MOOLARBEN COAL PROJECT

SECTION 4

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4.1.1 Licence and Tenement Details

The Moolarben coal exploration area is an amalgam of four older coal exploration titles comprising A428 in the north, A309 in the east, and A449 in the south, and part portion 741 in the west. Following the award of the area to MCM in August 2004 these former titles were consolidated into a single exploration area having a surface area of approximately 110 km^2. The licence has tenure of five years and is known as EL 6288.

4.1.2 Previous Exploration and Mining

Ulan Coal has been continuously mined by open cut and underground methods since 1924. The existing Ulan Coal Mine, which was commissioned in the 1980's supplies export thermal coal from its underground operation and the domestic and export thermal coal from the open cut mine.

Due to the relatively long and stable history of coal mining activity, the Ulan area has been extensively explored. Initial investigations were carried out by the New South Wales Mines Department in 1950, and later by the Joint Coal Board (JCB) in 1977. In the late 1970's the Energy Recycling Corporation (ERC) conducted a regional drilling program, which included a number of exploration holes in the project area.

In the early part of 1980 and again in the late 1980's, Ulan Coal Mines Pty Limited investigated the northern part of the project area. This work was part of a proposed expansion to the Ulan Colliery. During the period 1999 to 2003, the Department of Mineral Resources drilled a number of open and cored drill holes in the southern and central part of the project area. Following completion of this program, the Department of Mineral Resources invited expressions of interest for exploration and development of the Moolarben resource. After evaluation of submissions, MCM was awarded the area, which was granted as EL6288 in August 2004.

During the period November 2004 to May 2006 MCM has investigated the project area the subject of this EA report. This work has delineated open cut and underground coal resources comprising approximately 187Mt of coal; this includes ROM reserves of 127Mt. An integrated mine plan has been proposed to recover the resource at a rate of up to 10Mtpa of product coal.

4.1.3 Geology

4.1.3.1 Regional Setting and Stratigraphy

The MCP is located in the northern part of the Western Coalfield, and occupies the northwest margin of the Sydney-Gunnedah-Bowen Basin in NSW. This coalfield contains coal measures of mid to late Permian age, which are known as the Illawarra Coal Measures. The coal measures comprises up to six formations that collectively constitute a well-bedded sequence of claystone, mudstone, siltstone, tuff, sandstone and coal. These sedimentary units unconformably on-lap basement and strike in a northwest direction at dips of between 1 and 2 degrees to the northeast.

Triassic sandstones and conglomerates of the Narrabeen Group overlie the Illawarra Coal measures, which in turn overlie either Early Permian marine sediments (Shoalhaven Group) in the east, or in west, Carboniferous granite (Ulan Granite) and Rylstone Volcanics. Small plugs and remnant basalt flows of Tertiary age have been observed in outcrop in the Moolarben, Murragamba and Wilpinjong valleys. Unconsolidated and partially consolidated Quaternary sediments also occur throughout the area as valley fills and along dominant drainage lines, refer to **Figure 4.1**.

The coal measures contain a number of seams, however the major unit known as Ulan Coal is the only seam of economic significance within the MCP area. Ulan Coal occurs at the base of the Illawarra Coal Measures and is considered to be the northern equivalent of the Lidsdale seam, which has been extensively mined further south in the Greater Lithgow District.

In the northern part of the project area, the Illawarra Coal Measures, which are generally 100 m to 120m thick, are preserved by up to 60m of plateau forming Triassic sandstone. This area has been identified for underground development. In the southern and central west parts of the MCP area, erosion has largely removed the Triassic sandstones and upper parts of the coal measures. In these areas Ulan Coal is present under relatively thin cover, and is amenable to open-cut development.

4.1.4 Coal Geology

4.1.4.1 Seam Structure

Ulan Coal ranges in thickness from around 6m to about 13m and has been divided into six major sections – A to E. These sections have been further subdivided into 12 units (ULA, UB1, UB2, UC1, UC2, CMK, UCL, DTP, DWS, ETP, EBT and ELR). A generalized subdivision of Ulan Coal is shown in **Figure 4.1**, and briefly described below.

A Section

This is the top highly banded coal unit within Ulan Coal. It attains a thickness of about 2.6m and the stone plies within, comprise about one third by volume. The coal is high in ash, except for the top 0.3m which has a raw ash content ranging from 5% to 25%. This clean ply is referred to as the A working section (AWS). In the far southwest of the project area the A section shales out and is largely replaced by carbonaceous claystone and sandstone.

B Section

Unit B section with a thickness ranging from 1.2m to 1.8m, has a single, four centimetre, stone band centrally located. This band subdivides the section into units B1 and B2. The coal plies either side are normally moderately clean, although the upper ply tends to be higher in ash. The B section generally retains its identity over the entire project area.

C Section

This section averages about 3.2m in thickness, and is characterised by a band of tuffaceous claystone, 19 to 30 centimetres thick about one metre above the floor of the section. This band is referred to as the C Marker (CMK) The CMK retains its identity over all of the northern and central parts of the project area. Further south and east towards Moolarben, the thickness of the marker decreases and is replaced by over 2.5m coarse grained sandstones. Below the C marker is a one metre thick band of uniformly dull coal with high clay content. This is known as the C Lower unit (CL).

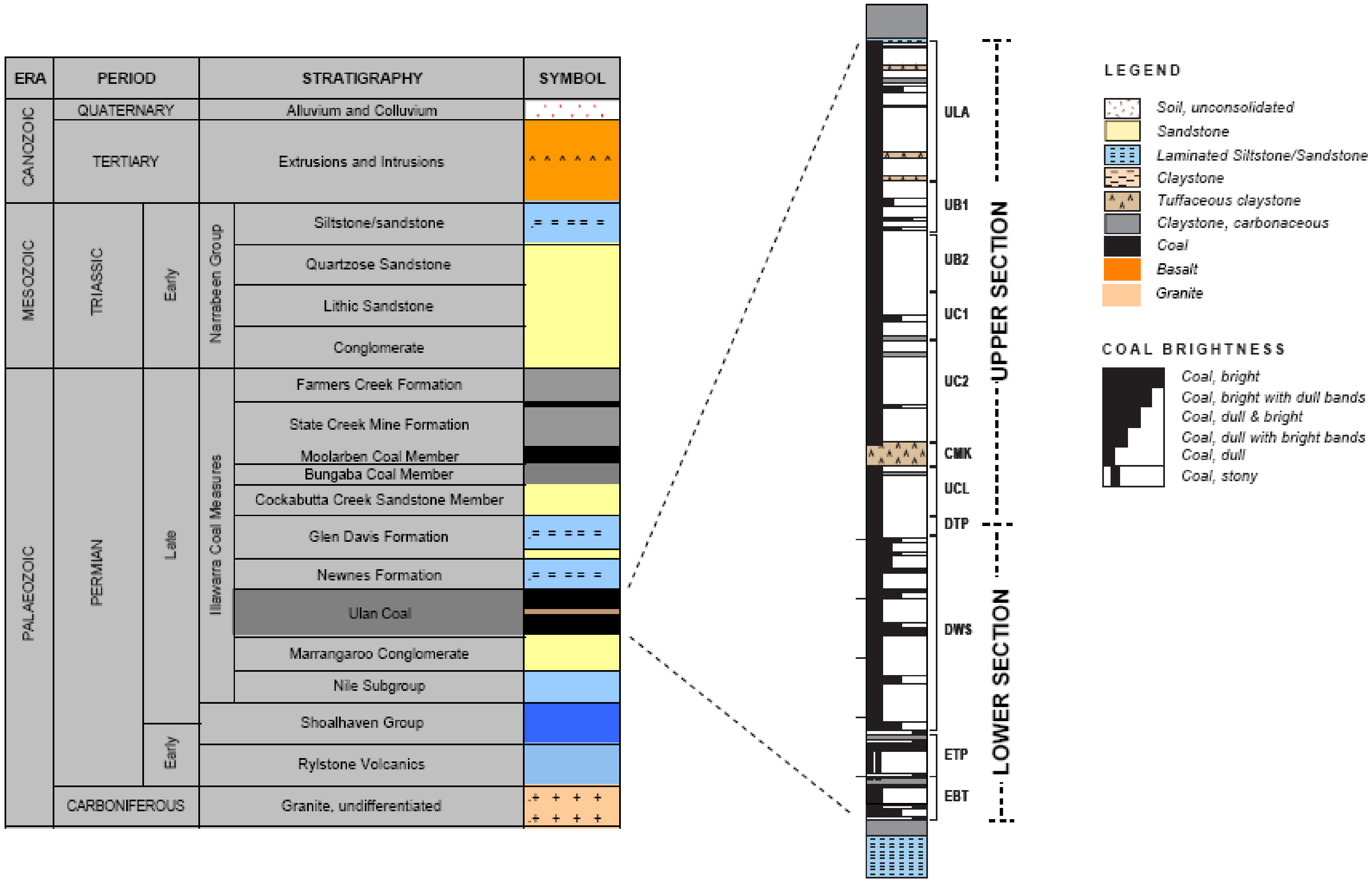


Figure 4.1: Generalised stratigraphic section of Ulan Coal.

D Section

In the north and northeast part of the project area, the D section comprises about 3.2m of generally dull and minor bright coal. A vitrinite rich band occurs some 20 centimetres below the true roof of unit D. This is locally known as the miners “shinnies” which defines the top of the lower ash coal in the section, the D working section (DWS). The higher ash coal in the roof is known as D top (DTP).

E Section

The E section is readily subdivisible into three subsections, the E top (ETP), E Bottom (EBT) and E Lower (ELW). The ETP and EBT comprises between 0.6m and one metre of generally clean coal proceeded by a claystone band of about 10 centimetres thickness. The ELW is about 40 centimetres thick, again with a 10 centimetre claystone band at the top. Wisps and lenses of mudstone tend to occur throughout the EBB until it grades into dark brown shale.

4.1.4.2 Coal Quality

The individual sections that make up Ulan Coal comprise plies of moderately low to moderately high ash. These plies are separated by partings of tuffaceous claystone and carbonaceous shale. Ulan Coal is a medium to high volatile bituminous ranked coal, with a calorific value of about 33 MJ/Kg (daf) In it’s raw state the coal plies are suitable for thermal power generation, although processing would be required to remove the non combustible stone partings.

4.1.4.3 Utilization Potential and Proposed Working Sections

The exploration programs have produced data on raw and clean coal for a variety of ply combinations in a number of potential mining areas. Based on these studies, the Ulan Coal has been separated into upper and lower coal-mining sections. These sections will yield a combination of export and domestic grade thermal coal.

The upper section (ACL), where fully developed is between 6.2m and 7.9m thick, and the lower section (DEBT) ranges from 4.2m to 5.5m thick, and is in the main about 4.5m thick. Both of these sections are proposed for open cut development. The underground area is restricted to a maximum extraction height of about 4.5m. In this regard the optimum quality of coal for this thickness is the D and E top plies (DETP). The DETP section ranges in thickness from 4m to 4.6m (refer **Figure 4.2**).

4.1.5 Coal Resources and Reserves

Total coal resources within the MCP DA area are estimated at 187Mt. This includes an estimated run of mine coal reserve of approximately 127Mt. The open cut operations would require the excavation of some 150 million bank cubic metres (Mbcm). The distribution of these quantities is shown in **Table 4.1**.

Table 4.1: Summary of Coal Resources and Reserves

Area	Overburden (bcm)	Coal Resources (t)	Waste (bcm)	Coal ROM Reserves (t)
Open Cut 1	96,166,300	49,037,200	85,531,988	44,509,440
Open Cut 2	30,633,300	18,028,600	26,032,391	15,835,576
Open Cut 3	101,757,499	46,234,100	38,218,109	18,302,285
Underground 4		74,044,704		48,276,850

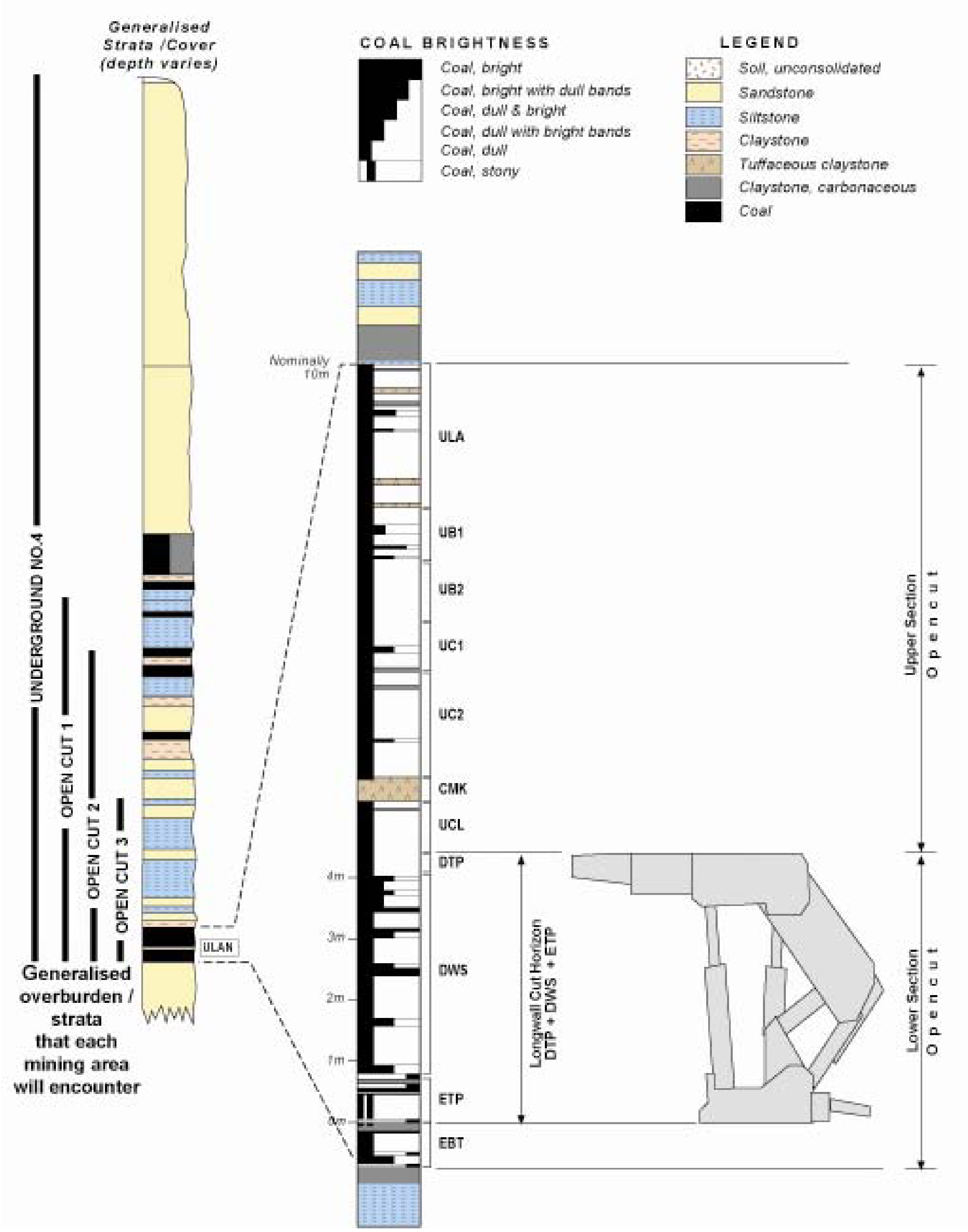


Figure 4.2: Proposed working sections of Ulan Coal for Underground and Open Cut operations.

4.2 Main Mining and Infrastructure Area

The main infrastructure area is located north of the Gulgong – Sandy Hollow Railway Line and east of Ulan Road, in the area approved by the Minister for Planning in 1985 for facilities similar to those proposed for this project. This area will contain the main administration offices for the MCP, the coal preparation plant (CPP) and Underground No.4 facilities.

The open cut resources occur in three areas, which are located in the southern and central parts of the project area. These are referred to as Open Cut 1, Open Cut 2 and Open Cut 3. The underground resource area is located in the northern part of the project area and is known as Underground No.4. The general arrangement of the project is illustrated within **Figure 4.3** and **Plan 3** in **Volume 2**.

The main infrastructure area is shown in **Figure 4.4** and **Plan 4** in **Volume 2**.

All facilities will generally be constructed with a steel frame, clad with a suitably coloured metal sheeting or similar product. Buildings will be constructed to a level free of inundation by floodwaters and will be built to appropriate building codes that consider the likely effects of earth-quakes.

4.2.1 Coal Handling and Preparation Facilities

All coal extracted in the underground and three open cut coal mines (approximately 12Mtpa ROM) will be handled and processed by the coal handling and preparation facilities described below. A generalised schematic of coal handling is illustrated in **Figure 4.5**.

4.2.1.1 Raw Coal Handling

Separate ROM coal handling systems are required for the open cut and underground mines. An overland conveyor approximately 2km long will connect Open Cut 1 to the main surface facilities north of the Gulgong - Sandy Hollow Railway Line.

Open Cut 1

Coal will be transported from the open cut to a 100,000t ROM stockpile or dumped directly to a 400t capacity dump hopper located adjacent to Open Cut 1. Coal will be reclaimed from the stockpile by front end loader and fed into the dump hopper and then to a primary sizer to reduce the coal to 350mm topsize. The coal is then conveyed to a secondary sizer station to reduce the coal to 125mm topsize, which is a suitable size for conveying over long distances. The dump hopper, primary and secondary sizers will be located in a box cut below ground level.

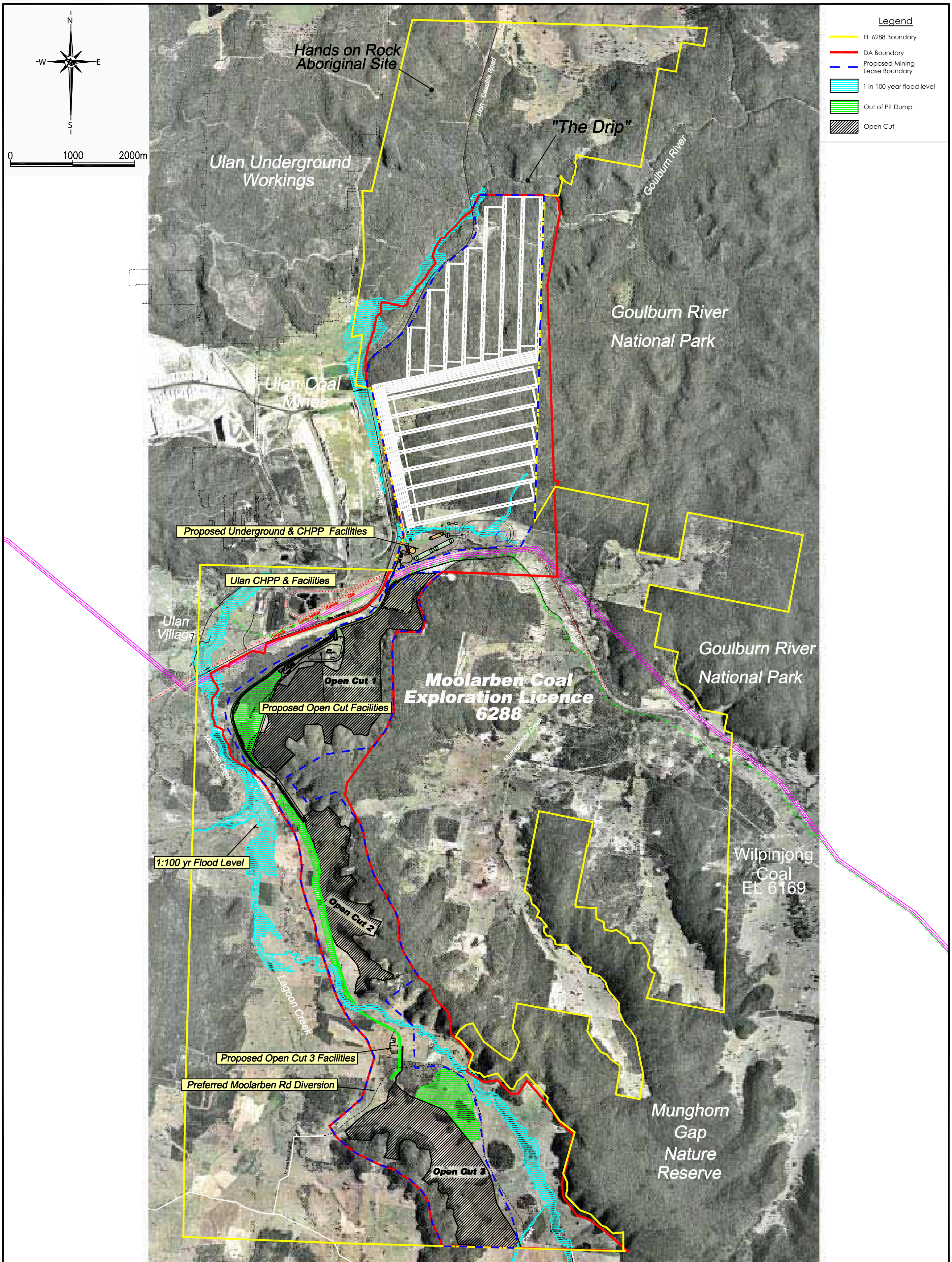
The ROM coal will be transported by overland conveyor to the overhead tripper conveyor over the plant feed stockpile, a distance of approximately 2km.

Open Cut 2 & Open Cut 3

ROM coal from Open Cuts 2 and 3 will be transported to the Open Cut 1 facilities by trucks on internal haul roads. The haul roads are fully bunded to reduce noise.

Underground Mine No. 4

The surface ROM coal system for Underground No.4 commences at the discharge point of the drift conveyor and consists of a conical stockpile with a reclaim conveyor and feeder arrangement in a tunnel below the stockpile. Reclaimed coal will be conveyed to a secondary sizer station and then to the plant feed stockpile via tripper conveyor.



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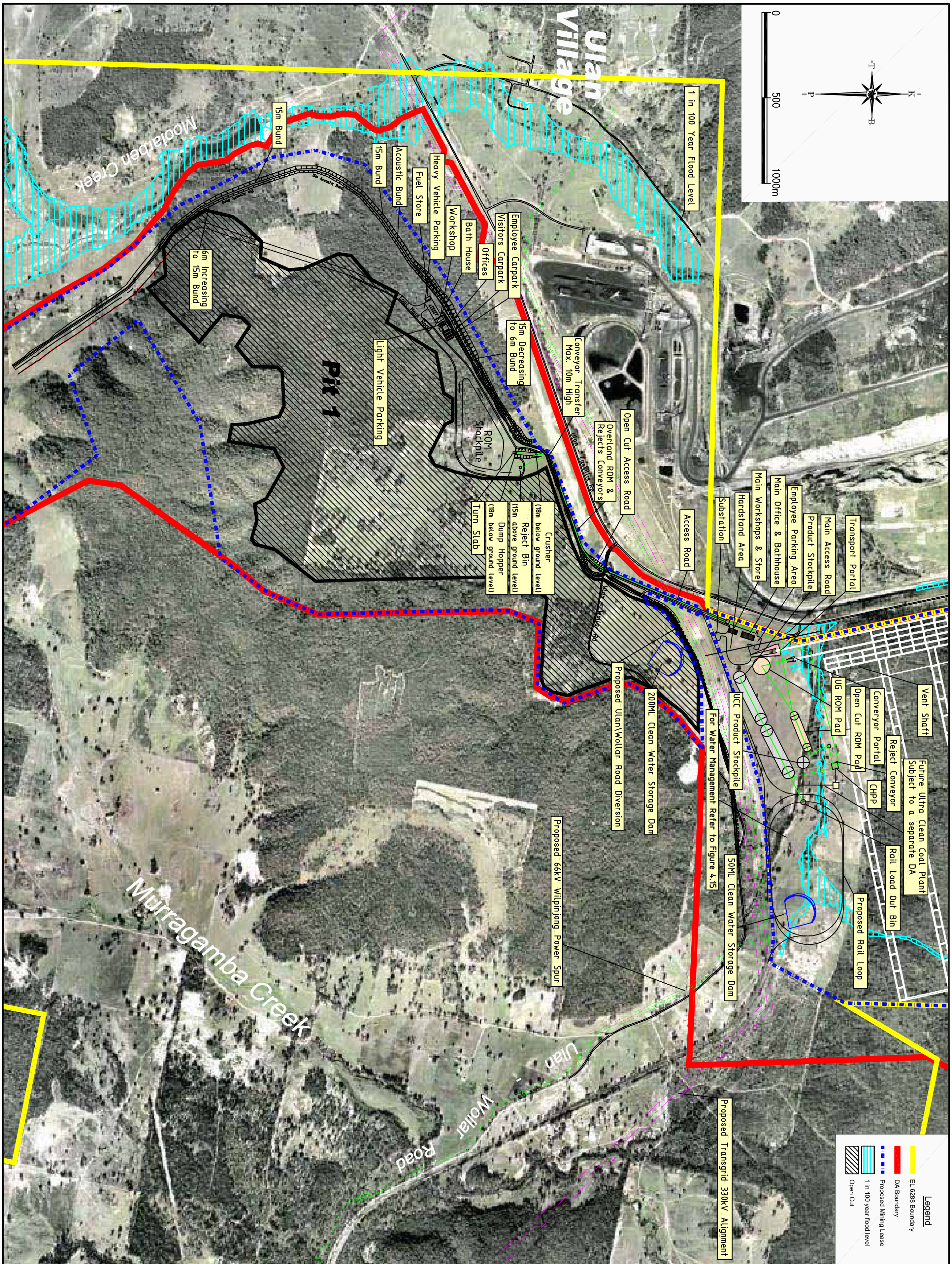
Moolarben Coal Project

General Arrangement

Figure 4.3

CAD FILE: Figure 4.3



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Moolarben Coal Project

Moolarben Coal Project Main Infrastructure Areas

Figure 4.4

CAD FILE: Figure 4.4

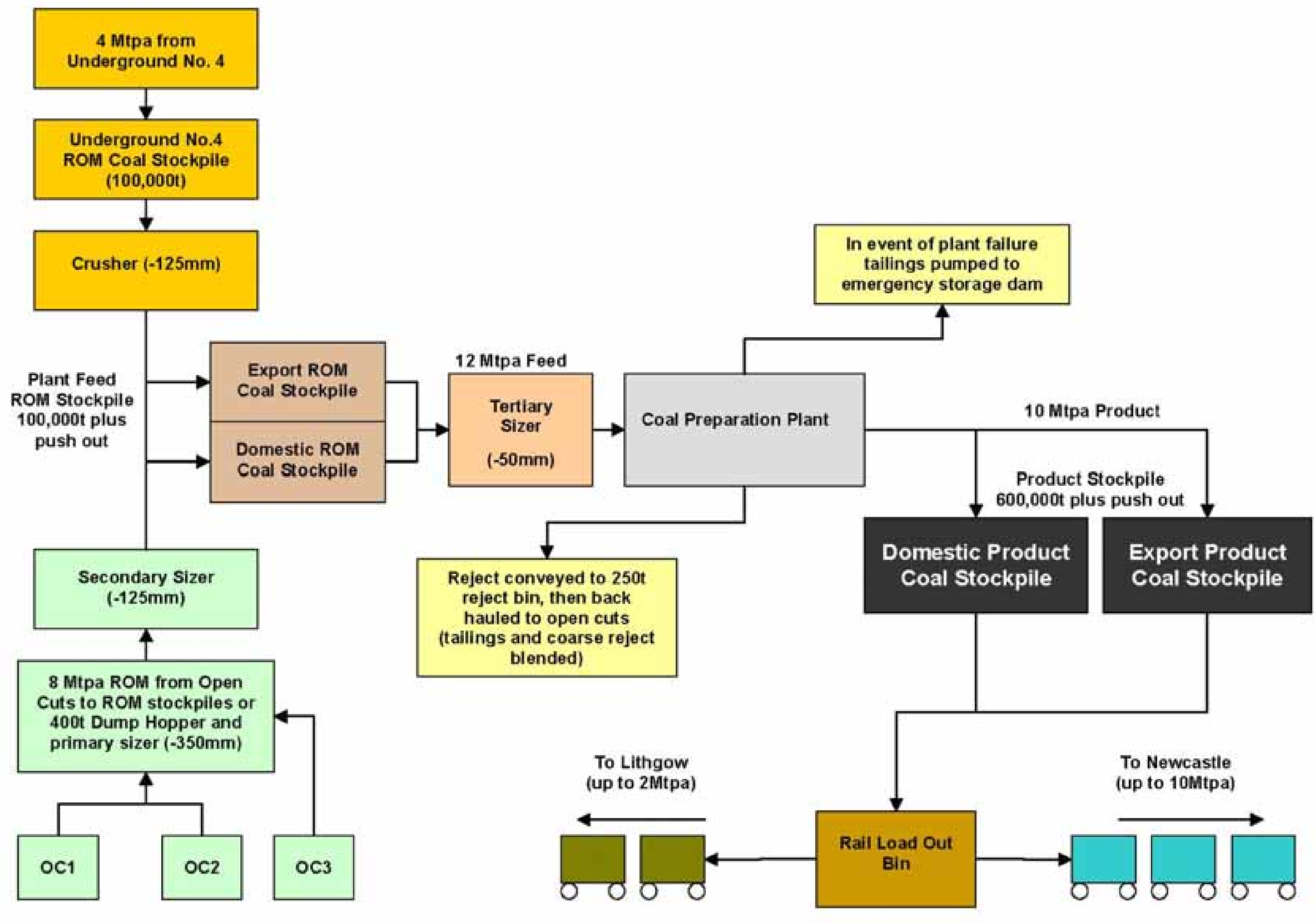


Figure 4.5: General schematic of coal handling and preparation process.

A nominal stockpile capacity of 100,000t has been allocated for combined longwall and development production. The drift conveyor discharge will be 50m above ground, allowing the conical stockpile to reach up to 45m in height. Should additional stockpile capacity be required, the area to the northeast will be available for dozer push out. Dozer push will be needed to assist reclaim as the stockpile volume diminishes.

4.2.1.2 Plant Feed Stockpile and Handling System

The CPP feed stockpile of 100,000t will be established to receive coal from Underground No.4 and the open cut mines. The stockpile will be divided into two distinct sections, one for export feed coal and the second for domestic feed coal. Should additional stockpile capacity be required, the areas on both sides are available for dozer push out.

The stockpile will be approximately 250m long and 18m high, with an elevated gantry carrying the conveyor and its tripper. Stockpile reclaim will be via conveyor installed in a tunnel below the stockpile. Reclaiming will require dozer pushing as the stockpile volume diminishes.

The reclaimed plant feed is then conveyed to the tertiary sizing station where it will be separated with the undersize material bypassing the sizer, and the oversize passing to a tertiary sizer for reduction to 50mm topsize. The undersize material and tertiary sized material is then conveyed to the Coal Preparation Plant.

4.2.1.3 Coal Preparation Plant

The Coal Preparation Plant (CPP) will process approximately 12Mtpa of raw coal per annum producing approximately 10Mtpa of product coal. The plant will primarily produce two thermal coal products, a low ash export coal and medium ash domestic coal.

The CPP will be a dense medium and spirals plant designed to process coal from the Ulan Seam to meet potential coal markets.

The CPP will employ 30 personnel and operate up to 24 hours per day 7 days per week. The facilities in the CPP include an administration office, crib room, bathhouse, workshop and stores. The main administration for the project will be located in the main surface facilities area.

All buildings will be constructed to a level free of inundation by floodwaters and be built to appropriate building codes that consider the likely effects of earth-quakes.

4.2.1.4 Product Coal Stockpiling and Handling

A 600,000t capacity product stockpile has been allocated to cater for product coals. Product will be reclaimed via vibrating feeders and a reclaim conveyor located in the conventional reclaim tunnel. The reclaim operation will involve dozer push on the coal stockpiles.

Export and domestic coals from the CPP will be transported by elevating conveyors to a 24m high elevated gantry conveyor running the full 700m length of the product stockpile. Trippers installed on the elevated conveyor will discharge the product to the appropriate domestic or export stockpile.

4.2.1.5 Train Load Out

An industry standard, automated, 4500t/h train loading system will be constructed. The rail loop is designed to allow trains to enter the facility from the direction of Gulgong or Sandy Hollow and be loaded and leave in either direction. The facility has the ability to supply power stations in the Hunter Valley, Central Coast or the Lithgow area, or alternatively access export facilities in Newcastle or Port Kembla. It is anticipated that there will be up to 2Mtpa transported west from the loop, and up to 10Mtpa transported east.

The final design configuration, including entry and/or exit rail spurs from the Gulgong-Sandy Hollow Railway Line to the rail loop will be subject to final train configurations and negotiations with ARTC. The final design may incorporate land parcels to the south-east of the project area.

A suitably sized train loading bin will be installed over the balloon loop with dozer push necessary to maintain the 4500t/h loading rate.

4.2.1.6 Reject and Tailings Disposal

An estimated 2Mtpa of coarse reject and tailings will be generated in the coal preparation process. The volume of coarse reject and tailings will be dependent upon the prevailing market conditions and product specifications.

Reject will be conveyed from the CPP to a 250t capacity bin located at the northern edge of Open Cut 1 adjacent to the dump station. This material will then be back hauled and placed in the overburden. As mining operations continue in Open Cuts 2 and 3, the Open Cut 1 final void may be used for the placement of reject material.

Investigations by Environmental Geochemistry International Pty Limited identified that reject may have the propensity to generate acid. To mitigate this potential impact, the material could be dosed using limestone or a similar ameliorant prior to disposal within the overburden, or be blended with overburden and capped with a suitable cover. The final disposal technique (dosage of limestone or cover methods) will be subject to further material characterisation.

Tailings disposal will not be required since all fines will be recovered at the CPP and either added to product or coarse reject streams. This method will result in a significant reduction in water use, with water pressed from tailings to be reintroduced to the coal processing circuit. However an emergency tailings storage dam will be constructed within the rail loop (refer **Figure 4.4**) of cater for emergency tailings storage. The dam may also be used for runoff and dirty water collection. Tailings in the emergency storage dam will be periodically removed and transported for disposal within the open cuts. The dam will be approximately 150m long, 50m wide and 2m deep and lined using best practice guidelines.

4.2.2 Underground No.4 Facilities

The Underground No.4 facilities will include a bath house, workshop and hardstand, fuel and oil stores, general stores, and car parking with sufficient capacity to cater for visitors and mine personnel.

These facilities are integrated with the main infrastructure buildings.

4.2.3 Alternatives Considered

Table 4.2 details the alternatives to the proposed main infrastructure area configuration that were considered.

Table 4.2: Alternatives considered to the proposed main infrastructure area configuration.

Alternative	Justification for Preferred/Proposed Configuration
Adoption of the same CHPP configuration approved under the valid 1985 consent for Ulan Coal Mines – Stage 2, which included Underground No.4.	The approved development consent involved a significant realignment of Bora Creek, the proposed alignment will substantially reduce impacts to Bora Creek with only a small section of the creek and its environs being impacted.
Disposal of tailings to separate tailings dams.	The proposal is to blend tailings with product coal and, or coarse reject. The reject (coarse and fines) will be conveyed to the open cut where they will be disposed of within the overburden.
Large water and tailings storages within the rail loop.	The proposal adopted two water storages and one small emergency tailings storage within the rail loop. Bora Creek no longer requires a diversion around the outside of the rail loop.
No processing of coal.	Significant economic loss to local, regional state, and national economies in the form of royalties and direct and indirect employment (further justification detailed within *Sections 5 and 7.*

4.3 Ultra Clean Coal Plant

FRL owns the Ultra Clean Coal (UCC) patented technology. UCC is a process for producing a high purity, chemically cleaned coal that is an environmentally acceptable and lower cost alternative to natural gas.

Fed into a gas turbine combined cycle (GTCC) generator, UCC can be converted into electricity at higher efficiencies than can be achieved in conventional coal fired power stations. The UCC fired GTCC can convert 50% to 55% of the energy in the fuel into electricity whereas most coal fired power stations in Australia only convert 38% to 45%.

As a result, a UCC fired GTCC power station will produce substantially less greenhouse gas emissions (more than 20% reduction) than best practice conventional coal-fired generators.

4.3.1 The UCC Process

The UCC process has parallels with the Bayer process for refining bauxite into alumina. A series of process steps provides UCC coal with a high level of coal purity with ash levels less than 0.1%.

Non-carbon minerals are converted to soluble forms via an alkali leaching process then dissolved via an acid washing process. The dissolved minerals are then precipitated as gypsum and aluminium silicates. The precipitates are suitable for commercial application in the building and ceramics industries, or alternatively, they are environmentally safe for disposal.

4.3.2 Pilot plant

FRL's wholly owned subsidiary, UCC Energy Pty Ltd, owns a pilot plant at Cessnock in the Hunter Valley, New South Wales, that it has built and operated. Some $45 million invested in UCC research and development to date has been funded by UCC Energy Pty Ltd and government grants.

UCC coal has been produced in the pilot plant and sent to Japan for evaluation. Test results indicate UCC coal produces positive results in terms of efficient gas turbine combustion under continuous operating conditions.

4.3.3 Demonstration Plant

A condition of EL 6288 is that an UCC demonstration plant is to be constructed onsite or adjacent to the MCP area.

The demonstration UCC plant is proposed to be developed adjacent to the CPP in the future, as shown in **Figure 4.4**. The UCC plant will process washed coal from the CHPP and convey UCC to an independent stockpile with a reclaim system to load UCC for transport by rail. The construction and operational details of the plant will be subject to a future Development Application and supporting studies.

4.4 Open Cut Coal Mines

4.4.1 Mining Constraints

Constraints for Open Cut Mines 1, 2 and 3 are largely a function of the geology, and environmental factors and in the case of Open Cut 1, the proximity to the village of Ulan. The open cut pits are bound by the following features:

- The paleochannel north of Open Cut 1;
- The sub-crop of the Ulan Seam that occurs near the western boundary of all three open cut pits;
- A consolidated alluvial channel (washout) along the eastern boundary of Open Cut 3;
- Moolarben Creek;
- The steep ridge lines to the east of Open Cut 1 and 2 and to the west of Open Cut 3.
- The existing alignment of the Ulan - Wollar Road. This road will be partially realigned.

4.4.2 Environmental Bunds

The initial out of pit material will be used to establish environmental bunds around the mining operations at Open Cut 1 and Open Cut 2.

The environmental bund at Open Cut 1 will be approximately 6m high adjacent to the Open Cut 1 infrastructure areas, and gradually increase to 15m around the end of Open Cut 1. This environmental bund will be constructed in the first six (6) months to ensure acoustical impacts from MCP related noise in the village of Ulan will be minimised.

The environmental bund at Open Cut 2 is approximately 10m high and located along the western edge of the open cut and associated haulage road.

The environmental bunds at Open Cut 1 and Open Cut 2 will generally provide effective mitigation of noise and visual impacts resulting from the MCP related mining activities.

4.4.3 Mining Sequence

Open cut operations will commence in the south west corner of Open Cut 1 and progress to the north east in strips. Following completion of Open Cut 1, Open Cuts 2 and 3 will be opened up in sequence. Underground No.4 development will commence at the same time as Open Cut 1.

Sequencing of open cut operations is subject to an acceptable agreement being made with the landholders. **Figure 4.6, Figure 4.7, Figure 4.8, Figure 4.9** and **Figure 4.10** demonstrate the anticipated mining sequence assuming appropriate agreements with landholders are made.

4.4.4 Mining Method

Open cut mining will be undertaken using conventional truck and excavator techniques. However, as mining technologies advance and economies change, the provision of new or revised mining methods will be pursued generally in accordance with industry best practice. The following sections progressively describe the open cut mining operations. Prior to disturbance of the land surface, clean water diversions and erosion and sediment control works will be established as required. This ensures that surface waters in the area are not impacted by mining activities and water falling within the mining area is captured and treated. The design principles and conceptual sizing of the surface water diversion and erosion and sediment control structures are further discussed in *Section 5* of the EA report.

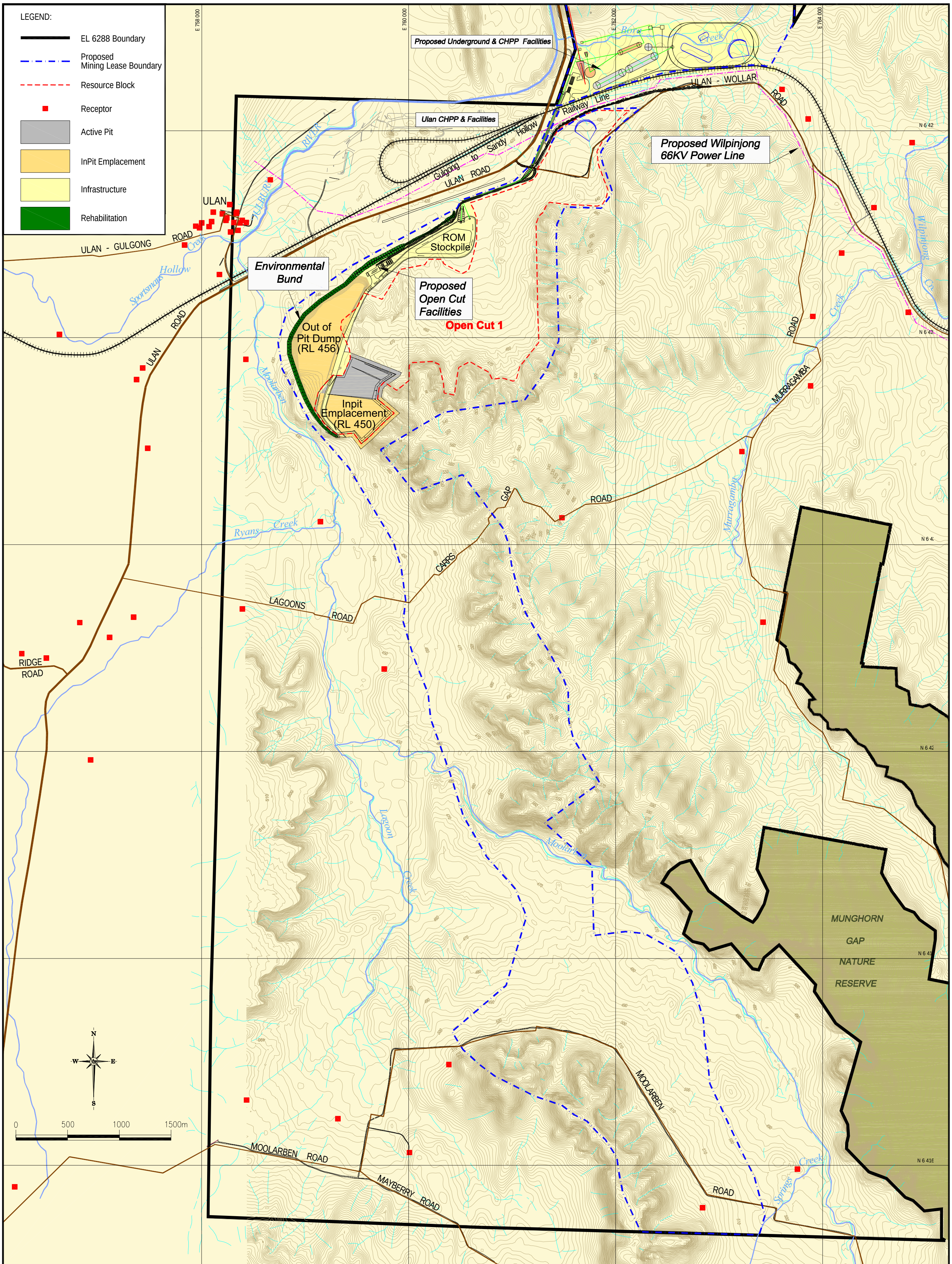
4.4.4.1 Vegetation Clearing and Topsoil Stripping

Vegetation clearing will be generally undertaken 6 to 12 months in advance of mining operations. The clearing of vegetation generally involves the following processes: -

- Selection and marking of significant hollowed and potential habitat trees for use as whole or in part timber habitat in the rehabilitation process;
- Collection of seed from a variety of species in the disturbance area will be undertaken prior to and during the clearing operations. This will allow rehabilitation to be undertaken with indigenous seed stocks;
- Clearing of other vegetation for construction;
- Removal of remaining tree limbs, stumps, shrubs and other woody vegetation that may be mulched for use in post-mining rehabilitation; and

Delineation of areas of weed infestation. The vegetation in these areas will be stockpiled and burnt separately.

Topsoil management will generally be undertaken in accordance with **Table 4.3** and the Land Rehabilitation Management Plan (LRMP).



Moolarben Coal Project

Moolarben Coal Project at 6 Months

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Figure 4.6

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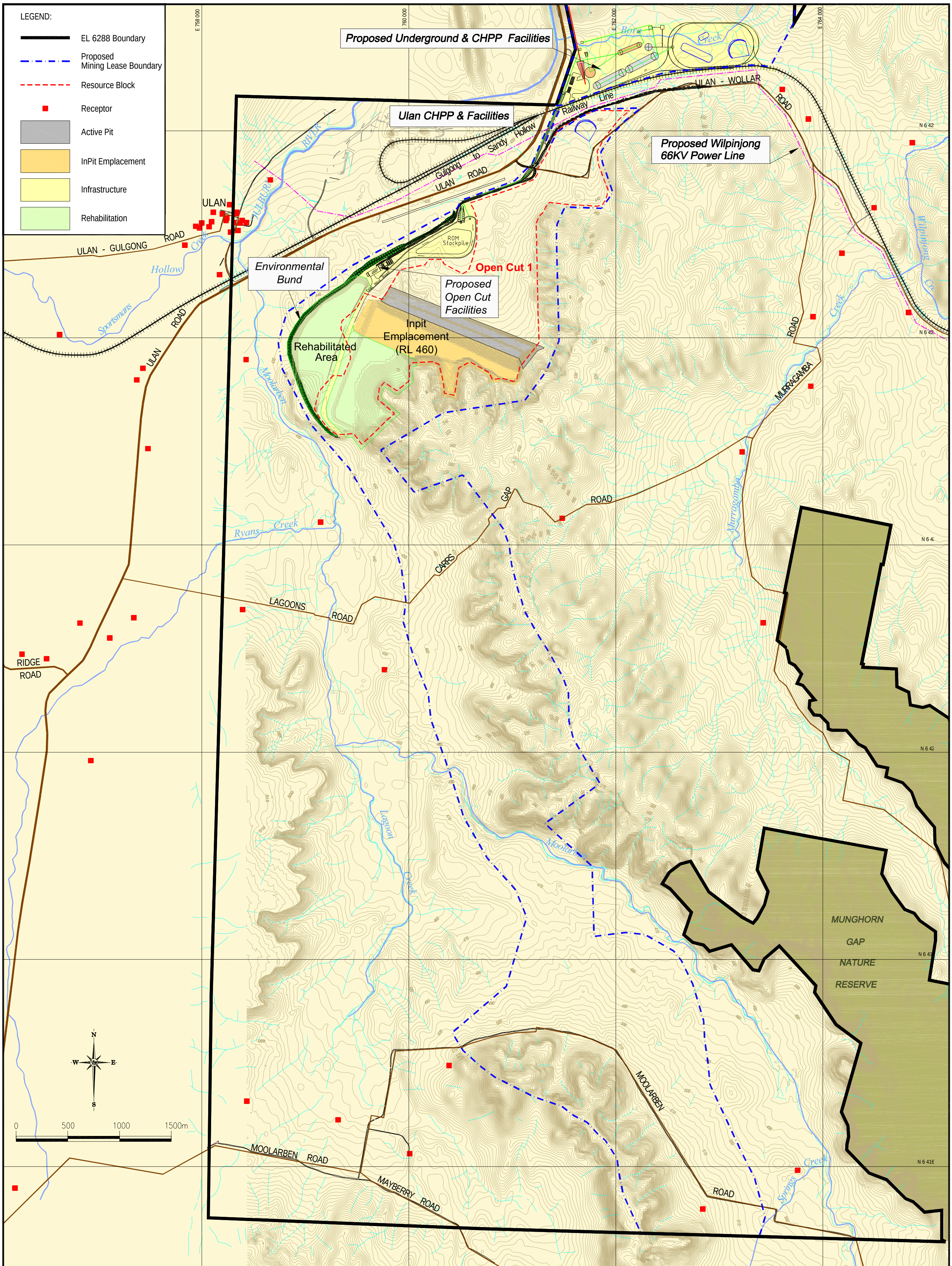

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Moolarben Coal Project

Moolarben Coal Project at 2 Years

Figure 4.7

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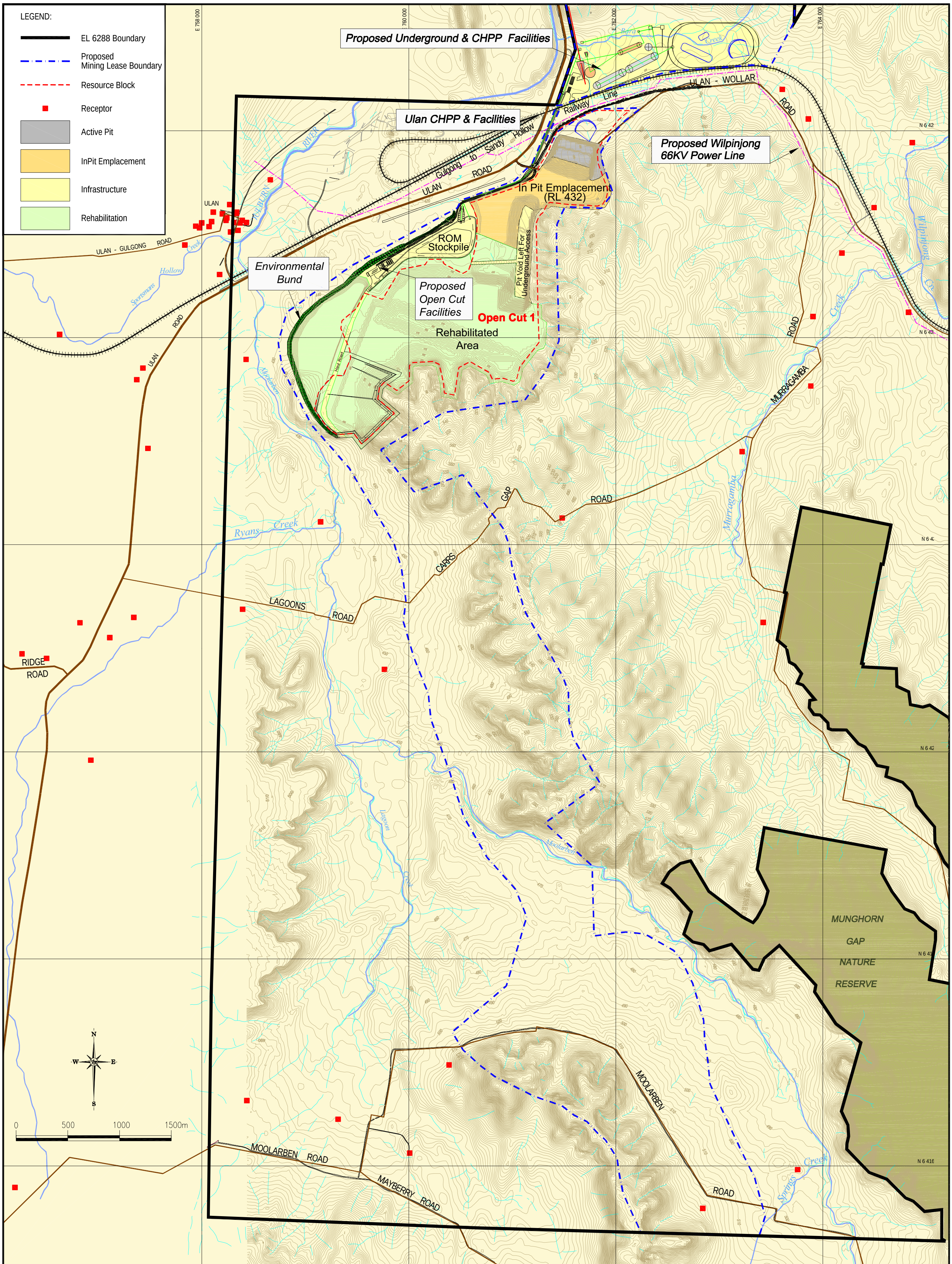

Moolarben Coal Project

Moolarben Coal Project at 5 Years

Figure 4.8

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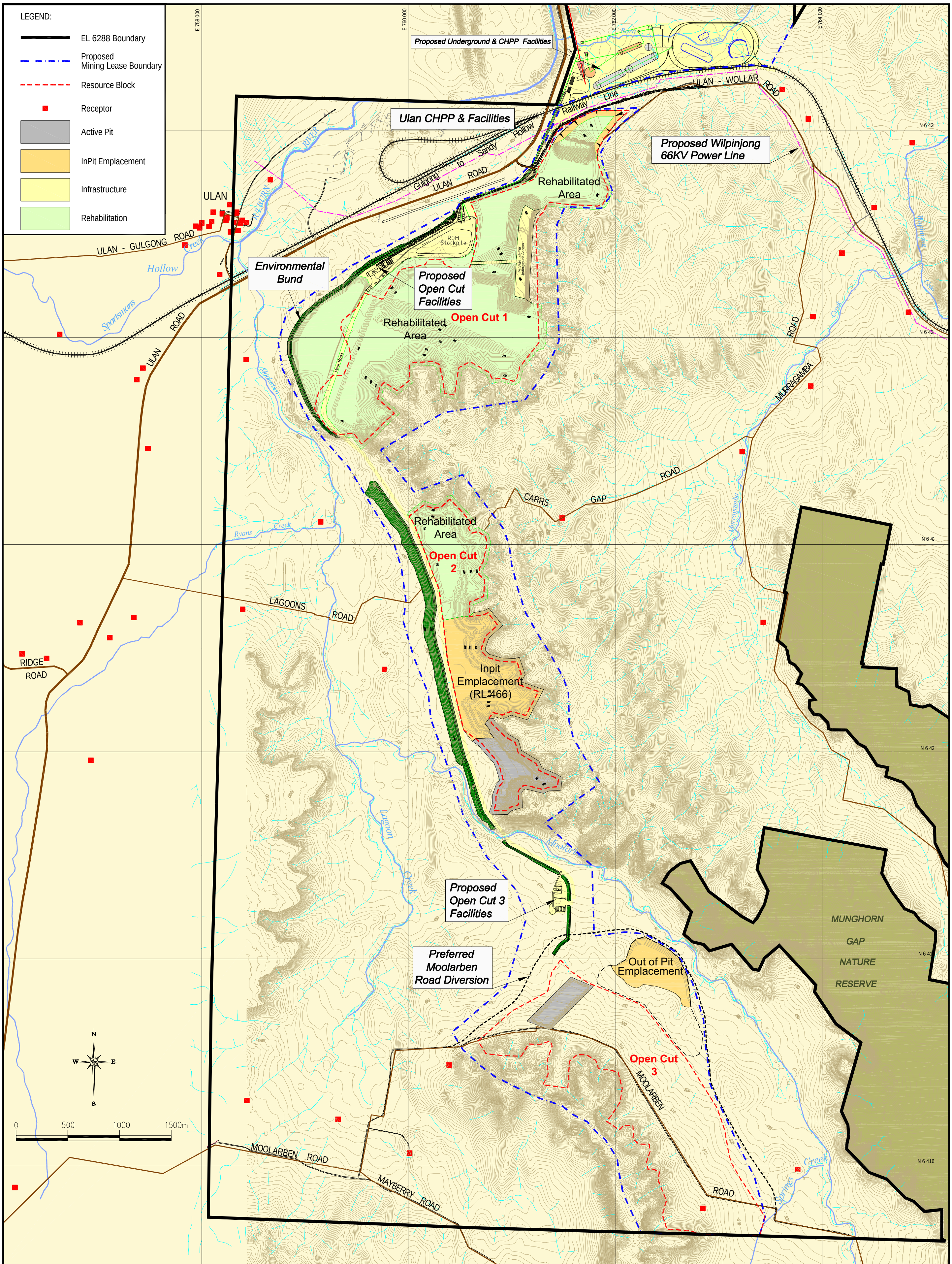

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Moolarben Coal Project

Moolarben Coal Project at 8 Years

Figure 4.9

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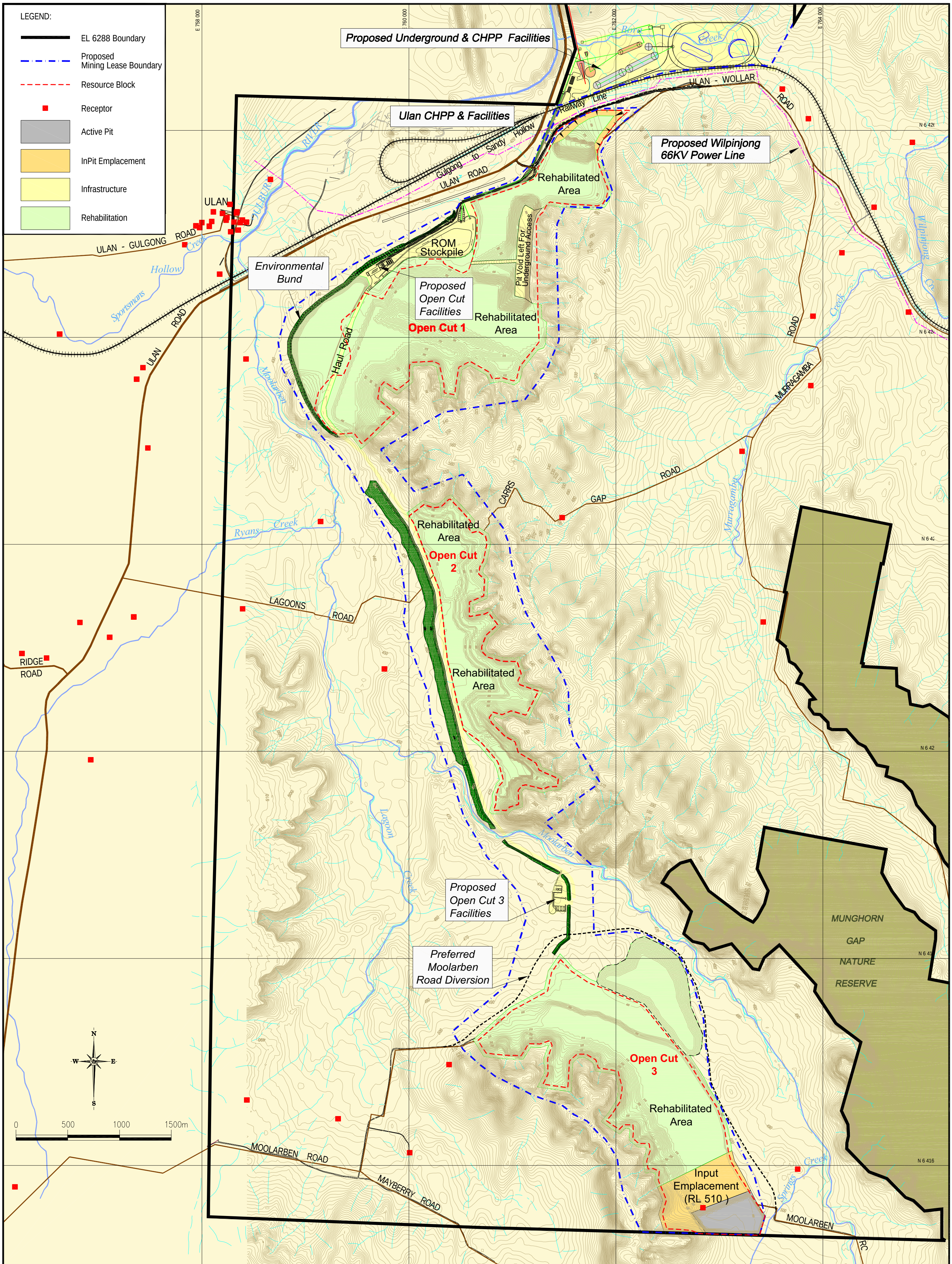

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Moolarben Coal Project

Moolarben Coal Project at 10 Years

Figure 4.10

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Table 4.3: Soil Resource Management

Prior to Commencement of Stripping Activities	*During Stripping and Stockpiling Activities*	*Prior to and During Rehabilitation Activities*
• Quantification of soil resources; • Characterisation of the suitability of material for rehabilitation purposes; and • Formulation of stripping and stockpiling guidelines including the nomination of appropriate depths, scheduling, and location of areas to be stripped and stockpile locations (detailed in the Mining Operations Plan).	• Minimise over-clearing; • Selective stockpiling of soil according to type (i.e. Great soil Group, topsoil, subsoil) and salinity; and • Storage of soil in a manner that does not compromise the long term viability of the resource.	• Implementation of amelioration measures to ensure the long term viability of the soil resources and manage salinity; • Management of soil suitability for rehabilitation; and • Progressive rehabilitation of final landforms as soon as practicable after completion or when areas are no longer required.

4.4.4.2 Overburden Removal and Emplacement

Following the removal of vegetation and stripping of topsoil, the overburden will be excavated. The removal of overburden is dependant on the strength characteristics of the material. Potentially all material above the coal seam will be drilled and blasted, however typically 10 to 15m of surface overburden may be weathered and not require blasting.

4.4.4.3 Dewatering

Limited dewatering will be required in Open Cuts 2 and 3, as the Ulan Seam and overlying sediments are only partly saturated through most of that area. The Ulan Seam is also partly dewatered in parts of the north-west of Open Cut 1, due to the regional effects of dewatering operations at the Ulan Coal Mine.

Given the limited ground water within the open cuts, dewatering will be undertaken via a series of in-pit sumps. Water will be pumped from these sumps to a series of water storages and managed in accordance with *Section 4.7 – Water Management.*

4.4.4.4 Blasting

Blasting will be designed to achieve optimal fragmentation of the coal (if necessary) and overburden. This is achieved using a combination of blast spacing and charge weight. A maximum instantaneous charge (MIC) is determined based on predicted strata strength and the proximity of neighbouring sensitive receptors and infrastructure, such as railway culverts and heritage buildings. Blasting using the calculated MIC will generally be conducted between the hours of 9.00am to 5.00pm Monday to Saturday and may at times require more than one (1) blast per day. Variations including throw blasting and dozer push will also be used. Blasted overburden and coal will be loaded by hydraulic excavators into rear dump trucks and transported to the emplacement and coal stockpile areas.

4.4.4.5 Emplacements

The out of pit emplacements have been designed and located to provide maximum environmental protection in terms of noise and visuals for residents of the area whilst minimising the impact on flora and fauna. A minimum amount of material will be placed out of pit until space allows placement in pit.

The Open Cut 1 out of pit emplacement will be built progressively from the eastern and internal side of the 15m environmental bund created in the first 6 months. The overburden emplacement height will be constructed to approximately 456m Australian Height Datum (AHD). After six to twelve months of mining the out of pit emplacement will be completed and “in-pit” dumping will occur, refilling the mining void.

The Open Cut 2 out of pit emplacement will be an elongated emplacement that runs along the western edge of the haul road, adjacent to the open cut. This emplacement will essentially be an environmental bund. The emplacement will be approximately 10m in height.

The Open Cut 3 out of pit emplacement will be located north east of the open cut. The emplacement will be located to minimise the sterilisation of coal reserves. The emplacement will be approximately 20m in height.

4.4.4.6 Removal and Transport of Coal to CHPP

On removal of the overburden the exposed coal is blasted or ripped and loaded by hydraulic excavator into rear dump trucks. The full Ulan Seam (up to 13m thick) will be mined in two sections and processed separately.

The coal will be transported along the bunded haul road to the run of mine (ROM) stockpiles or dump hopper. These trucks will then periodically collect reject material returned from the CPP to be dumped in pit. Coal in Open Cut 3 may be transported by prime movers to the ROM dump hopper adjacent to Open Cut 1.

4.4.5 Final Landform and Rehabilitation

4.4.5.1 General

The goals for the rehabilitation of the open cuts include the following:

- Re-establish stable, safe and effective landforms and surfaces by ensuring that the design of the final landforms, voids and emplacements are cognisant of revegetation, slope stability, surface drainage, erosion and sediment control;
- Maintain the diversity and genetic resource of the flora currently existing within the locality;
- Maintain and enhance habitat for native fauna; and
- Provide necessary access for the suppression of fires, control of noxious animals and weeds and to monitor the rehabilitation.

All rehabilitation activities will be subject to the preparation of the LRMP and be consistent with an approved Mining Operations Plan (MOP).

Rehabilitation will be undertaken progressively as mining is completed. Given the susceptibility of some soils in the region to erosion, timely rehabilitation will be a significant priority.

Flora and fauna surveys throughout the study area have identified the ecotone or edge between the open grazed pastures and timbered woodlands as being a significant fauna habitat area, and consequently this issue will be addressed with the LRMP and in *Section 5 – Existing Environment and Interactions* of the EA report.

Rehabilitation of the 3 open cuts, out of pit emplacements and the final voids will use indigenous flora species to provide linkages of the vegetation to the adjoining hills, and also aid in connectivity across the Moolarben Valley floor. Species composition will reflect typical vegetation communities throughout the Moolarben Valley.

4.4.5.2 Open Cut 1

Landform

The final landform for Open Cut 1 is illustrated in Figure 4.10. The out of pit emplacement will be shaped to provide a self draining stable landform, whilst not being adversely different from the surrounding landscape, the final height of the emplacement is approximately RL 460m AHD. The majority of the open cut itself will be filled, and overburden will be pushed up to the level of cut providing continuity with the existing hill side.

A section of the high wall located east of the infrastructure area will be left exposed to potentially allow future access to underground coal reserves beneath the ridge lines. These underground reserves will be subject to a separate Development Application and Environmental Assessment.

The final void is located in the northern portion of the open cut. The void will be approximately 80m deep and have an area of approximately 20ha. The proximity of this void to the CPP will allow this void to be utilised for the deposition of tailings and other reject from the processing of coal, both from resources proposed for extraction in this environmental assessment and also other future mining activities anticipated for the exploration licence. In the event that the void could not be utilised for coal reject and tailings disposal the sides will be battered to acceptable gradients and will form a local groundwater sink.

4.4.5.3 Open Cut 2

Landform

The final landform for Open Cut 2 is illustrated in Figure 4.10.

As the Open Cut 2 emplacement also serves as screening for coal haulage from Open Cut 3 it will be retained until completion of haulage from Open Cut 3.

Typically the final landform surface for Open Cut 2 will be shaped some 2 to 4m below the original topography with the final void being approximately 6m on the western side to approximately 30m below the original topography at its eastern extent. The void is currently designed with a gentle gradient into the void from the west, with steeper slopes against the existing escarpment.

4.4.5.4 Open Cut 3

Landform

The final landform for Open Cut 3 is illustrated in Figure 4.10. The out of pit emplacement will be shaped to provide a free draining landscape. In-pit dumping will result in a typical final landform at similar levels to the existing topography. The western side of the open cut will be shaped to ensure continuity with the adjoining hills.

The mining of Open Cut 3 will result in a final void in the south of the open cut shell on the southern boundary of EL 6288. The void will be approximately 8m deep on the eastern side to approximately 40m deep below the original topography at its western extent and have an area of approximately 26ha. The final void will be battered to acceptable grades and form a local groundwater sink, and potential source of water for improved biodiversity outcomes.

4.4.6 Infrastructure

4.4.6.1 Open Cut 1 and Open Cut 2

Open Cuts 1 and 2 will be serviced by the same infrastructure. This infrastructure is located adjacent to Open Cut 1, south of Ulan Road and south west of the Ulan-Wollar Road, as illustrated in **Figure 4.11** and **Plan 10** in **Volume 2.** The major components of this infrastructure are detailed below. In addition there will be visitor and employee parking areas with sufficient capacity for approximately 120 personnel vehicles and 15 visitor vehicles.

During the construction phase, contractors are likely to utilise relocatable buildings for site offices. The use of relocatable buildings during operational phases of the project may also prove a viable alternative to a static structure.

All facilities will generally be constructed with a steel frame, clad with a suitably coloured metal sheeting or similar product. Buildings will be constructed to a level free of inundation by floodwaters and will be built to appropriate building codes that consider the likely effects of earthquakes.

Access

Access to the Open Cut 1 infrastructure area will be via a newly constructed access off the Ulan to Wollar Road, approximately 200m east of the intersection with the Ulan-Cassilis Road. The access road will run adjacent to the raw coal and reject conveyors and Ulan Coal Mine air strip.

The access road and Ulan-Wollar Road intersection design will be in accordance with the Mid-Western Regional Council (MWRC) and the Roads and Traffic Authority requirements.

Maintenance access between the Open Cut 1 facilities and Underground No. 4 and CPP facilities will be via a light vehicle access road.

Workshop facility and hardstand

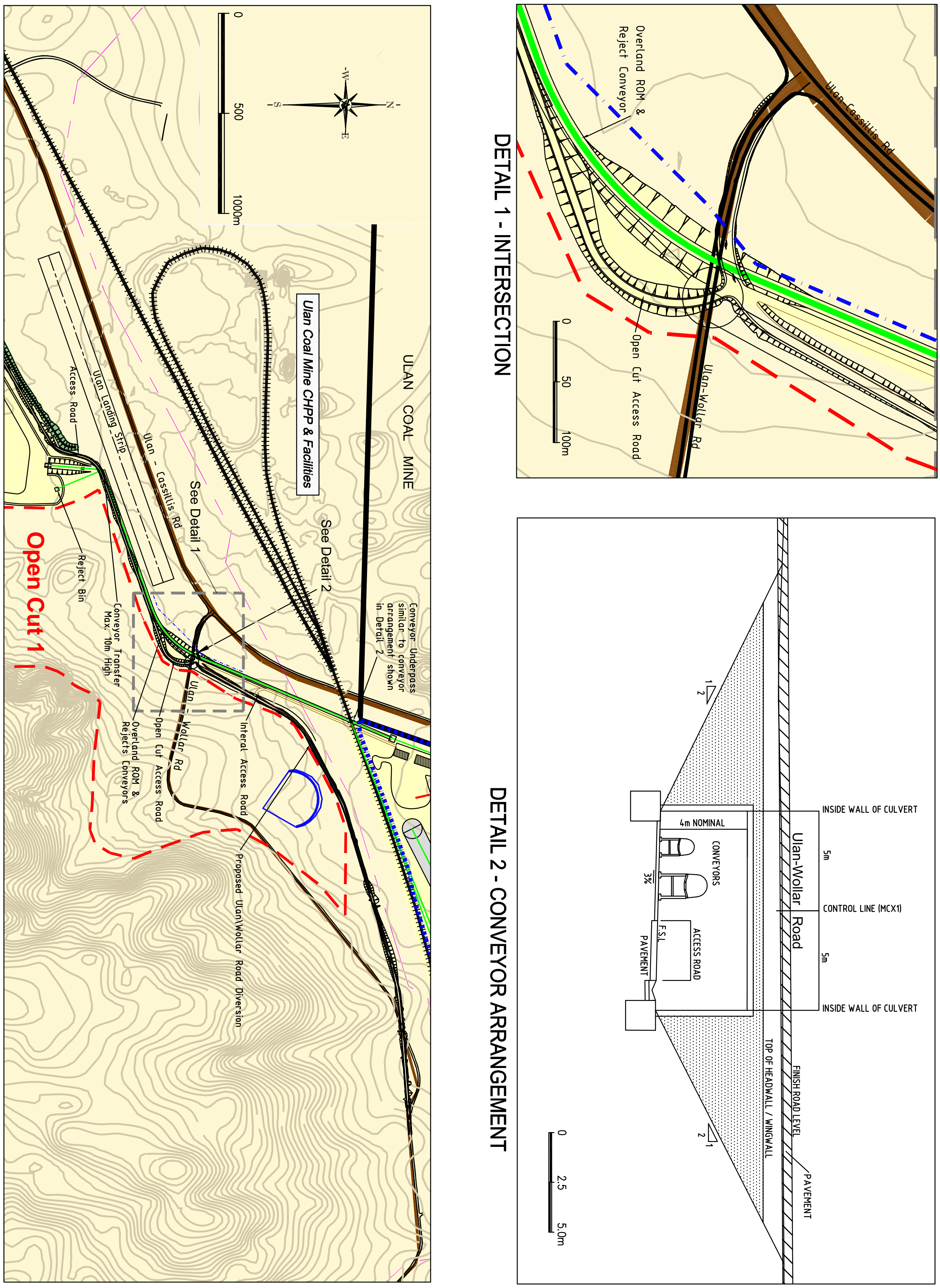
The workshop will service all vehicles and machinery working in the three open cut mines. A hardstand area will be located adjacent to the workshop for the parking of heavy vehicles and associated equipment.

Administration, crib room and bathhouse facility

This will be the administration facility for all open cuts and will be the point of entry for visitors to the open cut mines. The facility will also contain the bathhouse and crib rooms for open cut personnel.

Fuel and Lubrication Store

The fuel and lubrication store will contain three (3) above ground 110,000 litre diesel storage tanks, located within appropriately sized bunding. This fuel will service open cuts 1 and 2, with fuel delivered on a daily basis by semi-trailer or B-Double tankers. Lubrication stores contain a mixture of bunded above ground tanks and drums containing hydraulic oils, engine oils, and other oils.



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Moolarben Coal Project

Open Cut 1 Access and Conveyor Arrangement

Figure 4.11

CAD FILE: Figure 4.11

ROM and Reject Handling Facilities

Located adjacent to Open Cut 1 and the above mentioned facilities will be ROM stockpiles and dump hopper, primary sizer, secondary sizer, raw coal conveyor, and a reject return conveyor and bin. These facilities are described in Section 4.2 Main Mining and Infrastructure Area.

Landscaping

The immediate surrounds of the administration buildings and car parking areas will be landscaped.

4.4.6.2 Open Cut 3

The Open Cut 3 facilities will be a similar arrangement to the Open Cut 1 facilities, with the exception of the workshop, that will remain in the Open Cut 1 infrastructure area. The fuel storage facility in Open Cut 1 will potentially be relocated to this facility.

Access

Access to the Open Cut 3 facilities will be via the internal haul road that connects the pit with Open Cut 1. To minimise light vehicle traffic on this road staff will be transported to the mine via mini bus or four wheel drives. Fuel trucks will be escorted along this road by mine vehicles.

4.4.7 Proposed Equipment Fleet

Table 4.4 provides a list of the equipment fleet and numbers thereof for open cut mining operations. This equipment fleet is relevant for the three open cut mining operations, with the exception of Open Cut 3. Open Cut 3 will be the only pit to utilise a wide body prime mover with 50t capacity for the haulage of ROM coal to the dump hopper.

Table 4.4: Equipment Fleet for the Moolarben Coal Project

Typical Use	Machine	Anticipated Capacity Of Machine	Proposed Quantity
OVERBURDEN	Hydraulic Excavator	28 m^3	2
	Dump Trucks	240t	8
	Track Dozers	D11 or equivalent	3
	Overburden Drill		1
COAL	Hydraulic Excavator	25 m^3	1
	Dump Trucks	170t	6
	Wheel loader	15 m^3	1
	Track Dozer	D10 or equivalent	2
	Coal drill		1

Typical Use	Machine	Anticipated Capacity Of Machine	Proposed Quantity
	Standard prime mover with special wide body	120t	8
SUPPORT EQUIPMENT	Graders	16G	2
	Water Carts	100,000 L	2
	Rubber Tyred Dozer		1
	Track Dozer	D9	1
	Excavator	40t	1
	Front end loader		1
	Fuel Truck		2
	Service Truck		1
VEHICLES WORKING ON SITE	Stemming truck	10t	1
	Explosive truck	15t	1
	Franna crane	25t	1
	Light vehicles		10

4.4.8 Mining Schedule

Mining will commence in the lower strip ratio areas in the southwest of Open Cut 1 and proceed north towards the Ulan-Cassilis and Ulan-Wollar Roads. Similarly Open Cut 2 and Open Cut 3 will be mined from north to south. The operations will maximise the amount of overburden dumped in-pit. **Table 4.5** details the anticipated schedule of open cut mining operations. Open Cut 1 is scheduled to commence in the last quarter of 2007 ramping up to a maximum of 8Mpta, with an anticipated mine life of approximately 7 years. Open Cut 1 has been restricted in operations to 7Mtpa for the first three years of mining to ensure noise and air quality criteria for the village of Ulan are not breeched. Open Cut 2 will have a life of approximately 3 years and Open Cut 3 will have a life of approximately 4 years. The life of the operations at each open cut has been calculated assuming a maximum production rate of 8Mtpa of ROM coal. However, the life of the operation will extend beyond the calculated mine life if production levels do not reach 8Mtpa. MCM will seek to obtain a 21 year mining lease. MCM are committed to exploring and developing coal resources within EL 6288. MCM will seek further approvals in the future.

The open cut pits will operate 24 hours per day, 7 days per week.

Table 4.5: Anticipated Schedule of Open Cut Mining Operations.

Calendar Year	Year	Open Cut Mine No.	Rejects (Mt)	Coal Extracted (Mt)
2007	Construction / 0	1	0.1	Up to 1
2008	1	1	1.6	7
2009	2	1	1.6	7
2010	3	1	1.6	7
2011	4	1	1.8	8
2012	5	1	1.8	8
2013	6	1 and 2	1.8	8
2014	7	2	1.8	8
2015	8	2 and 3	1.8	8
2016	9	3	1.8	8
2017	10	3	1.8	8
2018	11	3	0.1	0.5

4.4.9 Structures, Roads and Utilities

4.4.9.1 Wollar Road

To recover additional coal resources in Open Cut 1, MCM propose to realign a section of Ulan - Wollar Road. The road will be designed with a 60km/h design speed for approximately 500m east of the intersection of the Ulan-Cassilis and Ulan-Wollar Roads and will have the following benefits:

- Improved pavement surface and design;
- Improved road geometry;
- Safer intersection speed entry; and
- A safer intersection with the proposed mine access road.

Figure 4.11 and Plan 10 in Volume 2 show the access arrangements from Ulan-Wollar Road into the Open Cut 1 facilities and conveyor tunnels below the Ulan-Wollar Road and Gulgong-Sandy Hollow Railway Line.

4.4.9.2 CHPP Road

A poorly formed road (primarily a "paper" road) exists within the CHPP infrastructure area, starting on the Ulan-Wollar Road continuing across the Gulgong-Sandy Hollow Railway Line in a north-westerly direction leaving the area north of the intersection of Bora Creek and the Ulan-Cassilis Road. MCM will seek to close the section of road between the Gulgong-Sandy Hollow Railway Line and the Bora Creek and Ulan-Cassilis Road intersection.

4.4.9.3 Carrs Gap Road

MCM will seek to close Carrs Gap Road west of Carrs Gap. MCM will liaise with the land holders and users of Carrs Gap Road to ensure that suitable access to their respective properties is maintained.

4.4.9.4 Moolarben Road

Open Cut 3 will require the partial realignment of Moolarben Road. MCM will seek to close a section of the existing Moolarben Road and realign the road. The realignment will be subject to a detailed design being approved by the MWRC. There are two potential alignments for the relocation these include:

- Extension of Mayberry's Lane to re-connect with the Moolarben Road south of the open cut; or
- Partial relocation of Moolarben Road to run east of the open cut along the consolidated alluvial channel and re-connect into Moolarben Road east of the southern boundary of the open cut.

The preferred alignment will be to relocate Moolarben Road east of the open cut along the consolidated alluvial channel washout (refer Figure 4.3) above the 1 in 100 year flood level. The major benefit of this alignment is the potential reserves of coal located south of EL 6288 could be mined in the future through the advancement of the Open Cut 3 high wall and final void. This road alignment will cross the coal haulage road. To mitigate potential traffic impacts between public road vehicles and haulage trucks (120t prime movers) traffic lights will be installed at the intersection of the two roads, favouring motorists.

Telstra telecommunications services adjacent to Moolarben Road will be relocated to the newly aligned Moolarben Road.

4.4.9.5 Open Cut 1 Optical Fibre Relocation

Telstra optical fibre cables run parallel to Wollar Road and will require diversion to the north of the Open Cut 1. The relocation of these cables will be undertaken by Telstra and be undertaken in a method that will not disrupt services to users of the optical fibre.

4.4.9.6 Open Cut 2 Energy Australia Easement

A Energy Australia 11kV power line runs in an easterly direction over Carrs Gap. This line could be made redundant and terminated at the last user in the Moolarben Valley. Users in the Murragamba Valley will have electricity fed from a new easement running from Wollar Road south along Murragamba Road.

4.4.9.7 Ulan Airstrip

The MCP Open Cut 1 facilities have been designed to meet the Civil Aviation Safety Authority (CASA) Guidelines.

4.4.9.8 Structures

Mining of Open Cut 3 will result in the displacement of two dwellings. These dwellings will be removed in advance of mining operations in accordance with the Australian Standard - AS 2601-2001: Demolition of Structures. Waste will be managed in accordance with the Waste Management Plan.

4.4.10 Alternatives Considered

Table 4.6 details the alternatives to the proposed open cut configuration that were considered.

Table 4.6: Alternatives considered to the proposed open cut configuration.

Alternative	Justification for Preferred/Proposed Configuration
Extension of Open Cut 1 north west beneath the Ulan Coal Mine airstrip.	Extension of the open cut in this area would have resulted in the relocation of the Ulan Coal Mine airstrip. The relocation of the airstrip would have resulted in a substantial clearing of vegetation to the west of the open cut and overburden footprints. This clearing would have resulted in significantly higher visual and acoustical impacts on Ulan Village.
Alternative out of pit emplacement construction and configuration at Open Cut 1, by starting the out of pit emplacement in the south and progressing the width of the dump north east, i.e. no environmental bund.	The proposed configuration of the out of pit emplacement involves the initial construction of an environmental bund around the western edge of the emplacement foot print. Subsequent out of pit emplacement construction is undertaken behind the environmental bund minimising acoustical and visual impacts on Ulan Village and the travelling public. The out of pit emplacement was also designed to minimise impacts on timbered land.
Out of pit emplacement for Open Cut 2 that is confined to the northern area of the open cut.	The elongated out of pit overburden emplacement was adopted to minimise visual and acoustical impacts to residents to the west of mining operations. It also provides effective screening of haulage operations from Open Cut 3.
Open Cut 3 – East, this would have been an extension of the existing Open Cut 3 footprint to the east, requiring the relocation of Moolarben Creek.	The development of Open Cut 3 – East has not been pursued within this Development Application. MCM may seek to mine this area in the future.
Several out of pit emplacements for Open Cut 3 were considered, with locations varying from south of the proposed emplacement to north west.	The proposed out of pit emplacement was chosen as it minimised impacts to existing vegetation.
Backfilling of final voids in Open Cut 1, 2 and 3 through the double handling of out of pit	The backfilling of the final voids with material from the emplacements would potentially give rise to adverse impacts to air quality, noise, surface water, soil erosion

Alternative	Justification for Preferred/Proposed Configuration
emplacements.	and flora and fauna. The Open Cut 1 final void will have a significant benefit to future mining operations for; tailings and reject disposal and also water storage.
No mining of Open Cut Mines 1, 2 or 3.	Significant economic loss to local, regional state, and national economies in the form of royalties, taxes and direct and indirect employment (further justification detailed with *Section 7 – Project Justification and Need*.

4.5 Underground No. 4 Coal Mine

The naming of Underground No. 4 coal mine is a consequence of a previously approved and valid development consent granted by the Minister for Planning on 4 October 1985 following a Commission of Inquiry covering the proposed underground operations and the CHPP infrastructure area. Underground No's 1 to 3 are associated with the UCML, of which Underground No .4 was formerly a component.

MCM have conducted a raft of environmental studies afresh for the Underground No 4 mine and infrastructure area. These studies re-examined the design and environmental impacts with today's technology and knowledge.

The MCP Underground No. 4 mine and infrastructure is consistent with the layout that received approval in 1985. However, MCM possess a greater understanding of the mining and environmental impacts than in 1985.

The re-examination of the Underground No. 4 mine and infrastructure has significantly increased knowledge of the area which otherwise would have been "lost" or not considered if the mine had already been developed.

4.5.1 Mining Constraints

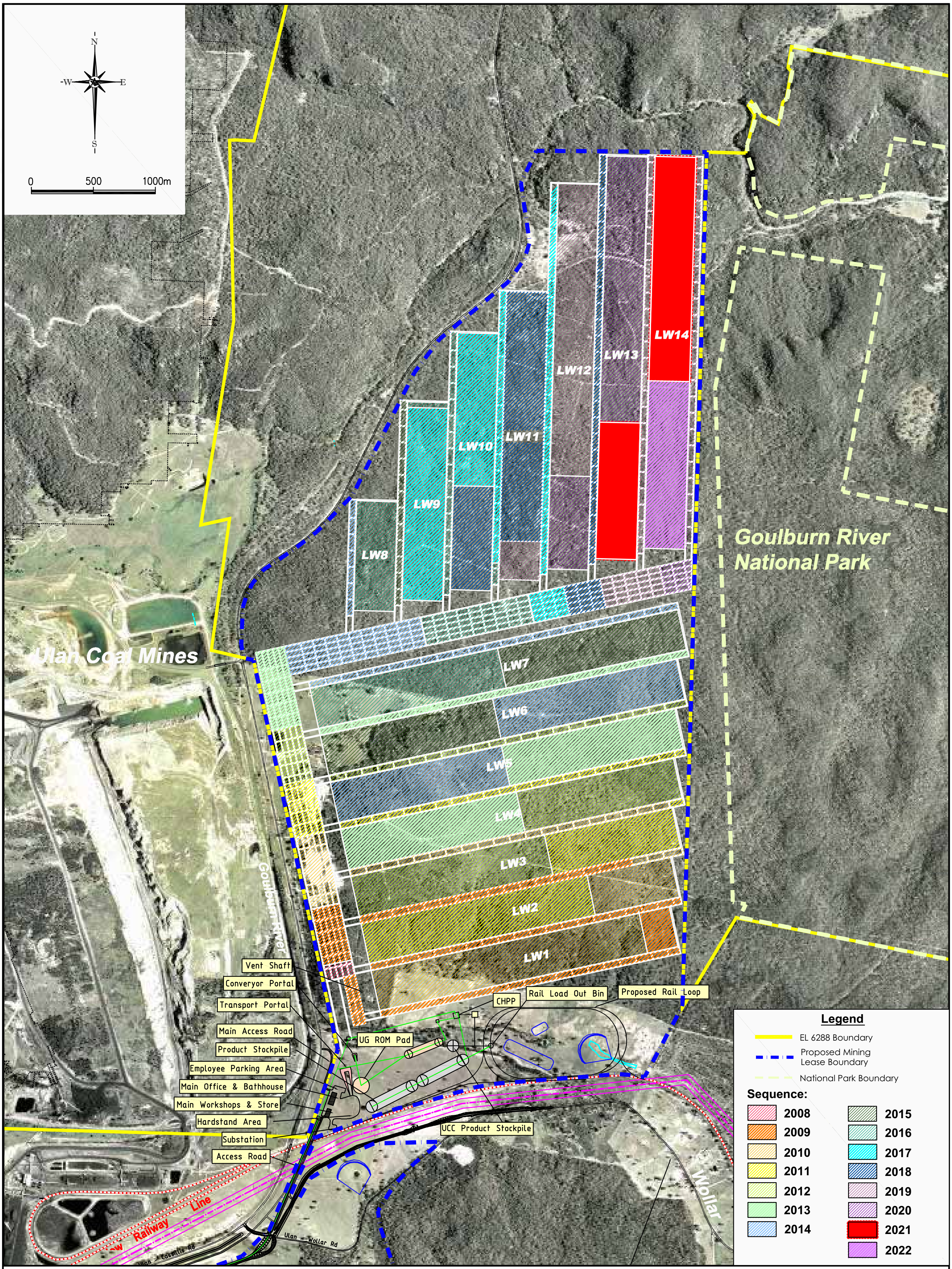
Constraints to mining of coal in Underground No.4 are largely a function of surface features and the boundary of EL 6288. The dominant mining constraints are as follows;

- The paleo-channel north of Open Cut No.1;
- Goulburn River National Park located immediately east;
- Lease Boundary;
- Ulan to Cassilis Road; and
- Goulburn River and the "Drip".

4.5.2 Mining Method and Sequence

The Underground No. 4 mine layout is shown by **Figure 4.12**. Mining will be via the retreating longwall mining method.

Mining will be in the D and E top section of the Ulan Seam. The cover in the area is generally in excess of 100m and suitable barriers will be provided for the Ulan-Cassilis Road and Goulburn River to the north and west, and the Goulburn River National Park to the east. This



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Moolarben Coal Project

Underground No.4 Longwall Layout and Staging

Figure 4.12

CAD FILE: Figure 4.12

will achieve maximum coal recovery with minimum effects on man made and natural surface features. A Subsidence Management Plan (SMP) will be prepared for approval as a component of the MOP prior to mining.

4.5.2.1 Drift Entries

Two drift entries will be constructed for access to the underground operations. One drift that provides access to the western side of the main headings will enable men and materials to access the underground. The second drift conveys coal from the underground to the surface.

The construction of the drifts will involve the excavation of box cuts.

Material removed during the drift entry construction will be utilised where possible in the construction of the CHPP facilities, excess material will be transported to Open Cut 1 for disposal with overburden. A geochemical assessment of this material has not identified any adverse characteristics that would prevent the use of the material in construction or its disposal with other overburden.

4.5.2.2 Continuous Mining

A “continuous miner” drives the underground tunnels, known as main headings and gate roads, by mechanically cutting coal using a rotating drum fitted with dozens of cutting picks. Shuttle cars are filled by the continuous miners and the coal is transferred to a conveyor system for transport to the surface. Once the continuous miner cut is completed, the roof is bolted to secure the roof prior to entry into the area by personnel. Using this method of mining, no mining personnel need work under unsupported roof. The main headings are the main access for the underground. The gate roads divide the un-mined portions of coal into longwall panels, ready for longwall mining.

4.5.2.3 Longwall Mining

Longwall mining is generally performed in a nearly continuous operation using specialist, integrated mining and roof support equipment (refer to **Figure 4.13**). Longwall panels are approximately 250m wide and range in length from 700m to 2500m. Panels 1-7 are orientated generally east-west, while Panels 8-14 are north-south.

Each longwall panel is mined in linear slices at the operating height by a shearer moving backwards and forwards across the coal face. Cut coal falls onto a chain conveyor that extends the full length of the face (approximately 250m). The cut coal is transported to one end of the face where it is transferred to a belt conveyor for transport to the surface. Large, self advancing hydraulic roof supports, support the roof immediately adjacent to the face. As the cut advances, the roof support line also advances, maintaining roof support over the whole face. The roof behind the roof supports is permitted to cave.

The longwall mining will commence in the south eastern corner of the underground area at Panel 1, which is progressively mined from east to west. On completion, the equipment is relocated to the eastern end of Panel 2 and mining continues. This process continues until Panel 8, which is then mined from north to south, with this sequence continuing until the southern end of Panel 14.

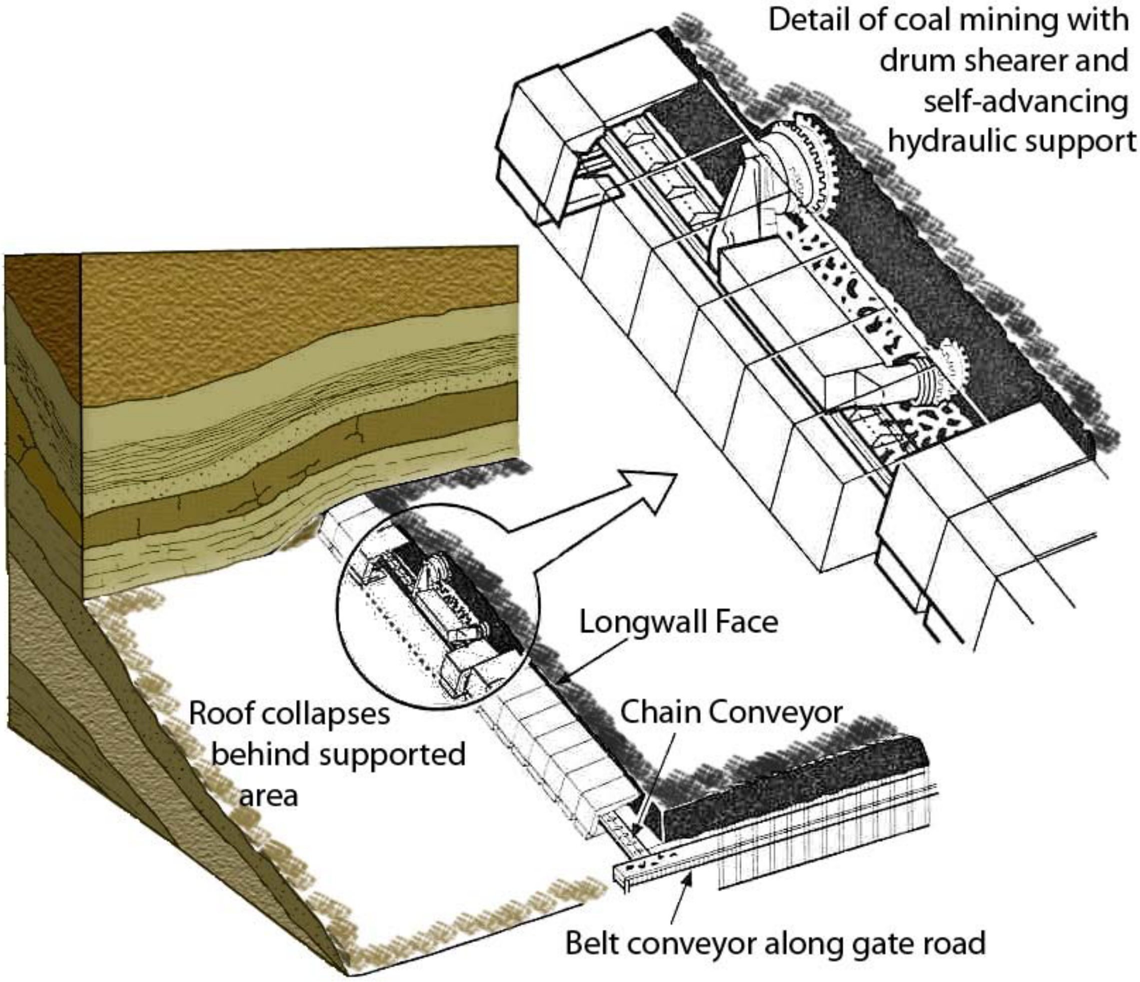


Figure 4.13: Schematic diagram of a longwall mining operation.

4.5.2.4 Ventilation and Gas Management

Longwall mining ventilation is provided by surface mounted ventilation fans. The ventilation fan provides fresh air in areas where personnel are working and extracts exhaust air. The location of the ventilation fan is shown in Figure 4.12.

Due to its chemistry, relatively low rank and shallow depth of cover, gas yields from the proposed underground and open-cut developments are not expected to be significant and fugitive gases would not normally support co-generation. An evaluation of gas desorbed from coal samples recovered from WMLB92 support this. WMLB 92 is located in the central part of the proposed underground development. A total of 5 samples, representing the Ulan seam subsections, were recovered from this bore from depths ranging from 104 to 114m.

These samples were monitored over a period of 2 weeks. In general, 90% of the gas desorbed was released in the first 4 days, and all samples were completely desorbed after 8 days. Cumulative gas contents (Q1+Q2) were all less than 0.5 m^3/t (0.1- 0.4m^3/t), with the lowest value originating from the E section. At these levels methane in ventilation air would be too low for useful and self-sustaining combustion.

Gas samples recovered from this work were tested at Simtars for composition. This work also indicates that the principal constituents are Carbon Dioxide at between 43-80%, followed by Methane, which is low at between 8.7-62%.

Ulan Coal Mines Pty Limited has been underground mining in similar conditions to Underground No.4 for over 25 years, and records of methane within the underground workings have been recorded to be only 0.1% of the vented air from the underground workings.

Similarly Wilpinjong Coal Mine analysed two boreholes within their environmental assessment for the composition of gases held within the coal seam, results ranged from 0% to 14% methane with an average concentration of 4.8%.

Due to the low gas yields MCM will not capture vented gases for both underground and open cut coal mines.

4.5.2.5 Dewatering

Dewatering in advance of the underground mining operations provides safe, economical and improved environmental outcomes during the extraction of coal. The dewatering of the underground mining operations will be undertaken through a series of dewatering/water production bores constructed on the surface with a piping network located in disturbed areas and following existing infrastructure corridors where feasible. A series of sumps within the underground mine will also be utilised. Water pumped from the dewatering bores and underground sumps will be managed in accordance with *Section 4.7 – Water Management*.

The declines are proposed to commence from boxcuts constructed within paleochannel alluvium, which is mostly unsaturated, but may yield some groundwater inflow. The paleochannel alluvium aquifer is perched above, and hydraulically separated from, the underlying Permian coal measures.

4.5.3 Mining Schedule

The proposal is to construct the drift entries for Underground No.4 mine during 2007. Production from the longwall will commence in 2009 and annual production will be approximately 4Mt ROM. The Underground No. 4 mine will have a life of approximately 14 years (including initial development, driveage and ramping-up to full production). The life of the underground operations (refer to **Table 4.7**) has been calculated assuming a maximum production rate of 4Mtpa of ROM coal. However, the life of the operation will extend beyond the calculated mine life if production levels do not reach 4Mtpa. MCM will seek to obtain 21 year mining lease.

Table 4.7: Proposed Underground No. 4 mining schedule.

Calendar Year	Year	Longwall Panel No.	Rejects (Mt)	Coal Extracted (Mt)
2007	Construction / 0	Construction	0	0
2008	1	Construction	0.025	0.5
2009	2	1	0.025	0.5
2010	3	1 and 2	0.2	3.7 to 4
2011	4	2 and 3	0.2	3.7 to 4
2012	5	3 and 4	0.2	3.7 to 4
2013	6	4 and 5	0.2	3.7 to 4

Calendar Year	Year	Longwall Panel No.	Rejects (Mt)	Coal Extracted (Mt)
2014	7	5 and 6	0.2	3.7 to 4
2015	8	6 and 7	0.2	3.7 to 4
2016	9	7, 8 and 9	0.2	3.7 to 4
2017	10	9 and 10	0.2	3.7 to 4
2018	11	10 and 11	0.2	3.7 to 4
2019	12	11 and 12	0.2	3.7 to 4
2020	13	12 and 13	0.2	3.7 to 4
2021	14	13 and 14	0.2	3.7 to 4
2022	15	14	0.1	1.5

The underground mine will generally operate 24 hours per day, 5 days per week with maintenance occurring 2 days per week. At times the underground mine will operate 24 hours per day, 7 days per week.

4.5.4 Infrastructure

Infrastructure (as detailed in *Section 4.2*) will include administration buildings, bath house, workshop and hardstand, fuel and oil stores, general stores, and car parking with sufficient capacity to cater for visitors and mine personnel.

4.5.5 Alternatives Considered

Table 4.8 details the alternatives to the proposed underground mine configuration that were considered.

Table 4.8: Alternatives considered to the proposed underground mine configuration.

Alternative	Justification for Preferred/Proposed Configuration
Alternative layout and orientation of longwall panels and gate roads.	Longwall panels and gate roads have been orientated in the preferred manner for the following reasons: • Maximisation of coal resource recovery; • Minimise environmental impact (i.e. no longwall mining under "The Drip"); • Minimise impacts to the Ulan-Cassilis Road; • Technical mining and safety constraints; • Ventilation issues arising from the Ulan underground coal mine requiring each block of 7 longwall panels to be isolated as advised by DPI; and • Orientation substantially the same as the

Alternative	Justification for Preferred/Proposed Configuration
	previously approved and valid development consent issued in 1985.
No mining of underground.	Significant economic loss to local, regional state, and national economies in the form of royalties and direct and indirect employment (further justification detailed with *Section 7 – Project Justification and Need*.

4.6 Ancillary Infrastructure and Services

4.6.1 Rail

The Gulgong to Sandy Hollow Railway Line runs through the project area and the rail loading loop will be constructed adjacent to the existing rail line.

The capacity of this line is currently being increased by Australian Rail Track Corporation (ARTC) and will be sufficient to transport the coal production when it comes on line.

4.6.2 Electricity

Power will be supplied at 66kV from the existing Country Energy Ulan Switchyard. The 66kV power line will be run adjacent to the road and rail corridor to the CHPP facilities where a 66/11kV substation will be constructed.

4.7 Water Management

The broad objectives of the conceptual water management strategy for the MCP are to:

- Divert upslope clean surface water runoff around disturbed mine areas where feasible;
- Maximise the volume of clean surface water available for mine processes in the early years of the open cut operation;
- Maximise reuse of treated dirty water on site;
- Store and treat groundwater make on-site and re-use as needed; and,
- Treat all residual mine water to an acceptable standard prior to its release to Moolarben Creek/Goulburn River system.

To meet these objectives, all potential ground and surface water sources have been identified and considered in terms of their projected quantity and quality, and their potential for re-use over the mine life.

The proposed Water Management System for the mine is presented schematically in **Figure 4.14** and **Plan 12** in **Volume 2**. This shows a distinct delineation between the management of groundwater and surface water. This is fundamental to the water management strategy and is based on the re-use of as much groundwater make as possible, with the treatment of the residual before discharge to the Goulburn River. Re-used groundwater and surface runoff due to rainfall will be dealt with separately and retained within the site for subsequent re-use as the mine progresses.

In order for this system to function, it will be necessary to install a series of storages and drainage works in and around the open cut mine areas and mine infrastructure areas. These will include:

- Diversion swales to divert clean water runoff around open cut pit areas where feasible;
- Clean water ponds to attenuate flows in the diversion swales and provide a constant supply of water to the mine infrastructure areas;
- Mine infrastructure ponds to store and supply water for mine processes such as coal washing;
- Pumps to transfer from clean water ponds around Open Cut 1 to the mine infrastructure ponds; and
- Sedimentation basins within each open cut area to treat surface water runoff from exposed mine areas and provide water for dust suppression and mine rehabilitation activities.

The Water Management Strategy for the mine has been developed to incorporate these features which have been conceptually sized based on the results of water balance modelling. The water balance modelling incorporates provision for projected mine water supply demand, storage evaporation, projected open-cut re-use requirements and approved discharge.

Notwithstanding, it should be noted that water management for the MCP will be subject to the preparation of a detailed Water Management Plan as a component of MCM's Statement of Commitments and mine operations plan prepared prior to the commencement of physical works onsite.

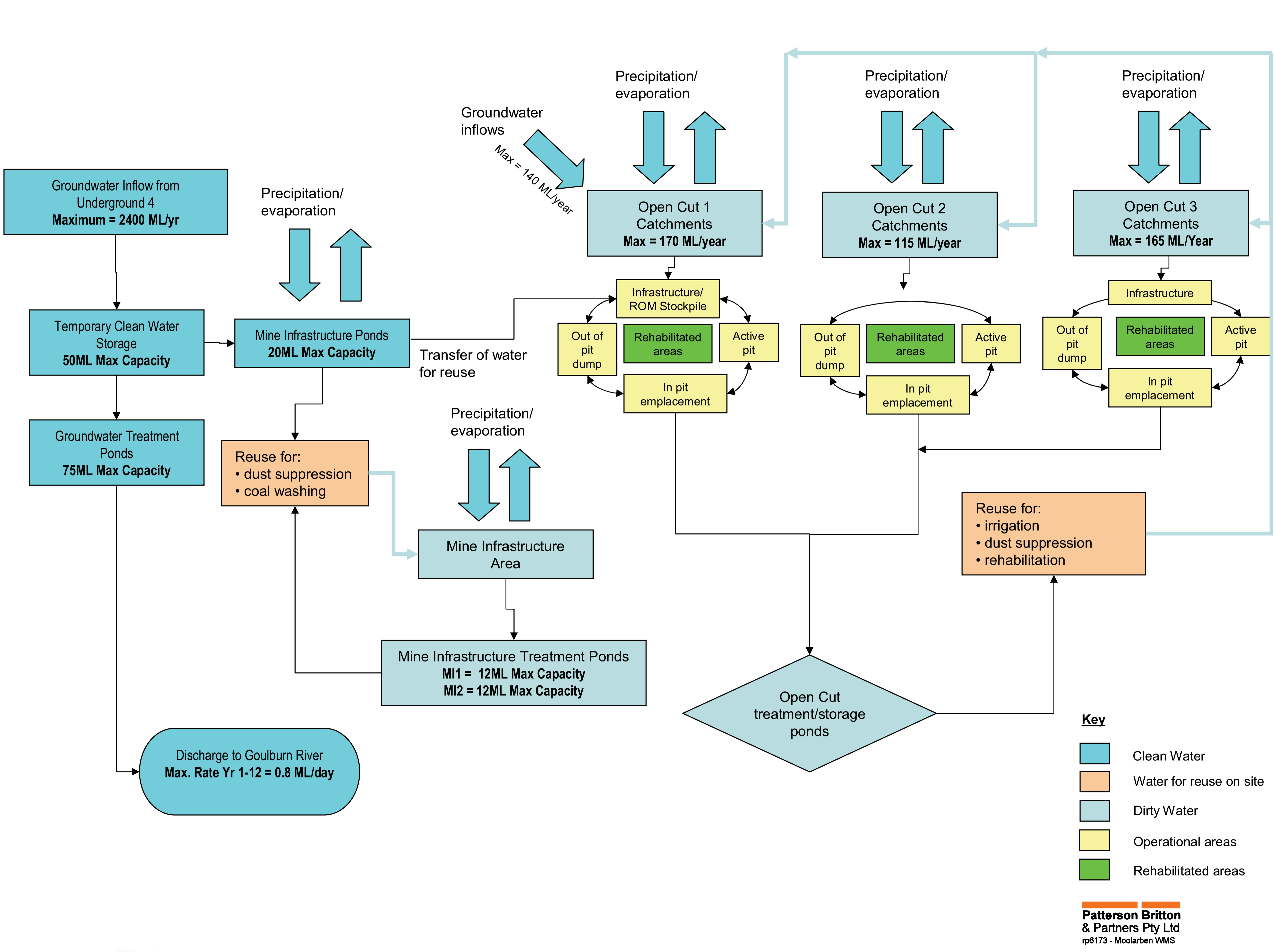
4.7.1 Dewatering

The open cuts and underground operations will be dewatered through a series of de-watering bores and above ground polyethylene pipes constructed where possible within previously disturbed areas.

Water sourced from the dewatering of open cut and underground operations will be pumped to the various water storages within the project area, through a network of above ground polyethylene pipes, utilising existing infrastructure corridors where feasible.

4.7.2 Water Supply

A water supply system including a bore field with pumps, pipeline, storage dams and tanks will be installed to service the MCP. Water will be sourced for mining operations according to an approved MCM Water Management Plan. Groundwater modelling has identified that the dominant water source for the MCP will be derived from the dewatering of the Underground No. 4 mine.



Moolarben Coal Project

Schematic of Proposed Water Management Strategy

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Figure 4.14

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The proposed approach to sourcing water for the project is to firstly make use of all groundwater mine inflows and runoff from disturbed mine areas, and recycling of water from the tailings. Any remaining water shortfall would be obtained from surplus water generated by nearby coal projects if available, or alternatively from local groundwater sources. During Years 1 and 4 to 11, it is predicted that mine water inflows will be less than water demand. In these years, the additional water required for the project can be obtained from production bores located around the eastern side of the Underground No. 4 mine or possibly sourcing surplus water from the Ulan Coal Mine operations. The production bores have the benefit of advanced dewatering of Underground No. 4. Anticipated MCP water demand is shown in **Table 4.9.**

Table 4.9: Anticipated MCP water demand.

Mining Year	Demand		Comments
	ML/day	ML/annum	
1	2.7	1000	Construction of Infrastructure, initial mining of Open Cut 1 and construction of the drifts for Underground No 4
2	4.0	1458	
3	4.1	1510	
4	6.3	2291	
5	6.9	2500	Corresponds to full production at a rate of 12 Mtpa ROM
6	6.9	2500	Open Cut 2 comes on-line
7	6.9	2500	
8	6.9	2500	Open Cut 3 comes on-line
9	6.9	2500	
10	6.9	2500	
11	6.9	2500	All open cut mining completed
12	2.6	937	
13	2.3	833	
14	2.3	833	
15	2.3	833	
16	0.1	52	Part year of production

4.7.2.1 Potable Water

Potable water for all facilities at the CHPP, Underground No.4 and Open Cuts 1 and 3 will be sourced from a combination of rainwater captured from the roofs of facilities, suitable quality bore water or possibly by road tanker.

4.7.3 Water Storages

In summary, the major on-site water storages (in addition to sedimentation dams throughout the open cuts) include:

- A temporary 200ML clean water dam to be site in the northern area of Open Cut 1 near the existing alignment of the Ulan-Wollar Road;
- A 80ML clean water dam to be sited inside the rail loop within the Infrastructure Area;
- A 200ML clean water dam to be sited within the area designated for Open Cut 2, which would initially provide clean water for irrigation and would subsequently serve for dust suppression as Open Cut 2 comes on-line; and,
- A 200ML clean water dam to be sited within the area designated for Open Cut 3, which would initially provide clean water for irrigation and would subsequently serve for dust suppression as Open Cut 3 comes on-line.

These dams will provide storage amounting to 680ML. In conjunction with the void from Open Cut 1 the storages are sufficient to contain predicted mine water inflows for the life of the project. Conservative assumptions within the groundwater model may mean that the predicted inflow rates to the Moolarben Underground No. 4 mine are overestimated by as much as 50%. However, it is considered prudent to take this approach until more recent information from Ulan Coal Mine is available, and until some history of pumping from Moolarben is available.

4.7.4 Dirty Water Management

The management of dirty water across the MCP will be premised on maintaining the separation of clean and dirty waters. This will be undertaken through the construction of appropriately sized and located drainage swales to capture, divert and convey clean waters around disturbed mining areas to the existing drainage network. Conversely dirty waters such as runoff from open cut mining operations, infrastructure areas and stockpiles will be captured, conveyed and stored in appropriately sized and located sedimentation basins.

Sedimentation basins will continue to operate during the mine rehabilitation phase following open cut mining. Runoff from rehabilitated areas will be collected, pumped to the sedimentation basins for treatment and extracted for use in rehabilitation e.g., for watering of vegetated areas. Basins will be decommissioned once rehabilitated areas are satisfactorily established.

Contaminants within the captured dirty water will vary depending on the source. Contaminants may include increased sedimentation, salt, acid and hydrocarbons. Captured dirty water will be segregated and stored based on the likely contaminant. All water storages will be monitored and treated as required to ensure the water is safely recycled.

The appropriate use of dirty waters will be identified within the Water Management Plan.

A Conceptual Water Management Strategy for the mine has been developed based on a water balance model that accounts for contributions due to rainfall, redistribution of groundwater make that has been used within the mine operation, and re-used surface runoff from disturbed areas of the mine. The water balance model also accounts for losses due to evaporation and is based on contemporary meteorological data and catchment parameters observed both in the field and from air photography.

The Strategy has been based on managing runoff from areas of the mine at strategic points during the mine life.

The concept is based on the provision of dirty water storages within each sector of the mine operation, namely the Mine Infrastructure Area, and Open Cuts 1, 2 and 3. No provision is made for separating clean water from upstream catchments. This is because it is considered to comprise a small volume of additional water that can be managed within the dirty water management system.

Rain that falls on each mine operational area will be collected as runoff and distributed across the site according to the topography that exists at the relevant stage in the mine life when the rainfall event occurs. A large proportion of the catchment draining to Open Cut 1 will comprise land surfaces that are unaltered from their existing state. Runoff from these areas will enter the operational areas of the mine and be intercepted by drainage swales. These drainage swales will be located at the downslope side of each mine operation area. Runoff collected by these swales will be gravity fed to sedimentation ponds. These ponds will serve as local dirty water storage ponds, with the water being re-used for dust suppression and the irrigation of rehabilitated open cut areas as mine development progresses.

Water falling within the active pit area will be stored locally and pumped to the nearest swale or sedimentation pond, whichever is closest.

The water balance model has been based on no net discharge from these areas. That is, all “dirty water” from the mine operation will be stored, treated and re-used within the mine operation.

Following rehabilitation of the open cut areas, there will be extensive depressions across the land surface which will be designed to hold water borne from post mine operation runoff. It is envisaged that these areas will be rehabilitated to become both water treatment systems and future habitat.

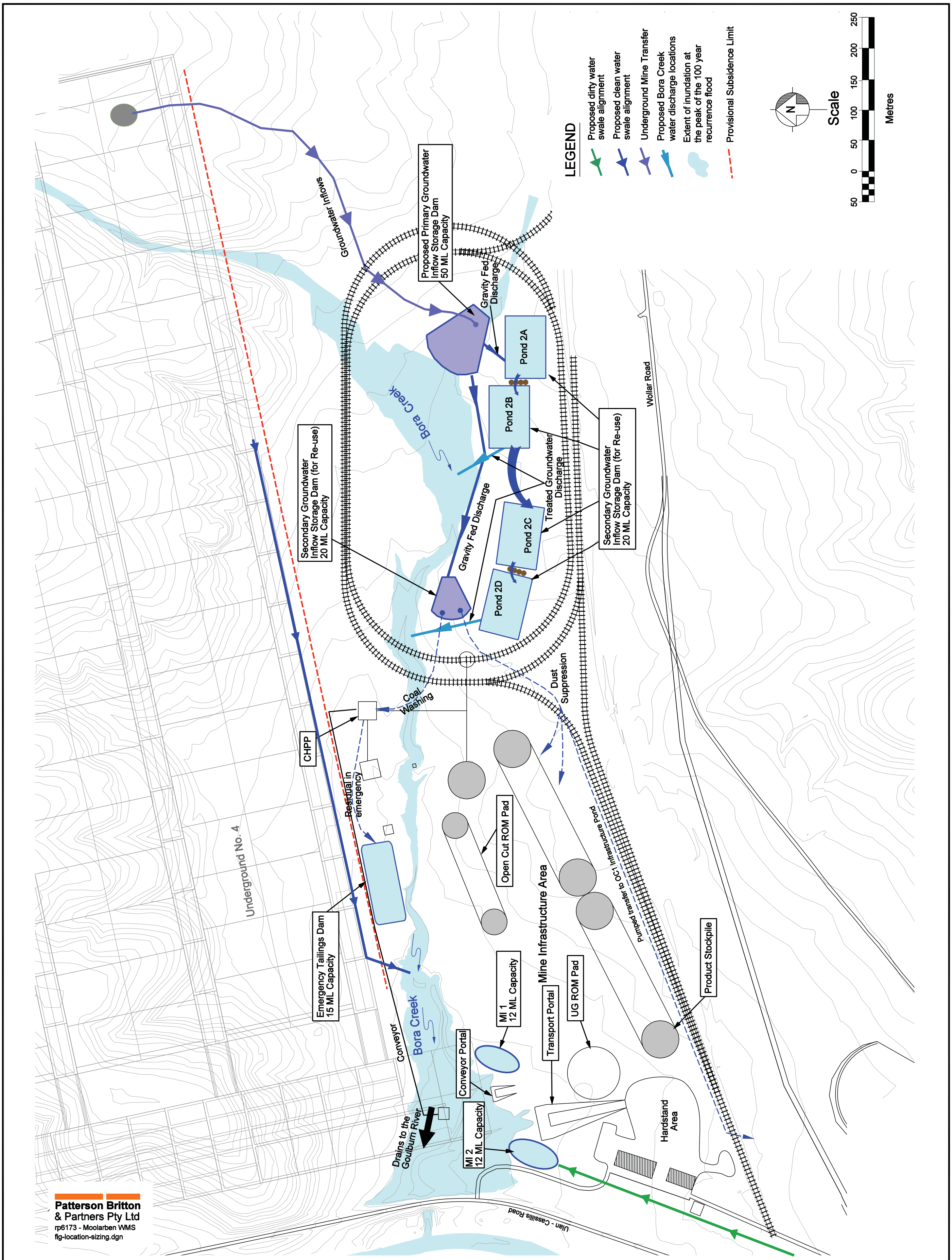
4.7.5 Surplus Water Management

Groundwater modelling has established that mining operations within Underground No. 4 will generate a substantial groundwater make. It is proposed that this groundwater make be re-used as part of coal washing operations in accordance with mine operation demands, and that the surplus be treated in preparation for discharge to the Goulburn River.

The results of testing (refer to **Appendix 5**) indicate that this groundwater will be of relatively good quality, with only some metal concentrations exceeding acceptable standards. Accordingly, surplus groundwater make would be treated to meet receiving water quality prior to discharge to the Goulburn River.

MCM’s Water Management Plan will incorporate a combination of the following measures as mechanisms for the management of groundwater inflows. These measures will comprise the following system: -

- The pumping of surplus groundwater to a 50ML storage dam that is to be sited within the most northerly of the rail loops within the mine infrastructure area (refer to **Figure 4.15** and **Plan 12a** in **Volume 2**).
- Water stored in this dam will be gravity fed to 4 connected Groundwater Treatment Ponds. These ponds will all be 120m long by 75m wide and have a capacity to hold water to depths of up to 2m. They will have a collective storage capacity of 75ML. The ponds would be interconnected by a broad-crested weirs constructed in each of the downstream bund walls. Aerators will be installed within each pond for the purpose of improving the potential for oxidation and thereby allowing metal concentrations to be reduced. The ponds have been sized to provide up to 10 days residence time, which is considered to be more than double the required time for satisfactory treatment assuming the installation of aerators; and



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Moolarben Coal Project

Surface Water Management in Main Infrastructure Area

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Figure 4.15

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- Progressive downstream discharge of treated groundwater make through each of Groundwater Treatment Ponds 2A, 2B, 2C and 2D. Testing of treated groundwater in Pond 2C and subsequent discharge to Bora Creek/Goulburn River once acceptable water quality is achieved.

  It is recognised that an approval will be required for the controlled discharge of surplus water to the local creek network. This is considered to be achievable due to the quality water that will come from Underground No. 4, and would have the added benefit of contributing valuable water resources to the environmental flow requirements for the Goulburn River.

  Notwithstanding, it will be necessary to treat the groundwater on-site before discharge, and the discharged water will need to be able to be shown to meet acceptable ANZECC water quality objectives for the protection of aquatic ecosystems, as well as the quality of the existing receiving waters.

Assuming acceptable water quality can be achieved, this surplus could be discharged to the Goulburn River system to support environmental flow requirements for these streams. The flow contribution from this surplus over the first 12 years of the mine life would not exceed an average of 0.7ML/day. An assessment of stream flow data for the DNR gauge at Ulan indicates that the 50^{th} percentile flow at this location in the Goulburn River is about 20ML/day. Therefore, the additional flow contribution to the typical base flow of the upper Goulburn River would amount to less than 5%.

In the years after Year 12, the potential groundwater make is greater and the rate of discharge could be higher. However, it is envisaged that other demands for clean water will come on line at this time and that any additional discharge would be able to be catered for by either: -

- Distribution to future mining operations (subject to approval) in other parts of EL 6288;
- Water sharing with Wilpinjong Coal Mine; and
- Distribution to nearby properties via pumping to storages to be located within the land surface area for Open Cuts 2 and 3, for the purposes of irrigation of agricultural areas. These storages would convert from agricultural use to mining use (e.g., dust suppression) when Open Cut 2 and Open Cut 3 commence.

4.8 Waste Management

A comprehensive Waste Management Plan will be developed for the construction and operation of the mine. Waste management will generally follow the hierarchy listed below:

- Avoidance
- Reduction;
- Reuse;
- Recycling or reclamation;
- Waste treatment; and
- Disposal.

The Waste Management Plan will be developed as a component of the proponent's Statement of Commitments and the Mine Operations Plan.

4.8.1 Effluent

During both construction and operations effluent disposal will be via approved on-site sewage management systems located adjacent to the bathhouse at the main surface facilities area. Effluent will be piped to the Open Cut 1 facilities and used in the rehabilitation process.

Effluent generated from the Open Cut 3 facilities will be disposed of via an approved on-site sewage management system located adjacent to the bathhouse with disposal via an irrigation system for rehabilitation activities.

All effluent will be disposed of in accordance with the DEC requirements.

4.8.2 Construction Waste

Construction wastes are likely to include timbers, metal, oils and fuels, batteries and general domestic rubbish. All waste will be segregated to allow responsible waste management with recycling or disposal to a local licensed waste facility via an approved waste contractor.

4.8.3 Operational Waste

Operational waste (other then effluent or coal processing wastes) is likely to include metal, oils and fuels, batteries and general domestic rubbish. All waste will be segregated to allow responsible waste management with recycling or disposal to a local licensed waste facility via an approved waste contractor.

4.8.4 Hazardous Materials Management

The Moolarben Coal Project will require the use of hazardous materials throughout the mining operation. Hazardous materials management will follow leading practice incorporating the following key principles (from *Leading Practice Sustainable Development Program For The Mining Industry, 2005)*:

- Knowledge of which hazardous materials are on site;
- Allocating clear responsibility for managing hazardous materials;
- Understanding the actual or potential hazards and environmental impacts in transporting, storing, using and disposing of these materials;
- Minimising the use and/or generation of hazardous materials;
- Constructing storage facilities that contain the materials in all foreseen circumstances;
- Disposing of waste materials in a way that eliminates or minimises environmental impacts;
- Seeking alternatives to disposal such as reducing, reusing and recycling products;
- Implementing physical controls and procedural measures to ensure that no materials escape during normal or abnormal operations;
- Having emergency response plans in place to ensure immediate action to minimise environmental effects should accidental or unplanned releases occur;
- Monitoring any discharges and also the environment to detect any escapes of the materials and measure any subsequent impacts; and

- Keeping adequate records including Material Safety Data Sheets (MSDS's) of chemicals onsite and reviewing them regularly so future environmental and health and safety problems are anticipated and avoided.

4.9 Work Force and Working Hours

4.9.1 Construction

The construction workforce will operate in accordance with **Table 4.10**.

Table 4.10: Construction Work Hours

Construction Shifts	Working Hours
Monday to Sunday	07:00-18:00

The construction workforce will be approximately 220 and will be sourced locally were possible.

4.9.2 Operations

The operational workforce will employ at its peak approximately 317 personnel, this includes five management and administration staff with the remainder of personnel spread across the MCM operations as specified in the tables below. Final shift hours are to be determined and agreed.

4.9.2.1 Open Cut Operations

The proposed open cut shift hours are generally shown in **Table 4.11**.

Table 4.11: Proposed Open Cut Shift Times.

Open Cut Mine Shifts	Working Hours
Monday to Sunday day shift 1	07:00-17:00
Monday to Sunday day shift 2	06:30-19:00
Monday to Sunday night shift	18:30-07:00

The three open cut operations are staged. This allows the same workforce within each open cut to be progressively relocated to the next open cut. It is anticipated the workforce will consist of the following personnel shown in **Table 4.12**.

Table 4.12: Proposed Open Cut Work Force.

Open Cut	Year 1	Year 2	Year 3	Years 4-21
Operators/ Management	82	102	102	102
Maintenance	18	18	18	18
Total Open Cut Workforce	**100**	**120**	**120**	**120**

4.9.2.2 Underground Operations

The proposed underground mine shift hours and manning are shown in **Table 4.13** and **Table 4.14** respectively.

Table 4.13: Proposed Underground Shift Times.

Underground Mine Shifts	Working Hours
Monday to Friday day shift 1	07:00-17:00
Monday to Friday day shift 2	06:30-15:00
Monday to Friday afternoon shift 2	14:30-23:00
Monday to Friday nightshift	22:30-07:00
Weekend dayshift	06:30-19:00
Weekend nightshift	18:30-07:00

Table 4.14: Proposed Underground Mine Personnel.

Underground	Year 1	Year 2-4	Year 5-7	Year 8-10	Year 11-21
Operators/Management	83	120	124	128	132
Maintenance	20	30	30	30	30
Total Underground Workforce	**103**	**150**	**154**	**158**	**162**

4.9.2.3 Coal Preparation Plant

The proposed CPP shift times and workforce numbers are shown in **Table 4.15** and **Table 4.16**.

Table 4.15: Proposed CPP Shift Times.

CPP Shifts	Working Hours
Monday to Sunday day shift 1	07:00-17:00
Monday to Sunday day shift 2	06:30-19:00
Monday to Sunday night shift	18:30-07:00

Table 4.16: Proposed CPP Personnel.

CPP*	Year 1	Year 2	Year 3-21
Operators/Management	15	15	25
Maintenance	5	5	5
Total CPP Workforce	**20**	**20**	**30**
*Note: Year 3 is the start of washing coal from Underground No. 4 mine.			

4.10 Mining Operations Plan

Prior to the commencement of mining, MCM is required under the Mining Act 1992 to develop and have approved a detailed Mine Operations Plan (MOP). The MOP must contain detailed plans of the proposed mining operations, and also a detailed environmental management system (EMS) that is supported by equally detailed environmental management plans. The environmental management plans will address the following items.

- Air pollution
- Erosion and sediment
- Surface water pollution
- Ground water pollution
- Contaminated polluted land
- Threatened flora
- Threatened fauna
- Weeds
- Blasting
- Operational noise
- Visual, stray light
- Aboriginal heritage
- Natural heritage
- Spontaneous combustion
- Bushfire
- Mine subsidence
- Hydrocarbon contamination
- Methane drainage/ventilation
- Public safety
- Other issues and risks

4.11 Mine Closure

Facilities within the main and Open Cut 1 infrastructure areas will be utilised for future mining activities associated with the remaining coal reserves contained within EL 6288. In the longer term the closure of mining operations will need to be undertaken in consultation with government authorities and stakeholders, and be consistent with the proponent's statement of commitments.

A Mine Closure Plan will need to be prepared in due course that addresses the key issues of safety, environmental issues, financial expectations and future land uses.

The Mine Closure Plan would need to document and detail the closure process, final rehabilitation including final voids, post closure maintenance, monitoring of environmental parameters, land tenure and future land use.

Scope exists in the future for the adaptive reuse of infrastructure for purposes other than mining related uses, for example tourism, educational, industrial and transport interchange. The future post mining land use will be consistent with the planning provisions that prevail at that time.