20 Cumulative Impacts

20.1 Introduction

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the impacts of the Project that are cumulative. There are three separate levels of cumulative impacts considered: Project Site localised cumulative impacts; regional cumulative impacts; and global cumulative impacts.

- **Project Site localised cumulative impacts**

  These are the cumulative impacts that result from mining operations in the immediate vicinity of the Project Site. Project Site localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers. These issues include dust deposition, noise and vibration, groundwater drawdown, groundwater and surface water quality, and transport. The EIS has specifically examined the cumulative impacts on sensitive receivers from the combined effect of the Poitrel Mine, Millennium Project and the Daunia Project.

- **Regional cumulative impacts**

  Regional cumulative impacts include the Project's contribution to impacts that are caused by mining operations throughout the Bowen Basin region. Each coal mining operation in itself may not represent a substantial impact, however the cumulative effect on issues such as habitat loss, water quality degradation, and socio-economic impacts may be sufficient enough to warrant consideration.

- **Global cumulative impacts**

  The only impact from the Project that is potentially global is greenhouse gas emissions. However, the level of emissions from the Project represents a very minor contribution at this scale.

This section also discusses the way in which the BMA Bowen Basin Coal Growth Project (BMA BBCGP) contributes or adds to the level of impact already experienced at these three levels. The BMA BBCGP involves: the development of new mines at Daunia and Caval Ridge; expanding operations at Goonyella Riverside Mine; and a new airport. These elements of the BMA BBCGP have environmental impacts that are potentially cumulative in nature on the region. The Project Site is separated from all the other elements of the BMA BBCGP by 20 km or more and therefore the other BMA BBCGP elements do not contribute to localised cumulative impacts at the Project Site (e.g. dust, noise, vibration, and groundwater drawdown). However, potentially cumulative impacts that are experienced at regional levels include social and economic impacts, regional loss of ecology and land resources, traffic and transport impacts, and greenhouse gas emissions. The cumulative impact of the BMA BBCGP on these issues is considered in this section.

The assessment of Project Site localised cumulative impacts is based on this Project EIS. The assessment of potential regional cumulative impacts from the BMA BBCGP is based on key impacts from the different elements of the BMA BBCGP presented in **Table 20-1** at the end of this section.

The sections below discuss impacts of the Project and the BMA BBCGP on environmental and socio-economic aspects at the local, regional and global levels.

20.2 Land Resources

The Project will result in the loss of approximately 240 ha of Class A and B Good Quality Agricultural Land (GQAL), which represents approximately 0.02 per cent of the Class A and B GQAL mapped within the Isaac Regional Council. The Project Site and the locality have primarily been used for grazing rather than cropping and much of the Project Site will be suitable for grazing post-mining. The post-mining land use is proposed to comprise a mosaic of self sustaining vegetation communities and grazing land, using appropriate native tree, shrub and grass species, and improved pasture species as appropriate. The assessment of land suitability, GQAL and rehabilitation of the Project Site is detailed in **Sections 4.3** and **4.5** of the EIS.

The potential for the remaining elements of the BMA BBCGP to have cumulative impacts in the region on land resources are tabled and discussed in **Table 20-1**.

20.3 Surface Water Resources

The mining area within the Project Site covers approximately 2,600 hectares, which represents approximately 0.7 per cent of the catchment area of the Isaac River upstream of the Project Site, and approximately 0.1 per cent of the total catchment area of the Isaac River. Post-mining, most of the Project Site will be contoured so that surface water discharges flow into the Isaac River and overall the Project will pose a very limited impact on the river's hydrology. The Project is therefore not expected to have a significant regional cumulative impact on surface water flows.

Potential water quality impacts (increased sediment load and salinity) on the Isaac River will be mitigated through measures outlined in **Section 6.2**, including a mine water management system, sediment dams, restrictions to site water discharges, progressive rehabilitation, spill controls, and water quality monitoring. Given the mitigation measures proposed for the Project, and the mining industry standards and regulations for water quality protection, the regional cumulative impact on surface water quality is considered small.

The Project will minimise water supply requirements by collecting, managing and reusing water on site. Water will also be supplied to the site via the Braeside Pipeline, which receives water from the Braeside Borefield and Eungella Dam. The Project demand for water from this system is 600 ML/a. The potential contribution of remaining elements of the BMA BBCGP is tabled and discussed in **Table 20-1**.

20.4 Groundwater

Assessment of groundwater is presented in **Section 7** of the EIS. The cumulative groundwater impacts were assessed through numerical modelling of the cumulative groundwater drawdown from the Daunia, Poitrel and Millennium mines.

The modelling predicted that the cumulative drawdown from the three mines would be centred around the Poitrel Mine, except during years 15 to 20 of the Project, where drawdown from the Daunia Project would be significant. The modelling has predicted that the drawdown by year 20 would be significant in the bores at Olive Downs, Winchester Downs and Daunia, with the drawdown in these bores estimated in the range of

3 to 5 metres. The groundwater drawdown in the vicinity of the Project Site will continue for around 25 years after mining ceases and then gradually recover.

The management of groundwater drawdown impacts is outlined in **Section 7.2**.

There are no significant regional users of the groundwater resource that the Project impacts on.

20.5 Terrestrial Ecology

Extensive broadscale clearing has occurred in the Brigalow Belt Bioregion since the Brigalow Land Development Scheme began in the 1960s and required landholders to develop land at a certain rate per annum in order to retain their leases (Australian Greenhouse Office, 2000). Overall, the development of mining in the region has resulted in limited clearing compared to other industries such as grazing. However, the historic broadscale clearing by other industries has effectively ceased, while the mining industry is in the process of expansion. Furthermore, clearing has been less extensive in areas where there was an identified potential for coal mining and therefore many of the larger areas of remnant vegetation lie over the region's coal resources.

Recognising the extent of clearing that has occurred historically, the Project planning has taken careful consideration to avoid and minimise the clearing of remnant vegetation, particularly vegetation listed as rare or endangered under Queensland and/or Commonwealth legislation. These areas, nominated by governments, represent an important approach to managing cumulative regional impacts.

The Project will result in the clearing of approximately 15 hectares of Endangered Brigalow woodland, which represents approximately 0.01 per cent of the remaining area of this vegetation community within the Brigalow Belt North Bioregion. The remainder of the Project's disturbance footprint comprises grassland dominated by introduced Buffel Grass, as described in **Section 8.4** of the EIS.

Over 60 hectares of Brigalow dominant woodland has been retained within the Project Site through re-arranging the mine footprint during the Project's planning phase. Groundwater drawdown due to mine operation is unlikely to cause impacts to the Brigalow woodlands, as discussed in **Section 7.2** of the EIS. Rehabilitation of the Project Site will seek to incorporate native tree, shrub and grass species where appropriate, as described in **Section 4.5**.

The Project will not pose a significant threat to habitats for threatened species, and will not result in any habitat fragmentation. The assessment of terrestrial ecology impacts is detailed in **Section 8.6** of the EIS.

The potential for the remaining elements of the BMA BBCGP to have cumulative impacts in the region on terrestrial ecology are tabled and discussed in **Table 20-1**. When taken as a whole the BMA BBCGP involves clearing over 350 ha of EPBC listed 'Endangered' vegetation communities. BMA will provide vegetation offsets for the total areas to be disturbed progressively during the BMA BBCGP assessment process.

20.6 Aquatic Ecology

The Project will not disturb or remove any defined water courses. The Project will result in the removal of 15 km of ephemeral drainage lines; however these drainage lines are devoid of riparian vegetation and represent a highly disturbed, low value aquatic habitat. The cumulative effect across the Isaac River

catchment is also expected to be minimal. The impacts to aquatic ecology are discussed in detail in **Section 9.5** of the EIS.

Numerous mining operations are operating in similar ecological areas (ephemeral creeks and drainage paths) within the Isaac River catchment. The Isaac River catchment is mostly covered by either mining leases, mining claims or exploration permits (coal, petroleum and mineral). Current mining leases only cover a small portion of the catchment, at approximately 1,800 km^2 or 8 per cent. Exploration permits, however, cover approximately two thirds of the catchment and if extensively developed they have the potential to cause significant cumulative impacts to aquatic ecology in the region.

The potential for the remaining elements of the BMA BBCGP to have cumulative impacts in the region on aquatic ecology are tabled and discussed in **Table 20-1**.

20.7 Air Quality

The assessment of air quality is presented in **Section 10** of the EIS. Cumulative air quality impacts may result from increased dust generation from the mining operations in the localised area, and also dust generated from the increased rail movements in the region.

The localised cumulative air quality impacts were assessed through incorporating background air quality data from the Olive Downs residence, which represents the impact of the existing Poitrel and Millennium Mines, as well as adoption of conservative assumptions in the modelling methodology.

The assessment found that the locality is affected by dust from mining, agricultural activities and also regional dust storms. Background air quality data indicates that dust deposition in the region is already above the EPA's recommended guideline. Numerical modelling has predicted that cumulative dust concentrations (i.e. the Project plus the background levels) are unlikely to exceed the ambient air quality goals in the *Environmental Protection (Air) Policy 1997*.

The Project will result in an increase in rail movements along the Goonyella System that connects the mines in the region to the Port of Hay Point. The Project is expected to generate an additional 400 rail movements per annum, which represents an increase in the order of 4 to 5 per cent over the existing rail movements along the Goonyella System. There is the potential for the additional rail movements from the Project to increase fugitive coal dust emissions along the Goonyella System corridor.

Queensland Rail has recently commissioned a study into fugitive coal dust emission and management along the Goonyella, Blackwater and Moura coal rail systems. The study concluded that whilst monitoring indicates that there is a low risk of health impacts from coal dust, either within or outside the rail corridor, there remains the potential for short term nuisance impacts from dust deposition (Connell Hatch, 2008). The study identified a number of practical and cost-effective mitigation measures that could be applied to reduce coal dust emissions from rail loads (Connell Hatch, 2008):

- Coal surface veneering using chemical dust suppressants at the mine;
- Improved coal loading techniques at the mine to reduce parasitic load on horizontal wagon surfaces and reduce over-filling and hence spillage during transport;
- Load profiling to create a consistent surface of coal in each wagon, which would be implemented at the mine, and

- Improved unloading techniques to minimise coal ploughing and parasitic load on wagons.

At the Project Site, the train load out facility will incorporate either a polymer or water based dust suppression system. This will reduce dust generated from coal trains.

The remaining elements of the BMA BBCGP will not contribute to cumulative air quality impacts from the Project.

20.8 Noise and Vibration

The assessment of noise and vibration is presented in **Section 12** of the EIS. The localised cumulative noise impacts were assessed through modelling the noise emissions from the proposed Daunia Mine, the existing Poitrel Mine and the existing Millennium CHPP.

The modelling has predicted that cumulative noise levels at neighbouring properties are expected to be within day time and night time criteria, with the exception of Olive Downs between years 15 and 20 of the Project, due to the proximity of the mine pit to that homestead over this period.

Queensland Rail, as operator of the Goonyella System, is responsible for the management of rail-related noise and has developed a *Code of Practice for Railway Noise Management* (2007) to guide operations, complaint resolution, monitoring, and land use planning.

Noise and dust generated at the Hay Point and Dalrymple Bay Coal Terminals is managed through the Port of Hay Point Environmental Management Plan (Queensland Ports Corporation, 2002), which includes operational controls and extensive environmental monitoring.

The remaining elements of the BMA BBCGP will not contribute to cumulative noise and vibration impacts from the Project.

20.9 Traffic and Transport

The assessment of traffic impacts is presented in **Section 13** of the EIS. The assessment has found that the Project in isolation will pose minimal impacts during construction or operation, with no significant impact to the Level of Service experienced by drivers along the Peak Downs Highway and other roads in the area.

As the Poitrel and Millennium Mines are already fully established and no nearby mines are planned for construction during 2009 to 2010, the Project's construction is unlikely to cause cumulative impacts to roads in immediate vicinity of the Project Site. However, construction may commence on the Caval Ridge Mine, (located approximately 20 km to west) during 2009 to 2010 and the cumulative construction traffic flows may potentially impact on the Level of Service along the Peak Downs Highway and other roads in the area. This will be assessed as part of future EISs for these elements of the BMA BBCGP.

The further development of mines in the vicinity of Moranbah will increase the operational traffic along the Peak Downs Highway and other major roads in the area. Over time, the increased operational mine traffic could result in a significant impact to the Level of Service experienced by drivers along these roads.

The potential for the remaining elements of the BMA BBCGP to have cumulative impacts in the region on traffic and transport are tabled and discussed in **Table 20-1**.

20.10 Social

The assessment of social impacts is presented in **Section 17** of the EIS. The assessment has concluded that while the Project itself is unlikely to have a significant impact on the local community, the continued expansion of mining in the region could result in significant social impacts.

The local community is currently facing a number of issues including:

- housing shortages and affordability;
- skill shortages; and
- increased traffic on the Peak Downs Highway.

While these issues will be exacerbated by the Project, it is considered that none of the issues are likely to be unmanageable. However, given the scale of mining planned in the region and if there is a lack of concerted action by key stakeholders including government and industry, there is a high likelihood that significant social impacts will occur to Moranbah and the surrounding communities.

The scale of potential cumulative impacts from the remaining elements of the BMA BBCGP are tabled and discussed in **Table 20-1**.

20.11 Economic

In terms of cumulative economic impacts, the Project contributes to Queensland's most important export commodity, which in total earns Australia around $10 billion. In the financial year ending 30 June 2008, coal contributed $1.04 billion in royalties to the Queensland Government. Based on changes to royalties announced in the Queensland State Budget 2008-09, royalties from coal are projected to rise to over $3.21 billion in 2008-09. The coal industry in Queensland employs about 20,000 people directly. A further 70,000 indirect jobs are created through the industry's activities.

The Project's high quality, low sulphur, semi hard coking coal and PCI coals are attractive to overseas buyers. The Project forms part of a growth strategy designed to strategically service the expanding demands of India, China and other international metallurgical coal markets.

The cumulative economic impacts of the Project include increased export income, royalties and employment, generating wealth within Queensland and Australia that significantly benefits the wider community. An assessment of Economic impacts of the Project is presented in **Section 18** of the EIS.

The potential for the remaining elements of the BMA BBCGP to have cumulative impacts on the regional economy are tabled in **Table 20-1**.

Table 20-1 Summary of Cumulative Impacts of the BMA Bowen Basin Coal Growth Project

Issue	Cumulative Impact Descriptor	Daunia	Caval Ridge	Goonyella Riverside	Airport	Comments
Production	Average annual coal production	4 Mt/a	5.5 Mt/a (+2.5 Mt/a from Peak Downs Mine)	8 Mt/a	Not applicable	The BMA BBCGP provides directly for an extra 17.5 Mt/a of coal production in the region. An additional 2.5 Mt/a will also be generated from the Peak Downs mine through the Caval Ridge CHPP. This increased production represents a significant contribution and cumulative effect on the region's socio-economic environment.
Land resources	Loss of good quality agricultural land – Class A and B	160 ha Class A 80 ha Class B 240 ha total	0 ha Class A 0 ha Class B 0 ha total	800 ha Class A 841 ha Class B 323 ha Class B-C 1964 ha total	To be confirmed during EIS	The Project involves the loss of a small amount of good quality agricultural land relative to that in the Isaac Regional Council area. Mitigation measures for this operation will be developed during the EIS for this element.
	Percentage of GQAL (Class A and B) lost in the Isaac Regional Council area. (Total GQAL in Isaac Regional Council area: Class A 813,000 ha; Class B 337,000 ha.)	0.02 %	0%	0.17 %		
Surface water resources	Off site water source	Braeside Borefield and Eungella Dam			To be confirmed during EIS	The Project represents a very small component of the regional water resource available. Caval Ridge and Goonyella represent larger users. Water conservation will be important on these projects.
	Water consumption from off-site (piped)	600 ML/yr	2800 to 4000 ML/yr	1000 to 5000 ML/yr		
	Project Site area compared to the total Isaac River catchment (22,400 km^2)	0.1%	0.3%.	5 to 10%	To be confirmed during EIS	Mining operations temporarily interfere with catchments. The Project and the BMA BBCGP as a whole represent a small percentage of the Isaac River Catchment.

Issue	Cumulative Impact Descriptor	Daunia	Caval Ridge	Goonyella Riverside	Airport	Comments
Terrestrial ecology	EPBC and VMA 'Endangered' RE cleared on site (% of total on site)	15 ha (6%)	22 ha (16%)	191 ha (23%)	To be confirmed during EIS	The Project will have a minimal impact at a regional scale, however, the BMA BBCGP includes clearing over 350 ha of EPBC listed 'Endangered' RE. BMA will provide vegetation offsets for the total areas to be disturbed progressively during the BMA BBCGP assessment process.
	EPBC 'Endangered' and VMA 'Of Concern' RE cleared on site (% of total on site)	0 ha (0%)	127 ha (83%)	0 ha (0%)		
	VMA 'Of Concern' RE cleared on site (% of total on site)	0 ha (0%)	247 ha (69%)	66 ha (5%)		
	VMA 'Not of Concern' RE cleared on site (% of total on site)	21 ha (94%)	354 ha (42%)	269 ha (9%)		
	Non-remnant vegetation cleared on site (% of total site)	1,750 (56%)	2,945 ha (65%)	2,457 ha(34%)		
	Fauna corridor disrupted	No	Yes	Yes		
	Habitat fragmented	No	Yes	Yes		
Aquatic ecology	Defined water courses removed or diverted.	0 km	11.4 km	Not available	To be confirmed during EIS	No defined water courses will be removed or diverted as part of the Project.
Greenhouse gases	Scope 1 and 2 emissions per year	0.2 Mt	0.4 Mt	1.8 Mt	To be confirmed during EIS	The total quantity of direct and indirect greenhouse gas emissions from the BMA BBCGP 2.4 Mt/a represent 0.4% of Australia's 2005 emissions. Total Scope 3 emissions represent 0.1% of annual global greenhouse gas emissions.
	Scope 3 emissions per year	10 Mt	15 Mt	46 Mt		

Issue	Cumulative Impact Descriptor	Daunia	Caval Ridge	Goonyella Riverside	Airport	Comments
Traffic and transport	Construction period Operational traffic – light vehicles Operational traffic – heavy vehicles Reduction in pavement life	2009 to 2010 200 vpd 20 vpd 1 % reduction in 2009 Minimal during operation	2009 to 2011 330 vpd 27 vpd 19% reduction in 2009. Additional 5% reduction in 2025, decreasing over the project life	2011 to 2013 616 vpd 35 vpd 6% reduction in 2011, additional 9% in 2012, additional 5% reduction in 2016, decreasing over the project life	To be confirmed during EIS	Impacts from the Project on traffic and transport are minimal. However, the combined effect of the BMA BBCGP represents a more significant impact that will be addressed in the Caval Ridge Mine and Goonyella Riverside Mine Expansion EISs.
	Increase in rail carriage movements (No. / year)	400	800	550	To be confirmed during EIS	The cumulative effect of this increase is significant only if the Gonyella Railway System is used for transport of all coal. In the long term the Goonyella Riverside Mine will use the Abbott Point Port, via the proposed Northern Missing Link. Other changes will include switching coal from Norwich Park, currently on the Goonyella Railway System, to a new rail and train load-out facility travelling south to Gladstone. The net effect is expected to minimise impacts on the rail system.
	Per cent increase in use of existing use of Goonyella Railway System	4.5 %	9 %	6.5 %	Not applicable	
Social	Peak total construction workforce Peak construction workforce in towns Total operational workforce Operational workforce in towns	450 45 300 90	1200 120 495 150	900 90 700 210	To be confirmed during EIS	The combined effect of the increases in workforce are expected to place a strain on the region. The consultation and social impact assessment processes initiated in this EIS will continue for other elements of the Project with a view to developing control strategies to minimise these impacts.

Issue	Cumulative Impact Descriptor	Daunia	Caval Ridge	Goonyella Riverside	Airport	Comments
Economic	Value added to Mackay Region	$56 – $70 M	To be confirmed during EIS	$130 – $240 M	To be confirmed during EIS	
	Value added to Queensland	N/A		$270 – $480 M		
	Value added to Australia	$64 – $80 M		$130 – $230 M		
	Jobs in Mackay Region (FTE persons)	340 – 460	To be confirmed during EIS	370 – 580	To be confirmed during EIS	
	Jobs in Queensland	N/A		460 – 710		
	Jobs in Australia	310 – 420		330 – 520		