaken for the Alpha Coal Project (Mine), coal mining is yet to commence in earnest in the Galilee Basin. As a result the geochemical nature of the material across the resource area and across the proposed projects is not as well understood as historical coal mining areas such as the nearby Bowen Basin.

While it is expected that the other locally proposed mining projects will have similar management and monitoring techniques to the Alpha Coal Project (Mine) it is possible, that if the mining waste is not appropriately handled there could be cumulative impacts on the surface water and groundwater environments in particular.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on solid waste is assessed as low.

G.5.10 Traffic and Transport

As part of the Alpha Coal Project (Mine) EIS a traffic impact assessment was undertaken on the surrounding road network to determine whether the traffic generated by the development (only) will have a significant impact on the performance of the existing road network (Volume 2, Section 17).

There is however a number of other regional significant developments previously identified in this document, currently operating, or are proposed of which their operations may coincide with the construction and/or operational phase of the Project. As such, the interaction between the vehicles generated by these other developments with the Project has been assessed to determine the performance of the road network under this 'cumulative impact' scenario. Tables G-4 and G-5 provide a summary of the existing and proposed developments within the Galilee Basin region and have been considered as part of the traffic and transport cumulative impact assessment.

The existing condition of the surrounding road network in the traffic impact assessment has been based on traffic count data collected in 2009. Therefore it is assumed that all 'Existing Developments'

outlined in Table G-3 have been included in that assessment given they were in a construction or operational phase at the time the traffic counts were performed. Consequently, it is only the proposed developments that are to be analysed in determining the cumulative impact on the performance of the road network.

The assumed vehicle routes for the proposed development are also incorporated into the cumulative impact assessment as these values are aggregated for that particular road length or intersection to determine if suitable road network performance is being maintained. The number of vehicle movements in many of the proposed developments is yet to be finalised. Instead, the relative size of each proposed development when compared to the Alpha Coal Project is utilised in estimating these traffic movements. A summary of the assumed vehicle routes for construction vehicles and personnel are provided in Volume 2, Section 17. As a reference, the peak vehicle generation rate for the Alpha Coal Project is in 2017 during peak operations with an Annual average daily traffic (AADT) of 147 vehicles per day (29% commercial vehicles). Table G-10 below shows assumed vehicle routes for proposed developments in the Galilee Basin Region in 2017.

Table G-10: Assumed Vehicle Routes for Proposed Developments in Galilee Basin Region – 2017

Project	Relative Size to Alpha Coal Project (%)	Vehicle Generation (AADT)	Assumed Vehicle Route
Galilee Basin Power Station	42%	62	Identical to Alpha Coal Project
Waratah Galilee Coal Mine	164%*	242	Identical to Alpha Coal Project
Kevin's Corner	100%	147	Identical to Alpha Coal Project
South Galilee Coal Project	67%	99	13.6% of vehicle origin West of site 86.4% of vehicle origin East of site
Powerlink and Sunwater Powerline and Pipeline Installation	21%	31	13.6% of vehicle origin West of site 86.4% of vehicle origin East of site
Ensham Underground	27%	40	100% of vehicle origin West of site

* Assumes the mine to produce 50 Mtpa.

Table G-10 identifies that the proposed developments will be utilising similar intersection and road sections as those proposed for this Project. In particular, the Capricorn Highway (between Barcaldine and Emerald), the Peak Downs and Gregory Highways (between Emerald and Mackay) and roads surrounding the Site will experience a cumulative impact from these developments. It also demonstrates that the Alpha Coal Project (Mine) is not the only significant proposed development in the Galilee Basin region.

A longer term assessment of the impacts of transporting the mine workforce between the Project site and Alpha aerodrome has identified potential for capacity constraints at Alpha aerodrome as multiple projects compete for air transport facilities. In conjunction with this matter there would be an increase in vehicle movements from various mine sites to Alpha aerodrome and into the road network around Alpha township. A response to the cumulative impacts of this issue could be the introduction of an operating airstrip at the Alpha Coal Project site, or possibly the adjacent proposed Kevin's Corner mine site, so that road transport, airport logistics and associated safety risks are mitigated.

G.5.10.1 Cumulative Impact on Road Lengths

Given the significant increase in vehicles generated by this Project (when compared to existing conditions), the inclusion of additional projects along Hobartville Road and Clermont-Alpha Road will impact on the modelled level of service (LOS) in 2017 when the Project is in its operational phase. This is to be expected given that the current road configuration is unsealed and designed for local residential access only. Developing three coal mines of similar size (as well as a power station) will significantly change the number and class-type of vehicles than those experienced without any development occurring. It is therefore concluded that the cumulative impact of any of the proposed projects will require appropriate upgrades to Hobartville Road and Clermont-Alpha Road.

All other roads (such as the Capricorn Highway, Peak Downs Highway and Gregory Highways) have sufficient capacity in their LOS to accommodate the cumulative impacts of these proposed developments without the need of significant infrastructure upgrade.

Whilst the Alpha Coal Project (Mine) has been shown to have negligible impact on the pavement maintenance requirements of these roads as a stand alone project, there may be some cumulative impact due to the additional projects increasing the existing traffic by greater than 5%. Exact details of the impact can not be determined at this stage due to insufficient information of the other projects' commercial vehicle generation. Additionally, any maintenance impacts will be associated with the timing of delivery of projects which is unknown at this stage. Detailed discussions will need to be held with DTMR regarding any maintenance impacts.

Table G-11 provides an indication of the extent that the cumulative impact will have on the surrounding road network. It should be noted that although the LOS for Hobartville Road and Clermont-Alpha Road deteriorate below a LOS 'A', they are all still at LOS 'C' or above which is considered to be an acceptable minimum level of performance for each road length under the *Guidelines for Assessment of Road Impacts of Development* (Queensland Department of Main Roads, 2006).

Table G-11: Summary of Cumulative Impact on Road Lengths – 2017

Road Segment		2017 Base Case (without Project)	2017 With Project	2017 With Project and Proposed Projects (level / rolling terrain)
Hobartville Rd (Clermont-Alpha Rd – site)	AADT	26	143	965
	LOS	A	A	B / C
Clermont-Alpha Rd (Alpha – Hobartville Rd)	AADT	106	208	1,030
	LOS	A	A	C / C
Clermont-Alpha Rd (Hobartville Rd – Mistake Creek)	AADT	21	66	888
	LOS	A	A	B / C
Clermont-Alpha Rd (Mistake Creek – Clermont)	AADT	102	147	969
	LOS	A	A	B / C
Capricorn Highway (Alpha – Gemfields)	AADT	681	701	1,693
	LOS	A	A	A

G.5.10.2 Cumulative Impact on Intersections

Capricorn Highway / Gregory Highway Intersection – Emerald

The Capricorn Highway / Gregory Highway intersection analysis identified that there is very little, if any, incremental impact between the 'no development' and 'with development' scenarios for the Project in 2013 and 2017. It should be noted though that the intersection performance is at or above capacity in 2017; however this is the case with or without any development occurring (i.e. background traffic growth to 2017 will result in the reduced intersection performance). As such, the proposed developments outlined in Table G-10 will have no cumulative impact on the existing configuration of this intersection as it will have already reach capacity prior to 2017 due to the background growth in the existing traffic volumes.

Capricorn Highway / Clermont-Alpha Road Intersection – Alpha

The analysis of the Capricorn Highway / Clermont-Alpha Road intersection indicated that there is negligible Degree of Saturation (DOS) and queue lengths for all scenarios modelled in 2013 and 2017 (i.e. $DOS < 0.1$). The addition of the vehicles generated by the proposed developments outlined in Table G-10 will have little impact on the performance on this intersection.

Other Intersections

The remainder of intersections along the vehicle routes are operating in a similar capacity to the Capricorn Highway / Clermont-Alpha Road intersection. As such it is expected that there will be no cumulative impact at these intersections based on the vehicles generated by the proposed developments.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on traffic and transport is assessed as medium.

G.5.11 Cultural Heritage

G.5.11.1 Non Indigenous Cultural Heritage

The Alpha Coal Project (Mine) EIS has identified a number of non-Indigenous cultural heritage sites within the Project site. Cumulative impacts for such sites are unlikely as they will not be affected by projects separate from the site itself. The possible exception to this could be sites that cross large geographic areas such as the Cobb and Co coach road and associate structures such as hotels. It is likely that this structure will be present on some of the neighbouring proposed project sites.

To mitigate the potential impacts on the identified non-Indigenous cultural heritage locations of significance, the Proponent will develop the Project site in accordance with the management procedures committed to in the EIS. This will include the appropriate level of survey of the coach road, where possible avoidance of the identified structures of significance and management of the identified locations in accordance with the site Cultural Heritage Management Plan (CHMP). It is expected that the projects adjoining the Alpha Coal Project (Mine) site will undertake similar assessments and introduce similar mitigation measures to minimise the potential cumulative impact on the areas with non-Indigenous cultural heritage values.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on non-Indigenous cultural heritage is assessed as medium.

G.5.11.2 Indigenous Cultural Heritage

Management of Indigenous cultural heritage significance and impacts for the Alpha Coal Project (Mine) will be by the CHMP process. The Project already has an agreed and signed CHMP for the Project area. Protection, management and mitigation measures of Indigenous cultural heritage finds will be agreed after cultural heritage surveys are complete, and will then be managed in accordance with the CHMP.

The CHMP allows for cultural heritage surveys to be carried out on an ‘as required’ basis prior to disturbance throughout the Project duration as construction and mining activities progress.

Typically Indigenous cultural heritage finds are dealt with in relative isolation and managed accordingly. It is possible that across the Alpha Coal Project (Mine) site and the adjacent two proposed project sites (Kevin’s Corner and Waratah) there may be a trend of types of cultural heritage finds that adds significance and the potential for a cumulative impact.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on Indigenous cultural heritage is assessed as low.

G.5.12 Social and Community

Cumulative impacts for social and community are inherently difficult to identify or assess because they are based on assumptions of assumptions, many of which are unknown because they were developed by other projects. Therefore, the purpose of this social cumulative assessment is to identify potential key considerations in the Project regional and local study areas, and identify a mechanism for better identifying and planning for cumulative impacts. The regional study area includes Isaac Regional Council (with a focus on Clermont), and Central Highlands Regional Council (with a focus on Emerald). The local study area includes Barcaldine Regional Council with a focus on Alpha. Table G-12 lists key considerations for each valued social component (VSC) assessed in the social impact assessment (SIA).

Table G-12 Key Considerations for the Study Areas regarding Cumulative Impacts

Valued Social Component	Key Considerations
History and Settlement	<ul style="list-style-type: none"> • Increased rate and scale of profile change; • Increased rate and scale of settlement pattern shift to accommodation village style arrangements; • Increased potential for in-migration to local and regional communities; and • More rapid transition from a predominantly agricultural area to a mining area.
Demographic	<ul style="list-style-type: none"> • Increased population to local and regional centres; • Increased rate of population growth; • Increased number of males aged 20 to 45; and • Increased ratio of non-Indigenous to Indigenous.
Culture and Community Dynamics	<ul style="list-style-type: none"> • Increased ratio of non-Indigenous to Indigenous; • Increased number of people from outside the region; • Increased potential for volunteers; • Increased disposable income; and • Predominance of shift-style employment.

Valued Social Component	Key Considerations
Housing and Accommodation	<ul style="list-style-type: none"> Increased cost of housing: <ul style="list-style-type: none"> Increased demand; Decreased supply; and Increased speculation. Increased rents; Increased pressure for land availability; and Increased demand on short-term accommodation.
Health, Wellbeing and Social Infrastructure	<ul style="list-style-type: none"> Increased demand on local and regional emergency services providers; Potential for service providers to reach critical mass and acquire additional staffing/upgrades; Potential for service providers to be stretched to their limits (service delivery and staff fatigue); Potential for community to feel overwhelmed/helpless; Potential for local social infrastructure to fall further behind demand; and Potential for increased skills and services in the region.
Education and Training	<ul style="list-style-type: none"> Increased training opportunities and skills development; Potential for local school to reach critical mass and receive additional staff; Potential for child care to reach limit; Potential for child care to acquire additional staff; and Potential for dedicated training to move to the region to service multiple mines.
Labour Market and Employment	<ul style="list-style-type: none"> Increased employment opportunities; Increased competition for workers; Increased wages at mines; Increased potential for skills drainage from other industries; and Increased potential for FIFO reliance by all projects.
Industry and Business	<ul style="list-style-type: none"> Increased competition for workers; Increased business opportunities in the region; Increased potential for development of an Alpha light industry precinct; and More rapid transition from a predominantly agricultural area to a mining area.
Income and Cost of Living	<ul style="list-style-type: none"> Increased disposable income; Potential increase in goods and services in the area; Potential increase in cost of local goods from businesses increasing prices to capture mining incomes; and Potential increase in housing costs and rent.
Governance	<ul style="list-style-type: none"> Increase in demand on councils; Increase in taxes and rates; Increased demand on services and infrastructure; and Increased profile with State and Federal governments.
Primary Infrastructure and Access	<ul style="list-style-type: none"> Reduction in effect of limiting factors in Alpha from increased investment; Increased pressure on limiting factors in Alpha if not addressed effectively; Increased demand on/use of State roads; Increased traffic and safety issues; Increased maintenance required on roads; Potential expansion of Alpha aerodrome; and Potential to increase rail activity along Longreach to Rockhampton line.

Valued Social Component	Key Considerations
Other - Access	<ul style="list-style-type: none"> • Potential for DTMR and councils to upgrade Alpha-Clermont Road from the Project to Clermont: <ul style="list-style-type: none"> – Potential to increase impact on Mackay businesses and community; – Reduce impacts (positive and negative) to BRC and CHRC; – Potential to transfer more road transport to Mackay via IRC; – Transfer of impacts from Alpha to Clermont; – Potential to increase population in Clermont and subsequent spin-off impacts; and – Potential for Alpha to receive minimal positive and negative impacts.
Other – consultation	<ul style="list-style-type: none"> • Consultation fatigue for councils; • Consultation fatigue for communities; • Confusion differentiating projects; and • Issues overlooked or under considered by key stakeholders due to other commitments/distractions.

The cumulative effect of more than one project in the Galilee Basin will likely result in an amplification of the Project impacts assessed for the regional study area and local study area. Impacts are limited by several key factors for each area which would remain limiting factors, unless one of the other projects intends to remove one of those factors. As an example, a project providing Alpha with a secure source of electricity and water directly to the community would significantly impact on the potential for people to relocate to the region for all projects. An upgrade of the Alpha-Clermont Road to Clermont would significantly impact on the geographic location, frequency and magnitude of impacts of the Project. Most impacts would likely transition away from Alpha and towards Clermont. Clermont is a larger centre with more services and better access to other major centres.

Overall the cumulative social impacts due the more than one of the proposed project going ahead in the Alpha area are likely to be fairly significant in both the regional and local study areas. In the regional study area (IRC and CHRC), the existing and other proposed projects in those regional councils will reduce the noticeable impact from the Alpha Project, and Alpha will essentially be an amplification of the other Projects. The Project will be a cumulative effect on the regional councils, rather than a direct impact. This is because of the distance the Project is to those councils, and because the existing and other proposed projects (not in the Galilee Basin) are within those councils boundaries. The Project therefore will be viewed more as a secondary concern for IRC and CHRC than a primary concern. As more projects develop in the Galilee Basin, the profile of the basin as a whole may increase for IRC and CHRC, making the basin a primary concern.

In the local study area, the amplification effect from the other projects has the potential to create near limitless scenarios. The primary factor will be the policies and programs each project implements regarding workforce sourcing, transport and accommodation. If additional projects to the Alpha Coal Project (Mine) go ahead, local opportunities for mine employment should remain the same; however, the choice of which project to seek employment with will increase. The lure of many projects may attract newcomers and former residents back to the region. This will increase business profits and opportunities.

The key to managing cumulative impacts is to have various projects proponents considering more than their own project in the development and implementation of their strategies, policies, and programs. This is best achieved through a high level, strategic forum which will enable key stakeholders to better understand the requirements and outcomes of multiple projects. There are several opportunities available to achieve this and the Proponent will explore opportunities for effective cumulative impacts management in consultation with the DIP SIA Unit.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on social and community is assessed as high

G.5.13 Economics

In considering the cumulative impacts of the Alpha Coal Project (Mine) it is necessary to identify the range of existing, planned and potential projects that may contribute to regional impacts. Cumulative impacts refer to the impact of the cumulative stimulus to the regional economy.

A significant proportion of existing, planned and potential projects rely on accommodation villages to house imported labour throughout the construction and operating phase of the Project. These accommodation villages provide some mitigation to the further tightening of small and tight regional labour markets. However, a small proportion of the construction and operating work force of existing, planned and potential projections will choose to relocate to within the region resulting in a population effect.

The stimulus created by existing, planned and potential projects within the region is likely to impact on the local labour markets, namely the Barcaldine Regional Council area, comprising Aramac statistical local area (SLA), Jericho SLA and Barcaldine SLA, and the regional labour market, namely Central West statistical division.

The existing projects within the area of influence of the Alpha Coal Project (Mine) are located primarily at Emerald, Clermont, Tieri and Blackwater. The existing coal mines fall within a well established mining area, the economy of which has had considerable time to adapt to changes in its economic base. The existing coal mines are located closer to the coast and have greater capacity to draw on large coastal communities, such as Rockhampton, Gladstone and Mackay for their labour or supply chain activities.

In terms of production, the largest existing project is Rio Tinto's Clermont Mine, which is closely followed by BMA's Blackwater Mine (11 Mtpa), and Rio Tinto's Blair Athol Mine (11 Mtpa). However, the Blair Athol mine is due for decommissioning in 2015.

The combined stimulus of the proposed projects will create significant demand for additional labour, physical inputs and housing. In particular, the combined labour demand of these projects would be for several thousand workers during the construction phase.

Table G-13: Proposed major projects within area of influence of the Alpha Coal Project

Project	Construction Workforce	Operation Workforce
Galilee Basin Power Station	1,000	60
Alpha Coal Project	1,350	2,382
Waratah Galilee Coal Mine	2,200	760
Galilee Coal (Northern Export Facility)	6,000 ¹	760
Kevin's Corner	2,500	2,000
The South Galilee Coal Project	1,500	750
Ensham Underground 1 & 2	600	390
Powerlink – electricity transmission project	500	N/A
SunWater - water transmission project	-	-

Note 1: The 6,000 workers refers to total demand for labour throughout construction as opposed to a peak or annual employment. Hence, were construction to take three years, the annual employment would be in the order of 2,000 workers.

The ability of the local economy to respond to this stimulus will be limited to a large extent by the size of the local labour force and depth of the local economy. Increased local demand is anticipated to arise directly in the form of increased demand for labour and business / industrial services and indirectly in the form of demand for additional housing and community services.

The economic base of the Barcaldine Regional Council area and to a lesser extent the Central West statistical division is likely to be insufficient to meet increased demand resulting from the various planned projects.

In response to the planned projects the local and regional economies would need to increase their capability both in terms of labour and business / industrial services. Such improvements to capability are likely to take time, indicating that the ability of local or regional economy to meet increased demand during the initial construction phases may be limited.

The labour force of the Central West region is estimated at less than 8,000 workers, with the Barcaldine Regional Council area hosting approximately 2,100 workers. The cumulative demand for labour during the construction phase of planned projects significantly exceeds the size of the region's labour force. Unemployment rates within the Central West region are less than 4% (below the state average), while labour force participation is over 80% (significantly above the state average).

Consequently, significant labour and business / industrial services would need to be imported from other regions, most likely coastal regions. Unemployment rates within Rockhampton are currently above the state average and labour force participation is below the state average, indicating some capacity in the Rockhampton labour market to meet labour demand within the Central West region.

The greatest local and regional development opportunities are likely to arise from meeting operational rather than construction needs. With project lives of approximately 30 years there is capacity for the local and regional economy to develop and diversify.

While the majority of future employment is likely to be imported and accommodated in an accommodation village, some workers will choose to relocate to the region. Also, as the economic base of nearby communities adapts to meet increased demand for business / industrial services, this

will attract more workers to the region. Increased local employment would result in population growth. Similarly, economic activity stimulated by the major projects will also increase demand for short term accommodation.

Local and regional economic growth and the consequent population growth will increase demand for a range of additional infrastructure and facilities, including housing, accommodation, health care, child care, retail facilities and schooling.

The confluence of a number of major projects within the area is likely to result in a number of impacts, including:

- Increased demand for labour;
- Increased demand for business / industrial services;
- Increased demand for housing; and
- Increased demand for economic and social infrastructure.

The existing size of the local and regional economy suggests that the stimulus created by the early stages of construction would be largely addressed through importing of labour and business / industrial services.

The extent to which the above impacts are positive or negative will ultimately be determined by the policy response of the business community and local and state governments. Providing the above impacts are met with increases in supply, impacts will be generally positive.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on economics is assessed as high.

G.5.14 Mine Cumulative Impacts Summary

The cumulative impacts from the development of the Alpha Coal Project (Mine) are summarised in Table G-14. The main cumulative impacts associated with the development of the Alpha Coal Project (Mine) relate to land, water, transport and air.

Appropriate management strategies are being developed to reduce this impact including a community consultation program, road and aerodrome upgrades and implementation of a series of management plants and monitoring programs.

The minor-moderate impacts identified in this analysis are both short term and temporary, making the cumulative impacts negligible.

Table G-14: Summary of Cumulative Impacts – Alpha Coal Project (Mine)

Environmental Value	Impact Significance
Land	Medium
Land Use	Medium
Landscape Character	Low
Nature Conservation	Low
Surface Water	High
Groundwater	Medium
Air Quality	Medium
Greenhouse Gas	Medium
Noise and Vibration	Low
Solid Waste	Low
Traffic and Transport	Medium
Non Indigenous Cultural Heritage	Medium
Indigenous Cultural Heritage	Low
Social and Community	High
Hazard and Risk	*
Economics	High

* Not assessed as all of the hazard and risk issues were contained on site and not applicable to a cumulative impacts assessment

G.6 Rail Cumulative Impacts

G.6.1 Overview

The Alpha Coal Project also involves construction of a 495 km railway to transport processed coal from the proposed Alpha Coal Project (Mine) to the proposed Multi Cargo Facility (MCF) at the existing Port of Abbot Point. The rail line will transport up to an estimated 60 Mtpa of coal on a single track and will service the Alpha Coal Project (Mine) as well as the proposed Kevin's Corner Mine which is also being proposed by HPPL.

In addition to the actual alignment, the rail component of the Alpha Coal Project (Rail) also includes:

- Two balloon loops, one at the Alpha Coal Mine and one at the Port of Abbot Point for loading and unloading;
- Eight passing loops each approximately 5 kms long to accommodate for export of 60 Mtpa of coal;
- Maintenance sidings along the railway line;
- Marshalling yard at the entry to the Abbot Point State Development Area (APSDA); and
- Five workers' camps accommodating 700 to 800 personnel per camp including three permanent camps and two temporary camps.

The proposed rail alignment commences at the Alpha coal mine, 50 km north of the Alpha Township and terminates at the Abbot Point coal export terminal, 25 km north of Bowen. The alignment of the Project has been selected on the basis of several factors, primarily environmental, economic and geotechnical grounds. The entire alignment is within the Burdekin River catchment and the alignment crosses a number of major and minor streams including the Belyando River, Suttor River, Bowen River and Bogie River. Topography is varied along the alignment with the highest point at 300 m above sea level.

Land use along the alignment is largely grazing and the alignment avoids towns and settlements. Towns and settlements within 50 km of the Alpha Coal Project (Rail) include Alpha, Collinsville and Bowen.

The alignment does not pass through any areas of high nature conservation significance such as national parks, nature reserves or state forests. The alignment does encroach upon the outer edge of the Caley Valley Wetlands at Abbot Point; these wetlands are listed on the National Directory of Important Wetlands. The alignment also traverses some areas of threatened ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999*, and endangered and of concern vegetation under the *Queensland Vegetation Management Act 1994*.

The potential cumulative impacts that may impinge on specific environmental and social values are identified in Table G-15 (construction) and Table G-16.

It is important to note that the matrices in Table G-15 and Table G-16 do not show which environmental values are affected by each of the proposed projects. It shows the values that could be adversely or beneficially affected as a result of the proposed projects being developed in close proximity to, or at a similar time as, the Alpha Coal Project.

Table G-15: Potential for Overlapping Impacts with Alpha Coal Project (Rail) – Construction

Project	Environmental Value														
	Land	Nature Conservation	Surface Water	Groundwater	Greenhouse Gas	Air Quality	Noise	Land Use	Social and Community	Transport /Infrastructure	Solid Waste	Landscape Character	Cultural Heritage	Hazard and Risk	Economics
Galilee Coal Project rail line	•	•	•		•	•	•	•	•	•	•	•	•	•	•
Water for Bowen	•	•	•		•			•	•	•	•	•	•	•	•
Northern Missing Link	•	•	•		•	•	•	•	•	•	•	•	•	•	•
Goonyella to Abbot Point expansion	•	•	•		•	•	•	•	•	•	•	•	•	•	•
Burdekin Highway Realignment/Burdekin Bridge	•	•	•		•			•	•	•	•	•	•	•	•
Powerlink power transmission line	•	•	•		•			•	•	•	•	•	•	•	•
Ross-Strathmore 275 kV transmission line	•	•	•		•			•	•	•	•	•	•	•	•
Drake Coal Mine (proposed)	•	•	•		•			•	•	•		•	•	•	•
Sonoma Coal Mine (existing)	•	•	•		•			•	•	•		•	•	•	•
North Goonyella/EagleField	•	•	•		•			•	•	•		•	•	•	•
Eaglefield expansion project	•	•	•		•			•	•	•		•	•	•	•
Alpha Coal Project (Mine)	•	•	•		•			•	•	•		•	•	•	•
Galilee Coal Project	•	•	•		•			•	•	•		•	•	•	•
Kevin's Corner Mine Project	•	•	•		•			•	•	•		•	•	•	•
Abbot Point Multi Cargo Facility	•	•	•		•				•	•	•	•	•	•	•
Abbot Point X110 Expansion	•	•	•		•				•	•	•	•	•	•	•

Table G-16: Potential for Overlapping Impacts with Alpha Coal Project (Rail) – Operation

Project	Environmental Value														
	Land	Nature Conservation	Surface Water	Groundwater	Greenhouse Gas	Air Quality	Noise	Land Use	Social and Community	Transport /Infrastructure	Solid Waste	Landscape Character	Cultural Heritage	Hazard and Risk	Economics
Galilee Coal Project rail line	•				•	•	•	•	•	•		•		•	•
Water for Bowen									•						•
Northern Missing Link	•				•	•	•	•	•	•		•		•	•
Goonyella to Abbot Point expansion	•				•	•	•	•	•	•		•		•	•
Burdekin Highway Realignment/Burdekin Bridge									•	•					•
Powerlink power transmission line					•			•		•		•		•	•
Ross-Strathmore 275 kV transmission line					•			•		•		•		•	•
Drake Coal Mine (proposed)	•	•	•		•			•	•	•		•		•	•
Sonoma Coal Mine (existing)	•	•	•		•			•	•	•		•		•	•
North Goonyella/EagleField	•	•	•		•			•	•	•		•		•	•
Eaglefield expansion project	•	•	•		•			•	•	•		•		•	•
Alpha Coal Project (Mine)	•	•	•		•			•	•	•		•		•	•
Galilee Coal Project	•	•	•		•			•	•	•		•		•	•
Kevin's Corner Mine Project	•	•	•		•			•	•	•		•		•	•
Abbot Point Multi Cargo Facility	•	•	•		•			•	•	•					•
Abbot Point X110 Expansion	•	•	•		•			•	•	•					•

A conservative approach was taken by assuming that the timing of the construction phases of the above projects will coincide. This may not be the case as some projects may be deferred and some may not proceed.

The nature and extent of the potential cumulative impacts are summarised in the following sections. In some cases, more detail is provided in other reports or attachments and, in such cases, a cross reference is provided.

The assessment of the significance of the impact is based on the methodology described in Section G.3. above.

G.6.2 Land Use

The Alpha Coal Project (Rail) will result in direct sterilisation of about 2,200 ha of Good Quality Agricultural Land (GQAL) and a further 800 ha of land that is not generally suitable for agricultural activities for the life of the project. Although the Project passes through some areas of Class A GQAL (high quality cropping land), there are no actual cropping activities affected by the rail corridor. This is discussed further in Volume 3, Section 5.3.7.

While this in itself is a small proportion of the overall GQAL reserves of the region, there is potential for cumulative impacts to occur as a result of loss of GQAL from other mining and infrastructure projects considered as part of this cumulative impact assessment.

Pipeline and transmission line projects have minimal impacts on GQAL as most farming activities can generally continue after construction.

Mine projects result in loss of GQAL for the life of the Project, however approval conditions for recently approved mines generally require progressive reinstatement back to pre-mining land uses, which is typically grazing in this area. It is expected that any new mines or mine expansions in the area would also be subject to these conditions. Hence, while agricultural productivity is affected for the life of the mine, in the longer term, at least some level of productivity is expected to be restored.

Rail and road projects also result in loss of agricultural productivity within the project footprint although this can also be restored to some extent if the rail/road is decommissioned.

The net cumulative effect of associated projects on agricultural productivity is that these projects will result in some loss of GQAL and that this loss is medium to long term, given the life spans of these projects.

Each individual project is required to be assessed against State Planning Policy 1/92 (Development and the Conservation of Agricultural Land). The policy principles of SPP 1/92 require that GQAL only be disturbed where there is no option, and that there are overriding benefits if GQAL is disturbed. For mining projects, and for associated infrastructure projects, project locations are largely fixed by the location of the resource and hence, while alignments for infrastructure can be optimized to minimize effects on GQAL, overall, alternatives do not exist. Economic impacts of loss of agricultural productivity are more than offset by economic benefits arising from the various projects.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on land use (loss of Good Quality Agricultural Land) is assessed as moderate in relation to loss of the resource and low in relation to overall economic impact, as the proposed new land use will offset economic losses.

G.6.3 Land

G.6.3.1 Sterilisation of Resources

Linear infrastructure has the potential to sterilize coal and other resources. In addition to the Alpha Coal Project (Rail), there are a number of existing and proposed rail lines, particularly crossing the Bowen Basin. Of these, the Goonyella – Abbot Point project (which incorporates the Northern Missing Link between Goonyella and Newlands and an upgrade of the existing rail line between Newlands and Abbot Point) is approved and expected to be completed in 2010 (<http://coalrail.qnetwork.com.au/COALRAIL-Projects>, accessed 15 September 2010). Additional coal

rail lines are currently being considered by several proponents looking to develop resources in the Galilee Basin.

The Proponent of the Alpha Coal Project (Rail) has carefully considered sterilization of coal resources in alignment selection and in particular, has co-located with the Goonyella-Abbot point upgrade alignments through the Bowen Basin to the extent practicable, while also seeking to avoid the town of Collinsville. Direct effects of the Project on coal and other resources is discussed in Volume 3, Section 4.3.6. Alignments for other proponents are not yet available and so it is not possible to assess the overall effect of these multiple rail projects on coal resources.

It is not practical or economically viable to route new linear infrastructure to completely avoid coal resources and reserves; economic principles generally dictate against increasing expenditure in the present to avoid future expenditure. By avoiding reserves that are likely to be exploited in the next 10-20 years, significant economic losses can be avoided. If in the longer term, coal reserves underlying linear infrastructure become viable for extraction, the costs of realignment of infrastructure to allow extraction of these resources is also likely to be justifiable.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on sterilization of resources is assessed as medium.

G.6.3.2 Erosion

Construction activities for the Alpha Coal Project (Rail), and other projects identified in the region all have potential to give rise to erosion and subsequent loss of soil resources and release of sediment to waterways. In addition, operating projects such as mine projects can be an ongoing source of sediment release if erosion control measures are not implemented. Finally, land use within the catchment generally can also result in exposure of soils to erosive forces and subsequent sediment release to surface waters.

Projects identified in Table G-7 take place within the Burdekin River catchment, and hence the combination of these projects and also ongoing catchment wide erosion has potential to impact on water quality in the Burdekin River and in subsequent releases of sediment to the Great Barrier Reef World Heritage Area and Marine Park.

Erosion and sediment control measures, if properly implemented, can be effective in minimizing erosion related impacts except in extreme rainfall events. Conditions of approval for major construction and mining projects in Queensland typically include requirements for erosion and sediment control plans to be developed and implemented. Queensland specific erosion and sediment control guidelines have been developed (for example International Erosion Control Association 2008), and training and certification of practitioners in erosion and sediment control is available through the International Erosion Control Association.

The Proponent is committed to developing and implementing an Erosion and Sediment Control Plan for construction, and to rehabilitating disturbed areas after construction. With these measures in place, sediment releases from the project are likely to be very low during construction and negligible during operation and will have little or no effect on overall sediment loads in the Burdekin River. Further, if other proponents achieve a similar standard, the cumulative impacts from erosion from multiple projects should be kept to a minimum.

Based on the assessment methodology given in Section G.3, the significance of erosion from multiple projects is assessed as low, provided that standard erosion and sediment control measures are applied to each individual project.

G.6.3.3 Construction Materials

Construction projects identified in Table G-7 will all require construction materials including hard rock. Demand for local and regional resources of hard rock may increase, leading to price increases and a shortage of available material. Effective mitigation measures for this sort of cumulative impact are not readily available, however it can be expected that economic/market forces will come into play, and potentially result in supply increases to meet anticipated demand. Adverse impacts associated with supply increases will typically be avoided as extractive industries must undergo assessment and development approval under the *Sustainable Planning Act 2009*. Some benefits may arise in terms of increased local and regional economic activity.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on availability of construction materials is assessed as low.

G.6.4 Landscape Character

The Alpha Coal Project (Rail) will be visible to viewers along the alignment, with the extent of visual impact depending on several factors, particularly the presence of vegetation or topographical screening and the extent of other development in the area. The rail line is generally at or near ground level and will not be visible except to people within a few hundred metres of the alignment or to viewers looking from above. Trains travelling on the rail line will be visible from greater distances, however with only 14 trains per day, at an average of four minutes per train to pass each viewing location, overall visual impact remains fairly low.

It should also be noted that the alignment passes through landscapes that have already been modified by:

- Vegetation clearing along most of the alignment;
- Presence of roads and powerlines through much of the landscape;
- Railway infrastructure around 300 km to 340 km and 420 km to Abbot Point; and
- Mining activity around 280 km to 300 km.

The area does not include any features of particular landscape significance, nor are there any particularly high visitation areas from which the Alpha Coal Project (Rail) is clearly visible.

Cumulative impacts on the landscape from existing and proposed developments will take the form of further modifications of the agricultural landscape, giving an overall impression of increased development and decreased remoteness.

Mitigation measures for visual impact of linear infrastructure are generally only warranted and practical in areas of particular landscape sensitivity; such areas are not present along the Project alignment or surrounding areas. For developments such as mines, visual impacts can usually be ameliorated by vegetative screening where these are visible to sensitive receptors. Management of cumulative impacts on sensitive receptors will need to be undertaken on a case by case basis to be identified by individual projects. For the Alpha Coal Project (Rail) there are two sensitive residential receptors

identified where mitigation through vegetative screening may be required, at the discretion of the landholder.

Overall cumulative impacts of the Alpha Coal Project and other identified projects on landscape are low. Moderate to high impacts may occur for particular sensitive receptors and may need to be managed individually by each project.

G.6.5 Nature Conservation

G.6.5.1 Terrestrial Ecology

The Alpha Coal Project (Rail) crosses Brigalow Belt and Desert Uplands bioregions. Key ecological features and sensitivities of these bioregions are:

- Brigalow, Bluegrass and Semi-evergreen Vine Thicket threatened ecological communities that are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC);
- Endangered and of concern regional ecosystems that are protected under the *Queensland Vegetation Management Act 1994*; and
- A moderate number of species listed under EPBC and the *Queensland Nature Conservation Act 1993* (NCA). Most of these are vulnerable plants and animals.

These are discussed further in Volume 3, Section 9.2.

From a biodiversity point of view, the most critical terrestrial ecological feature of these bioregions is the presence of threatened ecological communities; Brigalow, bluegrass and semi-evergreen vine thicket and equivalent endangered and of concern regional ecosystems. These ecosystems provide habitat for a range of species listed under EPBC and the *Queensland Nature Conservation Act 1993* (NCA).

Progressive clearing across the two bioregions has led to these ecosystems becoming threatened and hence, a high priority is placed on avoiding further loss. The rail component of the Alpha Coal project will result in direct impacts on 0.5% to 1% of the extent of the three threatened ecological communities. These communities are protected under Federal legislation, and are also protected via the *Queensland Vegetation Management Act* as these correspond to endangered or of-concern regional ecosystems under the Queensland Regional Ecosystem Description Database. The Project also crosses 111 ha of endangered regional ecosystems and 104 ha of concern regional ecosystems.

Alpha Coal Project (Rail) and any other projects disturbing these ecosystems are required to provide offsets, under both the Federal and State legislation. The offsets provided are required to be a larger area than that removed, however there can be a time lag between removal of the vegetation and the offset vegetation reaching the same level of maturity.

For the level of clearing required for the Alpha Coal Project (Rail), this time lag is not significant in terms of availability of remaining habitat to support native plants and animals while offset areas mature. However, if a number of other projects also requiring clearing of these ecosystems all occur in similar timeframes, then this could result in a medium term shortage of these ecosystems that would persist until offset areas had reached maturity. While information on timing of projects being considered in this cumulative impact assessment is limited, it does not appear that significant clearing of these ecosystems will occur in similar locations in the same time frame.

Linear infrastructure such as a rail line can also block movement of reptiles and small mammals, as well as expose animals crossing the rail line risk of being struck by trains. The Proponent has committed to providing fauna crossings at critical locations identified for fauna movement. With a peak of 14 train movements per day, animals will also have reasonable opportunity to cross the rail line. Provided that other rail infrastructure projects take similar measures, cumulative impacts arising from blocking of fauna movement are expected to be minimal.

One species identified in studies, the ornamental snake, has very restricted habitat. This species will be identified and relocated prior to clearing of this habitat, thus avoiding any contribution to cumulative impacts on the ornamental snake.

Based on the assessment methodology given in Section G.3, the significance of the overall cumulative impact on terrestrial ecological values is assessed as moderate in the short and low in the longer term, once offsets have reached maturity.

G.6.5.2 Aquatic Ecology

The most critical aquatic ecological feature along the Alpha Coal Project (Rail) is the National Directory of Important Wetlands listed Caley Valley Wetland at Abbot Point. This wetland is contained entirely within the Abbot Point State Development Area (SDA), and is also adjacent to the existing and proposed port facilities at Abbot Point. The Alpha Coal Project rail alignment crosses the edge of the wetland to the East as do existing rail lines into Abbot Point port, and the rail line proposed by Galilee Coal Project. Although there are no industrial developments currently being progressed within the Abbot Point SDA, this area has been specifically identified by the Queensland State Government for industrial development and it can be expected that such development will occur in the future. The Abbot Point SDA Development Scheme has identified the Caley Valley Wetland as an Environmental Management/Materials Transportation precinct.

The Department of Infrastructure and Planning is currently developing an Environmental Management Plan for the Caley Valley Wetlands. While the content of this plan is not currently available, it can be assumed that this will address management of impacts of development within the SDA, including transportation related development on the wetland and result in imposition of management requirements on proponents undertaking projects in this area.

In the absence of this plan, the Proponent has addressed hydraulic issues by allowing for flows to be maintained under the rail line (refer volume 3, Section 11), and also committed to development and implementation of an Erosion and Sediment Control Plan (refer Volume 3, Section 5). These measures will minimize the contribution of the Project to cumulative impacts on the Caley Valley Wetlands.

With the exception of the Caley Valley Wetland the Alpha Coal Project (Rail) has minimal impact on aquatic ecosystems and biodiversity. Streams crossed by the alignment are generally ephemeral and even where permanent water is present, diversity of species is generally low. This may be attributed to the natural barrier to aquatic animal movements into the upper areas of the Burdekin catchment from the Burdekin Falls, and later, the Burdekin Falls Dam.

Aquatic ecological values of the study area are discussed further in Volume 3, Section 10.2.

Mitigation measures incorporated into the Alpha Coal Project rail component that are important for protecting aquatic ecosystems are hydraulic design criteria allowing for flows to be maintained under the rail line (refer Volume 3, Section 11), and development and implementation of an Erosion and

Sediment Control Plan (refer Section 5). With these measures in place, the Project is not expected to contribute to cumulative impacts on aquatic ecosystems upstream of the Caley Valley Wetlands.

Based on the assessment methodology given in Section G.3, and assuming that a management plan for the Caley Valley wetlands is developed and implemented, the significance of the overall cumulative impact on aquatic ecological values surface water is assessed as low.

G.6.6 Surface Water

The Alpha Coal Project rail component has the potential to release sediment and other contaminants to surface waters during the construction stage. This risk is significantly lower during operation as disturbed areas will be reinstated. As discussed in Section G 6.5.2 the contribution of the Alpha Coal project rail component to overall sediment loads in the Burdekin River is likely to be negligible.

As a long piece of linear infrastructure, the Alpha Coal Project rail component will cross a number of major and minor streams. The railway line and embankments may alter drainage patterns within the catchment and also block or concentrate surface runoff. These effects, either alone or in combination with similar effects from other linear projects and mining projects may result in catchment wide impacts on flows and water quality that may in turn affect aquatic ecosystem health and biodiversity.

A preliminary drainage study has been undertaken for the rail alignment and design criteria have been identified to minimize changes to drainage patterns and hydrology (refer Volume 3, Section 11 and Volume 6, Appendix G). With these measures incorporated into the design of the Project, the Project itself will have little or no impact on hydraulics, and hence will not contribute to cumulative impacts of development on catchment hydrology.

However, although the proposed Alpha Coal Project (Rail) is not itself expected to contribute significantly to cumulative impacts on surface water resources, some of the other projects considered in this cumulative impact assessment do have significant potential for surface water impacts. As a result of this, the significance of the overall cumulative impact of projects in the Burdekin catchment on surface water is assessed as moderate. If the various proponents develop and implement surface water management measures, the cumulative impact can be considered low.

G.6.7 Groundwater

Groundwater related impacts during both construction and operation of the Alpha Coal Project (Rail) are predicted to be minor and localized (refer Volume 3, Section 12). The Project does not overlap with other projects that might impact on groundwater, and hence, cumulative impacts are not expected to be significant.

However, as with surface water impacts, mining projects in the cumulative impact assessment study area may cause groundwater impacts. Without knowing what management measures may be undertaken to manage groundwater related impacts, cumulative impacts on groundwater resources in the study area must be considered moderate. The cumulative impact may be reduced to low if groundwater management measures are identified and implemented by all proponents.

G.6.8 Air Quality

The Alpha Coal Project (Rail) has been assessed as having minimal impacts on air quality. During both construction and operation, air quality impacts are limited to the immediate vicinity of the railway

line and are well within guideline values for protection of human health, crop growth and ecological values.

Although the alignment passes close to some other dust generating projects, particularly Newlands coal mine, dust emissions from the rail component are not expected to overlap with dust emissions from the coal mining activities. Should the Galilee Coal Project rail alignment parallel the proposed Alpha Coal Project (Rail) in any area, combined effects of dust from projects may increase overall exposure of sensitive receptors to dust. Given that predicted dust emissions from the Alpha Coal Project are less than 50% of guideline values, and assuming similar modes of operation for the Galilee Coal Project rail component, cumulative impacts from the two projects are likely to remain within guideline values.

Overall, the rail component of the Alpha Coal Project is not expected to contribute to overall cumulative air quality issues at either a local or regional level. While other projects considered as part of this cumulative impact assessment may have significant localized air quality impacts under some conditions, these are not likely to overlap and the cumulative impact for air quality is assessed as low.

G.6.9 Greenhouse Gas

The rail component of the Alpha Coal Project will contribute to greenhouse gas emissions through:

- Clearing of vegetation;
- Embodied energy in materials used to construct the rail line and associated facilities; and
- Diesel consumption during construction and operation.

A detailed assessment is provided in Volume 3, Section 14.

Greenhouse gas emission data is not available for all of the projects considered in this cumulative impact assessment. Greenhouse gas assessments undertaken at the EIS stage of any project are necessarily limited by lack of information on items such as materials sources and quantities.

Emission targets have not been set for greenhouse gas emissions in Australia and so it is not possible to compare greenhouse gas emissions from the Project with emission targets, or to determine whether emissions from the Alpha Coal Project alone or in combination with other projects affect Australia's ability to meet obligations under the Kyoto Protocol.

The *National Greenhouse Emissions Reporting Act 2007* requires companies emitting more than 50 kt CO₂eq/annum of greenhouse gases to report emissions to the Federal government. Otherwise, there are no legal requirements in relation to greenhouse gas emissions, however a number of voluntary programs exist at Federal and state government levels and within the non-government sector to assist industry to reduce greenhouse gas emissions. HPPL has committed to a number of initiatives to minimize greenhouse gas emissions. Although information on commitments made by other proponents of projects that are part of this cumulative impact assessment is not available, it is expected that other proponents have also made similar commitments.

Without any overall policy context in which to assess greenhouse gas emissions, the cumulative impact rating cannot be assigned.

G.6.10 Noise and Vibration

Noise impact assessments undertaken for both construction and operation of the rail component of the Alpha Coal Project and indicated that noise related impacts are not expected to be discernable beyond five hundred metres of the Project and that noise levels were well within regulatory criteria. Similarly, vibration effects during both construction and operation are not likely to be detectable within 100m of the project. Further information on this assessment is provided in Volume 3, Section 14.

Noise levels from the Project, when combined with noise emissions from other projects may result in elevated noise levels at sensitive receptors. However, the Project alignment does not pass in close proximity to other projects in any locations where there are also sensitive receptors present.

Should the Galilee Coal Project rail alignment parallel the proposed Alpha Coal Project (Rail) in the vicinity of any noise sensitive receptors, combined noise effects may result in noise levels at sensitive receptors exceeding guideline limits. Should this occur, the two proponents may need to work together to address noise amelioration for sensitive residential receptors.

The Project is not expected to have discernible vibration impacts.

Overall, the Project is not considered to contribute to cumulative noise impacts. As noise impacts from most projects considered in this cumulative impact assessment are not likely to overlap, the overall cumulative impact is considered low.

G.6.11 Social and Community

G.6.11.1 Overview

The Alpha Coal Project (Rail) is one of a number of projects that represent development of the previously undeveloped Galilee Basin coal deposits. The Alpha Coal Project and Kevin's Corner Project are proposed to be served by the Alpha Coal Project (Rail) and the Galilee Coal Project (Waratah) is also proposing a rail link to Abbot Point.

For the initial 250 km of the Alpha Coal Project (Rail), the alignment passes through large pastoral landholdings in areas that have not previously been developed for mining. Hence, landholders in this area have not been exposed to development of this type and the develop will contrast strongly with current land use and development patterns.

From approximate 250 km to about 380 km, the alignment crosses the northern Bowen Basin, an area which has active mining as well as rail infrastructure connecting these mines to Abbot Point port facilities. The final section of the Project passes through pastoral areas, however these areas are crossed by major linear infrastructure including the Bruce Highway, the main North-South railway line and the Newlands-Abbot Point rail line.

The Social Impact Assessment conducted for the Alpha Coal Project (Rail) identified adverse social impacts associated with the Project as follows:

- Uncertainty and associated anxiety and stress, particularly during the feasibility stages, regarding the alignment and potential impacts of the project on land use and individual landholdings and concerns about property value;
- Construction related impacts such as noise, dust, traffic, presence of construction workforce, labour shortages (or difficulty competing with wages offered by construction contractors); and

- Ongoing operational impacts associated with property severance and associated difficulties in working properties, land use changes, property value changes, traffic hazards, impacts on stock and crops, labour shortages, increased population and demand for services (refer Volume 3, Section 20.6).

Potentially positive impacts are also identified as follows:

- Employment and business opportunities, increased economic activity;
- Improved services in response to increased population; and
- Cash compensation in relation to easement acquisition.

Although social impact assessments from most other projects identified as relevant to this cumulative impact assessment are not available, it can be expected that similar impacts will arise.

G.6.11.2 Increased Accident Risk

Mining and infrastructure projects have the potential to expose members of the community to increased risk from introduction of additional hazards such as vehicle accidents. This is discussed further in Section G.6.15.

G.6.11.3 Change in Land Use and Agricultural Productivity

For the initial 250 km of the Alpha Coal Project (Rail), the alignment passes through pastoral landholdings in areas that have not previously been developed for mining. Hence, landholders in this area have not been exposed to development of this type and will experience quite significant changes in land use and development patterns.

From approximately 250 km to about 380 km, the alignment crosses the northern Bowen Basin, an area which has active mining as well as rail infrastructure connecting these mines to the Port of Abbot Point. The final section of the Project passes through pastoral and farming areas which are also crossed by major linear infrastructure including the Bruce Highway, the main North-South railway line and the Newlands-Abbot Point rail line. From 465 km to the Port of Abbot Point the rail corridor is within the Abbot Point State Development Area.

The proposed Galilee Coal Project also includes a rail line linking the Galilee Basin to Abbot Point. Current information on this rail line from the Department of Infrastructure and Planning website indicates that the alignment will not be dissimilar to that proposed for the Alpha Coal Project (Rail), and particularly will result in new infrastructure in previously pastoral areas of the Galilee Basin. However, the Waratah Coal website shows a different alignment running east-west to a new port facility at Shoalwater Bay, in which case there would be no overlap of the two projects.

Should both rail lines cross the same landholding, impacts on workability of properties will be exacerbated, as will risk of exposure to hazards such as traffic and train accidents (see also G.6.15). The Alpha Coal Project (Rail) intends to continue consulting with landholders to minimize impacts on workability of agricultural properties. As both projects are subject to the same land acquisition process, it can be assumed that landholders will have the opportunity to negotiate with both Proponents in relation to optimal alignments to minimise impacts, stock and vehicle crossing points and other measures to minimize impacts on landholders. Landholders will also have the opportunity to negotiate a compensation package in relation to the easement acquisition which is intended to offset impacts on agricultural properties.

Change in land use in terms of loss of GQAL is discussed in Section G.6.2. Air quality and noise impacts associated with the changed land use are discussed in Sections G.6.8, G.6.9 and G.6.10 respectively.

However, there is another dimension associated with land use changes that relates to the perceptions and feelings of individuals and communities to these changes. While difficult to quantify, this change in land use may in turn affect people's sense of connection to place and pride in their properties. For the first 250 km of the proposed Project, non-agricultural development has been very limited to date.

Significant land use changes will occur if the proposed Galilee Basin coal mine projects and associated infrastructure go ahead, and over time, the Galilee Basin will become more like the Bowen Basin to the east that already has mining development and associated infrastructure.

Within the Bowen Basin, some properties are already affected by mining related infrastructure, hence the contrast between existing and new land uses may be less marked. However overall conflicts between mining infrastructure land use and agricultural land use will remain.

This impact is difficult to mitigate, since individuals will react differently in this regard. Some may welcome development-related land use changes because of associated economic benefits at a local or regional level, while others may find the changes personally distressing and also be affected by difficulties in carrying out agricultural activities on lands affected by infrastructure.

Overall cumulative social and community impacts in relation to changed land use and impacts on agricultural land use are assessed as moderate.

G.6.11.4 Employment Opportunities and Demographic Changes

The Alpha Coal Project (Rail) is expected to result in a population increase at the Abbot Point end of the alignment associated with permanent workers required for operation and maintenance of the rail facility. These increases are predicted to be up to about 350 persons (workers and families) by 2020, and it is assumed that most will reside in Bowen or surrounding areas. In addition, the Project will require fly in/fly out workforce of about 120 to undertake track maintenance; these workers will live in permanent accommodation camps along the Project alignment when on roster.

Other potential population increases in the area may arise from:

- Proposed coal mining projects in the Galilee Basin in the vicinity of Alpha and Jericho. It is likely that the bulk of the workforces for these projects will be fly in/fly out, but local businesses servicing the proposed mines may have permanent workforces residing in Alpha, Jericho and other nearby areas, additionally some workers at the mine may choose to live locally;
- Proposed rail line linking the Galilee Coal Project to a port at Abbot Point. Staffing levels and arrangements are likely to be similar to that proposed for the Alpha Coal Project (Rail), hence if the rail alignment connects to the Abbot Point port facilities, a similar population increase in Bowen is likely;
- Development of new coal mines in the northern Bowen Basin in the vicinity of the proposed rail alignment, including Drake Coal and Eaglefield expansion. Current arrangements for mines in this area are for fly in/fly out or drive in/drive out workforces. Some workers on existing mines in the northern Bowen Basin reside in Bowen and surrounding areas and it can be assumed that new mines may also result in some increase in resident population in Bowen and to a smaller extent, Collinsville. Other workers may reside in larger centres such as Townsville and Mackay. Benefits

from increased employment opportunities may be widespread across Queensland and Australia; and

- Other identified infrastructure projects such as the port developments at Abbot Point, transmission line, rail and road upgrades are likely to have large construction workforces that will be accommodated in temporary construction camps. In the case of the Abbot Point port expansion projects, there will be a small increase in permanent workforce and it can be expected that these workers and their families would reside in Bowen. Other infrastructure projects may also result in small increases in operation and maintenance crews operating at a regional level.

On the basis of the above assessment, population increases may occur in Bowen and surrounds and to a lesser extent in Alpha/Jericho and surrounds as a result of the cumulative impacts of projects. The Alpha Coal Project (Rail) component will contribute to population growth in Bowen and surrounds but will have minimal effect on permanent populations in Alpha, Jericho, Collinsville or other locations along the proposed alignment.

Accurate information is not available for all projects to allow an estimate of total population increase to be developed, however these population increases may be significant (i.e. more than 5%) taking into account the current populations of these towns, and existing population growth rates. Population growth in Barcaldine Regional Council is static, while population growth in Whitsunday Regional Council is similar to the State average at 2.6% per annum (refer Volume 3, Section 20). Consultation with Barcaldine Regional Council for the Social Impact Assessment (Volume 6, Appendix K) identified that there were physical and infrastructure limitations in Alpha township that would preclude significant additional population growth, particularly in relation to availability of a reliable water supply.

While employment opportunities are generally considered to be positive, one possible effect of the various projects may be to create a shortage in available labour at a local or regional level. This may either be due to restrictions in the overall labour force or because local businesses, and particularly agricultural businesses, cannot match wages and conditions offered by mining related jobs. Unemployment rates in Barcaldine and Isaac Regional Councils are very low, at 2.8% and 1.4% respectively for the March 2010 quarter (OESR). Unemployment in the Whitsunday Regional Council is 6.3%, slightly above the Queensland average of 5.6 % for the March quarter, however this probably reflects a higher proportion of travellers and unemployed people congregating at seaside locations such as Airlie Beach, rather than an actual shortage of employment opportunities in the area. This data indicates that there is a potential shortage in available labour in the project area.

Potential cumulative impacts of population growth on community services and facilities are discussed in Section G.6.11.5.

Cumulative impacts on population and employment are assessed as being low overall, however it should be noted that there is potential for shortage of labour and/or increased labour costs to be quite significant at a local level for individual landholders and small businesses.

G.6.11.5 Community Services and Facilities

The social impact assessment study for the Alpha Coal Project (rail) identified that lack of availability of community services and facilities was already a significant issue in Barcaldine Regional Council. Bowen township is better serviced in terms of health, educational, recreational and other community services and facilities although a community infrastructure gap analysis has indicated shortages in:

- Health care and aged population services.

- Services targeted at non-residential workers (within and outside the mining industry) and tourists.
- Family oriented services and family support services.
- Training (SGS Economics and Planning, April 2010).

As identified in Section G.6.11.4, the Alpha Coal Project (Rail) has the potential to contribute to population growth in Bowen but is unlikely to result in any significant resident population changes at any other locations.

Population growth can affect community services and facilities in two ways:

- May place additional strain on those services that are available, reducing access to existing services for the population generally and potentially leading to cost increases for private sector services.
- Provide a “critical mass” that then provides a driver for provision of increased services or levels of service.

A needs analysis of housing and community infrastructure in the Bowen/Collinsville area has been undertaken by SGS Economics and Planning, on behalf of Whitsunday Regional Council and Department of Infrastructure and Planning. The study identifies future requirements to meet anticipated population demand from projects currently being planned for the area but does not make any commitments for provision of these services. This may be appropriate at this time as most projects remain in the feasibility stage with no firm commitment to construct.

With no intervention, cumulative impacts of population increases from the various projects considered in this cumulative impact assessment on community services and housing affordability may be moderate. The Alpha Coal Project (Rail) is only expected to contribute to impacts in the Bowen area.

If a program for development of the community infrastructure needs identified in SGS Economics and Planning (April 2010) is implemented, cumulative impacts in the Bowen area will be neutral or positive, as existing temporary and permanent residents may have improved access to certain services.

G.6.11.6 Accommodation

For most projects, construction workforces will be housed in temporary accommodation camps and will operate on a roster basis, being flown out of the area when not on roster. The operation workforce of most mines and some other projects will also be on the same basis, while there will be some resident workers either directly employed by the projects, or employed by businesses servicing the projects.

As identified in Section G.6.11.6, the operational phase of the Alpha Coal Project (Rail) can be expected to create additional demand for housing in Bowen and surrounding areas, but is unlikely to have any significant impact on Collinsville, Alpha, Jericho and other towns proximal to the Project. Other projects identified in this cumulative impact assessment will also increase housing demand in the Bowen area, and to a much lesser extent Collinsville, Alpha and Jericho.

Whitsunday Regional Council has identified that housing availability and affordability is an issue in Bowen and Collinsville and Barcaldine Regional Council identified constraints to further population growth in Alpha township, based on availability of a reliable water supply and provision of services (see also Volume 3, Section 20.3.2).

A study by SGS Economics and Planning looked into accommodation issues in the Bowen and Collinsville area (SGS Economics and Planning, April 2010). The study identified housing needs and provided a number of “possible solutions and recommendations” for meeting both temporary and permanent worker accommodation needs. The study also recognises the need to continue to provide a range of housing options for existing residents to maintain affordability.

Similar studies have not been carried out for Isaac Regional Council and Barcaldine Regional Council.

As with community infrastructure and facilities, it will be difficult for responsible state and local government agencies to make firm commitments in relation to accommodation requirements until it is confirmed whether or not currently planned projects are to proceed.

Cumulative impacts in relation to accommodation requirements in the Whitsunday Regional Council area are considered to be low, provided forward planning continues to take place as identified in the Accommodation and Community Infrastructure Study (SGS Economics and Planning, April 2010).

Cumulative impacts from planned projects in Barcaldine and Isaac Regional Councils may be moderate, particularly due to some significant constraints to residential development in Alpha; however the Alpha Coal Project (Rail) is not expected to contribute significantly to cumulative impacts in Barcaldine or Isaac Regional Councils.

G.6.12 Traffic and Transport

The Alpha Coal Project (Rail) will generate significant traffic during construction, with increases of up to 12 light vehicles and 48 heavy vehicles per day on the Bruce Highway (Proserpine to Ayr). During construction, traffic volumes on the Suttor Development Road are expected to increase temporarily by up to 20%, while a 7% increase is predicted on the Gregory Development Road (Clermont-Belyando). Traffic increases on the Bruce Highway are predicted to be 1-2%.

Operational impacts from the Alpha Coal Project (Rail) are low, largely consisting of several busses and light vehicles per week transporting workers from permanent accommodation camps to airports at Emerald, Alpha and Proserpine.

Of the projects included in this Cumulative Impact Assessment will also contribute to increases in traffic on many of the roads affected by the Project on a both a temporary basis during construction and a permanent basis during operation. Although detailed analysis of combined traffic volumes has not been undertaken, cumulative impacts may arise from:

- Overlap of construction traffic between the Project and the Galilee Coal Project Rail Line, assuming this rail line follows a similar alignment as the Project. In some locations, traffic associated with the Northern Missing Link/Goonyella to Abbot Point rail upgrade project might also interact. Cumulative traffic impacts from the two projects will occur during construction only; operational traffic is minimal.
- Additional construction traffic on the Bruce Highway associated with port developments at Abbot Point as well as projects such as Water for Bowen and the Burdekin Bridge/Bruce Highway realignment.
- Additional operational traffic on the Bowen Developmental Road associated with mine development for the Drake Coal Mine and Eaglefield Extension.

Information on other projects is not detailed enough to perform any quantitative analysis of cumulative traffic numbers.

In addition to increased traffic volumes, the linear infrastructure projects will each require some temporary lane closures or possibly diversions or detours to allow construction across existing roads.

Cumulative effects on traffic from projects have several potentially major implications for road users:

- Risk of traffic accidents may increase;
- Delays to road users may occur; and
- Pavement damage may occur due to increased traffic levels.

Where construction phases of projects overlap and give rise to cumulative impacts, this can be managed through traffic management plans. Each traffic management plan will need to focus on maintaining safe road conditions and may need to take into account increased traffic levels from other projects, as well as any nearby activities being undertaken by other projects. Provided each individual traffic management plan is adequate in this regard, the effects of construction traffic and road works on safety will not be cumulative.

Where temporary road closures, detours or diversions are required, delays to motorists may be able to be further minimised if proponents work together to minimise delays on road users. This can be coordinated through involvement of relevant Regional Councils and Transport and Main Roads in preparation of traffic management plans.

During the operation phase of the Alpha Coal Project (Rail) and other rail projects identified, the main traffic impact will relate to crossings of existing roads. For the Alpha Coal Project (Rail), grade separated crossings are proposed at all major road crossings. It is anticipated that this will be the case for all other rail projects, hence cumulative impacts on major roads are not anticipated.

Level crossings are proposed on minor roads. For the Galilee Coal Project rail line, depending on the final alignment, the combined effects of the Galilee Coal Rail Project and Alpha Coal Project (Rail) may be that some local roads have several level crossings in close proximity. However, these are mostly remote rural roads with low traffic levels and overall impacts on road users are not likely to be significant, provided that the crossings have appropriate signals and safe lines of sight on approaches. For the Northern Missing Link/Goonyella Abbot Point Upgrade project the two projects cross Cerito Road at the same location, otherwise, the two alignments do not affect common stretches of road.

Operations phases of other projects identified in this cumulative impact assessment are not expected to rely heavily on roads that are crossed by level crossings.

Overall, cumulative impacts associated with construction traffic are low, provided that each proponent develops and implements a comprehensive traffic management plan.

Cumulative impacts associated with operations are also expected to be low.

G.6.13 Waste

The most significant wastes that will be produced by the Alpha Coal Project (Rail) are vegetation waste and potentially excess spoil during construction. Other construction and operation wastes are minor in quantity. Hazardous wastes will consist of waste oil and oily waste from vehicle and

equipment maintenance, and will be minor in quantity. Waste generation from the Alpha Coal Project (Rail) is further discussed in Volume 3, Section 16.

Significant cumulative impacts in relation to waste generation and management can occur where multiple projects generate wastes that, in aggregate, exceed the waste management capacity of a region, either because of the volume or characteristics of the waste.

Of the projects identified for this Cumulative Impact Assessment:

- All will produce small to medium amounts of waste oil and oily waste. Waste oil recycling services are available through several major waste contractors operating in Townsville and throughout the region.
- Other hazardous wastes such as acid generating rock and tailings from mining activities will be managed within each mining lease
- All projects have the potential to generate moderate to large quantities of vegetation waste. For most projects, this waste is retained and reused in rehabilitation and is not likely to pose any significant waste management issues at a regional level.
- All projects have the potential to produce waste spoil. Given soil characteristics in the region some of this spoil may include soils that are difficult to manage due to either dispersive or “shrink/swell” properties. If not properly disposed of, these soils could erode, resulting in releases of sediment to waterways (see also Section G 6.6). The Alpha Coal Project will address this issue in detailed design, aiming for a cut/fill balance where practicable. Achieving this has cost benefits for the project as it reduces costs associated with importing fill material, and also disposal costs. This incentive will also encourage other linear infrastructure projects to minimise generation of waste spoil. For mining projects, waste spoil can be retained on site.

Queensland has well established legislation in relation to waste management, and a mature private sector waste management industry. It is unlikely that any of the wastes that may be generated by projects in the area will not be able to be managed within regulatory requirements.

Overall, cumulative impacts in relation to waste management are expected to be low.

G.6.14 Cultural Heritage

G.6.14.1 Indigenous Cultural Heritage

In Queensland, projects involving disturbance to previously undisturbed areas must take appropriate steps to avoid or manage impacts on cultural heritage places or items that may be identified during the course of the project. The appropriate mechanism for this is to prepare a Cultural Heritage Management Plan (CHMP). The *Aboriginal Cultural Heritage Management Act 2003* and associated guidelines set out processes for this, with the most fundamental component of the process being that assessment of significance of Aboriginal cultural heritage and determination of subsequent management and mitigation measures is undertaken by relevant Aboriginal parties.

This process has advantages in terms of cumulative impacts as it allows the relevant Aboriginal parties to be involved in assessment all major projects taking place within their domain.

Surveys undertaken as part of this Project as well as previous studies in the area have identified a wide range of Aboriginal cultural heritage material in the vicinity of the Project. Assessment of the

significance of this material is at the discretion of relevant Aboriginal parties and management of disturbance to this material will be through a CHMP.

Where Aboriginal cultural heritage material is disturbed or destroyed by multiple projects, this can result in an overall degradation of cultural material that may be important to Aboriginal people in maintaining and understanding their relationships to country, as well as loss of scientific, archaeological and anthropological information.

The CHMP process allows for this impact to be mitigated to some extent by collection of material and information such that the material itself, and the information that it conveys is not lost, even if the cultural heritage context is changed. Provided that this process is applied to all major projects being undertaken in the region, cumulative impacts can be managed and are assessed as being low.

G.6.14.2 Non Indigenous Cultural Heritage

The area traversed by the Project was explored and settled from the 1850s. Since then, non-indigenous uses of the area have included pastoral activities and mining. Evidence of these activities and associated infrastructure is apparent across the region (Refer Volume 3, Section 19).

The Alpha Coal Project (rail) and other projects in combination have the potential to gradually destroy this evidence, thus reducing overall knowledge and understanding of non-indigenous settlement and use of the land. At a general level, this impact is mitigated by collection of information through historical and archaeological studies. However, the specific context of sites can also be of value to individuals seeking to relate to the historical landscape on a personal level.

The Project will pass close to several sites of non-indigenous cultural heritage significance and further work is proposed in the detailed design stage to better understand these sites and develop measures to avoid or manage impacts. Other projects being undertaken across the region may also impact on sites of non-indigenous cultural heritage, including both known sites and currently unknown sites that may be exposed by excavation. For infrastructure projects, it should generally be possible to avoid direct impacts, however for mine projects, the location of the target resource is fixed and impacts may not be able to be avoided.

As the Alpha Coal Project (Rail) is not currently assessed as having significant direct impacts on places or items of non-indigenous cultural heritage significance, the Project itself is not considered to contribute to cumulative impacts on non-indigenous cultural heritage significance.

G.6.15 Hazard and Risk

The proposed Alpha Coal Project (Rail) will present certain hazards to the community and the environment during both construction and operation. These hazards, in conjunction with existing hazards and hazards presented by other proposed projects may increase overall risk of environmental incidents or accidents involving community members.

A hazard and risk assessment for the Project was undertaken and is presented in Volume 3, Section 24. Most hazards identified have a low risk rating and can be readily managed such that these hazards are not likely to combine with other non-project related hazards to increase environmental and community exposure to risk.

The most significant hazards identified related to traffic incidents, both during construction and in the operation phase. For the Alpha Coal Project (Rail), the hazard and risk assessment identified that,

with design and management measures, The risk of accidents and incidents involving members of the community was moderate to low.

Other projects identified in this cumulative impact assessment may also present increased risk of traffic accidents as discussed in Section G 6.12. The cumulative impacts are assessed as low, provided that each proponent implements traffic management plans and that designs conform to Australian Standards and guidelines.

Overall, the cumulative impacts of the Alpha Coal Project (Rail) and other related projects on exposure of the community or environment to increased levels of risk are expected to be low.

G.6.16 Economics

Cumulatively, economic impacts from the Alpha Coal Project (Mine) and other identified projects in the Barcardine, Isaac and Whitsunday Regional Council areas will contribute to ongoing economic growth in Queensland and Australia. Overall effects of new mining projects must be offset against older mining projects that are approaching closure, however, net growth in economic activity and employment would still be expected.

The economic importance of the Alpha Coal Project (Rail) relates not only to its own economic impacts, but to its importance in facilitating development of coal resources in the Galilee Basin. Economic impacts associated with the mine component are discussed in Section G 5.13.

At a regional level, the economic assessment undertaken for the Alpha Coal Project (Rail) identified that the labour market in the immediate vicinity of the Project was quite constrained, with existing high participation rates and low unemployment. The exception to this is Bowen, where unemployment is slightly higher than the State average, however this may be a demographic issue rather than a reflection of a shortage of job opportunities. Businesses in the study area are largely associated with agricultural activity, and to a lesser extent mining activity. Overall, it is unlikely that significant labour or goods and services will be available from within the regional economy. This will limit the magnitude of overall cumulative economic benefits from the projects at the local and regional level. A further implication of the local and regional labour market is that labour shortages may arise. This is discussed further in Section G.6.11.4.

Conversely, the local and regional population will bear negative impacts associated with the various projects covered in this cumulative impact assessment, unless identified mitigation measures are implemented.

In the medium to longer term, it can be expected that the local and regional economies will adapt to the changes in economic activities that will arise from development of the Galilee Basin and associated infrastructure as well as other projects identified in this cumulative impact assessment. However, in the short term, labour shortages and associated increased labour costs, together with increased demand for goods and services in both the private and public sector may result in negative impacts on local residents and businesses.

Projects covered in this cumulative impact assessment will largely operate with fly in/fly out workforces which will limit impacts on local workforces (see also Section G.6.11.4). However, some further intervention may be required to assist local and regional economies to maximise benefits from the various projects as well as minimise adverse impacts.

Overall, cumulative economic benefits of the project are expected to be positive at a State and national level, and may be low negative to low positive at a local and regional level, depending on the extent to which adverse impacts arising from economic growth are managed and coordinated.

G.7 Rail Cumulative Impacts Summary

A summary of the cumulative impacts resulting from the development of the Alpha Coal Project (Rail) are provided in Table G-17. The most significant cumulative impacts associated with the development of the Alpha Coal Project (Rail) relate to sterilisation of coal resources, changes in land use, impacts on agricultural activities, loss of significant vegetation and habitat (prior to offsets being provided) and potential labour shortages. The Proponent’s management strategies in relation to these impacts include:

- Optimisation of the Project alignment to minimise impacts on known coal resources;
- Landholder Compensation Packages;
- Provision of offsets for significant vegetation and habitat; and
- Utilisation of a fly in/fly out workforce for construction and some aspects of operation.

Table G-17: Summary of Cumulative Impacts – Alpha Coal Project (Rail)

Environmental Value	Alpha Coal Project (Rail)
Land Use	Medium
Land	Medium - Low
Landscape Character	Low
Nature Conservation	Low
Surface Water	Low
Groundwater	Low
Air Quality	Low
Greenhouse Gas Emissions	Low
Noise and Vibration	Low
Social and Community	Low
Traffic and transport	Low
Waste	Low
Cultural Heritage	Low
Hazard and Risk	Low
Economics	Low