Waratah Coal
THE NEW ENERGY IN COAL

Waratah Coal

Updated Cumulative Impact Assessment

China First Coal Project – Galilee Basin

March 2013

Waratah Coal Pty Ltd • GPO BOX 1538, Brisbane Q 4001 • www.waratahcoal.com

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ACRONYMS AND ABBREVIATIONS

ACP	Alpha Coal Project
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
CC	Carmichael Coal Mine and Rail Project
CHMP	Cultural Heritage Management Plan
CIA	Cumulative Impact Assessment
CO_2	Carbon Dioxide
DNRM	Queensland Department of Natural Resources and Mines
EIS	Environmental Impact Statement
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GCP	Galilee Coal Project (Northern Export Facility)
GHG	Greenhouse Gas
KC	Kevin's Corner Project
km	Kilometres
Mtpa	Million tonnes per annum
OCG	Queensland Office of the Coordinator-General
PM_{10}	Respirable particles of dust have an aerodynamic equivalent diameter of 10 microns or less
$PM_{2.5}$	A finer fraction subset of PM_{10}
RE	Regional Ecosystem
SEIS	Supplementary Environmental Impact Statement
SGCP	South Galilee Coal Project
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SEWPAC	Sustainability, Environment, Water, Population and Communities
t CO_2-e/yr	Tonnes of Carbon Dioxide equivalent per year
TEC	Threatened Ecological Community
TSP	Total Suspended Particles
VMA	Queensland *Vegetation Management Act 1999*

1 INTRODUCTION

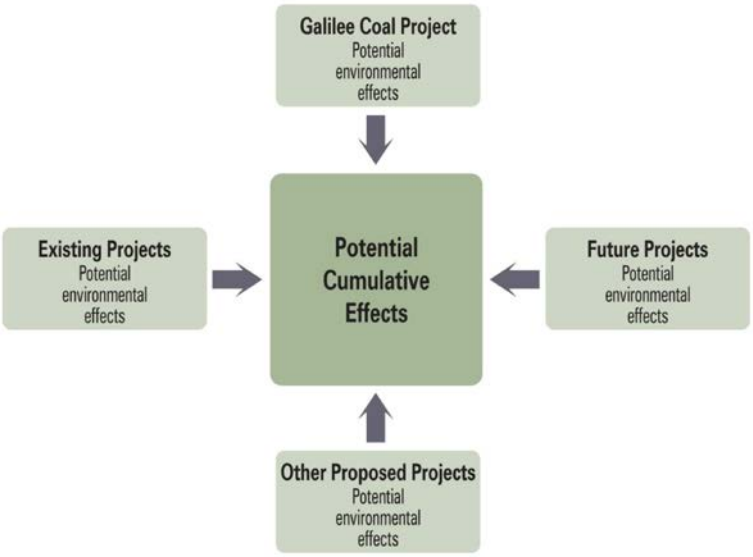
The Terms of Reference for the EIS requires Waratah Coal to undertake a Cumulative Impact Assessment (CIA) that provides clear and concise information on the cumulative effects of the project, and to discuss the interrelationship of these impacts with other existing and proposed projects.

The concept of cumulative impacts can be generally considered to be the situation whereby two or more individual effects which, when considered together, compound or increase other environmental impacts. Cumulative impacts, either positive or adverse, can result from singularly minor but collectively significant actions taking place over a period of time. These impacts can occur at either the local level or with a broader regional context.

The International Finance Corporation defines cumulative impacts as "the combination of multiple impacts from existing projects, the proposed project, and/or proposed projects that may result in significant adverse and / or beneficial impacts that would not be expected in case of a standalone project". The US Council on Environmental Quality defines cumulative effects as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions."

Each definition introduces the concept that sound Environmental Impact Assessment (EIA) considers the potential impacts from a project as part of the quantum of potential impacts from other known temporally and / or spatially related actions rather than as an isolated action. A schematic showing the CIA approach is shown in Figure 1.

Figure 1. Cumulative Impact Assessment Concept Schematic



This concept has been adopted by Waratah Coal throughout the preparation of the EIS and the consideration as to the potential cumulative environmental affects arising from the project.

It is also recognised that there is a potential for consequential impacts as a result of the interaction of the project with other existing, proposed or future projects. Consequential impacts are generally indirect impacts which arise as a consequence of the project. Assessments undertaken to address cumulative impacts and propose subsequent mitigation measures, will aim to minimise any consequential impacts as a result.

1.1 Aim

The aim of this CIA is to identify and assess the potential cumulative and consequential impacts that may be contributed to by the Galilee Coal Project (Northern Export Facility) and other proposed projects within the region.

1.2 Methods

The methodology used to assess the cumulative impacts is as follows:

1. Review of the potential impacts of the Galilee Coal Project as a standalone project (as detailed in the EIS and SEIS).
2. Identification of relevant projects that are either proposed, or have recently been approved but not yet constructed, that are located within the general vicinity of the Galilee Coal Project.
3. Review the cumulative impact assessments (where in existence) for the projects that have been identified as being of relevance for the CIA.
4. Determine the impacts of the project that have potential to interact and aggregate in time and space with those of other projects.
5. Define an appropriate spatial boundary for the analysis of cumulative impacts. Where operational schedules do not overlap, the likelihood of significant cumulative impacts is less. The spatial extent of the assessment boundaries varies according to the type of impact being assessed.
6. Define the appropriate temporal boundary for the analysis of cumulative impacts. The greater the distance between projects, the lower the likelihood of significant cumulative impacts. The temporal extent of the assessment boundaries varies according to the type of impacts being assessed.
7. Assess the cumulative impacts of the project using the matrix shown in Table 1.
8. Assess the significance of the cumulative impacts using the significance criteria detailed in Table 2.

In assessing cumulative impacts, Waratah Coal has adopted a conservative approach to their considerations. For example, the Cumulative Impact Assessment has assumed that the timing of the construction of the assessed projects will be concurrent with the project. Whilst this is not necessarily the case in reality, the assumption of concurrence has allowed a conservative approach to impact assessment.

Table 1. Cumulative Impact Assessment Matrix

ASPECT	RELEVANCE FACTORS		
	Low	Medium	High
Probability of cumulative impact	1	2	3
Duration of cumulative impact	1	2	3
Magnitude/intensity of cumulative impact	1	2	3
Sensitivity of receiving environment, significance of environmental or social values	1	2	3

Table 2. Cumulative Impact Assessment Significance Criteria

IMPACT SIGNIFICANCE	SUM OF RELEVANCE FACTORS	CONSEQUENCE
Low	4-6	Negative impacts may occur but can be managed by each proponent via standard environmental management practices. Special approval conditions are likely to be unnecessary. Monitoring to be part of a general monitoring program.
Medium	7-9	Mitigation measures are likely to be necessary and specific management practices to be applied. Special approval conditions are likely. Targeted monitoring program is required.
High	10-12	Alternative actions should be considered and/or mitigation measures applied to demonstrate improvement. Collaboration with other proponents/parties may be required to monitor and manage impacts. Specific approval conditions will be required. Targeted monitoring program is necessary.

The relevance factors used to determine the impacts on Table 1 are based upon professional judgement, past experience with similar projects and understanding of the impacts of the project as presented in the EIS and the SEIS. The sum of the relevance factors determined the significance of the impact as detailed in Table 2.

2 PROJECTS CONSIDERED

2.1 Overview

In the CIA included in the EIS, the following eight projects were included in the assessment:

- Isalink High Voltage Direct Current Transmission
- **Alpha Coal Mine**
- **Galilee Basin Power Station**
- **Kevin's Corner**
- Abbot Point Multi Cargo Facility
- **South Galilee Coal Project**
- Abbot Point Terminals 2 and 3 Expansions
- Drake Coal Project

Since the CIA included in the EIS, the Isalink High Voltage Direct Current Transmission Project has been placed on hold, and the significant project declaration status was repealed by the Queensland Coordinator General on 24 September 2012. As such, this project has not been considered in this updated CIA.

The EIS also proposed a port component; hence the assessment of cumulative impacts with reference to the port component of the project included assessments of the Abbot Point Multi Cargo Facility and Abbot Point Expansion project. As Waratah Coal no longer propose a port as part of this project, an assessment of cumulative impacts at the port is no longer required, as these will be the subject of the assessment for whichever port facility Waratah Coal chooses to utilise for the coal from the Galilee Coal Project. However, the port facilities are considered in this assessment from a consequential impacts standpoint.

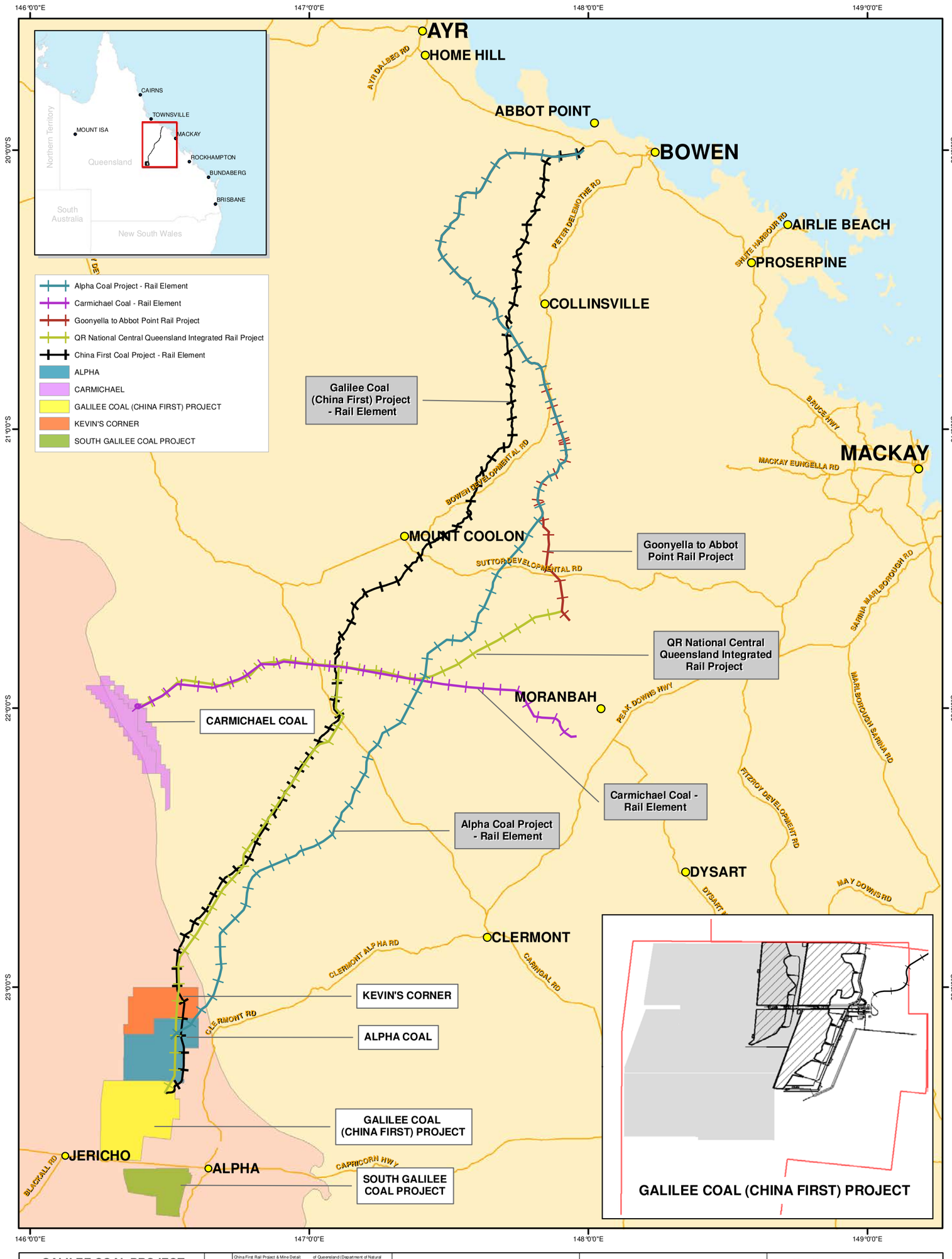
The Drake Coal Project has also been eliminated from this revised CIA as the revised CIA has focused on other proposed mining and consequential projects in the Galilee Basin that are currently under investigation, or expected to commence operations in the near future.

2.2 Mining Component

This revised CIA has focussed on projects in the Galilee Basin as these projects have similar sizing, timing and infrastructure requirements as the Galilee Coal Project. Key issues that were considered were the geographical overlap of one or more of the projects, and the extent to which the inter-relatedness of these projects resulted in creating a significant impact on the environmental values. These environmental values include built, natural social and cultural attributes within the project area of influence.

Hence, for the purposes of the CIA of the mining component of the project, the potential environmental, social and economic cumulative and consequential impacts of other Galilee Basin projects are considered most relevant. Also, there is real potential for minimisation of cumulative impacts given the 'greenfield' nature of the Galilee Basin.

The following mining projects within the Galilee Basin have been considered (see Figure 2).



GALILEE COAL PROJECT
(Northern Export Facility)

Waratah Coal
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Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	China First Rail Project & Mine Detail: of Queensland (Department of Natural Waratah Coal Pty. Ltd. 2012 Resources and Mines) 2013 Other Rail Projects: The State of Galilee Basin Boundary: State of Queensland (Department of State Queensland (Department of Natural Development, Infrastructure and Planning) Resources and Mines) 2013 2010 - 2012 Drainage Basins, EPC, MDA & ML: State
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File:WAR20-26-SEIS0096a-FIGXXa-CUMULATIVE-IMPACTS-130311

0 10 20 30 40 50
Kilometers
A3 Scale 1:1,300,000
Coordinate System: GCS GDA 1994

Arterial Road
Galilee Basin

LOCATION OF RELEVANT PROJECTS

Figure 2. Location of Relevant Projects considered in the Cumulative Impact Assessment

2.2.1 SOUTH GALILEE COAL PROJECT (EPBC 2009/4737)

AMCI (Alpha) Pty Ltd (AMCI) and Alpha Coal Pty Ltd (Bandanna Energy) are seeking to establish a new coal mine on two of their exploration tenements in the Galilee Basin in Queensland. The proposed South Galilee Coal Project (SGCP) will produce up to 19 Million tonnes per annum (Mtpa) of high volatile, low sulphur thermal coal for export to international markets.

The SGCP is a proposed open-cut and underground coal mining operation with an estimated mine life of approximately 35 years (2 years for construction, 33 years for operations). Over the life of the mine, the SGCP aims to produce approximately 447 Million tonnes of product coal for the export market.

This project was declared to be a significant project requiring an EIS under the State Development and Public Works Organisation Act 1971 (SDPWO Act) and also a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The SGCP is located approximately 12km south-west of the township of Alpha, or approximately 170km west of Emerald and 450km west of Rockhampton in Central Queensland.

The EIS was lodged in October 2012. The Coordinator-General is currently deciding whether supplementary information to the EIS is required.

2.2.2 ALPHA COAL – MINE ELEMENT (EPBC 2008/4648)

Hancock Prospecting Pty Ltd (Hancock) proposes to establish the Alpha Coal Project (ACP), which includes an open cut coal mine in the Galilee Basin, Central Queensland, to service international export energy markets for thermal coal.

Hancock's proposal involves the development of the following:

- A coal mine and processing plant located in the Galilee Basin, 40km north-west of Alpha, central Queensland
- A mine-to-port railway to transport processed coal to an export terminal at Abbot Point (see below)
- Associated infrastructure, including an airport near the mine site and power and water supply infrastructure

This project was declared to be a significant project requiring an EIS under the SDPWO Act and also a controlled action under the EPBC Act.

The mine will initially be a 30Mtpa open cut coal mine, with the potential for developing significant underground reserves. The coal will be treated by a coal preparation plant and conveyed to a rail load-out facility. It is expected that the coal will be railed to the Port of Abbot Point for export.

Initially all product coal is planned for export, however domestic use will be explored. The project has an expected mine life of 30 plus years, with sufficient Joint Ore Reserves Committee (JORC) compliant resources to significantly extend the Project life beyond 30 years. The rail facility will be designed to transport coal at a capacity greater than Hancock production thereby catering for possible future neighbouring Galilee Basin producers and other downstream producers.

The Coordinator General gave environmental approval subject to conditions on 29 May 2012 and the Commonwealth Minister gave approval on 23 August 2012. The project is projected to be operational by 2016.

2.2.3 KEVIN'S CORNER (EPBC 2009/5033)

Hancock Galilee Pty Ltd (Hancock) proposes to develop a 30Mtpa thermal coal mine in the Upper Permian coal measures of the Galilee Basin for the export market. The mine life is 30 years and it will comprise both open-cut and underground workings

The Kevin's Corner (KC) mine will be situated in central Queensland approximately 110km south-west of Clermont, 340km south-west of Mackay and 65km north of Alpha, the nearest residential area to the Project site.

This project was declared to be a significant project requiring an EIS under the SDPWO Act and also a controlled action under the EPBC Act.

The project will consist primarily of three underground longwall operations, supplemented in the early years with two open-cut pits. It is planned that the project would link with the rail line currently being proposed as part of the Alpha Coal Rail Project.

The mine contains sufficient resources to extend the project life beyond 30 years. The overall scope of the project includes an on-site airstrip and accessing and using the proposed Alpha Rail Line and expansion of the existing port facilities at Abbot Point.

The EIS was lodged in December 2011, the SEIS was lodged in December 2012. The SEIS and submissions received from public review regarding it are currently being assessed.

2.2.4 CARMICHAEL COAL – MINE ELEMENT (EPBC 2010/5736)

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

The Carmichael Coal Project is comprised of two major components:

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

This project was declared to be a significant project requiring an EIS under the SDPWO Act and also a controlled action under the EPBC Act.

The EIS was lodged in December 2012 and the EIS and the submissions from the public consultation are currently being assessed.

2.2.5 OTHER

MacMines also propose development of two open cut and two underground coal mines with a peak production of about 60 million tonnes per annum (Mtpa) of run of mine thermal coal, resulting in about 45Mtpa for export. The project site is located at the northern end of the Galilee Basin, about 270km south of Townsville and 300km west of Mackay. The proposed mine life is 40 years. The project will also require a rail connection from the mine to a suitable port facility, and development of suitable port capacity. Abbot Point is the preferred port facility. The Initial Advice Statement for this project was released on 24 October 2012, followed by Terms of Reference on 9 January 2013. This project was unable to be considered in this CIA as no further publicly available information was available at the time of writing (February 2013).

2.3 Rail Component

For the rail aspects of the project, this CIA has considered the following projects (see Figure 2).

2.3.1 ALPHA COAL PROJECT – RAIL ELEMENT (EPBC 2008/4648)

As part of their Alpha Coal Project, Hancock proposes to construct and operate a mine-to-port railway to transport processed coal to an export terminal at Abbot Point. The rail component of the Project comprises a north-south standard gauge, single track, non-electrified railway line, approximately 495km in length, two balloon loops, eight passing loops, maintenance sidings, signalling, a marshalling yard and accommodation facilities at selected locations along the rail corridor between the mine and the port facilities at Abbot Point.

The proposed north-south rail line has a design capacity of 60Mtpa product. Following declaration of this rail project as an Infrastructure Facility of State Significance under the SDPWO Act, the rail operator is obliged to provide third party access to the infrastructure where it is available. However it is expected that the majority of the available capacity would be utilised by the Kevin's Corner Project, which is also being developed by Hancock Galilee Pty Ltd. Further assessment would be required to support an expanded capacity from 60Mtpa.

The Coordinator General gave environmental approval subject to conditions on 29 May 2012 and the Commonwealth Minister gave approval on 23 August 2012. The project is projected to be operational by 2016.

2.3.2 QR NATIONAL CENTRAL QUEENSLAND INTEGRATED RAIL PROJECT (EBPC 2012/6321, EPBC 2012/6322)

Aurizon Holdings Limited proposes to construct and operate an integrated, heavy-haul rail system that will link coal mines in the Galilee and Bowen basins to eastern Queensland ports. The line will run from the Galilee Basin before linking with existing lines taking coal to the Port of Abbot Point near Bowen, or the Hay Point or Dalrymple Bay ports near Mackay.

The project will include the rail line, rail yards, lay-down areas, buildings, signals and communication equipment, construction camps and road works.

The Terms of Reference for the project were finalised on 20 September 2012 and Aurizon Holdings are currently finalising the EIS.

2.3.3 CARMICHAEL COAL – RAIL ELEMENT (EPBC 2010/5736)

The proposed Carmichael Coal Rail line has a track length of approximately 189km. Rail infrastructure comprises below rail and above rail components. The rail alignment is located within a nominal 95m wide corridor that runs from the terminal facilities at the Mine eastwards to connect with the Watonga Blair Athol Branch Railway of the existing QR National Goonyella Coal Rail System (Goonyella rail system), south of Moranbah.

The rail will enable haulage of up to 100Mtpa product from the Mine and third party users in the Rail (West) rail infrastructure corridor and up to 60Mtpa product on the Rail (East) infrastructure corridor

The rail component includes a terminus facility at the mine site, two balloon loops, eight passing loops track totalling approximately 247km (total track length) comprising both narrow and standard gauge along the length of rail, maintenance facilities and holding yards, and rolling stock.

2.3.4 GOONYELLA TO ABBOT POINT RAIL PROJECT (EPBC 2011/6082)

BHP Billiton MetCoal Holdings Pty Ltd (BHP Billiton) propose to construct a rail line, approximately 260km in length, to transport up to 60 million tonnes per annum of coal. The line would service a number of potential new and expanded coal mines.

The line would run from the Goonyella Riverside Mine in the Bowen Basin, approximately 24 kilometres north-west of Moranbah, to the Port of Abbot Point, near Bowen.

The project comprises a 60-metre-wide rail corridor, balloon loops at Goonyella Riverside Mine and Port of Abbot Point and associated infrastructure, including additional balloon loops, passing loops, bridges and culverts.

The Terms of Reference for the project were issued on 9 May 2012. BHP Billiton are currently finalising the EIS.

This project was unable to be considered in this CIA as no further publicly available information was available at the time of writing (March 2013).

2.3.5 CO-LOCATION OPPORTUNITIES

The Queensland Government has announced that only two rail alignments (one from the northern end of the Galilee Basin and one from the southern end) will be approved, which should provide access for all projects in the area[1]. The Carmichael Coal Mine and Rail Project and the Alpha Coal project were nominated as the two preferred options. Hence, from the southern end of the Galilee Basin, only the Alpha Coal Project rail line, the north to south alignment of the QR National Central Queensland Integrated Rail Project or the Galilee Coal Project rail line will likely proceed. As such the Alpha Coal and the north to south alignment of the QR Integrated Rail Project are considered primarily from a co-location of infrastructure standpoint, as it considered highly unlikely that more than one rail corridor will be built in the vicinity of Waratah Coal's proposed alignment along a north to south alignment from the southern Galilee Basin to Abbot Point. Hence Waratah Coal's rail cumulative impacts are considered from the standpoint of Waratah Coal's alignment and one alignment from the northern end of the Galilee Basin (i.e. the Carmichael Coal Rail alignment as no information is currently available regarding the east to west alignment of the QR Integrated Rail Project).

2.4 Consequential Projects

The following proposed projects are also of note as they could be, in part, brought about as consequential impacts of the Galilee Coal Project.

2.4.1 STANDALONE JETTY (EPBC 2012/6250)

Waratah Coal is proposing to construct and operate a new coal terminal, inclusive of onshore and offshore infrastructure, at the Port of Abbot Point. In May 2012 the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) finalised guidelines for the project.

2.4.2 PROPOSED ABBOT POINT EXPANSION AP-X

On Dec 21 2012 the Deputy Premier announced that the Queensland Government were seeking registrations of interest in the proposed Abbot Point Expansion (known as AP-X). Waratah Coal has lodged a registration of interest in this proposal. The ROI process is the beginning of a new process to identify prospective capacity seekers and development proponents.

1 In a policy statement issued by the Deputy Premier on 6 June 2012 it is stated that the government intends to support only one common user corridor from the south Galilee basin and one from the Northern end of the Galilee Basin.

2.4.3 GAILILEE BASIN POWER STATION

Galilee Power proposes to construct and operate a 900MW (nett) coal-fired power station that incorporates carbon capture and storage (CCS) technologies. The power station will be designed to incorporate the latest clean-coal low emission technologies. The power station will initially be constructed to generate nett 450MW, with a second 450MW module to be added as demand requires. The power station will be situated approximately 30km to the north-west of Alpha, and immediately to the east of Waratah Coal's proposed mine in the Galilee Basin, Central Queensland.

The power station will utilise waste coal from Waratah Coal's tenements as power station feedstock.

2.4.4 POWERLINK POWER TRANSMISSION LINE

Powerlink Queensland has been requested to provide a high voltage connection of 132kV to proposed coal mines in the Galilee Basin area for Hancock Coal for the Alpha and Kevin's Corner mines. Waratah Coal propose to utilise any spare capacity in this facility until the Galilee Basin Power Station becomes operational.

2.4.5 SUNWATER MORANBAH TO ALPHA PIPELINE

The proposed Moranbah to Alpha Pipeline is expected to provide the water to the Galilee Basin to help meet forecast supply for commercial mining operators as well as provide reliability and security for the local community in Alpha. Waratah Coal propose to utilise this facility.

With the exception of the Powerlink Transmission Line, all of the above projects are in their infancy and minimal information regarding the potential social, environmental and economic impacts associated with them is available.

3 DESCRIPTION OF CUMULATIVE IMPACTS

3.1 Land

The mine component of the project and those mines around it will cause disturbance of large areas of land resulting in altered landforms with potential for soil erosion and consequential degradation of water quality. Open cut mining will involve vegetation clearing, topsoil and overburden removal and stockpiling, extraction and transportation of coal as well as remediation works including void refilling and stockpile reshaping, site rehabilitation and revegetation. The potential cumulative impacts of these activities include loss of flora and fauna and their habitats; impacts to air quality from increased dust; and impacts to receiving water bodies.

The potential cumulative impacts of underground mining will not be of the same magnitude, but may include impacts to the hydrology of surface waters, and to a lesser extent follow on impacts on water quality and aquatic ecological values. New mines that will have similar impacts are also proposed both to the immediate north (Alpha Coal Mine – (ACP)) and south (South Galilee Coal Project – (SGCP)) of the mine site with other mines proposed further north (i.e. Kevin's Corner (KC) Mine and Carmichael Coal (CC) Mine) (see Figure 2), which have the potential to create cumulative impacts upon soils, land use and tenure, topography and landscape character. Impacts on soils and topography are considered in the context of their impacts on land use and tenure.

The cumulative impacts of the rail element of the project and the other rail projects assessed will include fragmentation and loss of agricultural properties, Good Quality Agricultural Land (GQAL) and Strategic Cropping Land (SCL) as well as vegetation clearing and reshaping of the land via cut and fill which has the potential to cause increased dust and impacts to water bodies from increased sedimentation.

3.1.1 LAND USE AND TENURE

3.1.1.1 Mine

The predominant land use around the five mining projects in the Galilee Basin is relatively low density, low intensity cattle grazing. The nature of construction and operation of the Galilee Coal Project (GCP) Mine and the other coal mines assessed will result in long-term impacts to land use. In order to mitigate the long-term impacts, the mine at end of production will be remediated to a state commensurate with pre-mining land use which is predominately grazing. All mines assessed are proposing a similar rehabilitation program that will return as much land as is practicable back to the pre-mining use; hence the long-term cumulative impacts will be significantly reduced. However, during the construction and operation of the mines there will be a large disturbance area and reduction in the amounts of agricultural land available for land use.

The GCP (or 'the Project'), the SGCP, KC and CC all comprise open cut and underground mining operations, whilst the ACP Mine will be solely an open cut operation. The open cut operations give rise to a higher potential to result in increased erosion post disturbance and will not allow for shared land use during mining operations. Whilst there is still potential for increased erosion of surface soils resulting from subsidence, the potential is vastly reduced when compared with open cut operations. With the appropriate management, the land above the underground mines can be used for grazing during mining operations. Waratah Coal proposes to do this, but it is noted that other proponents may not.

A much smaller, but still significant land use that will be affected by the construction and operation of the mines is nature conservation. All of the mines included in the CIA have some form of grazing within vegetated areas that also have nature conservation values. Some of these areas are also gazetted as Nature Refuges, for example, the Bimblebox Nature Refuge, found on the Waratah Coal mine site, and the Bygana West Nature Refuge, found on the Carmichael mine site. It is expected that all proponents will aim to return their sites to the same mix of cattle grazing and vegetation that occurred prior to mining. However, during mining operations, and until the rehabilitated vegetation achieves a suitable composition and maturity, there will be a loss of habitat for flora and fauna, and corridor movement opportunities for local fauna.

Given the aim of Waratah Coal and other proponents to return the land to the to the current land use of low intensity, low density cattle grazing, with some areas of grazed bushland, the project and the other four proposed mines being assessed in this CIA, are considered to constitute a temporary interruption to the land use in the region. The significance of the overall cumulative impact upon land use has been assessed as medium.

3.1.1.2 Rail

The predominant land use within the footprint of the Waratah Coal rail alignment is classified as 'for production from relatively natural environments' based on Queensland Land Use Datasets. Discrete parcels of land are found along the alignment and are classified as, 'Water or Production from Agriculture' (Dry Land and Irrigated) land use purposes which potentially encroach or abuts the corridor in various locations. Some areas along the rail alignment have been identified as set aside for conservation purposes, however, the rail alignment has been designed to avoid these areas.

The potential cumulative impacts on land use and tenure of the Waratah Coal rail alignment, and one alignment from the northern end of the Galilee Basin, as well as the Goonyella to Abbot Point Rail Project will include reduction in and fragmentation of agricultural properties, Good Quality Agricultural Land (GQAL) and Strategic Cropping Land (SCL). Mitigation measures for affected agricultural landowners include developing plans and funding any necessary infrastructure changes (e.g. fencing, access roads, cattle creeps, stock yards and watering points. Alignments may restrict access to mineral resources, but on the other hand will also provide opportunities for access to those resources through third party access agreements.

3.1.1.3 Cumulative Impact Significance

The significance of the overall cumulative impact upon land use has been assessed as medium.

3.1.2 LANDSCAPE CHARACTER

3.1.2.1 Mine

The five mine projects will have a direct impact upon landscape character in the region, especially the Project, the SGCP, the ACP and KC, which are situated adjacent to one another. However the degree of impact in terms of visual amenity will depend upon how many of the mines and other consequential infrastructure, such as the rail elements of the projects, the Powerlink transmission line, the Galilee Basin Power Station, and the SunWater Moranbah to Alpha Pipeline are visible within the same viewshed when viewed from a sensitive receptor.

In and around the project, the SGCP and the ACP the topography is generally gently undulating plains in the vicinity of the mine infrastructure areas and the open cut operations (which would constitute the most significant visual impacts). There is a general lack of major view points, outlooks or significant features in the areas surrounding these three mines.

There is also a low density of houses within and around these three project areas. Those houses that would be most affected are also those that would be acquired should the projects proceed (for instance Monklands, Kia Ora, Hobartville and Wendouree). Therefore few houses will have direct visual access to the mines and consequential ancillary infrastructure.

Increase in traffic on the roads around the projects will create an indirect impact within Alpha and Jericho, which would lead to a change in the towns' visual characteristics with reference to traffic. Without screening, the project mine site and likely also the SGCP, will be visible from some locations along the Capricorn Highway. This could be easily mediated through planting of screening vegetation along the road side.

Further afield, indirect cumulative visual impacts could include dust clouds from mining operations and light spill from night time operations. However, these can be significantly and easily reduced through effective environmental management measures on site, such as watering for dust suppression and careful design of lighting.

3.1.2.2 Rail

Whilst each proponent of the five proposed rail alignments assessed would be expected to minimise vegetation clearing, and minimise effects to the property operations of affected landholders, fragmentation and clearing of agricultural land and vegetation would be an unavoidable cumulative impact of rail construction.

However, the proposed rail projects are generally aligned through remote areas, avoiding most areas of development. At the local level, for areas close to the rail alignments (<1.5km) the proposed rail alignments would constitute a major visual impact, but given there is sparse population along for the majority of their lengths, observers are limited. Planting of screening vegetation along the rail would be a mitigation measure.

3.1.2.3 Cumulative Impact Significance

The significance of the overall cumulative impact upon land use has been assessed as medium.

3.2 Terrestrial Ecology

The cumulative impact of all mines has been assessed. For the rail, it is considered unlikely that more than one alignment will be constructed out of the southern Galilee Basin and one out of the northern Galilee Basin. Given that no information is available for the QR National Central Queensland Integrated Rail Project, this assessment considers the Carmichael Coal Rail Alignment as the northern Galilee line, and this projects alignment as the southern Galilee line. The Goonyella to Abbot Point line would also be a cumulative impact, but as no information was available at the time of writing, it was unable to be included. The Alpha Coal rail line is presented in terms of the opportunity for co-location and a comparison of cumulative impacts that would arise from the scenario of it and the Carmichael Coal Rail Alignment, or the Galilee Coal Project rail and the Carmichael Coal Rail Alignment, is given. It should be noted that should the Alpha Coal rail line be the selected rail alignment from the Galilee Basin, further work would need to be undertaken to allow the alignment to cater for all of the users needing access, as it currently only caters for 60Mtpa. 30Mtpa of this will be taken up by the Alpha Coal project itself, whilst the majority of the remaining 60Mtpa is expected to be taken up by KC. Upgrading the project to cater for more users would likely involve greater environmental impacts on terrestrial ecological values then have currently been assessed, as more passing loops would likely be required, as well as indirect impacts of increased rail on fauna crossing and nesting and breeding opportunities. As such the cumulative impacts presented herein with reference to the Alpha Coal Rail alignment are likely to be an underestimate, should this rail alignment proceed.

All of the mine sites assessed contain remnant regional ecosystems and habitat values (potential and actual) for least concern and protected species. Cumulatively the mine project sites may provide important landscape linkages through the remnant vegetation included within them. Figure 3 shows the Queensland Biodiversity Planning Assessment and the mine projects assessed for this CIA, whilst Table 3 gives a summary of some of the key impacts with reference to terrestrial ecological values. The Biodiversity significance given in the Biodiversity Planning Assessment is a ranking of an area according to specified values to

account for rarity, diversity, fragmentation, habitat condition, resilience, threats, and ecosystem processes. The value of an area is assessed on an extensive set of attributes such as relative size or condition, whether it is habitat for threatened species, or if it provides connectivity across the landscape. As can be seen from Figure 3, all mines assessed contain areas of State, Regional and Local Biodiversity significance. It should also be noted that other mining projects are proposed that be located between the Kevin's Corner and the Carmichael Coal mine sites.

Using several different variables to assess ecological values allows for a holistic assessment as, at the individual variable level, results are influenced by differing levels of survey effort and methods, seasonal considerations, land access issues and other variables can influence the reported values on one given site. For example, Table 3 shows that four threatened fauna species and three threated flora species were recorded from the SGCP, whilst the KCP surveys resulted in records of two threatened fauna species (with one additional considered likely to occur based on proximity of records and suitable habitat on site), and no threatened flora species. Therefore this type of analysis would suggest that the more ecologically significant site of the two is the SGCP, whilst in contrast, review of Figure 3

would suggest that the KC site is the more ecologically significant site. Figure 3 shows the overall impact, whilst the following sections allow more specific components to be considered in isolation.

3.2.1 PROTECTED AREAS

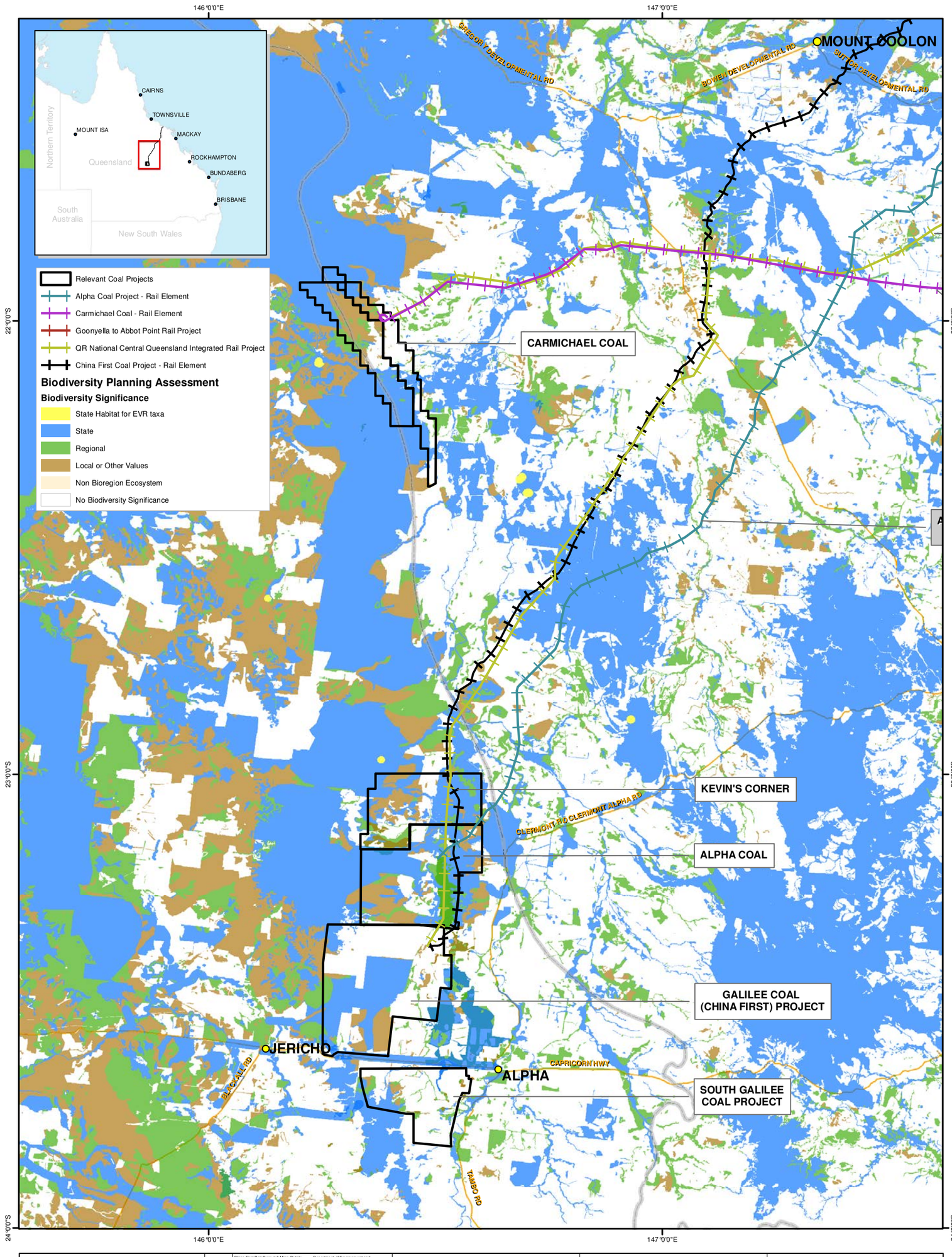
The Bimblebox Nature Refuge, listed in Schedule 5 of the Nature Conservation (Protected Areas) Regulations 1994, occupies an area of 7,912ha within EPC 1040 within the GCP mine site. The BNR would be impacted by mine construction and operation through both direct vegetation clearing and subsidence. The level of impact associated with subsidence is currently unknown. The area to be cleared to facilitate the open cut mines and supporting infrastructure is 4,017ha, just over 50%. An additional 3,422ha will be subject to subsidence from the underground mining activities. As a result of this impact the Nature Refuge status of the property is likely to be removed.

The Bygana West Nature Refuge covers an area of 1,487ha and is wholly contained within the CC mine footprint. Vegetation clearing for mining operations within the Bygana West Nature Refuge will result in the direct loss of approximately 1,301ha of the remnant vegetation in the nature refuge, an 88 per cent loss of its total vegetation coverage. The remaining 186ha of the nature refuge within the Mine (operation) footprint may be exposed to subsidence as a result of underground mining activities.

Doongmabulla Mound Springs Nature Refuge is situated 10km west of the CC mine. Doongmabulla Springs is also recognised as a Great Artesian Basin (GAB) discharge spring. Doongmabulla springs may have a maximum potential drawdown of approximately 0.12m 60 years into the operation of the mine. This CC EIS considers this to be potentially significant.

As such, cumulatively, the projects will reduce the amount of protected tenure land held in the region, and Queensland. Waratah Coal propose voluntarily offset the Bimblebox Nature Refuge at a ratio of around 2:1. The offset is proposed to be gazetted as a Nature Refuge and located on an area of land in which mining tenure can be extinguished, thereby guaranteeing the protection of the refuge against future mining projects.

Figure 3. Biodiversity Planning Assessment and Cumulative Impact Assessment Mine Projects



GALILEE COAL PROJECT
(Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	China First Rail Project & Mine Detail: Waratah Coal Pty. Ltd. 2012 Other Rail Projects: The State of Queensland (Department of State Development, Infrastructure and Planning) 2010 –2012 Biodiversity Planning Assessment: Department of Environment and Resource Management 2009 Galilee Basin Boundary: State of Queensland (Department of Natural Resources and Mines) 2013
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File:WAR20-26-SEIS0097a-FIGXXa-BIODIVERSITY-IMPACTS-130313

0 10 20 30 40
Kilometers
A3 Scale 1:800,000
Coordinate System: GCS GDA 1994

Galilee Basin
Arterial Road

BIODIVERSITY & RELEVANT PROJECTS

3.2.2 THREATENED ECOLOGICAL COMMUNITIES

As can be seen from Table 3 the mines will have a cumulative impact on Brigalow (Acacia harpophylla dominant and co-dominant), for which the SGCP and CC will need to clear 13.98 and 195ha respectively. However, the rail alignments will also require clearing of this TEC, being either 356.92ha if the GCP and CC rail projects were to proceed, or 436.9ha if the ACP and CC rail projects proceed (see Table 4). As such the cumulative impact to Brigalow would be either 565.9ha (mines and GCP + CC) or 645.88ha (mines and ACP + CC).

The other TEC with a cumulative impact is Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin. The KC project will require the clearing of 22.3ha (Table 3) whist the rail alignments will also require clearing of this TEC, being either 43.46ha if the GCP and CC rail projects were to proceed, or 130ha if the ACP and CC rail projects proceed (see Table 4). As such the cumulative impact to Natural Grasslands would be either 65.76ha (mines and GCP + CC) or 152.3ha (mines and ACP + CC).

As around 65% of the Brigalow (Acacia harpophylla dominant and co-dominant) TEC and approximately 20% of the Natural Grasslands TEC in Queensland occur in protected area estates, there is little chance of this TEC becoming extinct. However, there is potential for reductions in the extent, diversity and abundance of these community and species that utilize them (for example 14 animal species that are threatened nationally and/or at the state level are Brigalow dependent or preferentially utilise Brigalow habitat).

For each of the two aforementioned TECs, the cumulative impact would be less if the GCP rail alignment was the selected alignment from the southern Galilee Basin.

Each proponent will be required to provide offsets for the unavoidable impacts on each TEC and provide offsets such that there is a net conservation gain. Waratah Coal has determined that they are able to fully acquit all of their offset obligations.

Table 3. Mine Threatened Ecological Communities

	THREATENED ECOLOGICAL COMMUNITIES				
	Brigalow	**Natural Grasslands**	**Poplar Box**	**GAB**	**Total (ha)**
SGCP	13.98	–	–	–	**13.98**
GCP	–	–	–	–	**–**
ACP	–	–	–	–	**–**
KC	–	22.3	4.5	–	**26.8**
CC	195	–	–	Likely significant effect	**195**
Total (ha)	**208.98**	**22.3**	**4.5**	**Likely significant effect**	**235.78**

Brigalow = Brigalow (*Acacia harpophylla* dominant and co-dominant)
Natural Grasslands = Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
Poplar Box = Poplar Box Open Woodland
GAB = The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin

Table 4. Rail Threatened Ecological Communities

	THREATENED ECOLOGICAL COMMUNITIES					
	Brigalow	**WMW**	**C-BB**	**NG**	**SEVT**	**Total (ha)**
GCP	30.02	23.42	1.94	21.36	–	**76.74**
ACP	110	–	–	108	24	**242**
CC	326.9	–	–	22	–	**348.9**
GCP + CC	**356.92**	**23.43**	**1.94**	**43.46**	**–**	**425.75**
ACP + CC	**436.9**	**–**	**–**	**130**	**24**	**590.9**

Brigalow =Brigalow (Acacia harpophylla dominant and co-dominant)
WMW = Weeping Myall Woodlands
C – BB = Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
NG = Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
SEVT = Semi-Evergreen Vine Thicket

3.2.3 VEGETATION CLEARING (REGIONAL ECOSYSTEMS)

The cumulative clearing of vegetation required to facilitate all of the proposed mines will impact upon connectivity, habitat availability biodiversity. All mines require large areas of clearing to facilitate their projects. The amounts of remnant vegetation (Endangered, Of Concern and Least Concern remnant regional ecosystems (REs) listed under the Queensland *Vegetation Management Act 1999* (VMA)) to be cleared on each site are shown in Table 5. As can be seen in Table 5, the GCP mine will contribute cumulatively to vegetation clearing in the area, although the amounts to be cleared are significantly less than for the KC and CC projects.

Table 5. Total amounts of remnant vegetation within open cut and mining footprints for each mine

	SGCP	GCP	ACP	KC	CC
Open cut (ha)	585	4877.49	Not available*	28165.7	12587
Underground (ha)	1135	12659.76	Not applicable	12802.9	7162

*amounts of vegetation to be cleared to facilitate the mine were not able to be found in the Nature Conservation Chapter of the EIS or the associated technical appendix.

The amount of REs to be cleared to facilitate the mine infrastructure area and open cut mines for the GCP is shown in Table 6. The project will not require the clearing of any Endangered or Of Concern RE listed under the VMA.

However, the project will require the clearing of RE 35.791ha of RE 10.4.3, which has an Endangered Biodiversity Status. This equates to 0.20% of the extent within the Desert Uplands Bioregion. The CC mine will also require the clearing of around 545ha of this RE, which equates to 3.02% of the extent within the Desert Uplands Bioregion. Whilst the clearing required for the GCP clearing would contribute to a cumulative impact, it is minor compared with the clearing required for the CC project (contributing 2.4% of the cumulative total required to be cleared for these two mines).

The project will also require the clearing of 1173.61ha of RE 10.3.27, which has an Of Concern Biodiversity Status. The SGCP, KC and the ACP would all also require the clearing of RE 10.3.27. The amounts required to be cleared are 79.6 ha, 174.3ha and 8.98ha respectively. These together with the 1173.61ha required to facilitate the GCP bring the amount required to be cleared to facilitate the mines to 1436.49 ha, which equates to 1.30% of the extent within the Desert Uplands Bioregion.

Table 6. Amounts of REs to be cleared for the GCP mine and the percentage as a total of the Desert Uplands Bioregion

RE LABEL	VMA STATUS	BIODIVERSITY STATUS	TOTAL OPEN CUT (HA)	% CLEARED DU	DESERT UPLANDS BIOREGION (HA)
10.3.12	LC	NCP	74.369	0.23%	32,853.64
10.3.27	LC	OC	1,173.610	1.06%	110,571.79
10.3.28	LC	NCP	127.978	0.02%	610,798.04
10.3.3	LC	NCP	37.1845	0.12%	31,742.12
10.4.3	LC	E	35.791	0.20%	18,028.79
10.5.12	LC	NCP	342.949	0.24%	141,547.88
10.5.5	LC	NCP	3,002.560	0.32%	940,367.59
10.7.3	LC	NCP	67.504	0.07%	100,560.18
10.7.5	LC	OC	8.438	0.03%	26,458.19
Total			**4,870.38**	**0.24%**	**2,012,928.22**

The cumulative impact of the rail projects on Endangered and Of Concern REs is shown in Table 7. Table 7 shows that, whilst the project would not require will the clearing of more than 25ha of any Endangered or Of Concern RE, it will nonetheless contribute to a cumulative impact on Endangered and Of Concern REs. Considered within the context of the Queensland government directive to only approve one alignment from the southern Galilee the cumulative impact on these REs would be less if the GCP rail alignment was the selected alignment.

Table 7. Rail cumulative impacts on Endangered and Of Concern Regional Ecosystems

RE LABEL	VMA/EPBC STATUS	HA			TOTAL (HA)	
		ACP	GCP	CC	ACP + CC	GCP + CC
11.3.1	E/ Brigalow TEC	24.45	9.37	11.0	35.45	20.37
11.3.21	E/ NG TEC	0.09	-		0.09	-
11.4.1	E/ SEVT TEC	0.42	-		0.42	-
11.4.8	E/Brigalow TEC	25.45	23.21	2.5	27.95	25.71
11.4.9	E/ Brigalow TEC	51.55	2.56	23.9	75.45	26.46
11.5.16	E/Brigalow TEC	1.13	-	-	1.13	-
11.8.13	E/SEVT TEC	0.07	-	-	0.07	-
11.9.1	E/Brigalow TEC	7.25	-	-	7.25	-
11.9.5	E/Brigalow TEC	0.57	-	-	0.57	-
11.9.12	E/NG TEC	0.45	-	-	0.45	-
11.2.3	OC/SEVT TEC	12.16	-	-	12.16	-
11.3.2	OC/WMW TEC	25.42	18.26	-	25.42	18.26
11.3.3	OC	15.40	25.18	46.7	62.10	71.88
11.3.4	OC	7.17	24.08	-	7.17	24.08
11.3.13	OC	0.15	-	-	0.15	-
11.3.33	OC	7.61	2.25	-	7.61	2.25
11.3.34	OC	3.38	-	-	3.38	-
11.4.2	OC	0.97	-	-	0.97	-
11.4.5	OC	0.45	4.81	3.5	3.95	8.31
11.4.6	OC	0.68	0.53	20.7	21.38	21.23
11.4.11	OC/Threshold RE/NG TEC	8.48	2.29	128.1	136.58	130.39
11.5.10	OC	7.80	2.19	-	7.8	2.19
11.8.3	OC	0.001	-	-	0.001	-
11.8.11	OC/NG TEC	2.90	-	-	2.90	-
11.9.10	OC	4.95	7.76	1.4	6.35	9.16
11.11.10	OC	0.13	-	-	0.13	-
11.11.13	OC	4.30	5.02	-	4.30	5.02
11.11.16	OC	0.09	1.47	-	0.09	1.47
11.12.10	OC	2.12	2.61	-	2.12	2.61
11.12.14	OC	-	1.18	-		1.18
11.12.15	OC	-	1.58	-		1.58
11.12.16	OC	-	1.58	-		1.58
11.12.18	OC	-	0.39	-		0.39
Total					**453.39**	**374.12**

E = Endangered
OC = Of Concern
TEC = Threatened Ecologial Community listed under the EPBC Act
Brigalow= Brigalow (*Acacia harpophylla* dominant and co-dominant)
NG = Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
SEVT = Semi-Evergreen Vine Thicket
WMW = Weeping Myall Woodlands

Each proponent will be required to provide offsets for the unavoidable impacts on each RE and provide offsets such that there is a net conservation gain. Waratah Coal has determined that they are able to fully acquit all of their offset obligations.

3.2.4 TERRESTRIAL FLORA

As can be seen from Table 8, the SGCP and the GCP will both impact upon the Large-podded Trefoil (*Desmodium macrocarpum*), which is listed as near threatened under the Queensland *Nature Conservation Act 1992*. For the GCP, 95 specimens were recorded from the open cut mining footprint, and a further 39 from within the underground mining footprints. Two populations were detected from the SGCP study area, but neither will be impacted by their construction or operational activities. Studies for both the SGCP and the GCP concluded that this species may be more widespread than the current records from the area suggest, however, within the GCP area, it is considered likely to be less than 500 individuals, given the considerable level of survey effort that has been undertaken in the recent past within the study area. As the SGCP has reported it will not impact upon known populations of this project, and it has not been detected from any of the mine sites to the north, it is considered possible, but based on the reasonable level of survey that has occurred to date, unlikely that the project will have a cumulative impact upon this species

For the rail, both the proposed ACP and the GCP rail alignments would impact upon Black Ironbox (*Eucalyptus raveretiana*), as such a cumulative impact upon this species is considered unlikely, given the Queensland government directive that only one of these projects, or the southern alignment of the QR Integrated Rail Project will proceed.

Table 8. Threated flora species cumulative impacts

	SGCP	GCP MINE	GCP RAIL	ACP MINE	ACP RAIL	KC	CC MINE	CC RAIL
Large-podded Trefoil (*Desmodium macrocarpum*)	✓	✓						
Black Ironbox (*Eucalyptus raveretiana*)			✓		✓			
Round-leaved Heath Myrtle (*Micromyrtus rotundifolia*)								
Eleocharis blakeana	✓							
Dietrich's morning glory (*Bonamia dietrichiana*)	✓							
King-Blue grass (*Dichanthium queenslandicum*)					✓			

Each proponent will be required to provide offsets for the unavoidable impacts to each threatened flora species and provide offsets such that there is a net conservation gain. Waratah Coal has determined that they are able to fully acquit all of their offset obligations.

3.2.5 TERRESTRIAL FAUNA

As can be seen from Table 9, there are 11 fauna species of conservation significance that have been recorded from, or are considered likely to occur on more than one mine site. Alone, the GCP is not considered to represent habitat critical to the survival of any of these species, but it is acknowledged that the project has the potential to impact cumulatively on any one of these species, to varying degrees depending upon the importance of the GCP habitat in the context of that contained in the other project sites.

Table 9. Conservation significant fauna species recorded or considered likely to occur within the mine sites

	SGCP	GCP	ACP	KC	CC
Koala (*Phascolarctos cinereus*)	✓	✓		✓	✓
Little Pied Bat (*Chalinolobus picatus*)	✓	✓	✓	✓	✓
Brigalow Scaly-foot (*Paradelma orientalis*)	✓	✓			
Cotton Pygmy Goose (*Nettapus coromandelianus*)		✓			✓
Freckled Duck (*Stictonetta naevosa*)		✓			
Black-necked Stork (*Ephippiorhynchus asiaticus*)		✓			✓
Square-tailed Kite (*Lophocitinia isura*)	✓	✓			✓
Squatter Pigeon (southern) (*Geophaps scripta scripta*)		✓	✓	✓	✓
Black-chinned Honeyeater (*Melithreptus gularis*)		✓			✓
Black-throated Finch (southern) (*Poephila cincta cincta*)		✓			✓
Echidna (*Tachyglossus aculeatus*)	✓	✓	✓	✓	✓

Each proponent will be required to provide offsets for the unavoidable impacts to each threatened fauna species and provide offsets such that there is a net conservation gain. Waratah Coal has determined that they are able to fully acquit all of their offset obligations.

The potential impacts on fauna species for the rail alignments are quite different to those for the mines given the linear nature of the rail clearing footprints. Whilst the rail alignments result in loss of habitat, this is usually comparatively small and habitat fragmentation is likely to be a more serious impact of rail construction and operation, as the alignments could effectively act as a barrier to movement for some species. Waratah Coal have committed to minimising the rail alignment to the smallest amount practicable (which is on average 49.5m) and providing fauna friendly culverts to facilitate movement. However, given the Queensland Government commitment that there will be only one rail alignment from the southern Galilee Basin, it is considered unlikely that both the ACP alignment and the GCP alignment would both proceed, which would render cumulative impacts unlikely, as the CC rail alignment is too far removed spatially from either the GCP for the ACP for the impacts as a result of habitat fragmentation to overlap.

3.2.6 CUMULATIVE IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on Terrestrial Ecology has been ranked as medium.

3.3 Aquatic Ecology

3.3.1 MINE

As all mines are within the Belyando River catchment and cumulatively cover a relatively large proportion of the upper tributaries of this system, there is potential for cumulative effects of mine construction and operation to impact upon aquatic ecological values through alteration to catchment hydrology and reductions in water quality.

The GCP mine water management system has been designed to facilitate segregation of clean, dirty and contaminated water streams, and capture and re-use of dirty and contaminated water to meet site water demands, and to only allow water movement off-site in a flood event with an average recurrence interval of 1:1000 years.

The water balance modelling of the proposed site water management system demonstrates that adequately sized water containment dams combined with maximum on-site reuse of water and additional enhanced evaporation technologies (e.g. sprinklers or fan evaporators) will prevent uncontrolled discharge of contaminated water. No controlled release of poor quality mine affected water is proposed for the Galilee Coal Mine.

It should be noted however there will be some uncontrolled discharge associated with sediment control structures during prolonged wet periods. This water is expected to be of dischargeable quality as these sediment control structures will receive runoff from rehabilitated spoil areas.

All mines would be expected to have similar water containment protocols. Hence there is the potential for cumulative effects in periods of extreme flow, where mine runoff may not be contained. However, background water quality under these conditions is likely to be significantly impacted naturally.

Predicted reductions in local stream flows from mines due to interception of overland flows and stream flows in subsidence ponding area will create cumulative impacts on flow behaviour, which has the potential to impact upon aquatic ecological species and their habitat. However, aquatic ecological values are generally limited, as the waterways in the area have been subjected to a range of modifications and pressures such as causeways, the damming of creeks for stock irrigation, riparian vegetation clearing for agricultural purposes and the trampling of bed and banks through cattle access to the creeks. As such the sensitivity of the receiving environment is considered low.

3.3.2 RAIL

Construction works, such as those listed below have the most potential to impact on aquatic ecosystems include:

- bridge construction
- disturbing and stockpiling soils
- piling and culvert works for stream crossings
- use of potentially contaminated / low quality water for dust suppression and other site activities
- storage of oil, fuel and chemicals on site.

Potential impacts arising from construction of the rail include:

- loss of habitat
- fauna mortality
- decreased water quality
- changes to hydrology.

If properly managed the impacts to surface water resulting from the works are expected to be minimal.

However, given the Queensland Government commitment that there will be only one rail alignment from the southern Galilee basin, it is considered unlikely that both the ACP alignment and the GCP alignment would proceed, which would render cumulative impacts unlikely, as the CC rail alignment is too far removed spatially from either the GCP for the ACP for impacts on aquatic ecological values to overlap.

3.3.3 CUMULATIVE IMPACT SIGNIFICANCE

The significance of the cumulative impact for aquatic ecology for the mine has been assessed as medium, the rail has not been assessed given that the distance between projects renders cumulative impacts highly unlikely.

3.4 Surface Water

3.4.1 MINE

3.4.1.1 Diversions

Concept design of the proposed creek diversions has been undertaken in accordance with "Bowen Basin River Diversions, Design and Rehabilitation Criteria" and "Watercourse Diversions – Central Queensland Mining Industry". As a part of this design, geomorphic assessment of the existing creeks to be diverted has been undertaken. This

assessment has allowed the geomorphic features to be replicated as part of the diversion works. Features include maintained stream length, bed slope, meander radius, capacity and in-stream benching.

Hydraulic modeling has also been undertaken to assess the hydraulic performance of the diversions, the results of which indicate compliance with the velocity, stream power and shear stress limits specified by DERM, though there are some very localised minor deviations for velocity which will be mitigated through appropriate scour protection or planting. The results of the hydraulic modelling also demonstrate that changes in flood behaviour such as velocity, inundation depth and extent are limited to within the mine lease area.

As such the creek diversions within the mine site are not expected to contribute to any cumulative impact on hydrology, and indirectly, sedimentation and erosion.

3.4.1.2 Water balance modeling

Water balance modeling of the final underground and open cut mining operations has been undertaken to identify the potential maximum impact of the mine on stream flows in waterways downstream of the mine. This modelling indicates that the mean annual stream flow in Lagoon Creek at the downstream boundary will decrease by a maximum of 12% as a result of underground mine subsidence and capture and reuse of runoff in open cut pits and dams. This is a worst case scenario based on the final mine landform and assuming that no mitigation of longwall mining subsidence occurs. Management strategies such as ripping, re-compacting and seeding of all tension cracks, reshaping any internally draining areas to be externally draining by the construction of contour drains, and topsoiling and seeding any disturbed areas, have been identified that will significantly reduce the impact of the underground mining component of the project on downstream stream flows.

The SGCP EIS reports that under the worst case scenario the reduction in flows as a result of their mine water management system would be less than 7% for the Tallarenha Creek Catchment, and 0.3% for the Alpha Creek Catchment. The SEIS for the ACP downstream of the GCP indicates a reduction of -0.2% in baseline median flows in the Belyando River at the Gregory Development Road.

The SEIS for the KC project reports a reduction of flows as a result of mine subsidence under the worst case scenario of 1.3% at the mine lease boundary. Estimation of the reduction in mean annual flows for the CC project was undertaken using a static water balance using the preliminary water balance report (GHD 2012). A reduction of 0.4% in mean annual flows in the Belyando River at the Gregory Development Road was estimated.

Reductions in stream flow as a result of the GCP mine, and those upstream and downstream will result in a cumulative impact within the Tallarenha Creek subcatchment as the proportion of the catchment taken up by mines will be relatively large. However, there are no licences to take water from Tallarenha Creek, and licences for the use of water for agricultural purposes do not occur until the Belyando River. Furthermore the aquatic ecological values are generally limited, and not considered unique. As such the sensitivity of the receiving environment is considered low.

There will be a minor cumulative impact further downstream in the Burdekin River Basin. Under the scenario, the cumulative impact to mean annual stream flows has been estimated as a 1.1% reduction in the Belyando River at the Gregory Development Road.

3.4.2 RAIL

During construction and operation of the rail corridor there are a number of mechanisms that have the potential to impact on surface water quality including:

- increased sediment loads due to surface disturbance and vegetation clearing
- pesticides used for weed control
- use of potentially contaminated / low quality water for dust suppression and other site activities

- storage of oil, fuel and chemicals on site
- construction and operational phase water demands
- changes to stormwater regimes
- changes to the local hydraulic regime resulting from the rail alignment through watercourses and floodplains.

There are several standard mitigation measures that will be applied that will reduce the likelihood and/or magnitude of these potential impacts significantly. However, as the Queensland Government has specified that there will be only one rail alignment from the southern Galilee basin, it is considered that cumulative impacts to surface water are unlikely, as the CC rail alignment is generally too far removed spatially from either the GCP for the ACP for the impacts to surface water impacts to overlap.

3.4.3 CUMULATIVE IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on surface water for the project has been ranked as medium.

3.5 Groundwater

3.5.1 MINE

3.5.1.1 Quantity

As the GCP groundwater model extent is sufficiently broad to include the two nearest proposed mines, the SGCP and the ACP, explicit simulation of these mines to assess cumulative impacts has been undertaken, but there is incomplete knowledge of the geological detail and mining sequence for the other projects.

The cumulative impact modeling revealed that the effects on the natural flow pattern seem localised to the three mines (Figure 4).

The cumulative impact of the three mines on groundwater will result in a broad elongated cone of depression that is about 30km wide and over 100km in length along a north-south axis (see Figure 5). The eastern limit of drawdown is well defined, as it is controlled by outcropping geology and the erosion of coal measures. There is some expansion of the drawdown limit to the west, including a small tongue crossing the GAB geological boundary in the area where the GAB rocks are hidden by Quaternary cover. The expansion to the west is not substantial and considered unlikely to impact on the GAB aquifer or the GAB springs.

There is no predicted impact on groundwater-dependent ecosystems or GAB springs or the GAB aquifer, hence the GCP is considered unlikely to contribute to any cumulative impact on these values.

Figure 4. Groundwater Table Contours at the End of Mining, Model Layer 1 [m], for the SGCP, SGP and ACP Operating Mines

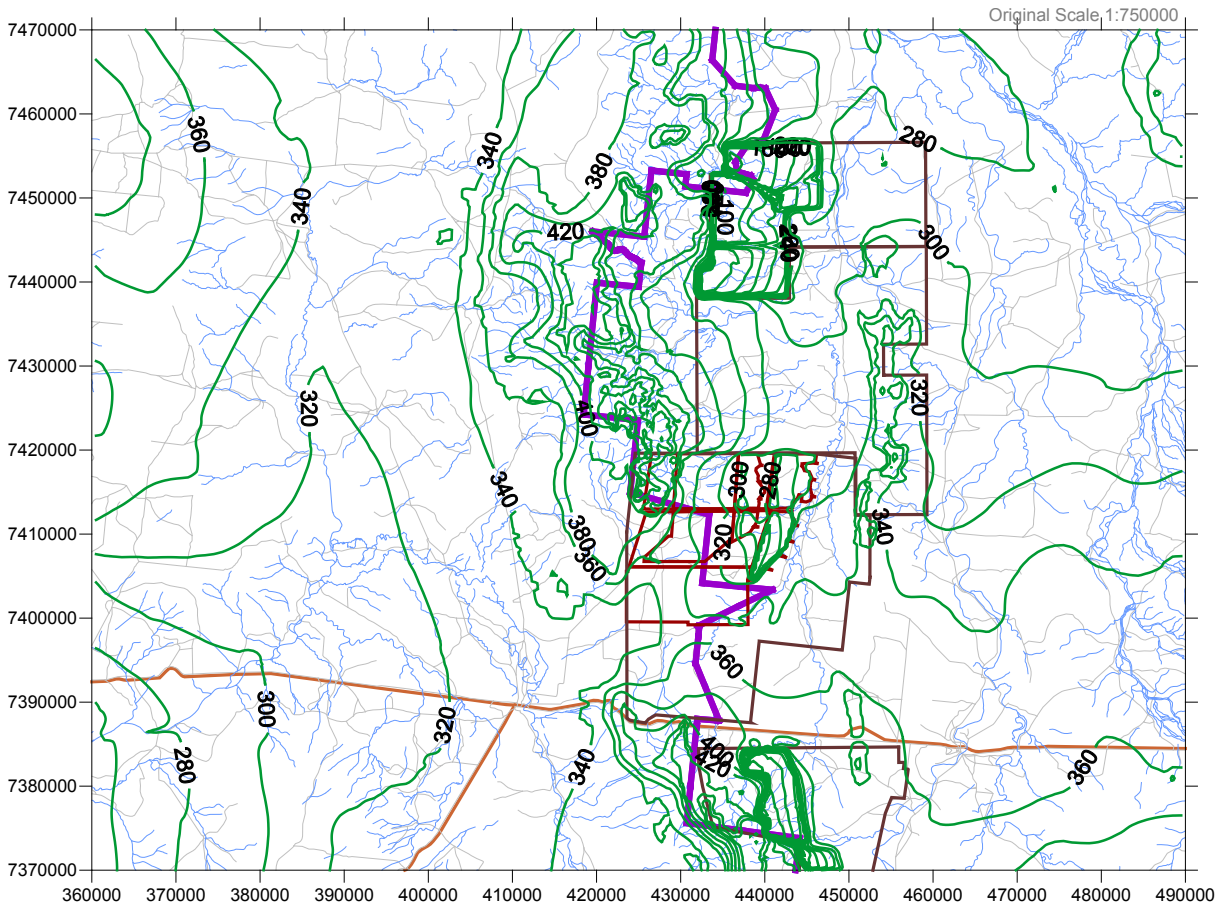
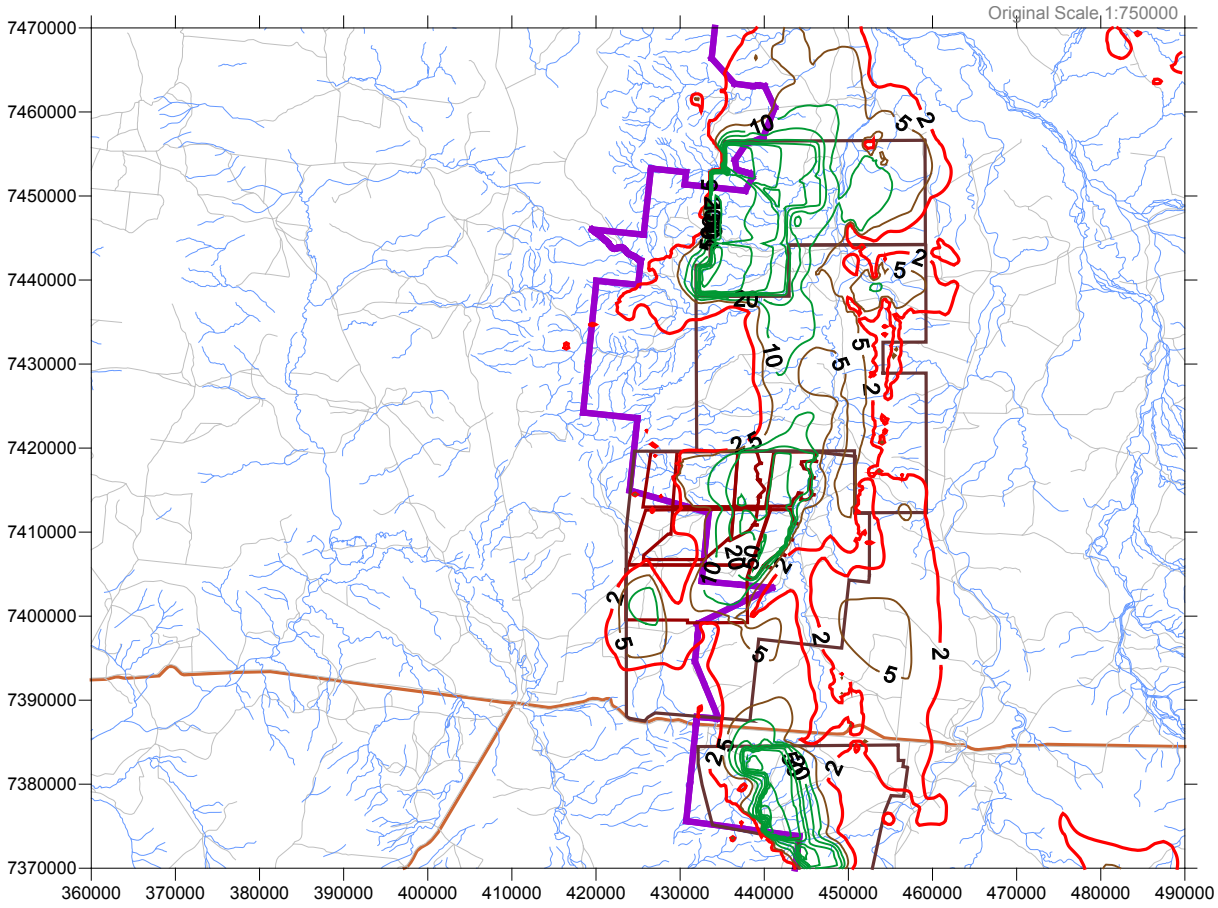


Figure 5. Cumulative Groundwater Table Drawdown Contours at the End of Mining, Model Layer 1 [m], for the SGCP, GCP and ACP Operating Mines



3.5.1.2 Quality

Groundwater contamination from mines will not occur in situ but could occur from coal rejects disposal and leaking disposal facilities. The risk of groundwater contamination from spills and leaks (from chemical, fuel and oil storage and handling at workshops and mine operations infrastructure) is low due to the naturally depressed water table.

The potential for impacts from surface storages of rejects, waste, fuel, oil and chemical storages are considered to be low because:

- groundwater levels around the mine are generally deeper and will become deeper due to drawdown around the mine
- it is expected that all proponents would have appropriately constructed storage and handling will result in low potential for leakages or spills
- the assessment of potential for acid generation and heavy metals impacts from the mine overburden and coal reject for the GCP indicate a low potential for these impacts.

3.5.2 RAIL

The main potential impacts with respect to groundwater are related to shallow near surface groundwater that could be impacted by the following railway construction activities:

- storage and handling of fuels / chemicals / raw materials
- bridge construction.

Impacts to local groundwater regimes may also occur where groundwater is within the construction zone in the upper onem of the surface or where bridge construction entails deeper construction in areas of shallow groundwater that requires dewatering of construction areas. If managed properly it is unlikely that the construction or operation of the railway will have any significant impact on groundwater resources.

Given this and the Queensland Government commitment that there will be only one rail alignment from the southern Galilee basin, which would render cumulative impacts unlikely, as the CC rail alignment is too far removed spatially from either the GCP for the ACP for the impacts to groundwater to overlap there is considered to be negligible chance of cumulative impacts to groundwater from the rail component of the project.

3.5.3 CUMULATIVE IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on Groundwater for the mine component has been ranked as high. The rail component was not assessed as there is considered to be negligible chance of cumulative impacts to groundwater from the rail component of the project.

3.6 Air Quality

3.6.1 MINE

A cumulative air quality assessment was conducted using estimated emission rates for the proposed Alpha Coal Mine and the proposed Kevin's Corner Coal Mine located immediately to the north of the Galilee Coal Project. The potential impacts of the mining projects on air quality arise mainly from dust generation. Impacts of dust emissions fall under two distinct categories, health and amenity. Potential health impacts are attributable to the concentration of respirable particles in ambient air. Respirable particles of dust have an aerodynamic equivalent diameter of 10 microns or less and are otherwise known as PM_{10} with a finer fraction of $PM_{2.5}$ (an important subset of PM_{10}).

Estimated emission rates for Total Suspended Particles (TSP) and PM_{10} were sourced from the following:

- Report – *Alpha Coal Mine Project Air Quality Assessment – Model Refinements* – Report prepared for Hancock Coal Pty Ltd – 21 May 2012 (URS, 2012) http://hancockcoal.com.au/index.cfm?objectid=7D6BCEBA-1372-5CE6-24482707D66C29AF, and
- Report – *Air Quality Assessment for the Kevin's Corner EIS Project* – Report prepared for Hancock Coal Pty Ltd – 6 April 2011 (URS, 2011).

In order to model worst case cumulative impacts that best coincide with the worst case impacts for the Galilee Coal Project the following operational years were chosen for Alpha coal mine and Kevin's Corner coal mine:

- Alpha Coal Mine – Year 20, and
- Kevin's Corner – Year 25.

It is estimated that these years would most closely coincide with Year 19 (worst case) emissions from the Galilee Coal Project and are also considered to be representative of worst case impacts from both surrounding proposed mines.

Estimated emissions (TSP, PM_{10}) for Year 20 operations at the Alpha Coal Mine are presented in Table 10.

Table 10. Modelled emissions for Alpha Coal Mine – Year 20missionSource Name Estimated emissions (kg/year)

EMISSION SOURCE NAME	ESTIMATED YEAR 20 EMISSIONS (kg/year)		TEMPORAL VARIATION
	TSP	**PM_{10}**	
Topsoil – Disturbance and Rehabilitation	65,264	32,632	Wind dependent
Overburden & In-Pit – IPCC	103,520	51,760	Wind dependent
Overburden & In-Pit – Drilling and Blasting	323,075	167,999	Constant
Overburden & In-Pit – Dragline	2,148,381	343,741	Wind dependent
Overburden & In-Pit – FEL of Overburden into Trucks	15,828	7,439	Constant
Overburden & In-Pit – Transport of Overburden to Dumps	5,444,220	1,361,055	Constant
Overburden & In-Pit – Truck Dumping at Overburden Dumps	1,388,364	499,811	Constant
Overburden & In-Pit – FEL coal trucks	276,765	132,847	Constant
Overburden & In-Pit – Dozers	136,738	35,552	Constant
Overburden & In-Pit – Graders	33,091	14,891	Constant
ROM Activities – Processing	0	0	Constant
ROM Activities – Truck Dumping at ROM	193,312	81,191	Constant
ROM Activities – FEL at ROM	55,352	26,569	Constant
ROM Activities – Dozer hours Coal at ROM total	18,752	5,438	Constant
ROM Activities – Wind Erosion from Stockpiles	1,458	729	Wind dependent
ROM to CHPP Conveyor – Conveyors	832	416	Wind dependent
ROM to CHPP Conveyor – Miscellaneous Transfer Points	8,966	4,214	Constant
CHPP Activities – Processing	5,359	2,090	Constant
CHPP Activities – FEL at CHPP	16,606	7,971	Constant
CHPP Activities – Dozer Hours Coal at CHPP	376	109	Constant
CHPP Activities – Loading Stockpiles	21,286	9,153	Constant
CHPP Activities – Unloading from Stockpiles	10,851	4,666	Constant
CHPP Activities – CHPP Conveyors	80	40	Wind dependent
CHPP Activities – Miscellaneous Transfer Points	1,734	815	Constant
CHPP Activities – Wind Erosion from Stockpiles	15,464	7,732	Wind dependent
Main Haul Roads – Transport of Coal to ROM	2,582,464	645,616	Constant
Main Haul Roads – Transport of Rejects to Dumps	0	0	Constant
Tailing Storage Facility – Wind Erosion	25,358	12,679	Wind dependent
Total Estimated Emissions:	**12,893,496**	**3,457,155**	

Source: Report – *Alpha Coal Mine Project Air Quality Assessment – Model Refinements* – Report prepared for Hancock Coal Pty Ltd – 21 May 2012 (URS, 2012)

Estimated emissions (TSP, PM_{10}) for year 25 operations at the Kevin's Corner coal mine are presented in Table 11.

Table 11. Modelled Emissions for Kevin's Corner Coal Mine – Year 25

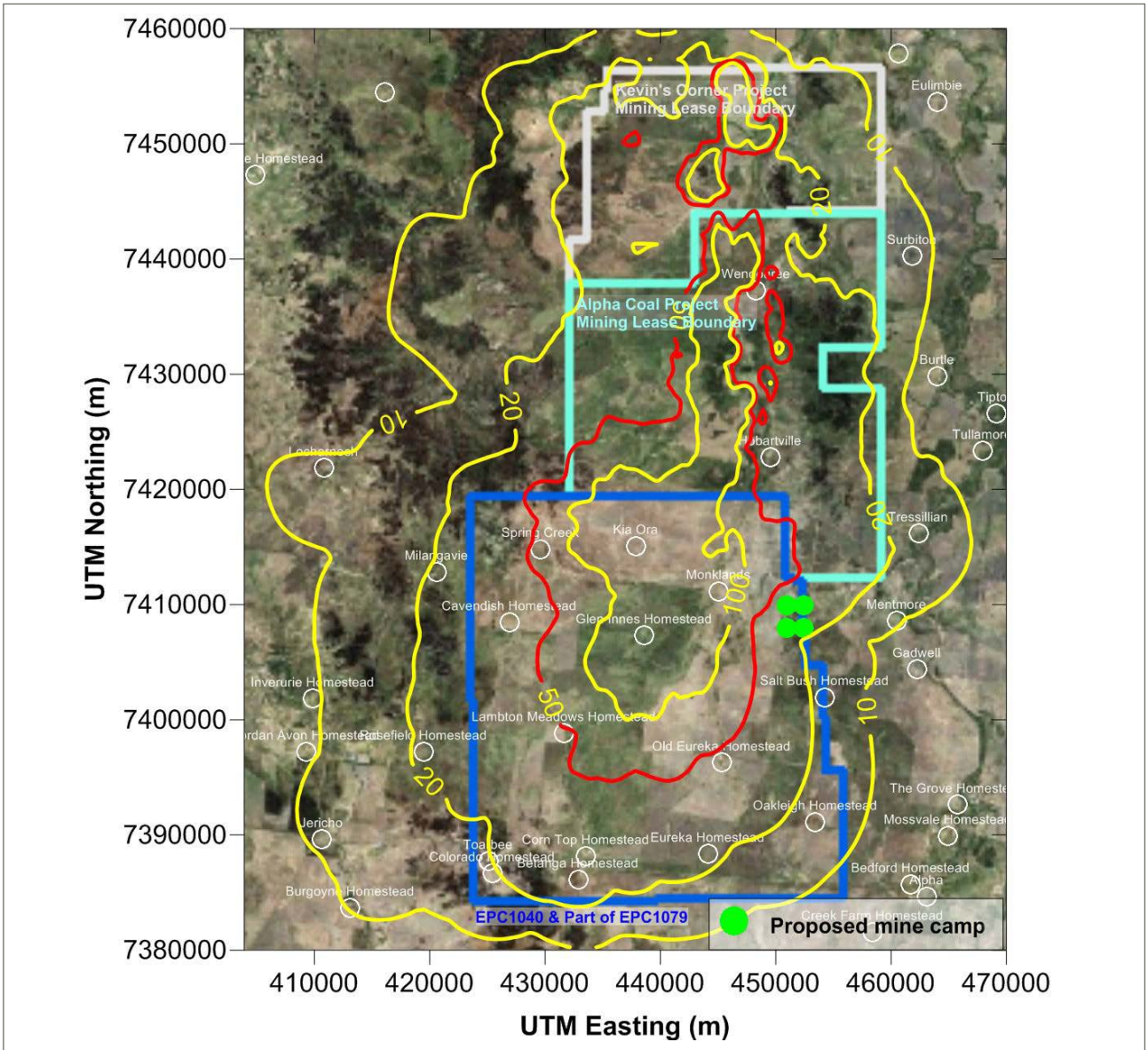
EMISSION SOURCE NAME	ESTIMATED YEAR 25 EMISSIONS (kg/year)		TEMPORAL VARIATION
	TSP	**PM_{10}**	
Disturbance & rehabilitation	28,277	14,139	Wind dependent
Drilling and blasting	9,573	4,981	Constant
Dragline operation	1,818,745	294,442	Constant
FEL of overburden into trucks	34,977	16,543	Constant
Transport of overburden to trucks (level 2 watering)	883,365	193,509	Constant
Truck dumping at overburden dumps	861,788	361,951	Constant
FEL of coal trucks	359,479	172,827	Constant
Dozers	300,181	73,761	Constant
Graders	728,085	194,589	Constant
Wind erosion from pits	37,932	37,932	Wind dependent
Wind erosion from overburden stockpiles	215,942	107,971	Wind dependent
Processing	-	-	Constant
Truck dumping at ROM	175,042	38,240	Constant
Dozer – coal at ROM (total)	83,994	48,408	Constant
Coal conveyors	323	128	Wind dependent
Conveyor transfer points	91,059	43,069	Constant
Coal processing	173,442	68,375	Constant
Loading of coal stockpiles	22,270	10,067	Constant
Misc transfer points	60,691	28,705	Wind dependent
Wind erosion from stockpiles	6,163	3,082	Wind dependent
Transport of coal to ROM (level 2 watering)	552,923	103,710	Constant
Transport of rejects to dumps (level 2 watering)	92,912	30,655	Constant
Wind erosion from tailings storage facility	112,128	56,064	Wind dependent
Total (kg/year)	**6,649,291**	**1,903,148**	

Source: Report – *Air Quality Assessment for the Kevin's Corner EIS Project* – Report prepared for Hancock Coal Pty Ltd – 6 April 2011 (URS, 2011)

The air quality modelling results for the cumulative impact assessment is shown in the following figures:

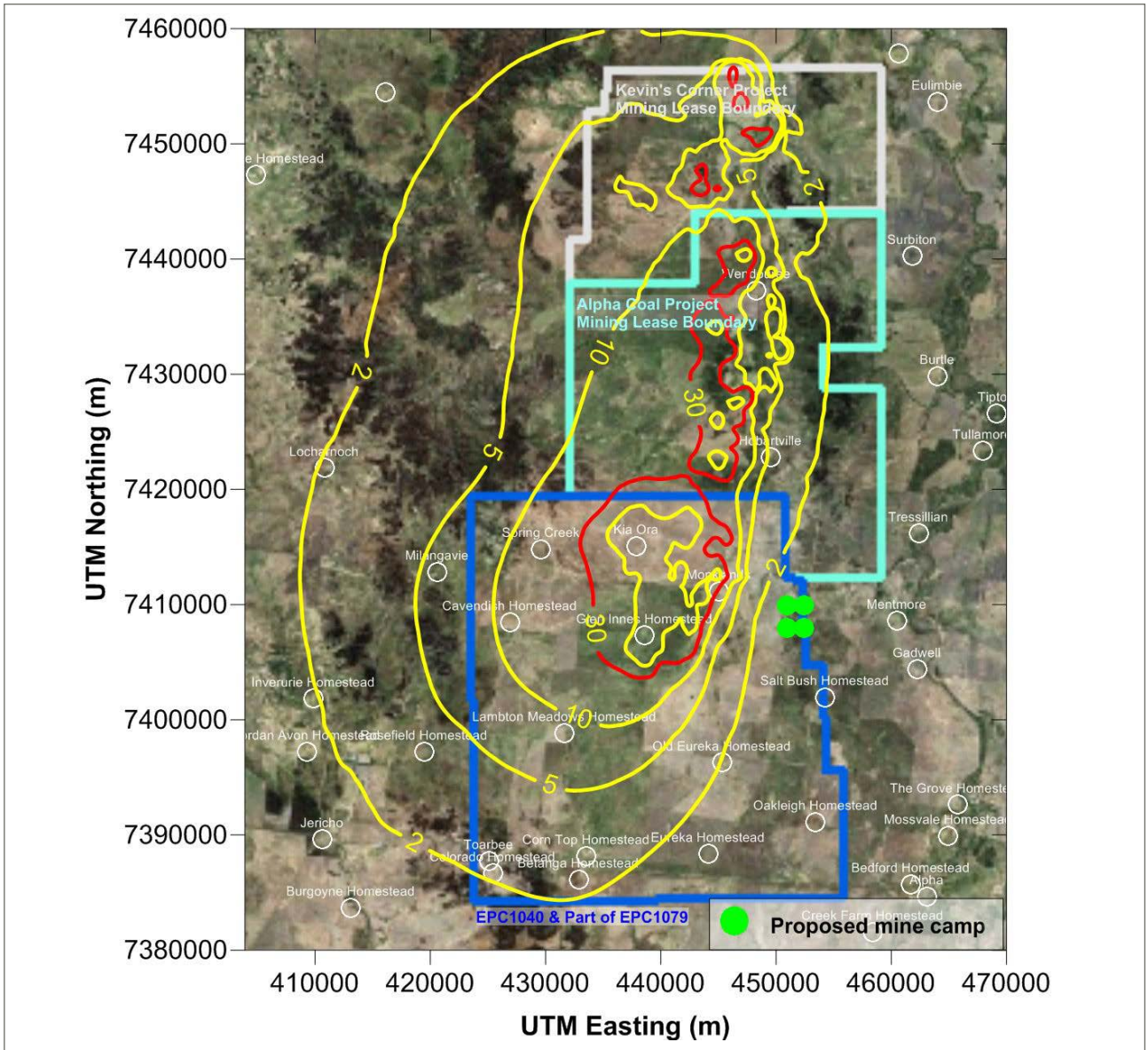
- Maximum 24-hour PM_{10} ground level concentrations (Figure 6).
- Annual average PM_{10} ground level concentrations (Figure 7).
- Annual average TSP ground level concentrations (Figure 8).
- Maximum 24-hour $PM_{2.5}$ ground level concentrations (Figure 9).
- Annual average $PM_{2.5}$ ground level concentrations (Figure 10).
- Average monthly dust deposition (Figure 11).

Figure 6. Cumulative air quality impact assessment – Predicted maximum 24-hour ground-level concentrations of PM_{10} – Year 19 – maximum mine emissions



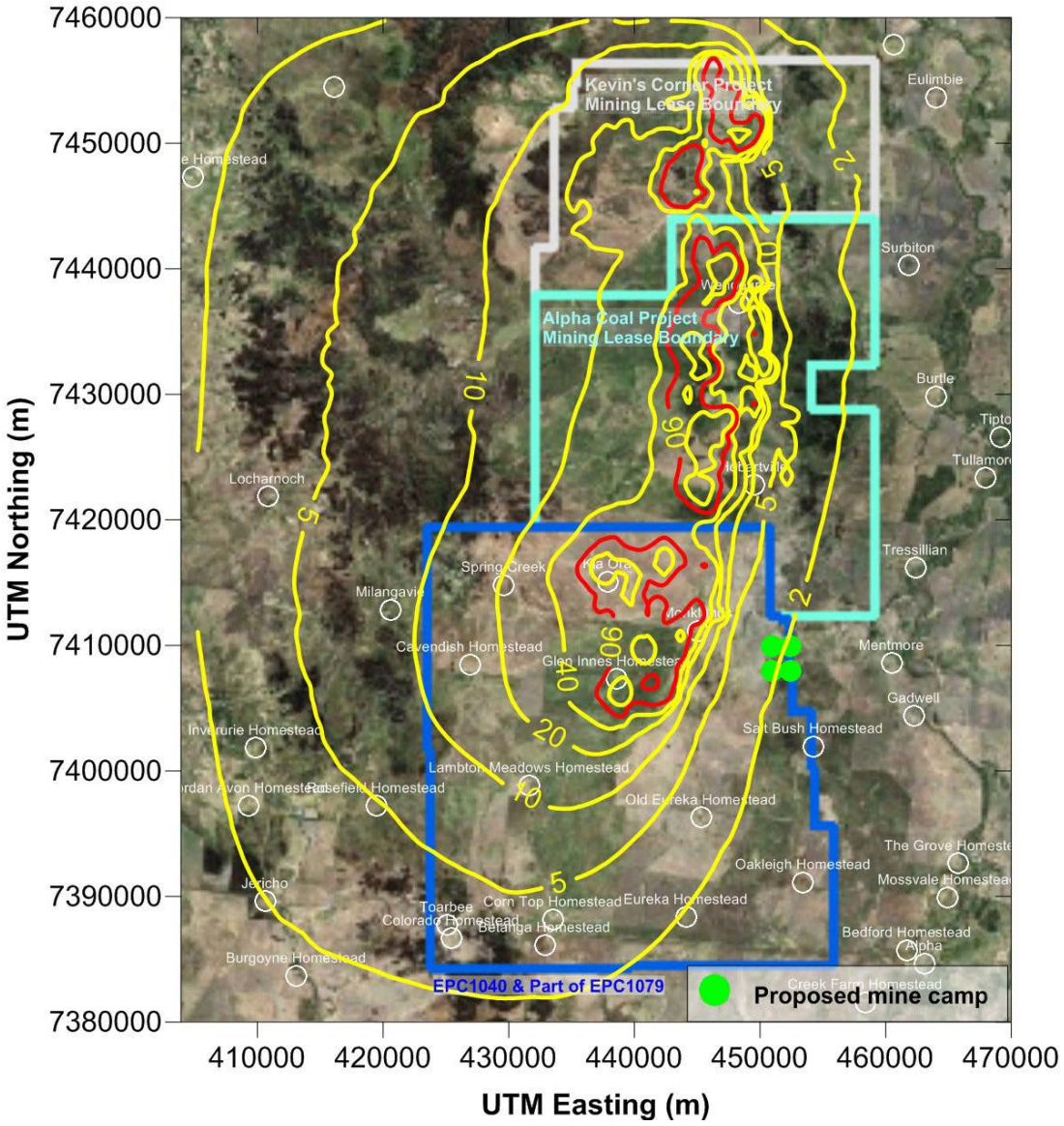
SPECIES:	LOCATION:	SCENARIO:	PERCENTILE:	AVERAGING TIME:
PM_{10}	Galilee Coal Project	Project emissions (Year 19) – maximum emissions and maximum emissions for the proposed Alpha coal mine and Kevin's Corner coal mine	Maximum	24-hour
MODEL USED:	**UNITS:**	**GUIDELINE:**	**MET DATA:**	**PLOT:**
CALPUFFv6	µg/m³	**EPP (Air) = 50µg/m³**	TAPM Generated	J Weidmann

Figure 7. Cumulative air quality impact assessment – Predicted annual average ground-level concentrations of PM_{10} – Year 19 – maximum mine emissions



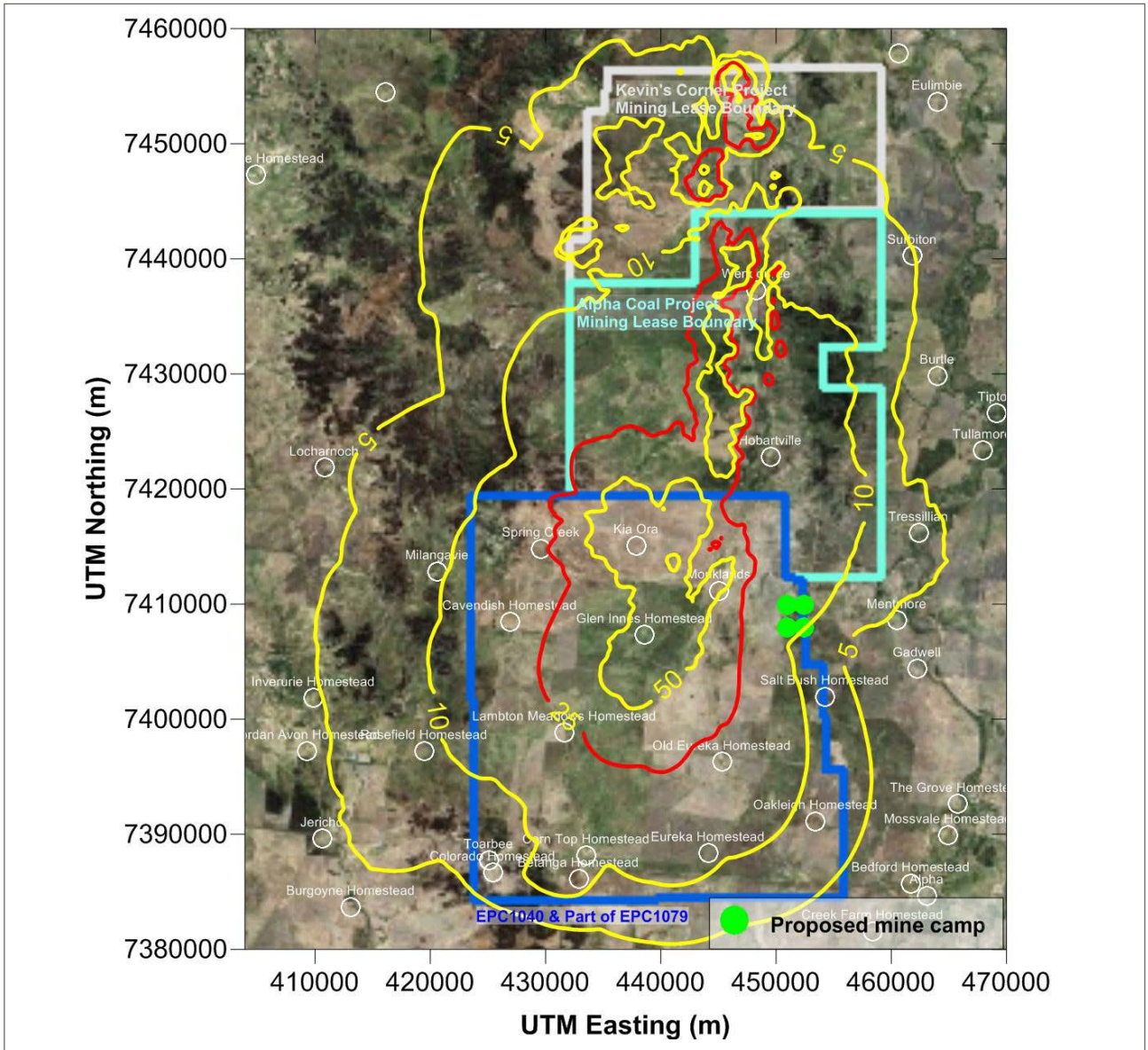
SPECIES:	LOCATION:	SCENARIO:	PERCENTILE:	AVERAGING TIME:
PM_{10}	Galilee Coal Project	Project emissions (Year 19) – maximum emissions and maximum emissions for the proposed Alpha coal mine and Kevin's Corner coal mine	Average	Annual
MODEL USED:	**UNITS:**	**GUIDELINE:**	**MET DATA:**	**PLOT:**
CALPUFFv6	µg/m³	**EPP (Air) = 30µg/m³**	TAPM Generated	J Weidmann

Figure 8. Cumulative air quality impact assessment Predicted annual average ground-level concentrations of TSP – Year 19 – maximum mine emissions



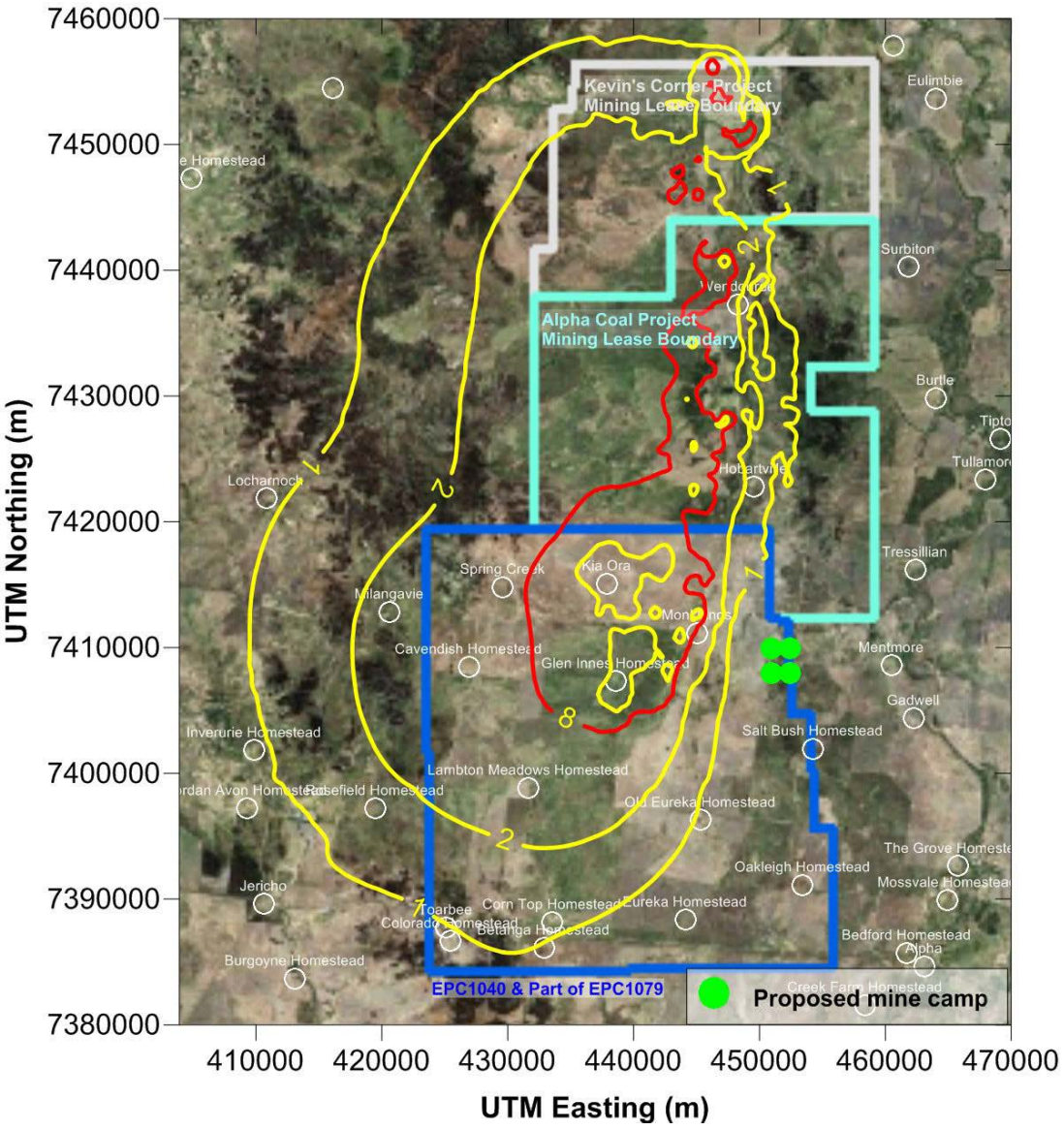
SPECIES:	LOCATION:	SCENARIO:	PERCENTILE:	AVERAGING TIME:
TSP	Galilee Coal Project	Project emissions (Year 19) – maximum emissions and maximum emissions for the proposed Alpha coal mine and Kevin's Corner coal mine	Average	Annual
MODEL USED:	**UNITS:**	**GUIDELINE:**	**MET DATA:**	**PLOT:**
CALPUFFv6	µg/m³	**EPP (Air) = 90µg/m³**	TAPM Generated	J Weidmann

Figure 9. Cumulative air quality impact assessment – Predicted maximum ground-level concentrations of $PM_{2.5}$ – Year 19 – maximum mine emissions



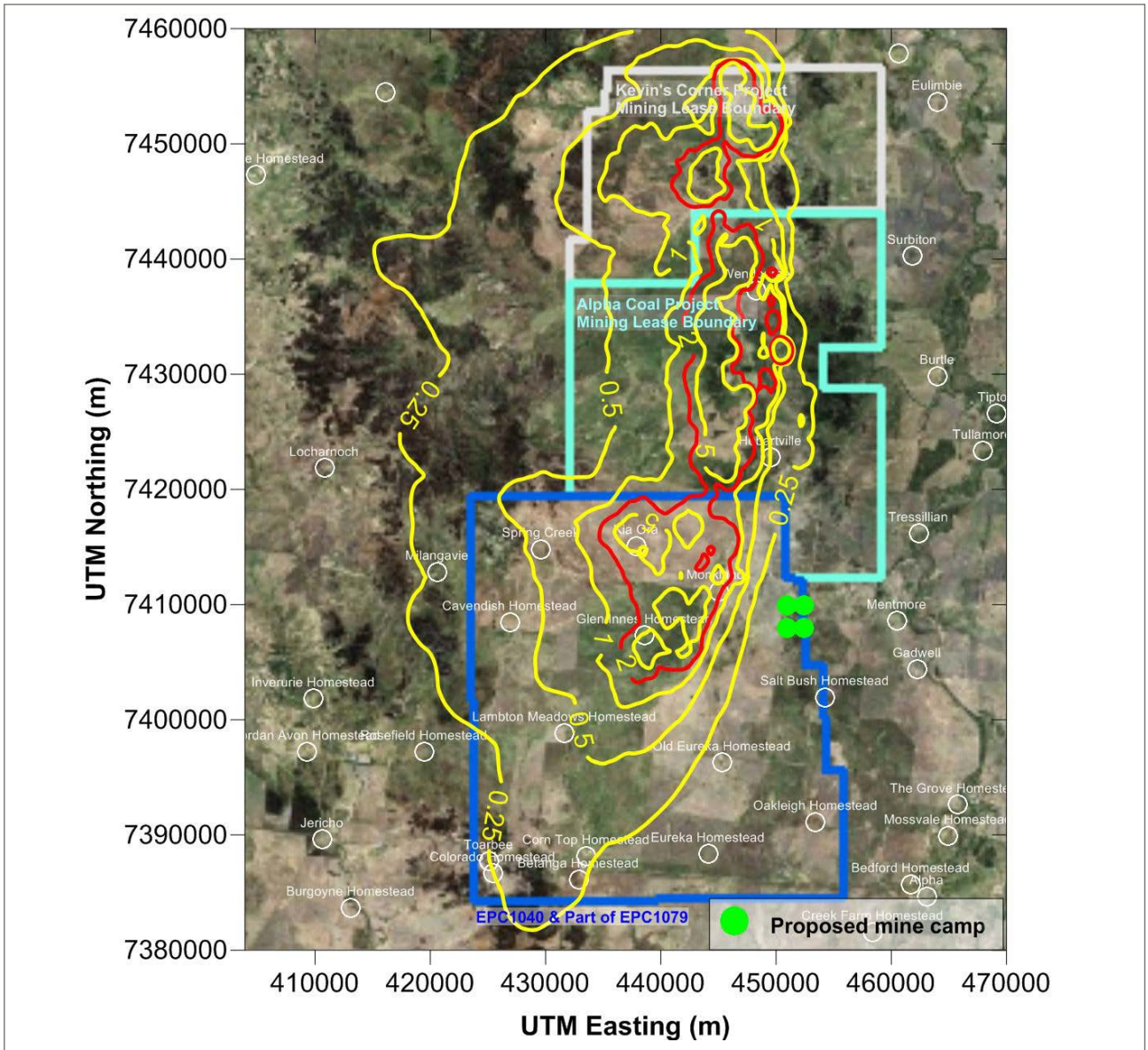
SPECIES:	LOCATION:	SCENARIO:	PERCENTILE:	AVERAGING TIME:
$PM_{2.5}$	Galilee Coal Project	Project emissions (Year 19) – maximum emissions and maximum emissions for the proposed Alpha coal mine and Kevin's Corner coal mine	Maximum	24-hour
MODEL USED:	**UNITS:**	**GUIDELINE:**	**MET DATA:**	**PLOT:**
CALPUFFv6	µg/m³	**EPP (Air) = 25µg/m³**	TAPM Generated	J Weidmann

Figure 10. Cumulative air quality impact assessment – Predicted annual average ground-level concentrations of $PM_{2.5}$ – Year 19 – maximum mine emissions



SPECIES:	LOCATION:	SCENARIO:	PERCENTILE:	AVERAGING TIME:
$PM_{2.5}$	Galilee Coal Project	Project emissions (Year 19) – maximum emissions and maximum emissions for the proposed Alpha coal mine and Kevin's Corner coal mine	Average	Annual
MODEL USED:	**UNITS:**	**GUIDELINE:**	**MET DATA:**	**PLOT:**
CALPUFFv6	µg/m³	**EPP (Air) = 8µg/m³**	TAPM Generated	J Weidmann

Figure 11. Cumulative air quality impact assessment – Predicted annual average dust deposition rates – Year 19 – maximum mine emissions



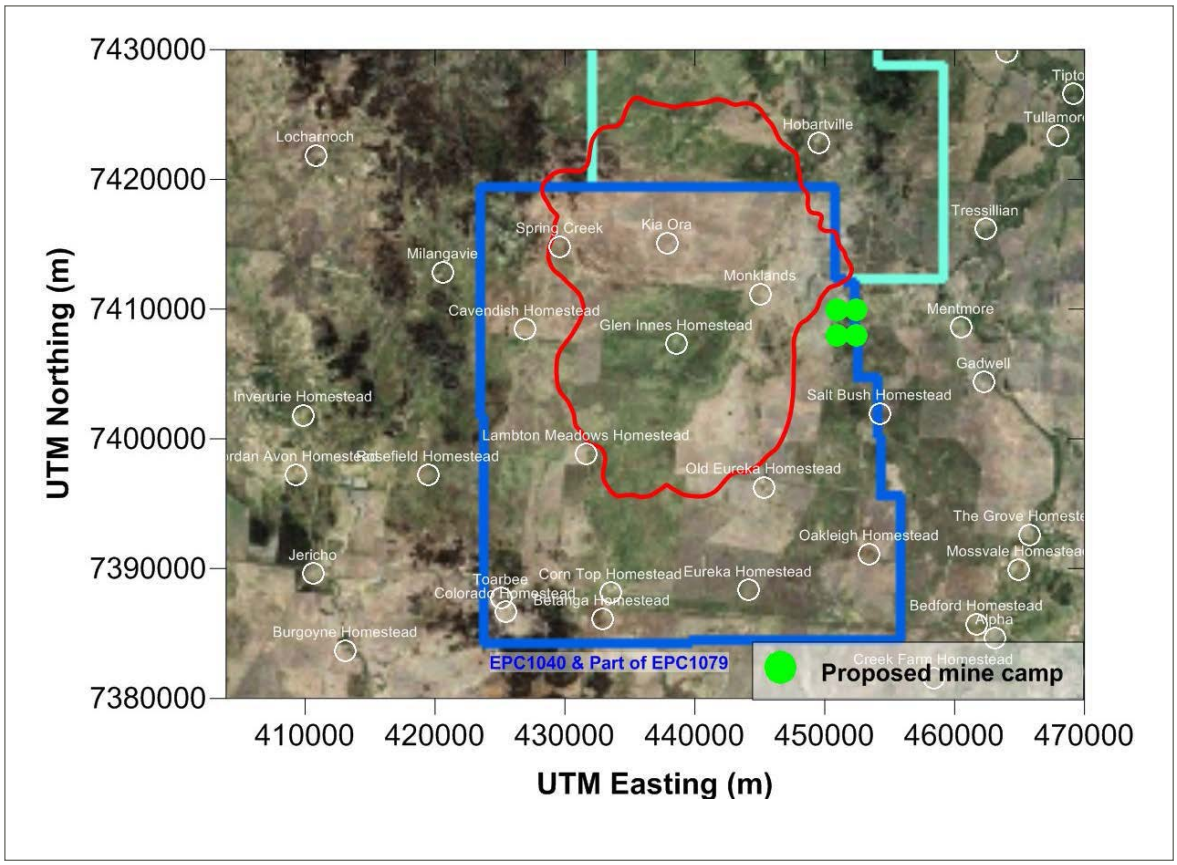
SPECIES:	LOCATION:	SCENARIO:	PERCENTILE:	AVERAGING TIME:
TSP (Dust deposition)	Galilee Coal Project	Project emissions (Year 19) – maximum emissions and maximum emissions for the proposed Alpha coal mine and Kevin's Corner coal mine	Average	Annual
MODEL USED:	**UNITS:**	**GUIDELINE:**	**MET DATA:**	**PLOT:**
CALPUFFv6	g/m^2/month	**2 g/m^2/month (project only)**	TAPM Generated	J Weidmann

Based on the air quality modelling results and recommended acquisition criteria, the following sensitive receptors will be acquired by the Galilee Coal Project in order to avoid significant air quality impacts:

- Kia Ora
- Monklands
- Spring Creek, and
- Glen Innes Homestead (Bimblebox Nature Reserve).

The affected sensitive receptors are shown in Figure 12.

Figure 12. Map of sensitive receptors and recommended acquisition criteria



The next highest air quality impacts are predicted for Lambton Meadows homestead, Hobartville and the Cavendish homestead.

Predicted daily PM_{10} concentrations for each receptor are shown in Figure 13, Figure 14 and Figure 15.

Figure 13. Predicted 24 hour PM_{10} concentration at Lambton Meadows homestead (cumulative impact)

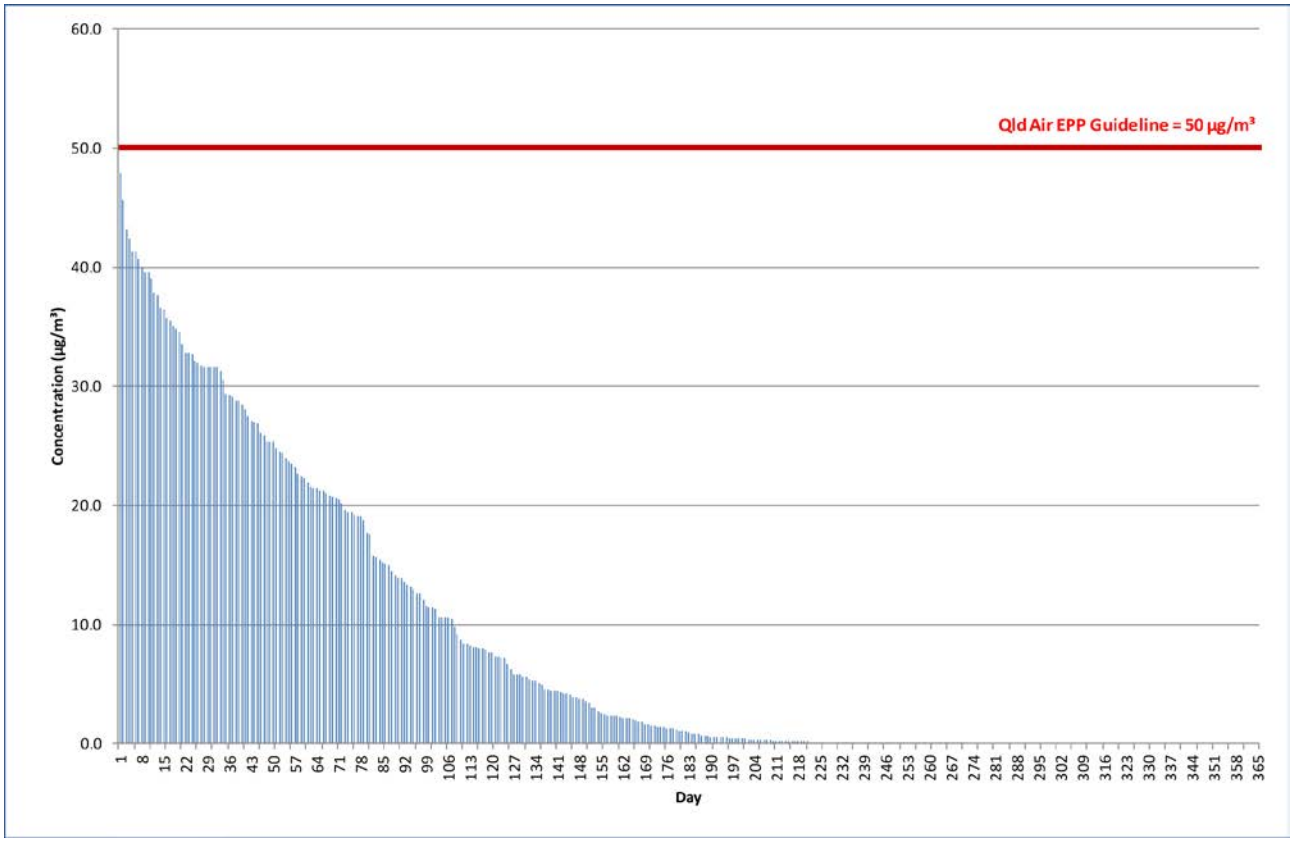


Figure 14. Predicted 24 hour PM_{10} concentration at Hobartville (cumulative impact)

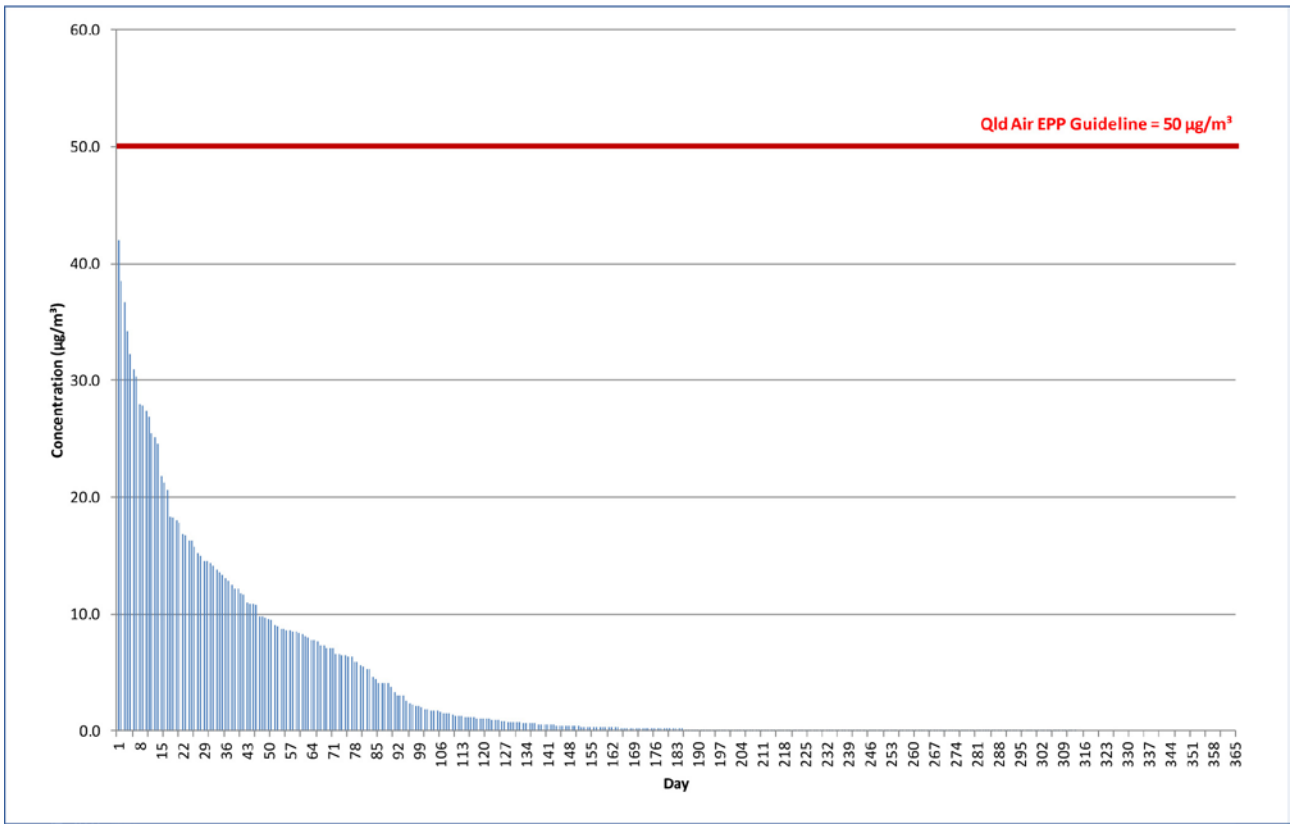
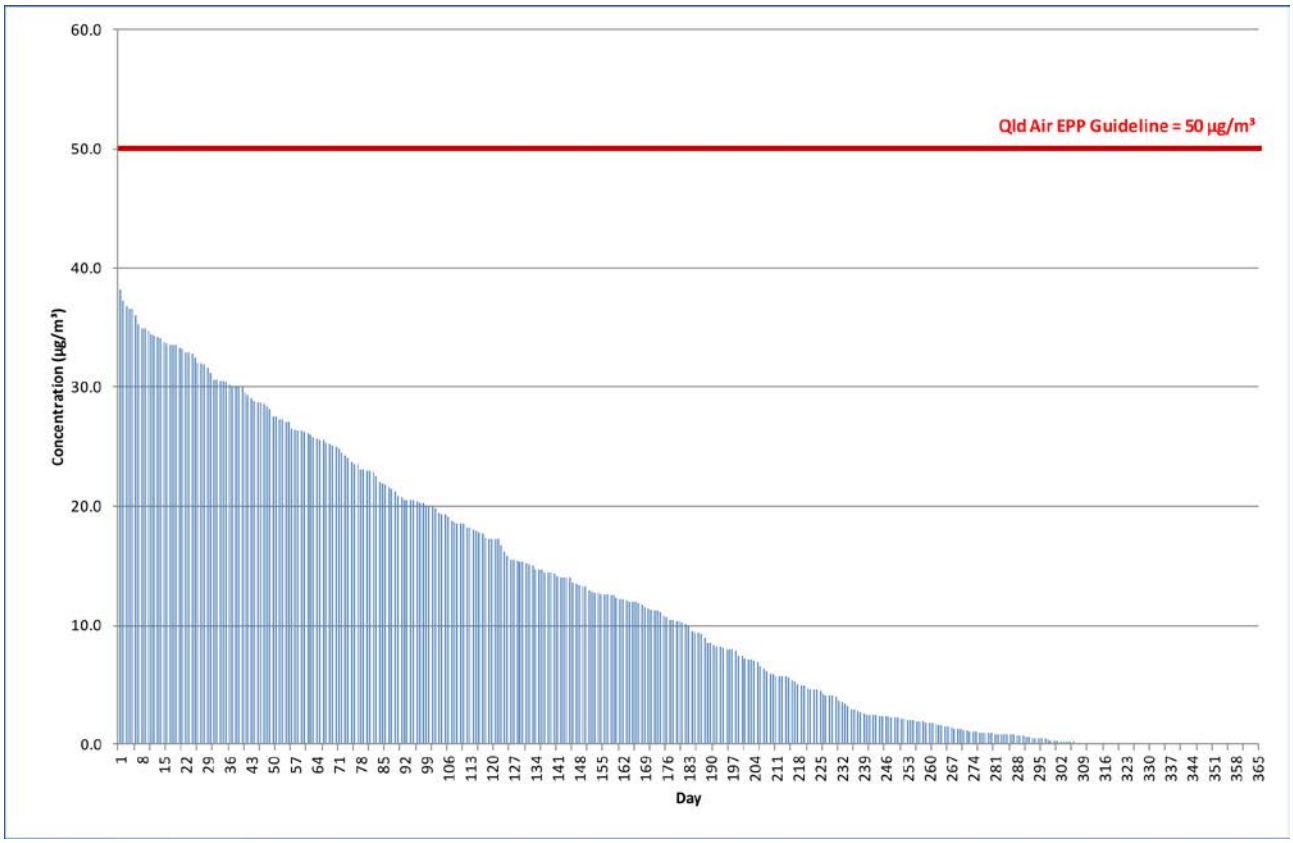


Figure 15. Predicted 24 hour PM_{10} concentration at Cavendish (cumulative impact)



The cumulative impact air quality model which includes maximum emissions from the Galilee Coal Project, year 20 emissions from Alpha coal mine and year 25 emissions from Kevin's Corner coal mine shows that air quality levels at these sensitive receptors is within Queensland air quality criteria.

However, it is important to note that background concentrations are not incorporated into the air quality modelling results for the cumulative air quality model. Background air quality was not incorporated into the cumulative air quality model as the model includes maximum emissions from the Galilee Coal Project, and the proposed Alpha and Kevin's Corner coal mines. During year 19 of operation these emissions are estimated to account for over 95% of total particulate matter emission in the region. Elevated background events may occur on occasion due to regional events such as dust storms and bushfires. However, it is not possible to predict the occurrence of dust storms and bushfires accurately or meaningfully in a localised air quality model.

For example, the 2009 dust storms experienced over much of eastern Australia were generated in South Australia and were transported through NSW and Queensland.

Furthermore, the *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM) uses the 6th highest 24 hour PM_{10} concentration in order to compare monitoring results to relevant air quality criteria. The Air NEPM 24-hour air quality guideline is consistent with the air quality criterion used in this air quality assessment. However, using the 6th highest concentration under the Air NEPM for monitoring results was designed to eliminate the reporting of elevated monitored levels due to natural events, such as bushfires and dust storms. Recently, the Air NEPM was reviewed. A recommendation from the review was that the reporting of the 6th highest concentration is removed from the Air NEPM and that all elevated ambient air quality levels events due to natural events are excluded from reporting and from comparison to the Air NEPM air quality guideline. Therefore, by including the large majority of particulate matter emissions in the region in the cumulative air quality model, and using the 1st highest predicted 24 hour PM_{10} concentration, the model is considered to be representative of the cumulative impact from the surrounding mines in the region.

On-going air quality monitoring at sensitive receptors will be performed in order to manage air quality impacts on an on-going basis as part of a reactive air quality management plan. That plan will incorporate continuous air quality monitoring adjacent to sensitive receptors. Standard mitigation measures include road and overburden encapsulation area watering.

3.6.2 RAIL

Air emissions during the construction phase of the rail corridors will be primarily dust related, with some minor emissions of combustion pollutants such as nitrogen oxides due to diesel and petrol vehicles and construction equipment.

The sources of dust emission include:

- clearing of vegetation and topsoil
- excavation and transport of earth material
- blasting
- vehicles travelling on unpaved roads
- vehicles and machinery exhausts, and
- activities from temporary hard rock and gravel quarries situated along the alignments.

As mentioned above, the impacts of dust emissions fall under two distinct categories, health and amenity. Potential health impacts are attributable to the concentration of respirable particles in ambient air. Respirable particles of dust have an aerodynamic equivalent diameter of 10 microns or less and are otherwise known as PM_{10} with a finer fraction of $PM_{2.5}$ (an important subset of PM_{10}).

Maximum impact from PM_{10} emissions occur under light winds and stable atmospheric conditions, when atmospheric dispersion is poor. These conditions occur most frequently overnight and early in the morning. As the rail construction would be restricted to daylight hours, these conditions usually occur outside periods of construction activity. Amenity impacts relate to visible dust plumes as well as deposition on buildings and materials. Amenity issues due to particulate matter emissions are associated with larger particles above 10µm as particles in this size range deposit out of the atmosphere in the vicinity of the point of emission.

The potential for air quality impact is greatest at receptors located at the edge of the rail corridor or at construction areas with the level of impact decreasing with distance from the construction areas. Based on previous experience with similar construction projects, dust related impacts are unlikely to be significant at distances greater than 500m from the source. Enhanced mitigation measures may be required where sensitive receptors occur within 500m of the alignment, and particularly where sensitive receptors occur within 100m of the alignment.

As such, and given the Queensland Government commitment that there will be only one rail alignment from the southern Galilee basin, it is considered unlikely that both the ACP alignment and the GCP alignment would both proceed, which would render cumulative impacts unlikely, as the CC rail alignment is too far removed spatially from either the GCP for the ACP for impacts to air quality to overlap.

Without mitigation, sensitive receptors may be adversely affected by dust levels, particularly from an amenity point of view. Health related impacts are unlikely given the relatively short term nature of construction activities in the vicinity of individual receptors.

Operationally, Waratah Coal commits to the following dust control measures:

- Waratah Coal proposes to use tippler wagons (gondola) rather than the more traditional bottom dump coal wagons. With the use of tippler wagons, coal hang-up should be negligible or eliminated. Bottom dump wagons are more frequently associated with coal hang up, particularly in wet weather, and

- In addition to the tippler wagons, Waratah Coal's solution to mitigation of coal dust is to provide a cover to the top of the wagons. It is intended these covers will be made of fibreglass. These covers have been proven in service, operating in conditions ranging from –40°C to +40°C. The railcar cover system meets the criteria for a "closed transport vehicle" specified in the United States Code of Federation Regulations (CFR), Title 49, Transportation (Subsection 173.403(c)).

In addition to significantly reducing coal dust, these commitments provide reduction in emissions from fuel consumption as using covers provides better train aerodynamics, which reduces fuel consumption, and associated emissions.

3.6.3 CUMULATIVE IMPACT SIGNIFICANCE

The mine air quality assessment undertaken for the GCP concurs with that undertaken for the KC mine site that there would be a cumulative impact of the GCP, ACP and KC projects at Kia Ora, Monklands, Spring Creek, and Glen Innes Homestead (Bimblebox Nature Reserve). However, these sensitive receptors will be acquired by the Galilee Coal Project in order to avoid significant air quality impacts, so this potentially significant cumulative impact will be negated.

For the rail, given the minimal impact the construction and operation of the GCP rail is expected to have on air quality, and the distances between the CC rail alignment and the GCP alignments, it is considered that cumulative impacts are unlikely.

The significance of the cumulative impact for the mine has been assessed as medium. The rail has not been assessed given that the distance between the ACP and CC project, or the GCP project and the CC project, renders cumulative impacts highly unlikely.

3.7 Greenhouse Gas Emissions

3.7.1 MINE

The GCP mine is projected to produce 2.3Mt Carbon Dioxide equivalents (CO_2-e) per annum, with scope 1 and 2 emissions contributing approximately 48% and 52% of total emissions, respectively. The bulk of the annual scope 1 greenhouse gas emissions are associated with fugitive methane emissions released during open cut mining (31%) and during underground mines (26%). The remainder is predominately associated with diesel consumption for mining equipment (26%). The majority of total scope 1 emissions are CO_2 emissions and CH_4 emissions, with negligible amount of N_2O emissions.

The average greenhouse gas emissions predicted for each mining project are presented in Table 12. The emissions are also represented as a percentage of the Australian emissions for the 2008/2009 and the Queensland emissions for 2008/2009.

Table 12. Greenhouse Gas Emissions

	SCGP	GCP	ACP	KC	CC	TOTAL
GHG average emissions average (CO_2-e/yr)	357,000	2,304,495	2,036,006	2,019,637	2,286,000	**9,003,138**
%age Aust total*	0.65	0.42	0.37	0.36	0.42	**1.65**
%age Qld total**	0.23	1.49	1.31	1.30	1.47	**5.81**

*The 2008/09 Australian emission total of 546Mt

**The 2008/09 Queensland emission total of 155 Mt CO_2-e (including land use, land-use change and forestry).

As can be seen from Table 12, all mines except for the SGCP are predicting similar GHG emissions to that projected for the GCP. Cumulatively, the mines would emit 9,003,138t CO_2-e/yr, which equates to 1.65% of the Australian emissions for 2008/2009, or 5.81% of the Queensland emissions for 2008/2009. The GCP would contribute 0.42% or 1.49%, respectively.

The emissions intensity of the GCP mine is 0.06 t CO_2-e/t saleable coal, which is approximately equivalent to the average emissions intensity of existing Australian coal mines that have both open cut and underground operations, and is less than the average emissions intensity of all coal mines (0.079 t CO_2-e/t saleable coals).

Technical assessments undertaken during the EIS process suggest that the project can most effectively reduce its annual emissions through improvements in energy efficiency. Waratah Coal is committed to undertaking ongoing internal measurement and monitoring of emissions, in addition to mandatory reporting. The focus of the monitoring program will be to identify sources with the greatest potential for emissions reductions. Greenhouse gas emissions may also be offset through investment in third party projects that reduce emissions below a demonstrated baseline, for example, through forestry agreements, renewable energy and partnerships such as with Australia Carbon Trust.

It is expected that all proponents would commit to similar measures to reduce the GHG emissions of their operations, for example, incorporating and accelerating the uptake of energy efficiency, integrating greenhouse issues into business decision and providing accurate reports on GHG emissions in compliance with legislation.

3.7.2 RAIL

The Greenhouse Gas Emissions estimated from the GCP rail component are 3,437,475t CO_2-e/yr during construction, and 2,919,480t CO_2-e/yr for operations. The vast majority of these amounts are from emissions associated with diesel consumption. Diesel combustion for transport energy purposes accounted for 85% of the construction emissions, whilst 95% of the emissions for the operation of the rail derive from diesel consumption in the locomotives. The CC project emissions are estimated at 637,000t CO_2-e/yr. Together, these two projects would result in 3556480t CO_2-e/yr.

3.7.3 CUMULATIVE IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on GHG has been ranked as medium.

3.8 Noise and Vibration

3.8.1 MINE

From the assessment conducted, noise impacts from mine operations would be expected at locations Eureka, Lambton Meadows, Salt Bush and Cavendish without any noise treatment (with no impacts at Kiaora, Monklands and Hobartville since they are expected to be acquired or moved). Attenuation is required regarding:

- crushers associated with OC2 at the source (partial enclosure) or modification of the proposed earthworks to include a berm between the OC2 crushers and Eureka, or a combination of the two (for residence at Eureka)
- crushers associated with OC1, OC2 and the underground mines at the source (partial enclosures) and / or the combination of shielding from spoil dumps or stockpiles (for residences at Lambton Meadows, Salt Bush, Cavendish).

Both the SGCP and the ACP report that noise and vibration levels from their projects in isolation are not expected to impact on any sensitive receptor outside of their project boundaries. Regardless of this, it is possible that the cumulative noise and vibration effects of these projects, in concert with the GCP, will increase the impacts on

Lambton Meadows, Salt Bush and Cavendish, which are not currently proposed to be relocated or acquired. Waratah Coal commit to:

- on-going noise and vibration monitoring will continue to be carried out in accordance with the requirements of EP Act, the EPP (Noise), Environmental Protection Regulation 2008, and the Environmental Authority
- the GCP will investigate all noise and vibration related complaints
- corrective actions resulting from complaints investigations will be implemented.

3.8.2 RAIL

There is only limited potential for significant construction noise emissions from the rail construction at the nearest receptors due to the nature of the construction activities, the allowable time for construction per day and the large intervening distance between the sources and the receptors. Key activities producing noise and vibration during construction that are likely to impact on sensitive receptors will be identical or less than those during the operational phase.

The predicted levels comply with the vibration levels recommended to achieve human comfort. No adverse human comfort vibration impacts would result from the GCP at any residential location, during coal train pass-bys.

Given the above and the Queensland Government commitment that there will be only one rail alignment from the southern Galilee basin, it is considered unlikely that both the ACP alignment and the GCP alignment would both proceed, which would render cumulative impacts unlikely, as the CC rail alignment is too far removed spatially from either the GCP for the ACP for noise and vibration impacts to overlap.

3.8.3 CUMULATIVE IMPACT SIGNIFICANCE

The significance of the cumulative impact for noise and vibration for the mine has been assessed as medium. The rail has not been assessed given that the distance between the ACP and CC project, or the GCP project and the CC project, renders cumulative impacts highly unlikely.

3.9 Waste

3.9.1 MINE

Each mine is likely to generate solid wastes (as well as waste water and air emissions, which are dealt with separately). Environmental harm could occur in and around any mine site if wastes are not managed properly. If mines adjacent to each other fail to manage waste correctly, then cumulative impacts to water, soil and air could occur. This is, however, considered highly unlikely.

The increase in mining in the region will likely result in an increase in the demand for recycling and waste transportation services, which is expected to be resolved through market forces resulting in an increase in these service providers. This is considered to represent a positive socio-economic impact.

For the GCP, overburden, coal rejects and tailings waste streams will be appropriately managed and monitored throughout the life of the mine. It is expected that the other mines assessed as part of this CIA would implement similar management techniques. Appropriate management of these waste streams significantly reduces the potential for waste streams entering waterways and groundwater systems and flowing off-site.

3.9.2 RAIL

For the rail component of the project wastes will be stored or transported for offsite disposal. There is considered to be minimal potential for waste related cumulative impacts of the rail component of the project.

3.9.3 CUMULATIVE IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on waste has been ranked as low.

3.10 Traffic and Transport

3.10.1 MINE

The regional transport network in the vicinity of the mine that will be subject to construction and operation traffic is illustrated in Figure 16. The majority of these roads are administered by BRC, the exceptions being the Capricorn Highway and Clermont-Alpha Road, which are state controlled roads managed by Department of Transport and Main Roads (DTMR).

The nearest major road to the GCP mine site is the Clermont-Alpha Road. From Alpha the mine site is most effectively accessed via Hobartville Road, then Monklands Road.

Development of three mines of a similar size (as well as the Galilee Basin Power Station) will significantly change the number and class-type of vehicles from the currently existing situation. For the SGCP, the impact analysis identified potential increases in daily traffic exceeding 5%, and therefore considered significant by the Guidelines for Assessment of Road Impacts of Developments (GARID), on the Capricorn Highway, between Alpha and the SGCP and on the Clermont-Alpha Road from Pioneer-Clydevale to Hobartville.

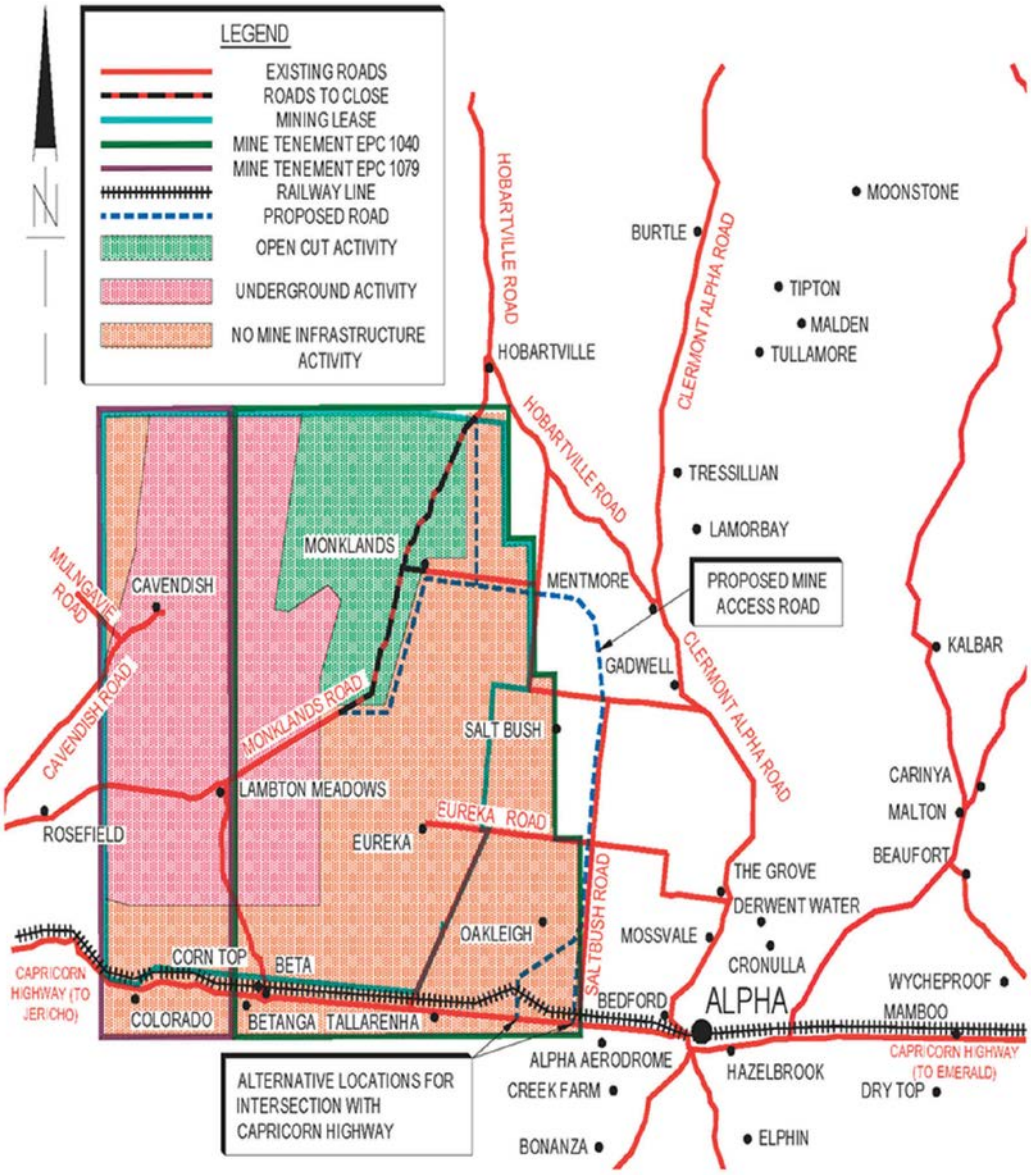
For the ACP the traffic impact assessment determined that the traffic generated by the mine would have a significant impact on the existing road network.

Mine generated traffic will consist of several categories including Drive in Drive out (DIDO); state, regional and local staff; specialist contractors; and servicing of development. These trips will be distributed throughout the road network on a local, regional, state, interstate and over dimensional level. The traffic generated by the other mine sites assessed is expected to have a similar composition.

The interaction between the vehicles generated by all three developments, and potentially also the KC project, will likely result in a cumulative impact on traffic in the local area.

As a mitigation measure, it is proposed to upgrade the existing Saltbush Road to provide a direct connection between the mine and the Capricorn Hwy. This road would provide a more direct access route to the GCP from Alpha than via the Clermont-Alpha Road which follows the Alpha Creek alignment from Alpha to the mine, and is the major proposed network for the ACP. The SGCP proposes to the construct Auxiliary Right Turn and Auxiliary Left Turn treatments at the intersection of the Carpentaria Highway and the SGCP Mine Access road.

Figure 16. Regional transport network



3.10.2 RAIL

Operation of the rail will not impact upon the local transport network.

The construction of the railway over a three year period is expected to have a temporary impact on the local transport network. Currently state controlled roads intersected by the railway carry light traffic volumes, with the exception being the Bruce Highway. Parts of these roads will be used as supply routes for materials from quarries, goods and services from regional townships, as well as for transport of workers from accommodation camps. Consequently, this may increase traffic on these roads by up to 157 Vehicles Per Day (VPD). Heavy vehicle impacts to the external road network will predominately concentrate along haul routes to quarry sites.

The proposed railway will impact a number of existing infrastructure transport corridors including Major State Controlled Roads and Railway Lines (one instance)and Minor State Controlled Roads and Local Authority Roads (16 instances)

There are approximately 190 existing tracks that have been identified as crossing the rail line.

Due to the remote nature of the majority of the railway, environmental impacts of increased traffic to nearby sensitive receivers such as residences, stock and roadside vegetation, is expected to be minimal. The exception to this may be along designated haul routes through townships, such as Collinsville and Mount Coolon.

Given the above and the Queensland Government commitment that there will be only one rail alignment from the southern Galilee basin, it is considered unlikely that both the ACP alignment and the GCP alignment would both proceed, which would render cumulative impacts unlikely, as the majority of CC rail alignment is too far removed spatially from either the GCP for the ACP for traffic and transport impacts to overlap. Furthermore, the construction timing for either of the southern Galilee Rail alignments would need to overlap with that of the CC project for cumulative impacts to occur.

3.10.3 CUMULATIVE IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on traffic and transport has been ranked as medium.

3.11 Indigenous Cultural Heritage

Management of both mine and rail impacts on Indigenous Cultural Heritage will be via the Cultural Heritage Management Plan (CHMP) process. The mine and rail projects assessed in this CIA cumulatively affect native title/ Aboriginal Party areas. It is likely that this will result in increased demand on Aboriginal parties to be involved with consultation and field investigations. If the construction activities requiring the involvement of Aboriginal Parties for multiple projects coincide, then the pressure on these groups to respond to requests for involvement may become significant. This has been taken into account in the social cumulative impact assessment.

No listed indigenous cultural heritage will be impacted by the GCP, however, items of unrecorded Indigenous cultural heritage may occur near it and the proposed mine and rail developments, and without appropriate site management initiatives, may be threatened by construction impacts.

Unrecorded Indigenous heritage resources within GCP impact areas will be identified during dedicated field surveys conducted by the relevant Aboriginal party as agreed in the CHMPs. The conduct of the cultural heritage study and the implementation of site protection or remediation measures will be specified in approved CHMPs, either already agreed or still to be negotiated with each Aboriginal party.

Indigenous Cultural Heritage finds are typically dealt with on a site by site basis and managed though each parties CHMPs. It is expected that the other surrounding mines will have similar management and mitigation measures with regards to Indigenous Cultural Heritage. It is possible however, that across the GCP and the surrounding mine and rail sites there may be a trend of types of cultural heritage finds that adds significance and the potential for cumulative impact.

Impact mitigation measures that may be required include avoiding certain highly sensitive areas, carrying out more field investigations including sub-surface testing, recovering datable occupation material, and collecting and relocating cultural heritage items.

3.11.1 CUMULATIVE IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on indigenous cultural heritage has been ranked as low.

3.12 Non-Indigenous Cultural Heritage

3.12.1 MINE

The open cut mine and associated facilities which includes three pastoral properties: Kiaora, Glenn Innes, and Monklands. A further area of underground mining will be below the Cavendish, Spring Creek and Lambton Meadows properties.

The survey and assessment of the mine area revealed that generally the project will have only a minimal impact on places of non-indigenous cultural heritage significance, with the only site identified as potentially significant being the Monklands homestead. On Monklands the shearing shed, in particular, is intact with some machinery and a wool press remaining in-situ. Monklands is a typical and good example of a smaller holding that was developed following the resumption of the larger runs in the late 19th century.

This site would potentially meet the threshold for local significance, with evidence of use in this former sheep property in the shearing shed and wire-netting fence. The development of the mine and associated infrastructure will require the demolition or removal of the Monklands homestead complex.

The SGCP, ACP and KC EIS's identified a number of non-indigenous cultural heritage sites within their projects.

3.12.2 RAIL

The proposed rail project will have a minimal impact on places of non-indigenous cultural heritage significance. Two places that would meet the threshold for entry on the Queensland Heritage Register were identified; however these places are not likely to be directly impacted by the Project works.

3.12.3 CUMULATIVE IMPACT SIGNIFICANCE

The project is not expected to only impact upon one place with possible non-indigenous cultural heritage significance, the contribution of the project to cumulative impacts on cultural heritage in the area is considered to be low.

3.13 Socio-economic

The SGCP, GCP, ACP and KC and are located near Alpha. The CC mine is located around 200km north of Alpha and is expected to have a much lower impact on Alpha than other proposed mines. The Queensland Government has identified all four mines in the vicinity of Alpha as 'significant'.

The relative size of these coalmines is worth noting:

- In 2010/11 Queensland's 56 operating coalmines produced 180Mt product coal, the largest being the Blair Athol and Blackwater mines (both producing between 10 and 12Mtpa)
- At full production the 4 proposed mines in the vicinity of Alpha will produce around 115Mt product coal per annum.

The Department of Natural Resources and Mines listed three coal projects under construction and 31 advanced coal projects in the Bowen Basin as at July 2012 (DNRM, 2012). Although the recent decline in coal prices has delayed some plans for mine development or mine expansion, and the proposed expansion at Abbot Point has been temporarily suspended to enable a review of existing capacity and forecast demand before proceeding, continued expansion of coal production in the Bowen Basin, and development of multiple mines in the Galilee Basin, is forecast.

In addition to the expansion of the coal industry, a number of Coal Seam Gas (CSG) projects are being developed in Central Queensland and generally involve the extraction of CSG in the Bowen and Surat Basins; the construction of gas pipelines to Gladstone; and the construction of Liquefied Natural Gas plants and expansion of port facilities at Gladstone.

Despite the current economic uncertainty, it is likely that several coal projects will be developed in a similar timeframe to that proposed for the Galilee Coal Project. Similar timeframes are likely because several coal projects will depend on the construction of expanded port facilities at Abbot Point, and will therefore aim to complete rail and mine construction and commence production as soon as possible after the expansion of port facilities.

Drawing on research conducted by the University of Central Queensland (Lockie *et al.*, 2008; Petkova *et al.*, 2009;), experience gained from the development of the *Sustainable Futures Framework for Mining Towns* (DLGP, 2007), and responses to the EIS for the Galilee Coal Project, the cumulative impact of multiple resource projects being developed within a similar time frame will include:

- Continued growth in employment opportunities
- Increased demand for locally available goods and services required for mine construction and operations
- Local skill shortages
- In-migration, despite a shift towards a higher proportion of fly in – fly out (FIFO) workers
- Increased demand for housing, resulting in further rises in both house prices and rental costs
- A shortage of temporary accommodation (potentially impacting on tourism)
- Increased traffic, and
- Increased demand for public and private services, including social services, emergency services and commercial services.

While many of the above impacts sound negative, continued expansion of the mining industry will:

- Help address the decline in population rural Queensland has experienced in recent decades
- Increase personal income levels in the region
- Lead to improved public infrastructure and services
- Raise workplace health and safety standards (including in non-mining sectors)
- Provide substantial (voluntary) financial contributions to local organisations and activities, and
- As a result of high income levels, contribute to a level of commercial services, entertainment and events more typical of an area with much higher population.

Mining is helping redress the inequality between rural and urban areas that has prevailed for several decades, particularly in terms of personal income levels and access to infrastructure and services. However, those people living in the mining areas have overwhelmingly been critical of the lack of resources allocated in response to rapid population growth, and have maintained a popular view that too few mining benefits are returned to the area in which mining occurs. The Royalties for the Regions initiative may help change this perception.

3.13.1 SOCIAL IMPACT SIGNIFICANCE

The main social impacts and their significance, resulting from both the project and from the development of multiple, large-scale resource projects, are summarised in Table 13. Note that the summary focuses on the main social impacts, as recommended in the Leading Practice Strategies for Addressing the Social Impacts of Resource Developments (Franks *et al.*, 2009), rather than trying to list all potential social impacts. Note also, the significance of an impact (grouped as extreme, high, medium or low) is based on an assessment of the likelihood and consequence of an impact occurring, as recommended in the *Guideline to Preparing a Social Impact Management Plan* (DIP, 2010), and in *Leading Practice Strategies for Addressing the Social Impacts of Resource Developments* (Franks *et al.*, 2009), not using Table 1 and Table 2 as for other elements considered in this CIA.

As such, significance has been categorised based on the combined score of the likelihood and consequence:

Likelihood (L): 5 = almost certain; 4 = likely; 3 = possible; 2 = unlikely; 1 = rare

Consequence (C): 5 = severe; 4 = major; 3 = moderate; 2 = minor; 1 = negligible

Significance (S): 10 = extreme; 8-9 = high; 5-7 = medium; 3-4 = low; 2 = negligible

Table 13. Summary of Social Impacts and Significance

IMPACT	DESCRIPTION OF PROJECT IMPACT	SIGNIFICANCE	
		Project	Cumulative
Positive			
Increased employment	The project will generate an additional 3,000 jobs during construction and 4,000 jobs during operations in Queensland; and an additional 700 jobs during construction and 600 jobs during operations in the region.	Medium	High
Improved skill levels	Skill levels in the region will be increased as training is provided to workers, apprentices engaged, and support provided to local schools to establish pathways for school children to enter the mining industry.	Medium	Medium
Increased business activity	The project will procure a range of goods and services from the project area and local region, leading to a direct increase in business activity and employment. By contributing to population growth, the project will also have indirect and induced impacts on business activity and employment.	Medium	High
Higher income levels	Increased employment and business activity will increase personal and family income levels in the project area and local region.	High	High
Population growth	The project will lead to a substantial increase in the population of Alpha, and contribute to modest population growth in the Bowen area.	Medium	High
Improved infrastructure and services	The project is expected to lead to substantial improvements in infrastructure and services in Alpha, and significant improvements in Bowen, both from the project's contribution through the Royalty for the Regions Initiative, and from direct contributions by Waratah Coal as part of a coordinated, multi-proponent response in both locations. Population growth will also help secure improved public and commercial services in Alpha and Bowen.	High	Extreme
Negative			
Additional stress	The uncertainty over the rail alignment and which railway will be constructed is causing uncertainty and stress for property owners. Mine and rail construction will cause further stress on property owners.	High	High
Dust, noise, vibration and reduced visual amenity	People residing in the vicinity of the mine and railway can expect, to varying degrees, increased levels of dust, noise, vibration and reduced visual amenity as a result of the project.	Medium	Medium
Lower cattle production	Cattle operations will be disrupted on some properties, potentially increasing labour requirements and possibly reducing cattle productivity.	Medium	Medium
Loss of staff to the mining industry	Government agencies and local businesses, including grazing and agricultural enterprises, will lose staff to the mining industry, leaving them short-staffed and/or facing higher recruitment, labour and training costs.	High	High
Increased demand on health and emergency services	Resident and FTE population growth will place additional demand on health and emergency services in Alpha and Bowen. Increased traffic on highways and local roads may also contribute to an increase in traffic accidents and may therefore increase the demand on police, fire, ambulance and health services.	Medium	Medium

IMPACT	DESCRIPTION OF PROJECT IMPACT	SIGNIFICANCE	
		Project	Cumulative
Negative (Continued)			
Rising living costs	Housing prices, rental costs and the costs of local goods and services are expected to rise. Shortages in accommodation and trade services are likely. Higher living costs will disadvantage the non-mining sector and particularly low-income groups.	Medium	High
Loss of rural atmosphere	Without a well-managed and adequately resourced approach, Alpha could lose its existing friendly, rural atmosphere and exhibit a range of characteristics more commonly described as befitting a mining town.	Medium	High
Decline in tourism	A lack of temporary accommodation in Alpha, and potentially Bowen, or excessive costs for temporary accommodation, could result in a decline in tourist numbers, and therefore, less business activity.	Medium	Medium
Economic decline following mine closure	Mine closure (or a downturn in the mining industry) may result in a decline in employment levels, contracting opportunities and income levels in the project area.	Medium	Medium

The Galilee Coal Project will have social and economic impacts through much of Queensland. When considering the cumulative impacts from the development of multiple large-scale coal projects in the Galilee Basin, the most impacted community will clearly be Alpha. However, the expected expansion at Abbot Point will impact significantly on the Bowen community. The most impacted individuals will be property owners with land in the MLA, followed by property owners with land in the rail corridor, then employees and contractors.

3.14 Economy

The potential for the projects to provide significant positive impacts on the local, state and national economies is substantial, as shown in Table 14.

Table 14. Cumulative Capital Expenditure

PROJECT	CAPITAL EXPENDITURE (BILLION)
SGCP	$4.2
GCP	Mine $4
	Rail $2.5
ACP	Mine $4.2
	Rail $2.8
KC	$6.9
CC	Mine $21.5
	Rail $1.2

It is acknowledged in that some industries may experience a decline in output and labour relative to what would be expected to occur without the projects occurring. However, the following key points should be recognised:

- The projects are expected to result in a net increase in jobs overall, and higher levels of economic output, and
- The projects will result in a reallocation of resources to higher paying industries that provide higher value to the Australian economy.

So while some sectors may experience a decline in activity relative to what might otherwise be expected to occur without the project, overall the local, Queensland and Australian economies will be better off.

3.14.1 ECONOMIC IMPACT SIGNIFICANCE

Based on the assessment methodology presented in Table 1 and Table 2, the significance of the cumulative impact of the project on economics has been ranked as high (positive).

3.15 Project contribution to Cumulative Impacts

Table 15 provides the details of the GCP contribution to cumulative impacts. The assessment is based upon residual impacts.

Table 15. Cumulative Impact Significance Assessment

ENVIRONMENTAL VALUE	LAND USE	LANDSCAPE CHARACTER	TERRESTRIAL ECOLOGY	AQUATIC ECOLOGY	SURFACE WATER	GROUNDWATER	AIR QUALITY	GREENHOUSE GAS	NOISE AND VIBRATION	WASTE	TRAFFIC AND TRANSPORT	INDIGENOUS CULTURAL HERITAGE*	NON-INDIGENOUS CULTURAL HERITAGE	SOCIAL**	ECONOMICS***
Probability of cumulative impact	2	2	3	3	3	3	3	3	2	1	3,1	1	1	3	3
Duration of cumulative impact	2	2	2	2	2	3	2	2	2	1	2,1	1	1	3	3
Magnitude/intensity of cumulative impact	2	2	2	2	2	2	1	2	1	1	2, 2	1	1	2	2
Sensitivity of receiving environment, significance of environmental or social values	1	1	2	1	1	1	1	2	1	2	2, 1	1	1	1-3	2
Total	**7**	**7**	**9**	**8**	**8**	**9**	**7**	**9**	**6**	**5**	**7**	**4**	**4**	**7-10**	**10**
Impact Significance	**Med**	**Med**	**Med**	**Med**	**Med**	**Med**	**Med**	**Med**	**Low**	**Low**	**Med**	**Low**	**Low**	**Med -High**	**High**

*For indigenous cultural heritage the average of cultural and archaeological impacts is given

**for socioeconomic a different impact significance scoring system was used - the positive impacts were high, the negative impacts were medium

***Economics is a positive impact

4 CONCLUSION

The Cumulative Impact Assessment considered the SGCP, the GCP, the ACP, KC and the CC project mine and rail elements and assessed both the likelihood of cumulative impacts arising from the interaction of these projects, and, where cumulative impacts were deemed likely to arise, the GCP contribution to those cumulative impacts. The cumulative impacts for which the contribution of the GCP was considered to have a low significance are:

- Noise and Vibration
- Waste
- Indigenous cultural heritage
- Non-indigenous cultural heritage

The cumulative impacts for which the contribution of the GCP was considered to have a medium significance are:

- Land Use
- Landscape Character
- Terrestrial Ecology
- Aquatic Ecology
- Surface Water
- Groundwater
- Air Quality
- Greenhouse Gas
- Traffic and Transport

For social cumulative impacts, the contribution of the GCP was considered to have a medium to high significance.

For economic cumulative impacts, which are considered positive, the contribution of the GCP was considered to have a high significance.

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