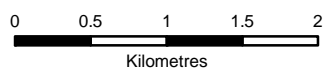


**LEGEND**

- + Existing Railway
- Proposed Mine Infrastructure
- Existing 66kV Transmission Line
- ▭ Mining Lease
- ▭ Mineral Development Licence



**FIGURE 3-1**  
**DAUNIA COAL MINE EIS**  
**PROJECT LAYOUT**



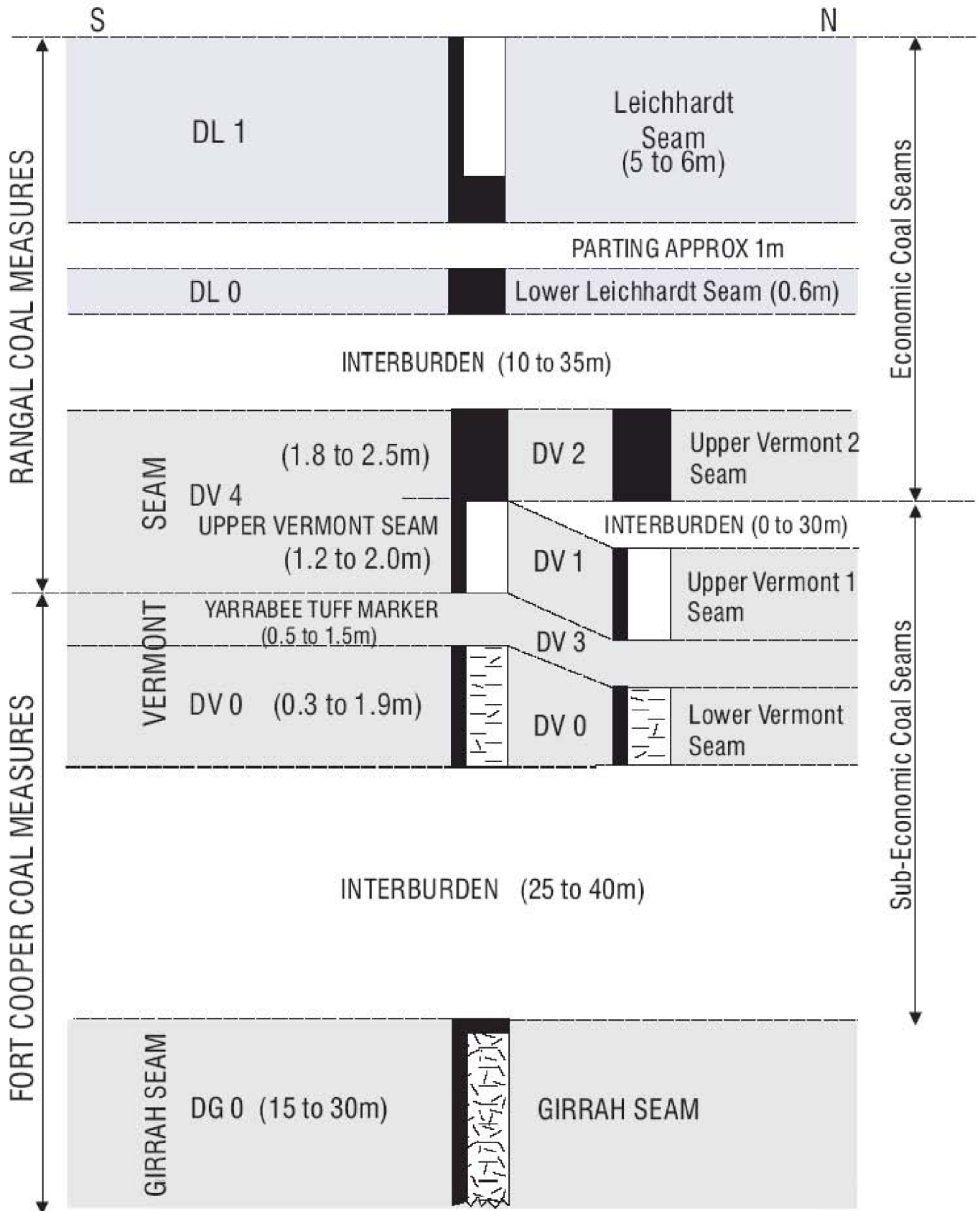
Scale 1:50,000 on A4  
Projection: Australian Map Grid - Zone 55 (AGD84)







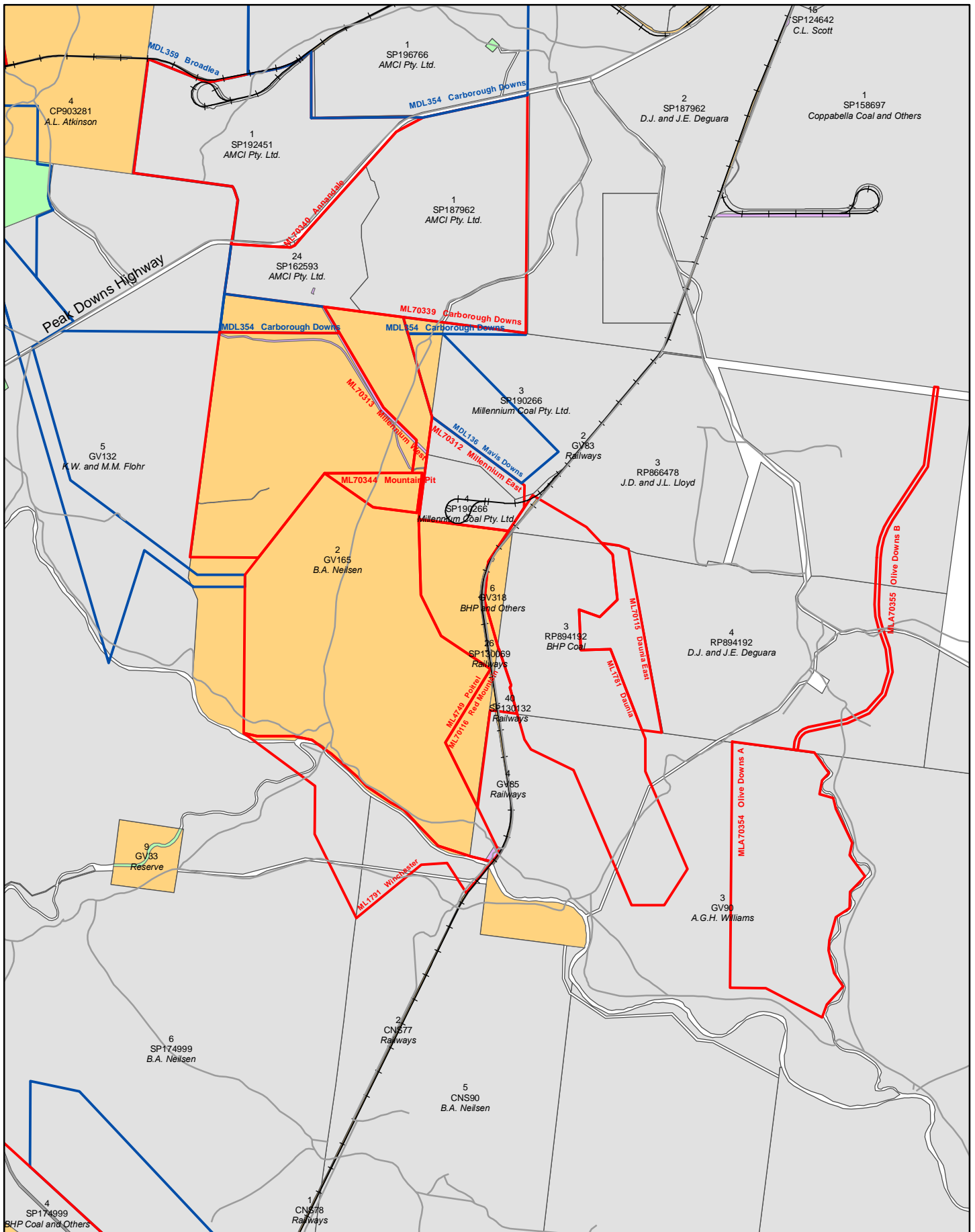
# DAUNIA - SEAM NOMENCLATURE



**FIGURE 3-3**  
**DAUNIA COAL MINE EIS**  
 DAUNIA COAL DEPOSIT  
 TYPICAL STRATIGRAPHIC SECTION







**LEGEND**

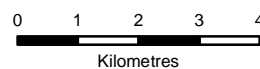
- Roads
- + Existing Railway
- ▭ Mining Lease
- ▭ Mineral Development Licence

**Land Tenure**

- ▭ Freehold
- ▭ Lands Lease
- ▭ Easement
- ▭ Reserve
- ▭ State Land



**FIGURE 3-4  
DAUNIA COAL MINE EIS  
MINING AND OTHER TENURE**



Scale 1:125,000 on A4

Projection: Australian Map Grid - Zone 55 (AGD84)



BHP Billiton Mitsubishi Alliance

About 560 Mbcm of overburden will be removed over the life of the mine. The majority of this material, about 486 Mbcm, will be progressively returned to in pit spoil dumps. About 74 Mbcm of overburden will be placed in out of pit spoil dumps.

The above spoil quantities have been estimated based on a 20% swell factor for drill and blast spoil and 10% swell for free-dig spoil.

Design parameters adopted for mine planning include:

- › 100 m wide mining strips, nominally 500 m in length;
- › out of pit spoil dump external face slopes of 1 (vertical) : 10 (horizontal), or 10%;
- › out of pit spoil dump benches of 10 m width at 10 m intervals (lifts).

### **3.5.2 Product Coal Production Schedule**

The final production sequence will depend on sales and infrastructure constraints. Excavator and truck mining will produce an estimated 85 Mt of product coal, based on a production rate of approximately 4 Mt/a over approximately 21 years.

On average 60% of the product will be coking coal and 40% will be PCI.

### **3.5.3 Mining Sequence**

The depth to the top of the Leichhardt coal seam varies between about 40 m and 80 m across the deposit. Interburden between the Leichhardt and Upper Vermont seams result in a maximum pit depth of approximately 120 m to access the Upper Vermont seam, which is the limit of economic coal. The overall average stripping ratio of overburden (bcm) to ROM coal is 7 to 1. In-situ overburden densities average 2.3 t/bcm, but vary with material type.

An overview of the proposed mining sequence is shown in **Figure 3-5**. Mining will commence in the north eastern part of the deposit to establish the initial box cut before advancing to the north along strike and down dip, taking the blocks of coal on the eastern limit of the deposit. Once mining has progressed to the northern extent of the deposit the mining face swings to the west and then south along the western limit of the deposit. From about year 10 to year 15, mining occurs as a 2-pit operation. The second pit enables the removal of coal along the western limit of the deposit.

By about the end of year 15, mining has reached the economic limits of a truck and excavator fleet in the northern part of the deposit. At that point, mining returns to the eastern limit of the deposit, with a new box cut to the south-west of the eastern out of pit spoil dump. Mining then progresses into the southern most economic limits of the deposit.

Overburden produced during the first few years will be trucked to an out of pit spoil dump located to the east of the deposit, on the Daunia East Mining Lease (ML 70115). Overburden is scheduled to be placed back into the pit from about year 3. Approximately 35 Mbcm are placed in out of pit spoil dumps in the first five years. A further 55 Mbcm is scheduled to be placed into the pit over the corresponding period.

The proposed mine development sequence is for the initial box cut, and then every five years is illustrated in **Figure 3-6** to **Figure 3-10**. The main features of the mining sequence are outlined below.

- › Vegetation will be cleared and stockpiled.
- › Topsoil will be stripped from all areas to be disturbed, using scrapers or bulldozers and rear dump trucks, and if not used immediately, it will be stockpiled for later use.
- › Topsoil stockpiles will be located at the base of spoil dumps, to facilitate later spreading over disturbed areas.
- › Competent overburden will be drilled and blasted, then excavated in benches using large hydraulic excavators and loaded into rear dump trucks.
- › Two box cut areas are planned (each along the eastern boundary of the resource). Material from the box cuts will be used to:
  - construct haul roads;
  - backfill mine voids; or
  - transported to nearby out of pit spoil dumps.
- › The exposed coal will be drilled and blasted (or thin seams ripped by a dozer) and then loaded into rear dump trucks for transport to the CHPP via the mine haul road.
- › The coal rejects and dewatered tailings will be buried within the spoil dumps.
- › A combination of in pit and out of pit dumping will be used, preferring in pit dumping wherever sufficient room is available.
- › The dumps will be progressively shaped to their final landform based on a maximum overall slope from dump crest to dump toe of 10 per cent.
- › The dumps will be topsoiled and revegetated either to native bushland or pasture.
- › Drainage structures such as graded banks will direct runoff to dams constructed at the base of the dumps to collect sediment and contain mine water if the pits require water to be pumped from them.
- › At the completion of mining, voids will either be completely backfilled or rehabilitated with 1 in 6 (17 per cent) slopes and drainage protection, with rock armouring applied where required. The base of the rehabilitated final voids in the south will slope down to a maximum depth of 100 m below the existing surface level. Other voids will be either progressively backfilled or backfilled at when mining operations stop.

In the mining sequence described above, land disturbance will be minimised by:

- › returning the majority of the overburden to the open cut pits;
- › avoiding tailings dams or out of pit reject dumps; and
- › using existing infrastructure at the Poitrel Mine and the Millennium Project, including the access road, power and water supply, sewage treatment, rather than constructing stand-alone facilities.

#### **3.5.4 Mine Rehabilitation**

The proposed post-mine land use for disturbed areas is a mosaic of self sustaining vegetation communities and grazing land using appropriate native tree, shrub and grass species, and improved pasture species as appropriate. Local plant species will be included in the seed mix so as to restore elements of the pre-mining communities to the rehabilitated assemblages. The criteria for achieving self-sustaining final landforms will be developed during the operation as part of the BMA Closure Plan for the Project, calling on site-specific rehabilitation trials, monitoring and research programs.

The design of spoil dumps is an important part of the mine rehabilitation. The spoil dumps will be constructed in 10 m lifts. Final dump slopes will be regraded to a maximum angle of 10 per cent, with contour drains constructed at 10 m vertical intervals.

The main features of the progressive rehabilitation process are:

- › constructing a stable final landform consisting of out of pit spoil dumps, in pit spoil dumps and rehabilitated final voids;
- › progressively constructing dumps to final landform design, to minimise reshaping at the end of mining;
- › immediately respreading suitable topsoil across available reshaped areas or stockpiling until suitable reshaped areas are available;
- › contour ripping immediately after topsoil placement to control erosion;
- › seeding with an appropriate seed mix prior to the wet season to maximise the benefits of subsequent rainfall;
- › applying appropriate fertiliser for plant establishment if required;
- › respreading cleared vegetation on rehabilitated land; and
- › managing direct rainfall and runoff from the rehabilitated landform in sediment dams and in rehabilitated final voids.

The indicative program for rehabilitation includes:

- › Year 3: commencing rehabilitation on the lower batters of the eastern out of pit spoil dump.
- › Year 5: all the eastern out of pit spoil dump will have been rehabilitated and the rehabilitation of the eastern slopes of the in pit spoil dump and the initial 'plateau' areas on top of the in pit spoil dump will have commenced. This will continue progressively for the next 10 years, with substantial areas revegetated and other areas progressively recontoured, topsoiled and seeded.
- › Year 17: commencing rehabilitation of the second eastern out of pit spoil dump. The in pit spoil dumps in the south east and south west will be progressively rehabilitated over the remaining life of the mine.
- › Year 21: mining has ceased, the batters of the in pit spoil dumps draining to final southern void will be rehabilitated; and all buildings, plant and equipment including the CHPP will be removed and dams will be left for potential future use (with background landholder approval), or decommissioned. The objective is to leave a stable and fully rehabilitated site.

### **3.5.5 Blasting**

Blasting may be required for both coal and overburden. The Poitrel Mine, which mines through similar soils and geology, does not use blasting for coal but does not blast overburden. The range of potential blast sizes for the Project will be about 200,000 bank cubic metres (bcm) for coal blasts and range from 500,000 to 750,000 bcm for overburden.

An explosives contractor will provide explosives and undertake all blasting activities. The existing Poitrel magazine will be expanded for the storage of blasting equipment and accessories for the Project.

Over the life of the mine, the amount of bulk explosives (Ammonium Nitrate / Fuel Oil (ANFO)) used per annum is estimated to be approximately 30,000 tonnes.















### 3.5.6 Mine Equipment

The mining contractor will supply the heavy mining equipment, which would be transported to site by road in large components and assembled on site. The estimated number and type of mining equipment proposed is shown in **Table 3-3**.

**Table 3-3 Indicative Mine Equipment**

Mine Activity	Indicative Mine Equipment	
	Item	Number
Overburden and Spoil Removal	Excavator	3-4
	Front End Loader	1
	Rear Dump Truck	14-20
	Overburden Drill	1-2
	Dozers	3-4
Coal Extraction	Excavator	1
	Front End Loader	1
	Rear Dump Truck	4-5
	Coal Drill	1
	Tracked Dozer	1-2
Haul Road Maintenance	Grader	2
	Water Cart	2
Tailings Load & Haul	Front End Loader	1
	Small Excavator	1
	Rear Dump Truck	1-2
Soil & Clay Removal	Scraper (during construction)	4

### 3.6 Mine Facilities and Infrastructure

Mine facilities and infrastructure will include roads, dams, administration buildings, water and sewerage infrastructure, a heavy-vehicle workshop, a change house and warehouse (**Figure 3-12**).

Raw water will be supplied to the operation from the existing Process Water Dam at the Poitrel Mine. The Process Water Dam is supplied via the Braeside Pipeline, which takes water from the Braeside Borefield and the Eungella Dam. BMA has an existing allocation from these sources that is sufficient to cover the Project's water demands. Further discussion of water demand for the Project is provided in **Section 6.1.2**. Only minor pumping and piping is required to connect the Project to the Poitrel Mine supply.

Potable water will be trucked to site by a contractor. Further details are provided in **Section 3.8.3**.

Sewage generated by activities at the Project will be treated through an expanded modular sewage treatment plant (STP) at the Poitrel Mine. Only minor pumping and piping is required to connect the Project to the Poitrel sewerage system and STP. Effluent from the STP will be disposed in evaporation trenches or ponds managed by the Poitrel Mine. Biosolids will be buried on the Poitrel Mine site.

Access to the mine site will be via the Poitrel Mine access road from the Peak Downs Highway. This access road is also shared by the Millennium Project.



- Coking Coal: 7.5 per cent ash, 14.0 per cent moisture as shipped; and
- PCI Coal: 9.8 per cent ash at not greater than 8.5 per cent total moisture.

A schematic of the CHPP Process is shown in **Figure 3-13**. The approximate annual throughput of the CHPP is shown in **Table 3-4**.

**Table 3-4 Coal Handling and Preparation Plant – Throughput of Project Coal**

CPP Component	Indicative Maximum Annual Throughput
Project ROM Feed to the CHPP	5.6 Mt
Project Washed Product Coal	4 Mt
Project's CHPP Waste (rejects) returned to the Project's waste dumps	1.6 Mt

### 3.7.2.1 ROM Hopper & Raw Coal Conveyor

The uncrushed ROM coal will be transported from the mine pits by haul trucks to the ROM hopper where it will be directly dumped into the hopper by truck or front-end loader. The ROM hopper will be sized to receive two truckloads in succession.

The ROM hopper will be fitted with a grizzly (1 m wide aperture) and feeder breaker. The feeder breaker will reduce the coal from the hopper to a top size of -250 mm. Discharge from the feeder breaker will be directed onto the 800 t/h raw coal conveyor and elevated to the sizing station. A weigh scale will be used to control the feed rate of the feeder breaker. A tramp iron electro magnet and metal detector located along the conveyor will remove ferrous materials. Discharge from the magnet will be into a tramp bin located adjacent to the conveyor.

### 3.7.2.2 Sizing Station

The raw coal conveyor will discharge into the secondary sizer for reduction to nominally -120 mm. The secondary sizer will be a low speed high torque centre sizing machine which minimises fines generation.

Coal discharge from the secondary sizer will be directed to the tertiary sizer for reduction down to 50 mm topsize. Discharge from the tertiary sizer will be collected by the plant feed conveyor.

### 3.7.2.3 Desliming

The plant feed conveyor discharges into the desliming screen feed box and then directly onto a multislope double deck desliming screen. Sprays will assist the desliming operation and the - 1.4 mm material and water will be collected in the desliming screen underpan. The - 50 +16 mm coarse coal and the -16 +1.4 mm small coal will discharge from the double deck desliming screen into separate launders.

The -50 +16 mm coarse coal launder will be flushed into the coarse coal dense medium cyclone feed sump. The -16 +1.4 mm small coal launder will be flushed into the small coal dense medium cyclone feed sump.





#### **3.7.2.4 PCI and Coking Coal Circuits**

The CHPP will be designed with separate product circuits for PCI and coking coal. The processes in these product circuits are similar.

The dense medium cyclone feed sumps will be a wing tank type design. Constant sump level will be provided by overflow of excess medium to the correct medium sump. Mixed dense medium and coarse coal from the dense medium cyclone feed sump will be pumped into a single dense medium cyclone.

Clean coarse coal product and dense medium will overflow from the product cyclone and discharge directly into a feed box that discharges onto a multislope product drain and rinse screen.

Reject coal and medium will underflow from the product cyclone into a feed box which will distribute onto a multi-slope reject drain and rinse screen. Rejects material will be discharged directly onto the rejects transfer conveyor.

Medium drained from the first section of the product coal and reject screens will be returned to the correct medium sumps. Adhering medium will be rinsed from the product and reject by water sprays on the final section of the screen and report to the dilute medium sump.

The product coal will discharge into a coarse coal centrifuge for dewatering. The dewatered coarse product will be discharged directly onto the product coal conveyor. The centrifuge effluent will be transferred to the dilute medium sump and will be pumped to the magnetic separators to enable recovery of additional magnetite and misplaced fine coal.

The rejects will discharge onto the reject transfer conveyor that will discharge on the reject conveyor for transfer to a reject bin which in turn will be emptied for transport and disposal in the spoil dumps.

##### › Correct Medium and Magnetite Recovery Circuit

The medium draining from the coarse coal and small coal drain and rinse screens will report to the small coal or coarse coal circuit correct medium sumps so that it can be recirculated. A portion of each stream will be diverted to provide correct medium to sluice small coal or coarse coal from the desliming screen discharge launder to the small coal and coarse coal DMC feed sumps.

Excess medium from each circuit will overflow from the DMC feed sumps into their respective correct medium sumps.

The dilute medium from the rinse sections of the small coal and coarse coal drain and rinse screens will be piped to a common dilute medium sump. The dilute medium will be pumped to the magnetic separators. Concentrate from the magnetic separators will gravitate into both of the correct medium sumps. Effluent from the spigot discharge of the separators will be collected and will report to the desliming screen feed box to assist in dilution of the raw coal prior to desliming.

##### › Density Control

Density control is achieved by maintaining 'overdense' medium in the small and coarse coal correct medium sumps and injecting clarified water into the suction line of each circuit's correct medium pump to

dilute it to the correct density. The medium density will be monitored on the correct medium pump discharge pipes and feed back control will be used to adjust the rate of injection water

To maintain 'overdense' medium in the correct medium sumps, some correct medium is bled from the correct medium circuit to the dilute medium sump. From there it is pumped to the magnetic separators and returned to the correct medium sumps as a magnetite concentrate.

› Magnetite Addition

When the level drops sufficiently in the correct medium sumps, magnetite will be added to return it to the nominal operating level.

Magnetite losses will be made up from the magnetite bulk storage sump by the magnetite pump. The sump will be designed to take three, 28 tonne truck loads of magnetite emptied onto an inclined beach. The magnetite will be slurried into the sump pump by a controlled hose monitor and pumped to the correct medium sump or recycled to the magnetite sump.

› Spirals Circuit

The 1.4 mm x 0 mm underflow from the desliming screen is directed to the classifying sump. From here, the slurry is pumped to a classifying cyclone. The overflow stream from this cyclone reports to the flotation circuit.

The cyclone underflow will gravitate to spiral feed distributors. Fine coal spirals will beneficiate the fine coal into rejects and fine product. The fine reject from the spirals will flow by gravity to the spirals reject sump.

Fine coal product from the spirals will be laundered to a spiral product sump and pumped to the spiral product thickening cyclones. The thickened underflow will report to the fine coal centrifuge feed box. The cyclone overflow will report to the desliming screen feed box.

Product coal will discharge from the centrifuge feed box into fine coal centrifuges for dewatering and be discharged onto the coking coal product conveyor. The centrifuge effluent will report to the spiral product sump where it will be recirculated back to the spiral thickening cyclones.

Fine reject from the spirals will be laundered to a spiral rejects sump and pumped to the spiral reject thickening cyclones. The thickened underflow will report to the fine coal rejects high frequency screen for dewatering before being discharged onto the coarse rejects conveyor. The cyclone overflow and screen effluent will report to the fine coal effluent sump.

› Flotation Circuit

The desliming cyclone overflow will report to two Microcels where air and reagents are added to assist with the flotation process.

Flotation reagents will be stored in and distributed from a bunded storage area located remote from the CHPP. This facility will include one collector storage tank and one frother storage tank.

The collector will be dosed directly into the flotation cell feed by a collector dosing pump (fitted with a variable speed drive) located in the reagent storage area.

The frother will be dosed directly into the flotation cell feed pump suction by a frother dosing pump (fitted with a variable speed drive) located in the reagent storage area.

#### › Froth Thickening

The froth concentrate from the micro cells will gravitate to the coal thickener de-aeration tank and then into the centre well of the thickener. Flocculant is added to the coal thickener feed launder to assist settling of the coal prior to discharging into the feed well of the hi-rate thickener. The flocculant will be provided from a packaged powder based flocculant preparation plant which prepares and doses anionic flocculant to the coal thickener.

Thickened solids from the coal thickener underflow will be pumped to the vacuum disc filters. Filtered product is discharged onto the smalls product conveyor. Overflow from the coal thickener is used as wash water for the flotation cells. Filtrate from the filters is also recycled through the coal thickener. This maximises the recycling of frother contaminated water in the flotation circuit and avoids transfer of this water into other areas of the plant where it can create problems.

#### › Tailings Thickening

The tailings from the micro cells will gravitate to the tailings filtrate tank and then be pumped to a high rate tailings thickener. Thickened solids from the thickener underflow will be pumped to multiple belt press filters. The solids discharged from the belt press filters will be transferred by a single conveyor and discharged into a bunker for collection by mobile plant. Overflow from the tailings thickener will report back to the clarified water sump and will be recirculated through the plant.

Flocculant is added to the tailings thickener feed launder to assist settling of the tailings prior to discharging into the feed well of the hi-rate thickener. The flocculant will be provided from a packaged powder based flocculant preparation plant which prepares and doses anionic flocculant to the tailings thickener. Additional flocculant makeup will be provided to allow for the addition of cationic flocculant if required to assist in the dewatering of the tailings.

#### › Coarse Rejects Handling

The coarse and fine rejects will be dewatered by screening and discharge on to a conveyor to the rejects bin. This will be collected in trucks for disposal in the spoil dumps. Tailings will be dewatered using band press filters to produce a cake that is discharged on to a conveyor to a bunker. The cake will then be loaded into small dump trucks for disposal in the spoil dumps.

#### › Product Handling

Small coal and coarse coal product will be discharged from the CHPP via the product distribution station to product coal stockpiles.

From the product distribution station, the small and coarse coal products are discharged onto transfer conveyors and conveyed to coking and PCI radial stackers before being discharged onto the ground. In the product distribution station a series of diversion chutes make it possible to either direct the small or coarse coal product to separate product streams or one combined stream.

› Train Load-Out

The train load-out system will be capable of loading a single 10,000 tonne train in 2.5 hours. Hence, the average loading rate will be approximately 4,000 t/h. The existing 350 t train load-out bin at the Red Mountain load out facility will provide sufficient capacity during loading subject to maintaining coal flow through the coal valves. Multiple product coal dozers will maintain the required load-out rate (depending on the required product blend).

The train load out conveyor will collect reclaimed coal and elevate it to the existing Red Mountain 350 t train load out bin at a nominal rate of 4,500 t/h.

### **3.7.3 CHPP Water Consumption**

The estimated demand for CHPP process water is 85 m<sup>3</sup>/h, with an estimated maximum demand of 165 m<sup>3</sup>/h. This water will be sourced from the Process Water Dam.

Additional water demand at the CHPP will exist for:

- › the Fire system,
- › washdown water,
- › dust suppression systems, and
- › potable water.

A combined fire, washdown and dust suppression reticulation system will be provided around the CHPP, and will also service the site office and workshop facilities. The fire protection system for the CHPP will be developed on the philosophy of early fire detection, emergency warning and taking a pro-active response to an emergency fire situation.

Washdown water will be provided in transfer stations and in the preparation plant building at each floor adjacent to each set of stairs. All washdown water will be supplied from the fire water system through 25 mm hoses in the transfer stations and preparation plant.

Dust suppression sprays will be provided at appropriate transfer points in the raw coal handling system including the ROM bin.

A potable water system will be provided around the CHPP area, and will also service the CHPP site offices and workshops.

### **3.7.4 Air Services**

Compressed air will be reticulated around the CHPP for use as plant and instrument air. Plant air will be reticulated to the CHPP workshop facility, raw coal area sizing station and ROM hopper.

### **3.7.5 Reagents/ Diesel System**

The reagents required to operate the flotation cell (diesel and MIBC) will be provided and stored in a purpose built facility (fuel farm). The fuel farm will consist of one storage tank for each of the reagents located in a fully bunded area. The diesel tank will also be used for light vehicle and product stockpile dozer refuelling. Pumps and piping to transport the reagents from the storage tanks to the flotation circuit will be supplied.

## **3.8 Water Management**

### **3.8.1 System Overview**

The Project will manage water using the following principles:

- › undisturbed area runoff from the Project Site and its vicinity will be diverted away from disturbed areas by diversion drains, which will drain to the Isaac River;
- › disturbed area runoff will be captured in sediment dams and used preferentially for dust suppression or as process water in the CHPP; and
- › ability to transfer water between sediment dams at the Project and the Process Water Dam to optimise the use of water at the Project and Poitrel Mine.

The key elements of the water management system are:

- › sediment dams;
- › Process Water Dam; and
- › pit water storage.

A schematic of the water management system is provided in **Figure 3-14**.

Rainfall runoff on the Project Site will be managed by a series of diversion drains, pit storage and sediment dams. Water collected in the mine pits will be pumped to sediment dams to maximise pit operability. Disturbed area runoff will be directed to sediment dams.

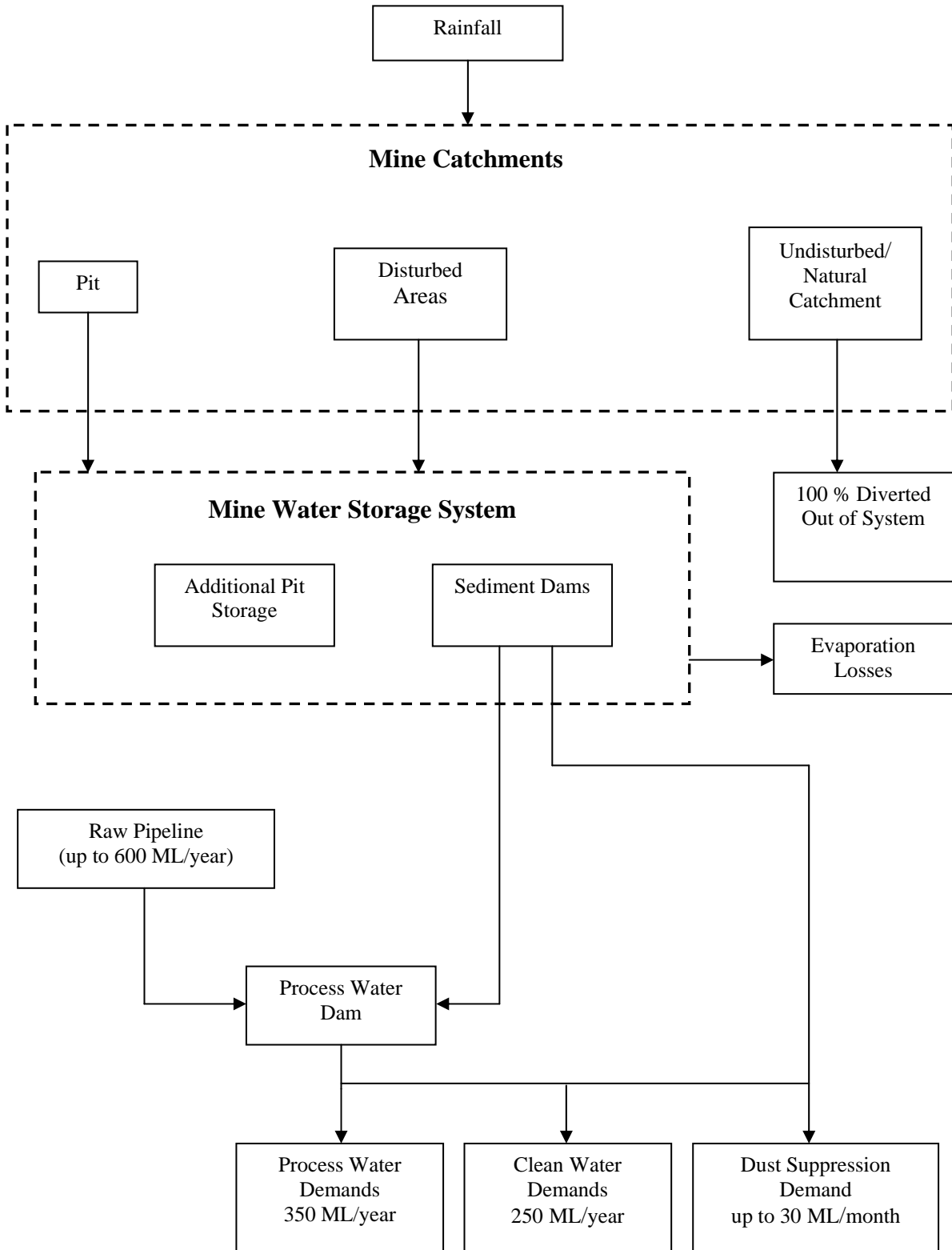
The water from the sediments dams will be used to satisfy site water demands, including dust suppression, and transferred to the Process Water Dam to be used for process water in the CHPP. Raw water from BMA surface water allocations will be piped to the Project Site to supply clean water demands and to supplement site water demands as required.

In a major rainfall event resulting in a volume of runoff greater than the storage capacity in the sediment dams, excess water will be stored in one or more of the mine pits. There will be little risk of water discharges occurring from the Project Site to the Isaac River, except in an emergency or when a rainfall event exceeds the 10 year ARI event, 24 hour design criteria. Under such circumstances, if discharge were to occur, there would be negligible change in the water quality of the Isaac River as there would be significant flood flows.

### **3.8.2 Sediment Dams**

There will be a number of sediment dams that will be used to settle out suspended solids in runoff from disturbed areas including waste rock dumps.

Mine pit water consisting of rainfall runoff to the pit floor and seepage into the active pit will be pumped to the water dams. Water from the sediment dams may be transferred between the dams or to the Process Water Dam to recreate the storage capacity needed for the next rainfall runoff event. These dams will generally operate at a low level. Water may also be used to meet processing demands at the CHPP or the Project's dust suppression demands when available.



**Figure 3-14 Water Management Schematic**

### **3.8.3 Water Supply**

The Project will require about 600 ML / year of raw water for use within the CHPP and dust suppression. The site water balance indicates that an external water supply is required (see **Section 6**).

The raw water supply for the Project will come from the existing Process Water Dam used by the Poitrel Mine and Millennium Project. A new operating and standby process water pump will be placed in the north eastern corner of the Process Water Dam to pump water via an above ground poly pipe for use in the CHPP.

The Process Water Dam is supplied via an existing 1 km long buried pipeline that connects to the existing existing Braeside water pipeline, which is connected to the existing, licensed Braeside borefield. BMA's allocation from the pipeline is sufficient or provide for the water demands at the Project.

The Braeside pipeline is constructed of 450 mm ID mild ductile iron cement lined (DICL) and currently supplies water to the Riverside, Poitrel and South Walker Creek mines, and the town of Moranbah. The instantaneous water availability from the pipeline will depend on the operating rules imposed by the supply agreement to be negotiated with the owner/operators of the Braeside pipeline.

Potable water from Moranbah will be trucked to site by a contractor and stored in several potable water tanks with pump distribution systems. These systems will supply potable water to administration offices, the CHPP and workshop facilities. The potable water demand will be approximately 0.5 to 1.0 ML/a.

#### **3.8.3.1 Water for Dust Suppression**

The water for dust suppression at the Project site will be supplied from sediment dams on site or the Process Water Dam, if the various sediment dams are dry.

### **3.9 Coal Transport**

#### **3.9.1 Train Movements**

The product coal will be railed via the existing Red Mountain rail loop on ML 70116 to ship loading facilities at the Hay Point Coal Terminal or Dalrymple Bay Coal Terminal (DBCT) over a distance of approximately 172 km. Additional rail track will be constructed on the Red Mountain rail loop to upgrade its capacity to accommodate the Project.

The total amount of coal railed will be approximately 85 Mt over the 21 year life of the Project, requiring about 400 train movements per annum.

#### **3.9.2 Port Capacity**

The Hay Point Coal Terminal is located 40 kilometres south of Mackay in Sarina Shire and commenced operations in the 1970s. The Hay Point Coal Terminal is owned and operated by BMA. Mines supplying Hay Point Services are Goonyella - Riverside, Peak Downs, Saraji, Gregory / Crinum, Norwich Park, Poitrel and South Walker. Hay Point Coal Terminal has a capacity of approximately 44 Mt/a. The DBCT is located near Mackay and commenced operations in 1983 as a common-user facility. At present, DBCT handles the products of upwards of 10 northern Bowen Basin mines. The DBCT currently has three berths with a fourth under construction. DBCT's current capacity is approximately 64Mt/a and will be approximately 85Mt/a when the fourth berth construction is completed.

Average shipping size is 93,000 t through the Hay Point Coal Terminal. Based on 4 Mt/a this equates to approximately an additional 43 shipping movements on a per annum basis.

### 3.10 Power Supply

Power supply to the Project will be via an extension of the existing 66 kV transmission line at the Millennium / Poitrel Project CHPP to Daunia. The existing 66 kV transmission line originates from the Moranbah substation. The proposed alignment of the transmission line is shown in **Figure 3-1**.

### 3.11 Construction

#### 3.11.1 Schedule

Following the issue of environmental and mining approvals and a decision to proceed with the Project, construction will commence with the box cut. The CHPP, administration buildings, sedimentation water dams, and the haul road would also commence construction around this time. The construction period is expected to be in the order of 16 months, with the majority of construction work occurring between March 2009 to and June 2010.

Construction will typically be undertaken during daylight hours, with box cut development occurring on a seven day, 24 hour basis.

#### 3.11.2 Material Volumes and Equipment

The indicative types and quantities of construction materials required for the Project are shown in **Table 3-5**.

**Table 3-5 Construction Phase Material Quantities**

Construction Material	Estimated Quantity (tonnes)
Steel	5,000
Concrete	10,000
Haul Road Base (gravel)	200,000

Raw materials for concrete and road base will be sourced from the site or local quarries. It is likely that a temporary concrete batch plant will be established during the construction phase.

Fuel used during the construction phase will be stored in bunded facilities within the construction lay down area. Construction equipment will be serviced and maintained at the site workshop.

The indicative number and type of construction equipment required is shown in **Table 3-6**.

**Table 3-6 Indicative Construction Equipment**

Type of Equipment	Indicative Number in Construction Fleet
Earth Scraper	3
Excavator	3
Front End loader	2
Dump Truck	12
Grader	2
Crane	4
Water tanker	2
Concrete trucks/pumps	2
Concrete Batch Plant	2

### **3.11.3 Transport of Plant and Equipment**

Construction equipment will mainly be transported by road to the site, on standard or over-dimensional loads. Large items of mining equipment that cannot be divided into smaller components, and the larger coal crushing and handling equipment requiring construction off-site, will be transported on State roads under permit. Where necessary, these vehicles will be accompanied by safety escorts.

Deliveries during construction will be limited to items such as mining equipment, building supplies, fuel, concrete, steel and items for the construction of the CHPP, workshops and administration buildings.

Transport of personnel will be undertaken by private vehicles and by buses.

## **3.12 Workforce**

### **3.12.1 Project Management**

BMA will contract the mining operation to a mining contractor and the construction of the CHPP and the pipeline to a construction contractor. It is also envisaged that a suitable contractor will be appointed to operate the CHPP. The Project will employ about 450 construction employees and about 300 operational employees.

In addition, BMA will provide a Daunia management group throughout the operations phase consisting of a:

- › General Manager;
- › Senior Mining Engineer;
- › Senior Metallurgist;
- › Senior Geologist; and
- › Environmental professional.

The management group together with support staff off-site will overview mining and coal handling/treatment operations.

### **3.12.2 Construction Phase**

The Project's construction workforce will peak at about 450, including employees involved in the construction of the CHPP, water supply pipeline and other infrastructure. The project's contractors will provide additional opportunities for local employment in construction, transport, and the supply of goods and services.

The workforce skills required for construction will include heavy equipment operators, boilermakers, carpenters, scaffolders and electricians. The Project's construction workforce will primarily reside in the accommodation centre at Coppabella, with some workers accommodated in the local townships. Locally sourced employees are likely to reside at their existing place of residence.

### **3.12.3 Operational Phase**

There will be approximately 10 BMA employees during the operational phase. The mining and CHPP operating contractors will employ about 300 people during operations. Production and maintenance staff will work nominally on a 2 x 12 hour roster.



The BMA operations workforce is likely to live in the surrounding townships, with some use of the accommodation centre at Coppabella. The contractor's operational workforce is likely to primarily reside in the accommodation centre at Coppabella.

### **3.13 Decommissioning**

The final rehabilitation of the mining areas is discussed in **Section 3.13** of the EIS.

On the completion of mining, infrastructure will be treated as follows:

- › mine roads will either be left behind for use by the subsequent land holder or deep ripped and rehabilitated;
- › water dams will remain if required by the subsequent land holder and approved by regulators; otherwise, the dam walls will be breached and the area rehabilitated;
- › buildings, plant including the CHPP and equipment will be removed and the surface rehabilitated. This will include the workshop, offices, storage tanks and coal handling facilities; and
- › concrete pads will be broken up and covered with benign spoil, topsoiled and revegetated.

A workforce of approximately 100 employees and contractors will be required during the decommissioning stage.

### **3.14 Project Alternatives**

#### **3.14.1 No Project**

Without the Project, the Proponent would lose market share and profitability. The Government would lose revenue due to royalties, freight charges and taxes. Employees and support contractors would lose employment and income. Secondary support industries and service suppliers would also suffer from a reduction in demand for their services and a resulting reduction in income.

**Section 2.1** provides more details on Project need.

#### **3.14.2 Alternative Locations**

The exploitation of other resources in the Bowen Basin (such as a new mine at Caval Ridge and an expansion of the Goonyella Riverside Mine) is being considered as part of the BMA Growth Strategy. All elements of the BMA Growth Strategy are necessary to meet the growing demand for these coal products in India, China and other international markets.

#### **3.14.3 Mining Methods**

The fault bounded blocks and the relatively shallow depth to coal at Daunia are ideal for open cut mining. These features make underground mining at Daunia a difficult proposition with regard to geotechnical stability and access. The strategy of maximising the production of semi-hard coking coal would not be achieved by underground mining. The costs of underground mining would be substantially more expensive than open cut mining. Hence, open cut mining was selected to develop the resource.

An analysis of open cut mining concepts has been undertaken to determine the most suitable mining method. Selection of a mining method entails consideration of a range of factors including production quality targets, production rate and site constraints (e.g. environmental, social, proximity to water). Mining concepts

generally relate to different mining tasks such as box cut excavation, pre-stripping waste to the upper seam or post-stripping waste to the lower seam. The following concepts were considered for the Daunia deposit:

- › Electric rope shovel and trucks (mining approximately 100m to 150m strips);
- › Hydraulic excavators and trucks (mining approximately 50m strips); and
- › Dragline applications (mining approximately 50m to 60m wide strips).

The excavator and truck fleet was chosen due to the complex geology and the nature of the fault bounded coal blocks, which makes a dragline less economic than the more flexible excavator and truck fleet.

#### 3.14.4 Final Voids

The (then) Queensland Department of Mines and Energy (DME) Technical Guideline on 'Open Pit Rehabilitation' (DME, 1995) provided five objectives for final voids that remain at the end of operations.

- 1) To ensure that open pits and spoil faces are rehabilitated in a form consistent with the agreed post-mining land use;
- 2) To ensure that open pits and spoil faces remain stable after the completion of mining;
- 3) To provide for suitable and adequate sealing of mined face strata, where sealing is required;
- 4) To ensure that open pits are properly drained and, where used as a water storage, hold water of acceptable quality; and
- 5) To rehabilitate open pits so that risks to public safety are minimised.

At the completion of mining, most voids will have been progressively backfilled. The last mining blocks planned to be mined are in the southern end of the pit. At the completion of mining at the Project Site, there will be a final void remaining. Spoil material that has been temporarily stored in small adjacent out of pit dumps will be placed back into the final void. Additionally, with the use of side cast blasting where required, the batters of the remaining final void will be cut back to a 1 in 6 slope and pushed back into the final void. Where lack of competent material poses a stability risk, rock armouring will be applied. The rehabilitated void in this southern part of the Project Site will provide a stable landform, offering habitat for a variety of terrestrial and aquatic fauna, consistent with final land use objectives. The base of the rehabilitated final void in the south, while no longer on the pit floor, will lie approximately 100m below the existing surface level and so will most likely still accumulate some water from groundwater ingress. See **Figure 3-11** which shows the final rehabilitated landform.

Various options presented in DME (1995) were considered for the final void at the Project, including:

- › **Backfilling.** Waste rock will be progressively backfilled into the pit during operations. The refilling of the final voids (volume about 150 Mm<sup>3</sup>) would make the Project uneconomic. However, the sequence of mining operations has been appropriately planned to minimise the size of the void, and the rehabilitation of the sloping faces of the void will aim to make them stable. A geotechnical report on in pit waste rock and highwall stability will be prepared prior to mining lease surrender. Any coal strata or other strata exposed in the face of the final void will be sealed prior to the void collecting water.
- › **Use as a Water Storage Area.** The void will collect water with a water quality suitable for stock or irrigation use. However, the water is likely to be at considerable depth in the void most of the time and this will likely constrain its use.

- › **Development as a Wetland / Wildlife Habitat.** This is the chosen option, for the reasons stated above.
- › **Use for Refuse Disposal.** The void will not be sufficiently close to the source of waste for this option to be economical, and there is unlikely to be a need in the foreseeable future for a refuse/garbage disposal facility of this size.

### **3.14.5 Water Supply**

The Project will require about 600 ML/a of raw water. Various water supply options were considered, including:

- › harvesting water from the Isaac River;
- › harvesting water from New Chum Creek;
- › groundwater on site, and in the vicinity of the site; and
- › supply from the existing Process Water Dam at the adjacent Poitrel Mine.

The harvesting options were not considered viable in the current conditions given the unreliable flows in the Isaac River and New Chum Creek, the existing demands on the Isaac River and the likely difficulty in gaining new water allocations from this system. Groundwater was not considered as a reliable water supply for the Project, as there is little reliable groundwater yield on site or from bores in the vicinity of the site. The use of groundwater was also considered likely to impact on the reliability of the existing groundwater supply to neighbouring and downstream landowners. Any water produced as a result of mining activities will be used in the mining operation.

Connection to the Process Water Dam is low cost, with relatively small pumps and short piping lengths to deliver the water from the dam to the CHPP.

Hence, the supply of water from the existing Braeside borefield via the Process Water Dam was considered the most reliable water supply option with the lowest impact.

Treated potable water from Moranbah water will be trucked to site by a contractor. This is the most economical means of water supply. An onsite water treatment plant would be cost prohibitive and generate waste water streams requiring management. The potable water demand will be approximately 0.5 to 1.0 ML/a.