Chapter 2

Project Rationale and Alternatives

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2. PROJECT RATIONALE AND ALTERNATIVES

2.1 Project Rationale

The project aims to establish an open cut coal mine in the Bowen Basin as a commercial energy resource for the supply of coking and thermal coal to the international coal markets. The project will be well positioned to take advantage of existing and planned coal transport infrastructure and port facilities to capitalise on increases in global demand for coal. Demand for coking coal and high quality thermal coal is expected to increase over the next decade – particularly from Asian and Indian markets. Australia's proximity to these countries gives it a significant commercial advantage in the international market place.

Exploration within the project area has been conducted since the early 1970s by a number of companies including the proponent. Exploration activities have included regional drilling, geotechnical surveys, extensive regional geological mapping, environmental surveys and cultural heritage work. The project area includes the Moranbah and Rangal Coal Measures which are both currently being commercially extracted from nearby mines within the Bowen Basin.

Exploration activities defined a resource of approximately 650 million tonnes (Mt) of economically recoverable coal. Mining operations will produce approximately 10 Mtpa product coal for export markets. The resource is mainly coking coal; however, economic quantities of thermal coal are also contained within the deposit and will be mined for sale.

Production from the project will comprise two products:

- high quality hard coking coal; and
- thermal coal.

It is anticipated that the coking coal product will be sold under long-term off take agreements with major end-users prior to production commencing. The most likely markets are anticipated to be Asian steel mills; however interest has been expressed from other consumers in India, Europe and Brazil.

Development concepts and parameters of the project have assumed an approximate 50 year life. The mine area covers only a portion of the overall project area so there is some potential that ongoing exploration may extend the mine area and life. Accordingly, the mining lease applications seek a 50 year duration to allow for exploitation of the known resources, plus additional resources likely to be identified during the operation, and an allowance of suitable timeframes to permit successful rehabilitation.

2.1.1 The International Market for Coal

In general, the short term market outlook for coking and thermal coal is bearish, following a sharp decline in the prices of coking and thermal coal in 2012. However, medium to long term forecasts continue to remain bullish, reflecting the expectation that world demand for coking and thermal coal will continue to increase as energy demands increase.

2.1.1.1 Short to Medium Term Market

Thermal coal prices have fallen from approximately $140 per tonne in early 2011 to approximately $90 per tonne in third quarter 2012 and coking coal prices have fallen from approximately US$290 per tonne in early 2011 to approximately US$190 per tonne in third quarter 2012. Coking coal prices are forecast to decline to approximately US$150 per tonne by 2016 as supply for globally traded coking coal exceeds demand. Australia will remain the world's major supplier of coking coal and exports are predicted to increase from 140 Mt in 2012 to 170 Mt in 2016. Thermal coal prices are predicted to be at approximately US$95 per tonne in 2016. Australian exports of globally traded thermal coal will continue to increase from 168 Mt in 2012 to 191 Mt in 2016, but with increased competition and supply from other countries, principally Indonesia. The markets for coking coal and thermal coal are expected to stabilise following widespread production cuts, including in Australia[1].

In addition coal producers face increasing operating costs, with an increase of 70% over the previous decade and a high Australian dollar[2]. As a result a number of Australian coal miners have decided not to invest in proposed coal projects or cut jobs in the coal mining sector[3]. Thus, in the short term, investment in the Byerwen project may counterbalance a decline in coal mining investment from other coal miners and provide job opportunities in the coal mining sector.

2.1.1.2 Long term Market

The United States Energy Information Administration produced the International Energy Outlook 2011[4], which makes the following long term projections about long term world energy supply and demand in the period to 2035, including world coal supply and demand:

- Fossil fuels are expected to continue supplying much of the energy used worldwide.
- In the absence of national policies and/or binding international agreements that would limit or reduce greenhouse gas emissions, world coal consumption is projected to increase by 50% from 2008 to 2035.
- Although world coal consumption increases at an average rate of 1.5 percent per year from 2008 to 2035, the growth rates by region are uneven, with total coal consumption for Organisation for Economic Cooperation and Development (OECD) countries remaining near 2008 levels and coal consumption in non-OECD countries increasing at a pace of 2.1 percent per year.
- The countries of non-OECD Asia (includes India and China) account for nearly all of the projected increase in world coal consumption from 2008 to 2035.
- Led by strong economic growth and rising energy demand in non-OECD Asia, total coal consumption in non-OECD countries is expected to grow by 76 percent from 2008 to 2035. The substantial increase in non-OECD coal consumption illustrates the importance of coal in meeting the region's energy needs.
- Substantial increases in regional coal production from 2008 to 2035 include 6.5 million billion British thermal units (Btu) in Australia/New Zealand, representing 9 percent of the increase in world coal production.
- Asia remains the world's largest importer of coal, accounting for 70 percent of the growth in total world coal imports from 2009 to 2035.
- Australia is the world's leading exporter of steam and coking coal combined. About 78 percent of its coal production was exported in 2009. Over the projection period, Australia dominates international coal trade as it continues to improve and expand its inland transportation and port infrastructure to expedite coal shipments to international markets.

[1] UBS Securities Australia Ltd, UBS Global I/O® Commodity Price Review, October 2012
[2] ABC Rural, August 2012
[3] The Australian, September 2012
[4] US Energy Information Administration, International Energy Outlook 2011.

- Coal deposits are widely distributed, 79 percent of the world's recoverable reserves are located in five regions: the United States (27 percent), Russia (18 percent), China (13 percent), non-OECD Europe and Eurasia outside of Russia (11 percent), and Australia/New Zealand (9 percent).

Over the long term Australia is well placed to take advantage of the projected increase in demand for coking and thermal coal from Asian countries. Future indicators suggest that the strong coal demand from China will continue. There is also strong potential for Indian customers to enter the market to satisfy supply shortfalls in that country. It is expected that demand for prime quality, hard coking coal will outstrip supply creating a need for new mines to supply the marketplace. Increasingly large end-users are taking up equity positions in Australian coal projects to ensure supply.

2.1.1.3 Outlook for the Byerwen Coal Project

Queensland coal producers, with access to significant coal reserves and availability of efficient rail and port infrastructure, are well placed to service the increasing global demand for coal. Queensland has approximately 33 billion tonnes of raw coal in situ identified through exploration drilling. Coal is Queensland's most important export commodity, providing significant benefits to the State through strong financial returns, and increasing employment opportunities. Coal mining is a significant contributor to regional economic development in Central Queensland.

The project will be well positioned to take advantage of future increases in global demand for coal and existing and planned coal transport infrastructure and port facilities. Demand for coking coal and high quality thermal coal is expected to increase over the next decade – particularly from China, India and Korea. Australia's proximity to these countries gives it a significant advantage in the market place.

2.1.2 Economic Benefits

The likely economic impacts of the project can be divided into two distinct categories. First is the primary, direct economic impact resulting from the project's expenditure in the community, employment of personnel, direct payment of taxes, State royalties and infrastructure charges and use of resources within the community, surrounding region, and Queensland. The second category is the indirect impacts that flow on from the:

- increased spending and employment in production induced support activity as a result of increased demand for goods and services from coal mining activity; and
- increase in household consumption as a result of additional wages and salaries being spent within the local economy.

Construction will commence immediately upon grant of the project's mining leases. Accordingly, construction is intended to commence in 2013/14, with the project expected to be commissioned and producing coal by 2015. The project is well located to take advantage of established infrastructure in the region. The project area is approximately 20 km west of Glenden, approximately 60 km south of Collinsville (both of which are mining towns) and approximately 140 km west from the major regional centre of Mackay. The project is connected to the Port of Abbot Point by the Goonyella to Abbot Point (GAP) rail line which intersects the project area.

Royalty payments to the Queensland Government for the coal production are predicted to be approximately $13.2 billion over the life of the project. In addition, mining lease rentals, payroll tax, company tax, income tax and goods and services tax will be paid to State and Federal governments as a result of the project.

The economic impact assessment (refer **Chapter 30**) estimates that the project will provide significant economic net benefits to the region, State and rest of Australia, during both construction and mine operations. Over the period of the first phase of construction the project is estimated to have the following direct and indirect economic benefits in the region and State:

- $2,712 million in output
- $1,309 million in gross value added (outputs less inputs)
- $700 million in household incomes
- Up to 5,609 FTE jobs (direct and indirect) in any one year.

During the operations phase the project is estimated to have the following average annual (following the initial four years of ramp up) direct and indirect economic benefits:

- $2,299 million per annum in output
- $1,133 million per annum in gross value added (outputs less inputs)
- $482 million per annum in household incomes
- 6,206 full time equivalent jobs per annum (direct and indirect).

The project will employ approximately 350 people during construction and between 400 and 550 people per year during operations. During the first construction phase, the project is estimated to generate approximately 2,736 direct full time equivalent (FTE) jobs in any one year, comprising 1,264 in the region, 1,340 in the State and 132 in the rest of Australia. In addition, the project is predicted to generate a further 2,873 indirect FTE jobs in the region, State and rest of Australia. During each year of operations, the project is estimated to generate approximately 2,583 direct FTE jobs, comprising 1,375 in the region and 1,208 in the State. In addition, the project is predicted to generate a further 3,623 indirect FTE jobs in the region and State during operations.

During the construction phase the project will support industry activity primarily in the manufacturing and construction sectors. During operations, the project will directly support industry activity in the mining industry, as well as its supply chain (manufacturing and wholesale trade) through flow-on activity.

The economic and social benefits from the project will complement the contribution from existing QCoal mines such as Sonoma.

2.1.3 Social Benefits

The social impact assessment (refer **Chapter 31**) demonstrates that the project will provide considerable social benefits to the region during both construction and mine operations.

The benefits provided to the community from the project include the following:

- Additional government revenues will be raised through taxation and royalties, which may be used to provide additional infrastructure and services in the region, Queensland and Australia.
- Workers and their families relocating to Glenden provide opportunities for increased participation in volunteering, and local sporting and recreational activities/groups.
- Capital investment to upgrade existing recreational facilities and/or construct new facilities will also be considered.
- Over the long term, the increase in population should provide opportunities for improved community cohesion through greater resources for interaction and community participation.
- There will be opportunities for local and Queensland suppliers/businesses through project expenditure and flow-on activity. This will present additional employment opportunities in the supply chain to meet the increased demand for these goods and services.

- New job opportunities will be generated during the construction and operation phases of the project. The proponent will look to recruit locally where possible and practical, then within region and rest of Queensland.

2.2 Alternatives to the Project

2.2.1 Do Nothing

The economic and social benefits to the region and state from proceeding with the project are described above. During operations the direct gross value added (i.e. excluding indirect economic benefits) by the project is approximately $1,133 million per annum. By way of comparison the value of agricultural production within the entire Mackay statistical division was approximately $1,067 million in 2009/10.

If the project did not proceed, there is potential for the on-going global demand for coking and thermal coal to be lost to an international competitor, with losses of export revenue, State coal royalties, local, regional and state employment and ancillary business opportunities. Lost government revenue would be approximately $13.2 billion over the life of the project and approximately 6,200 FTE direct and indirect jobs per annum would not be created.

Under the do nothing scenario the environmental and social impacts of the project would not be realised. However, this EIS concludes that, with appropriate mitigation measures, negative environmental and social impacts do not outweigh the benefits of positive social and economic impacts.

2.2.2 Mining Methodology

The project involves the extraction of coal from eight open cut pits. As the coal deposits are relatively shallow, the project will operate as a series of open-cut mines, yielding approximately 664 million tonnes of ROM coal over life of the project. Underground mining is not technically or economically feasible in the areas with a low strip ratio due to the multi-seam nature of the deposit. Hence open-cut mining has been selected as the preferred mining method in these areas.

2.2.3 Mining Schedule

The project's mining schedule has been developed to provide an optimum mix of coal recovery and economic feasibility over the life of the mine. Byerwen Coal has considered a number of potential mine layouts and mining methodologies, based on the economic recoverability of good quality coal to meet market expectations.

In development of those mining layouts, the proponent has also sought to ensure that there is an appropriate balance between the economic returns needed to justify the development of the project and the mitigation and control measures required to minimise impact on the environment and the surrounding communities.

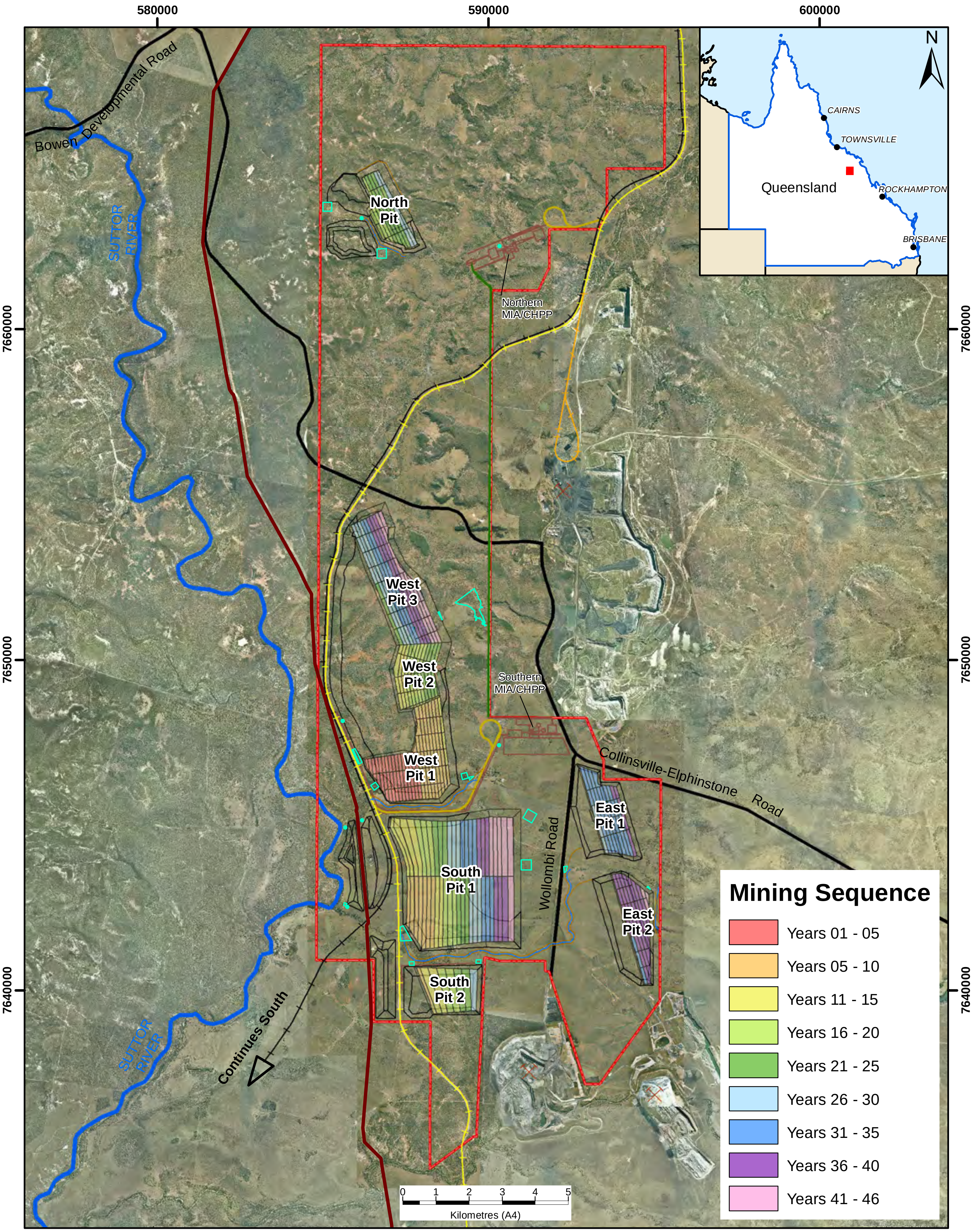
Coal will be extracted from eight open pits in the sequence shown in **Figure 2-1**. The project operations chapter (refer **Chapter 7**) provides detail on mine operations sequencing. This section describes the resource, operational, economic and environmental factors that have been considered in selecting the location and scheduling of open pits is described below:

- North pit (NP), west pits 1, 2 and 3 (WP1, WP2 and WP3), and south pits 1 and 2 (SP1 and SP2) target the coal seams within the Moranbah Coal Measures, which strike north-south along a line linking these pits and which dip from west to east. Coal resources currently considered to be economic do not extend south of SP2.

- East pit 1 and 2 (EP1 and EP2) target coal seams in the Rangal Coal Measures which crop out in the eastern portion of the project's tenements and dips from west to east.
- WP1 is the first pit from which coal will be extracted as it has the lowest strip ratio.
- WP1, WP2 and WP3 will ultimately form one area of mining with a single final void. However coal will be extracted at different periods from each of these pits depending on the strip ratio and the intention to produce a similar annual average output of coal.
- The northern project areas are largely constrained by undulating topography and areas where coal resources occur at greater depths. Further exploration activities will determine the extent of economic coal resources.
- SP1 and SP2 are separated by a drainage corridor to allow a creek diversion to transfer water from the east to the west of the tenements.
- SP2 and WP1 are separated by a drainage corridor to allow a creek diversion to transfer water from the east to the west of the tenements. In addition this corridor allows for project infrastructure (rail line and raw water supply pipeline) to connect third party infrastructure to the project's southern infrastructure area.
- The western limits of SP2, SP1, WP1, WP2 and WP3 are constrained by:
  - third party linear infrastructure (one existing rail line, one proposed and approved rail line, one water pipeline, one gas pipeline)
  - the need to provide areas for out of pit waste rock stockpiles that do not sterilise economic coal reserves
  - the western boundary of the project tenements
  - the Suttor River.
- The northern limit of WP3 is constrained by the presence of third party linear infrastructure (one existing rail line, one proposed line and State-controlled road) that traverse the project area from west to east.
- Due to the limited availability of unconstrained land available for out of pit waste rock to the west of SP1, waste rock from SP1 will be hauled to excavated areas within WP1.

Measures that have been taken into account in mine scheduling include:

- the quality and quantity of economically recoverable coal
- the effective use a dragline, excavators, shovels and other mine equipment that need to operate to meet consistent annual coal production targets
- the optimum rail capacity, including coal loading facilities, number of trains and rolling stock.



Legend

- Project Area
- Waste Rock Dumps and Pits
- Burdekin to Moranbah Pipeline
- GAP Rail line
- Newlands Mine Rail Loop
- Alpha Coal Project Rail Line
- Train Loading Facilities
- Central Infrastructure Corridor
- Dam (mine affected, sediment affected, clean water)
- Suttor River
- Drainage Bund
- Drainage Diversion
- Formed Road
- Mine Infrastructure
- Existing Mine Site

Mine Sequence	
Figure 2-1	Byerwen Coal Project
Date: 28/02/2013	Author: samuel.ferguson
	Map Scale: 1:150,000
Revision: R1	Coordinate System: GDA 1994 MGA Zone 55

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2.2.5 Waste Rock and Coal Removal

Several methods of open-cut coal exposure were initially identified as potentially suitable for the project deposit. In order to assess the merits of each method, Byerwen Coal undertook an analysis on each potential coal exposure option. The options considered were:

- Excavator and truck
- Electric shovel, rear dump truck and dozer push
- Rope shovel and ultra class rear dump trucks
- Dragline
- In-pit crushing and conveying
- Driverless trucks.

These options were primarily considered on the basis of cost and practicality. The environmental impact of each option was assessed as being comparatively similar, although variations in impact were considered.

A combination of a dragline and 500 t and 350 t class electric excavators were selected. This combination provided the most efficient and effective means to remove large volumes of waste rock and extract coal from multiple coal seams. In addition the use of an electric motor on the dragline will reduce local air emissions, noise levels and operating costs compared with the equivalent diesel powered engine.

The type of dump trucks required to haul overburden were selected on the basis of minimising haulage movements and therefore resulting in lower environmental impacts.

Waste rock will be transported across third party linear infrastructure (one existing and one potential rail line) for stock piling at out of pit waste rock dumps to the west of SP1 and SP2. The option of in-pit crushing and conveying systems is being considered in order to minimise the risks associated with third party linear infrastructure crossings by mine waste haul trucks. In-pit crushing and conveying systems are capital intensive and technically more risky, requiring considerable engineering design effort to demonstrate their practical application.

Driverless trucks are being trialled at other mines in Australia. They may be used in the future at the project if trials are successful, but are not considered as part of this EIS.

2.2.6 Location and Design of Out of Pit Waste Rock Dumps

The location of out of pit waste rock dumps has been selected as follows:

- located to the west of open pits as the coal dips from west to east and it is uneconomical to haul coal greater distances and more difficult to integrate in-pit and out of pit waste rock dumps for the purposes of rehabilitation
- situated in an area that would minimise the sterilisation of any economically recoverable coal
- avoid third party linear infrastructure and provide a buffer of a least 50 m between mining activities and third party infrastructure
- avoid defined watercourses and wetlands, including the Suttor River and provide at least a 200 m buffer to defined watercourses and wetlands, other than defined watercourses subject to diversion due to the location of open pits
- avoid, to the greatest extent, drainage features
- integrate in-pit and out of pit waste rock dumps into a single landform for rehabilitation, except where they are separated by third party linear infrastructure.

Based on the above criteria:

- three out of pit waste rock dumps will be created, to the west of SP1 and SP2, that will not be integrated into in-pit waste rock dumps as they will be separated by third party linear infrastructure and constrained by buffers to watercourses and drainage features
- waste rock from SP1 will be hauled to excavated areas within WP1 to minimise the footprint of the three 'isolated' waste rock dumps.
- a single out of pit waste rock dump will be created to the west of WP1, WP2 and WP3 that will be integrated into the in-pit waste rock dumps
- out of pit waste rock dumps associated with EP1, EP2 and NP will be integrated with in-pit waste rock dumps.

The total area available for out of pit and in-pit waste rock dumps is limited and therefore waste rock dumps will be constructed to approximately 60 m in height. Waste rock dump design is described in **Chapter 9** and **Chapter 10**.

2.2.7 Final Voids

The final landform for the project will incorporate final voids. The proposed mining process involves limited out-of-pit dumping of waste rock in the early stages of mining, with the remainder being dumped in-pit. Backfilling the final void will require waste rock from the out-of-pit dump to be transported to the final void. This will require either the out-of-pit dumps to be left in an unrehabilitated state during mining, or disturbance of a previously rehabilitated area. It will also require additional earthworks after the saleable product has been exhausted and will sterilise any remaining resource. Backfilling of several open cut pits has been incorporated into the mine plan, however it is not considered viable to backfill all pits. The management of final voids, including final void water volumes and quality, is described in **Chapter 11**.

To reduce the number and footprint of final voids:

- SP2 will be backfilled with waste rock from SP1
- EP1 will be backfilled with waste rock from EP2
- WP1, WP2 and WP3 will contain a single final void.

The final landform will include four final voids in SP1, the west pits, EP2 and NP.

The primary objective of final void design is to make the voids safe to ensure public safety. This may involve re-contouring batters and discouraging public access.

The other considerations in final void design are the catchment extent, void location and access arrangements. These variables affect the movement of water into and from the void. There are three general approaches as follows:

- Isolated void: This approach aims to isolate the void from surface water and groundwater systems by minimising the catchment extent and creating a permanent groundwater sink. This approach is preferential in situations where the void water quality is expected to be poorer than surface water systems and the void can be configured to avoid overflows. In situations of high groundwater inflows or large catchment extents, this may not be a feasible option.
- Intermittent flushing void: This approach aims to isolate water in the void from surface water systems until there is a very large flow in the receiving environment. During large flows the void overflows and relies on dilution to minimise water quality impacts. The flushing arrangement is normally achieved by configuring weirs at the inlet and outlet of the void.

- Regularly flushed void: This approach aims to regularly flush water from the void. This approach is well suited to situations of high groundwater input or when the risk of overflow of isolated void water (subject to evapo-concentration effects) to the environment is unacceptably high.

Consideration was given to each of these approaches, however the isolated void was selected as the lowest risk option for reasons described in **Chapter 11**.

2.2.8 Location of Water Management and Mine Infrastructure

Byerwen Coal considered a number of options for the location of the mine infrastructure areas (MIAs), coal handling and preparation plants (CHPPs), co-disposal dams, mine affected water dams and other dams taking into account a range of social, economic, topographical, environmental and mine operations factors.

For the following reasons, the proponent determined that an MIA and CHPP would be required in the north and south of the project area:

- The project extends approximately 35 km from north to south.
- There are two mining phases comprising mining in the south (SP1, SP2, WP1, WP2, WP3, EP1 and EP2) and mining in the north (NP).
- Hauling ROM coal over long distances from south to north or vice versa would not be economical and would result in increased dust and noise emissions.
- The GAP rail line intersects both the south and north of the project area, and a connection in both locations is viable with the added benefit of reducing the need for transporting product coal over long distances via trucks or a conveyor.

Mine infrastructure and water management infrastructure is planned to be situated in an area that would minimise the sterilisation of any economically recoverable coal.

Following a progressive review of site options, and taking the above factors into account, the most suitable central locations for southern and northern mining infrastructure over the 50 year life, are shown on **Figure 2-1**.

The location of the MIAs and CHPPs was selected to minimise:

- the haul distance for ROM coal
- length of project rail lines and rail loops
- sterilisation of any economically recoverable coal
- impacts on environmentally sensitive areas by locating infrastructure in previously cleared areas, where possible
- impacts on sensitive receptors from mining activities, principally from noise and air emissions, by maximising the separation distance to the nearest receptors.

Mine affected water dams and co-disposal dams were preferentially located where possible in areas previously cleared of the majority of remnant vegetation, with relatively flat topography and offering sufficient space to accommodate the required storage.

2.2.9 ROM Coal Handling Alternatives

Coal will transported by dump truck along haul roads from the open pits to the ROM coal pads adjacent to the northern and southern CHPPs. Internal haul roads will be designed to the length travelled and to minimise environmental impacts. The size of haul trucks has been optimised so as to minimise the number of movements with the benefit of reducing dust and noise emissions. In-pit conveyors to transport ROM coal from the pit to the ROM pad were not considered practical for the following reasons:

- An in-pit coal conveying system is most suitable for large thick seams that are homogeneous in nature. The project's coal resource exists in narrow seams. There will be multiple benches open with coal coming from multiple sources at any one time. Access to the ever-moving benches requires the flexibility of trucks.
- With a conveyor system there is only one conveyor going to one location. With a number of coal pits and blocks within pits mined simultaneously and dumped on the conveyor, unintended blending will occur which will reduce resource recovery efficiency and quality.

ROM coal will be directly dumped to a ROM hopper by truck or fed from the ROM stockpile by a front end loader, before passing through crushers. Due to the volume of coal and multiple grades of coal, a single ROM pad with multiple sections for various coal grades was considered optimal.

2.2.10 Alternatives Considered For Coal Preparation

Byerwen Coal's experience suggested that the capital and operating benefits of two CHPPs, located in the southern and northern tenement areas would be preferable to a single CHPP or multiple satellite facilities. The beneficial aspects of a two facilities include the minimisation of ROM coal transport, land disturbance, plant, equipment, manning and general infrastructure. As a result, the options explored by Byerwen Coal focused on the development of two CHPPs.

The opportunity to bypass run of mine (ROM) coal around the CHPPs was investigated and preliminary coal quality analysis estimated minimal coal is suitable for bypass. Thus development of additional infrastructure around the CHPP for the bypass product coal is not required. However, the volume of rejects will increase if no coal is bypassed.

During prefeasibility, Byerwen Coal reviewed a number of options and configuration to process ROM coal. The coal processing concept was based on a dense medium cyclone and spirals process. Alternate processing concepts, such as the use of a jig for coarse coal processing, were considered. The dense medium cyclone and spirals configuration was selected to be the most effective and is also well established technology in the coal industry.

2.2.11 Rejects

Approximately 5 Mtpa of rejects will produced during operations. Two disposal methods, common to both the southern and northern CHPPs, were assessed for the project. The preferred option is to truck the coarse reject (greater than 12 mm) to mined spoil and co-dispose the mid-size reject (1 mm to 12 mm) and fine rejects material (less than 1 mm) to disposal cells in a co-disposal dam using gravel pumps and a combination of steel and poly pipework. Co-disposal of mid-size and fine rejects is a common practice successfully employed in many Australian mines.

The coarse rejects will be deposited by truck, initially in the voids between the waste rock stockpiles. The waste rock stockpile peaks will then be dozed to cover the rejects, and subsequently overlain by topsoil as part of rehabilitation.

The alternative method is to truck all reject and dewatered rejects material to in-pit co-disposal cells with fine rejects being dewatered using belt filters. Filter pressing of fine rejects is an accepted process in coal preparation plants throughout Australia.

The preferred method for disposal is option 1 - trucking of the coarse rejects and co-disposal of the mid-size and fine rejects. The coarse rejects can then be hauled as back loads to disposal areas using mine haulage trucks.

Dewatering of the fine rejects will require up to fifteen belt press filters. The operation of these units is labour and energy intensive involving regular adjustment of operating parameters and replacement of filter cloths. The presence of reactive clays can also adversely affect the moisture content of the produced filter cake.

Rehabilitation for both disposal methods is similar.

2.2.12 Product Coal Transport and Train Loading Facility Options

The GAP rail line intersects the project area in the south and the north and will carry product coal from the mine to the Abbot Point Coal Terminal. Two train loading facilities (comprising rail spur connected to the GAP rail line, rail loop and train loading bin) provide the most effective method to transfer product coal from the southern and northern product coal stockpiles to the GAP rail line. Both train loading facilities (TLFs) are entirely within the project tenements.

The route of the southern TLF was selected to minimise any additional sterilisation of coal resources by following the route of a planned creek diversion and minimising the distance between the GAP rail line and the product coal stockpile.

The route of the northern TLF was selected to minimise the amount of cut and fill required through undulating terrain and to minimise the distance between the GAP rail line and the product coal stockpile.

2.2.13 Product Coal Transportation

Given the quantity of product coal to be transported annually (estimated average of 10 Mtpa) there are no other feasible or practicable alternatives to the coal being transported to Abbot Point, other than by rail. The only other potential option would be road transport. However, the impact of transporting 10 Mtpa of product coal by road using B-triples, road trains, or equivalent from the mine to Abbot Point would result in significant road pavement impacts and unacceptable safety risks and impacts to road users and the community along the route. The cost would also be prohibitive.

The transport by rail will be on the GAP rail line, which is currently in operation and servicing other coal mines in the region.

2.2.14 General Waste Disposal

Byerwen Coal has investigated a number of options for disposal of mine generated waste (regulated and non-regulated). In accordance with the *Environmental Protection (Waste Management) Policy 2000* (EPP (Waste)) and the *Waste Reduction and Recycling Act 2011* the project will follow the waste hierarchy strategy of avoid, substitute, reuse, recycle and dispose. Mine site waste streams include rejects and tailings, waste rock, general municipal, green wastes, regulated wastes, and sewage. Options for rejects and waste rock management are described in **Section 2.2.11** and **Section 2.2.6** respectively.

2.2.14.1 General Municipal Waste

All project generated domestic and general municipal wastes are proposed to be disposed of by licensed contractors, most likely to a Council operated facility. Waste generated would, generally, be from the mine infrastructure area. Tyres may be disposed of at in-pit waste rock dumps.

Byerwen Coal proposes to use the Glenden waste facility for disposal of general wastes other than:

- wastes that are reused or recycled, either on-site or at a designated facility

- wastes planned for on-site disposal
- regulated wastes or other wastes that the cannot be accepted by the Glenden waste facility.

The proponent is working with the relevant council to assess the future capacity of the various facilities to accept wastes during the life of the project.

2.2.14.2 Green Waste

Byerwen Coal's preferred options for the management of cleared vegetation are:

- re-use on site as fauna habitat
- selective chipping or mulching for use in rehabilitation.

2.2.14.3 Sewage

Sewage generated at mine site ablution facilities will be treated on site. Treated effluent will be irrigated and biosolids will be either be used on site for rehabilitation works or disposed of a regulated waste disposal facility by an appropriately licensed waste contractor. Due to the distance between existing sewage treatment facilities and the mine site it is not considered practicable to transport all raw sewage, nor is it certain whether existing facilities could cater for all raw sewage.

The location of the treated effluent irrigation will consider soil and vegetation characteristics in order to prevent release of contaminants beyond the irrigation area.

2.2.15 Roads

The primary mine site access for heavy vehicles and buses will be along Collinsville-Elphinstone Road which connects Glenden to the Bowen Developmental Road and bisects the project area.

Byerwen Coal will transport the majority of workers from the accommodation village in Glenden to the mine site by bus, with some transport movements in light vehicles. Bus transport is the preferred option as it reduces the number of vehicles on the road, minimises the safety risk to workers and the public and reduces impacts on residences along the preferred route.

No formed public roads will require realignment as a result of the project. Some unformed public roads may require the provision of alternative routes.

2.2.16 Operations Workforce Transport

The preferred method for transport of workers between the mine village in Glenden and the mine site for daily shift rotation, is by shuttle bus. This will reduce traffic impacts and improve safety for workers and other road users. There will be some workers who commute from Glenden to site by private vehicles.

The workforce will be comprised of those operating on a drive in drive out (DIDO) basis and those who live permanently in Glenden. The DIDO workforce is likely to originate or transit through Mackay when travelling to the accommodation village in Glenden. It is likely that a proportion of those who DIDO will utilise private transport when starting and completing shift rotations, however bus transportation will be provided from key localities such as Mackay.

2.2.17 Water Management

The preferred mine water management strategy is described in **Chapter 8**. The objective of the water management strategy is to manage water generated within the project area and reuse or control releases to the environment in a manner that does not cause adverse impacts to surface water quality or stream hydrology. It will be necessary for the project to release water to the environment to balance the mine water inventory. This will be achieved through a controlled release strategy that allows discharge into waterways only when specific flow and water quality criteria have been satisfied.

A no release scenario was not preferred due to the significant increase in dam sizing and storage capacity that would be required to contain mine-affected water captured on site, impacts this would have on watercourse hydrology through reduction in flows and the ability to release water without compromising water quality objectives.

2.2.18 Raw Water Supply

Byerwen Coal has commenced discussions with a third party water supplier (SunWater) for the sourcing and delivery of water for the project. SunWater's existing Burdekin to Moranbah water pipeline connects the Burdekin water supply scheme at Gorge Weir to Moranbah and intersects the project area. SunWater are planning to duplicate this water pipeline by constructing a water pipeline parallel to the existing pipeline which will also intersect the project's tenements. The project will source raw water from the existing pipeline in the initial years of construction and operation and from the duplicate pipeline once it is constructed and operational. Sourcing raw water from existing and proposed third party infrastructure that intersects the project's tenements will minimise disturbance and be cost effective. No other options were considered viable for the supply of raw water during operations.

During the two-year construction period, raw water will be required for dust suppression, moisture adjustment and potentially concrete mixing. The proponent will consider various options for supply of construction water, including the establishment of the water supply required for operations part way through construction, importing water via trucks and arrangements with local landholders for supply of water.

2.2.19 Potable Water

It is anticipated that approximately 10 kL per day of potable water will be required on the mine site during construction and operations. In the initial phases of construction this water will be trucked to site from the nearest available source of potable water available for sale, likely to be Glenden. During the bulk of construction and operations raw water will be treated to potable standard on the mine site.

As no accommodation facilities will be provided on the mine site (i.e. within the project area), the potable water demand is at a volume that does not warrant the installation of pipelines to the site.

Potable water demand and all approvals for supply of potable water, at the accommodation village in Glenden will be provided by the independent owners and operators of these facilities.

2.2.20 Power Supply

Power supply to the southern and northern tenement areas will be via spurs to an existing 66kV line that originates from the Newlands substation and traverses east to west across the project site. The existing line was built to provide power to a de-commissioned gold mine west of the project area. The spurs will be entirely on the proponent's mining leases.

As the existing power supply infrastructure caters for the project requirements, no other power supply options were investigated.

During the early phases of construction (i.e. prior to construction of project substations), diesel generators will supply power.

2.2.21 Telecommunications

Existing telecommunications infrastructure in the region will support the initial construction and operations workforce requirements. The proponent will continue to assess telecommunications options to provide safe and reliable communications for the project.

2.2.22 Accommodation

The proponent's preference is for accommodation to be provided in Glenden, however should this option be rejected by the local authorities, the proponent will seek the necessary approvals to accommodate all workers in a camp on the project mining leases.

Workers will have the choice of whether to live locally or commute to work. The proponent's preferred option is to house workers in Glenden, which is within a safe daily travelling distance to the mine site. It is anticipated that approximately 30% of workers will choose to live locally in Glenden in houses and duplexes while 70% will choose to commute from other locations to stay in purpose built accommodation village during their shift.

Sufficient land is currently being sourced to provide for the future workforce's preferred accommodation requirements and a third party is developing this accommodation on behalf of the proponent. Duplexes and houses will attract families, allowing for the growth of a resident population in Glenden while well-designed accommodation village facilities will provide a suitable option to those who wish to commute.

2.3 Relationship to Other Projects

The commencement of mining operations will coincide with the development and ramp up of port (Abbot Point) and rail infrastructure expansions. These interrelated projects are the subject of other assessment and approval processes, but their development is critical to the operation of the Byerwen Project.

The Ports Corporation of Queensland (PCQ) was the proponent for the expansion (stage 3) of Abbot Point Coal Terminal from 25 Mtpa to a capacity of 50 Mtpa. This project received approval to proceed, subject to conditions from the State and Federal governments, construction has been completed and the Port expansion is operational. Byerwen Coal has secured capacity for 5 Mtpa of coal product to be exported from Abbot Point Coal Terminal and negotiations are underway to secure an additional 5 Mtpa capacity.

QR National's existing GAP rail line traverses the Byerwen mining leases and will create the means for transport of product coal but will also create operational issues for location of open pits and waste rock dumps and crossings by haul roads, access roads and linear infrastructure.

A number of the major mine proponents in the Galilee Basin are proposing rail and infrastructure corridors that pass through or close to the project area. The most advanced project, Hancock Coal's Alpha Project has been approved and shows a preferred rail corridor that bisects the Byerwen project area. Other coal mines are proposed in the Galilee Basin which may result in additional rail infrastructure being constructed in the Byerwen project area. This could include a separate rail corridor or upgrades (e.g. additional passing loops) along the proposed Alpha Project rail alignment.

SunWater's Burdekin to Moranbah water pipeline system traverses the project area. This water supply is important for the project, but the pipeline will also create operational issues for location of open pits and waste rock dumps and crossings by haul roads, access roads and linear infrastructure.

The Byerwen project is located immediately to the west of Xstrata Coal's Newlands and Wollombi/Suttor Creek mines which produce in excess of 10 million tonnes of mainly thermal coal per year for the export market. An existing haul road corridor from Wollombi/Suttor Creek to the Newlands processing area intersects the project area.

The interaction of the various project and activities proposed for the Byerwen area will require high level coordination to ensure the best quality outcomes for the State of Queensland and the various project proponents.

2.4 Co-location Opportunities

As described above, Byerwen Coal proposes to use existing:

- rail infrastructure (the GAP rail line) for supply of coal to Abbot Point
- water supply infrastructure (SunWater's Burdekin to Moranbah water pipeline system) for the supply of raw water
- power supply infrastructure.

All of the above third party infrastructure intersects the project tenements and therefore the project is taking advantage of co-location opportunities.

The train loading facilities developed for the project are entirely on the project tenements and there is no practicable opportunity for sharing of train loading facilities with nearby mines.

Mine site infrastructure (CHPPs, MIAs) will be designed to meet the needs of the project. There are no practicable opportunities for co-locating this infrastructure for use by other mines.

No economic coal seam gas resource has been identified within EPC614 or 739 however some of the area is subject to a petroleum exploration permit (ATP688P) held by BNG (Surat) Pty Ltd. Part of the project's MLA areas are overlapped by the current petroleum exploration permit ATP688P held by BNG (Surat) Pty Ltd. Exploration drilling in ATP688P has reportedly identified a potential coal seam gas resource at Tilbrook to the northwest of the Byerwen Coal Project. As part of the development of Sonoma Mine, QCoal entered into an agreement with the holders of ATP688P.