

Appendix C

Mine Plan Justification Report

Bylong Coal Project

Gateway Certificate Application
Supporting Document



Bylong Coal Project

Gateway Mine Infrastructure Justification Report

Prepared for the purpose of the Gateway Application

December 2013



1. Introduction

As part of the recently introduced Gateway Process there is a necessity to understand the relationship and evolution of the preferred Project mine plan aligned with traditional mine planning constraints along with any additional requirements under the Gateway Process. The purpose of this report is to specifically describe the infrastructure requirements related to the Bylong Project (the Project) along with iterative design considerations of relevant environmental and social constraints. In addition to traditional mine planning constraints, the following Gateway topics relevant to the Bylong area will be discussed in more detail:

- Biophysical Strategic Agricultural Land (BSAL) – it is to be noted that at the time of this report specific identification criteria for BSAL is currently under dispute and final protocols are yet to be finalised
- Groundwater considerations pertaining to the Aquifer Interference Policy (AIP)
- Equine Critical Industry Cluster (CIC) – it is to be noted that at the time of this report mapping of Equine CIC within the Bylong area is not finalised and is under dispute

It is important to understand the iterative mine planning process that has been undertaken over the past two years in order to satisfy:

- the newly implemented Gateway process
- changing requirements released in draft protocols and untested perceptions relating to the Gateway process

Where possible, mine planning has been undertaken to satisfy an ever changing process and proactively mitigate any foreseeable issues.

2. Project Site Description and Infrastructure Requirements

The Project (i.e. opencut and underground longwall operation) requires the standard supporting infrastructure for such a mining operation. The quality of targeted coal warrants coal processing to satisfy conditions for the proposed export market. As a result, the Project requires significant infrastructure in both a Coal Handling and Preparation Plant (CHPP) and Rail Loop connecting to the existing Australian Rail Track Corporation (ARTC) rail line passing through both authorisations. Relevant Mine Industrial Areas (MIA's), access roads, power lines, dams and haul roads are also required to support the operation. Specific to the location of the Project is the requirement for Accommodation Facility housing up to 550 personnel at the peak of the mine operation. Other smaller ancillary and supporting infrastructure requirements will also be required as part of the operation, for example: sedimentation dams; diversion drains; temporary short term demountable buildings etc.

3. Constraints and relevant Gateway considerations

The starting point for design has been based on traditional tried and tested mining constraints pertinent to both Authorisations (A) 287 and A342. Subsequent iterative mine planning has been undertaken as best as possible to adapt to recently (and ongoing) implementation of new gateway criteria and understanding of such criteria. The main traditional constraints to both mine layout and infrastructure design are (see Figure 1):

- Existing regional infrastructure and associated mine site interaction
- Original Class II agricultural land - and more recent BSAL
- Rivers, stream and creeks along with any associated alluvials
- Flood modeling extents (i.e. Q50, Q100 & Q1000)
- Steep topography (i.e. escarpments and cliffs)
- Sensitive environmental and heritage receptors
- Areas of suitable coal extraction (i.e. to avoid coal sterilisation, infrastructure has been sighted in areas with limited coal extraction potential)

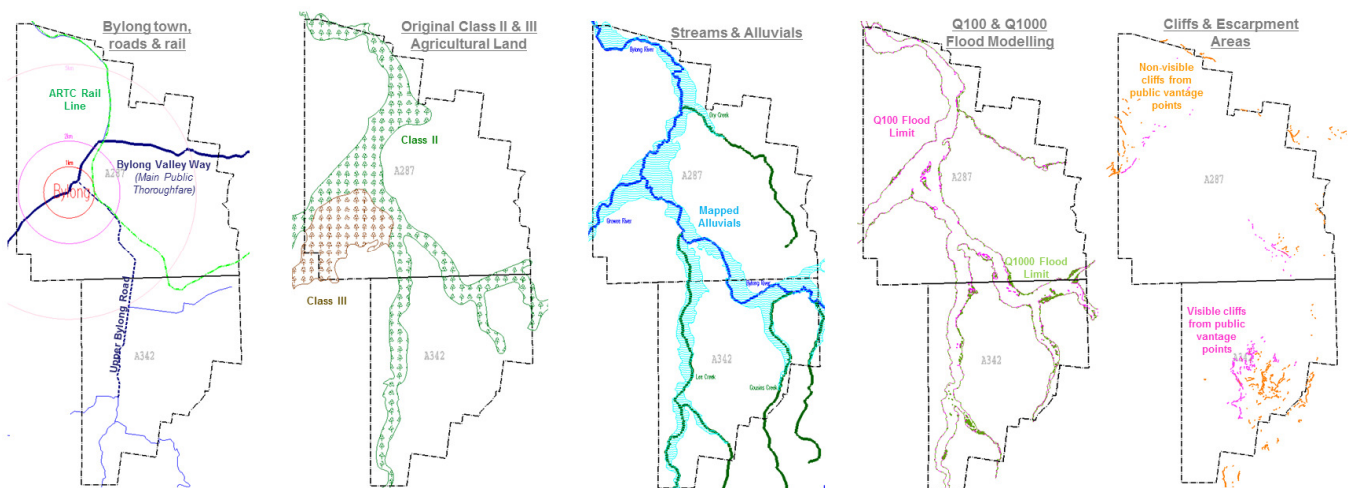


Figure 1 A287 and A342 with relevant major traditional constraints to mining and infrastructure

The Project area within A287 and A342 is characterised by a dominant valley bounded by escarpments and steep topography. The relatively flat valley is comprised of ephemeral creeks and rivers with associated alluvial and corresponding flood plains. Topography within the authorisations plays a major role in governing the appropriate location of the selected infrastructure – this has been the starting point of design and focus point of iterative infrastructure studies. The primary focus of design relates to the rail loop and the specific grade requirements to meet certain specifications dictated by ARTC standards. The rail loop is therefore “limited” to the relatively flat low lying



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valley areas. All other major mine infrastructure naturally gravitates towards this key piece of infrastructure.

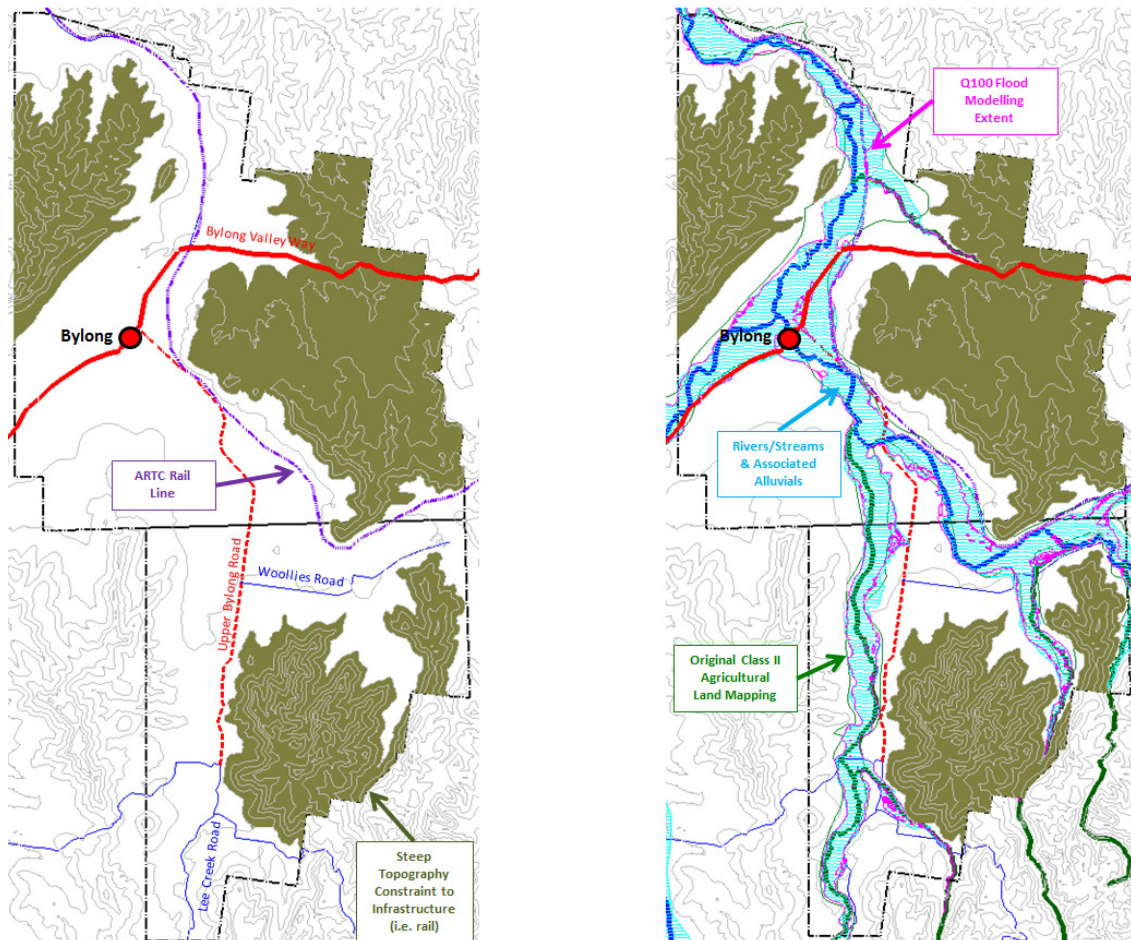


Figure 2 Topography and constraints specific to relevant infrastructure

Having determined suitable topographic locations within the site, the major environmental considerations have been identified so as to provide a “cookie cutter” approach identifying areas that are off limits as well as providing possible areas that may present as favourable for infrastructure outside such constraints. Changing BSAL and CIC mapping has also been considered for the duration of designs.

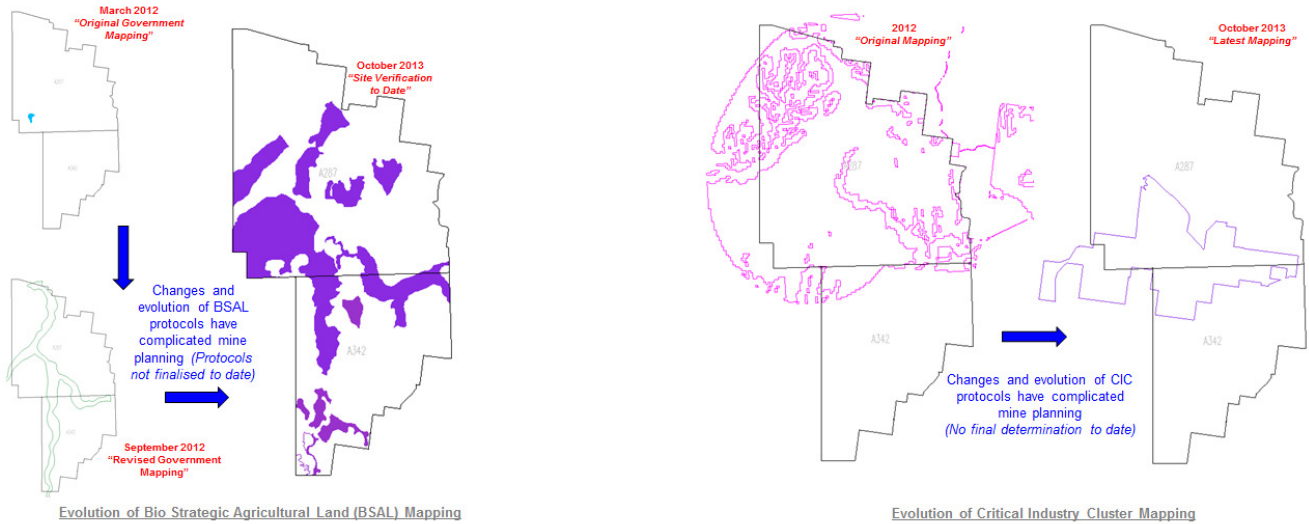


Figure 3 Changing BSAL implications to Project

4. Infrastructure Location – Options Considered

The foundation for most infrastructure design is primarily related to the rail loop location and minimising distance of coal clearance as well as reducing overall disturbance footprints. A number of alternative rail loop locations have been considered and designed throughout the duration of the Project.

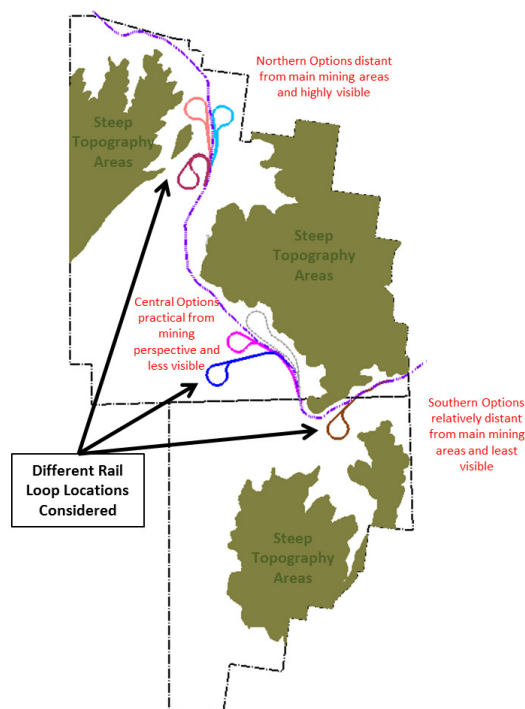


Figure 4 Examples of Rail Loop locations considered throughout duration of project



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The final infrastructure locations ultimately best satisfy both environmental and mining requirements. The selected mine plan (i.e. two opencuts and a longwall operations) is centered within both authorisations and as a result the infrastructure associated with servicing the mine and coal clearance would logically be sited within the central portion of both authorisations, outside areas incurring Gateway implications.

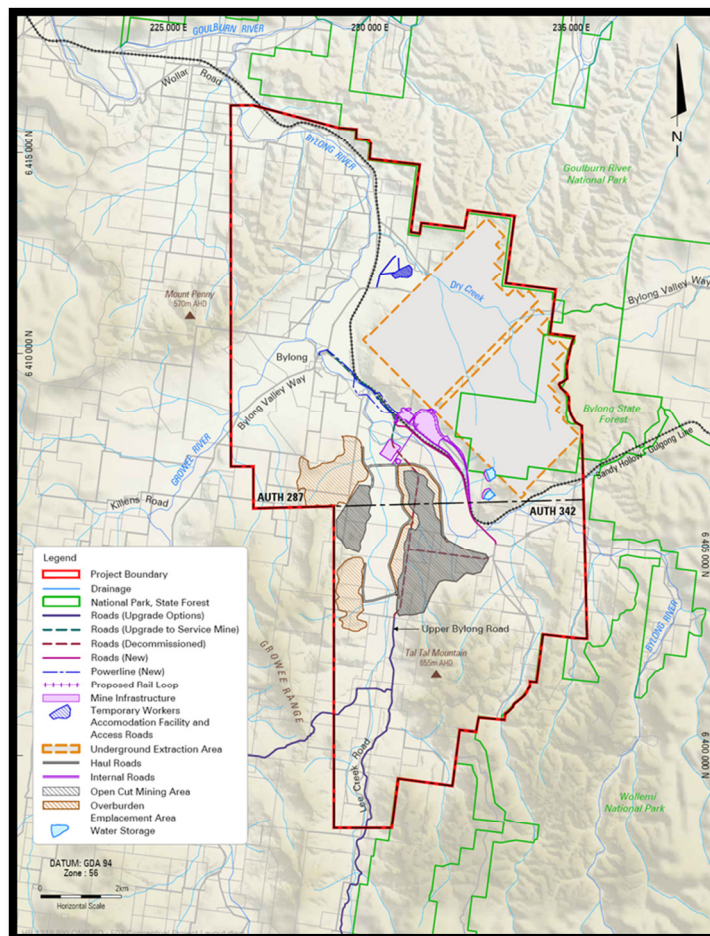


Figure 5 Mine Plan

From a Gateway process point of view, the major considerations for infrastructure locations are:

- Visual impacts - i.e. from an Equine Critical Industry Cluster (CIC) perspective
- Groundwater and surface water
- BSAL

Visual

The township of Bylong and the main public thoroughfare (i.e. Bylong Valley Way) are located within the northern portion of A287. Logically, infrastructure suits a site south of these areas to minimise visual impacts along with potential noise and dust impacts. Visual impacts are considered most relevant in terms of Equine CIC's and tourism aspects. Initial mine designs as part of the Pre-Feasibility Study (PFS) located infrastructure as far south within A342 in an attempt to mitigate

Level 2, 66 Hunter Street Sydney NSW Australia 2000 **T:** (61 2) 9300 3333 **F:** (61 2) 9221 6333

E: info@cockatoocoal.com.au **W:** www.cockatoocoal.com.au

these amenity issues. However, the selected site presented with notable surface water impacts and agricultural land disturbance issues. An important aspect with this initial design involved constructing significant quantities of rail embankment across alluvial flood plains and ultimately adding risk to surface water flow and associated groundwater influences as a result of surface water changes. In addition, the embankment footprint provides disturbance of agricultural land as well segregating a pocket of agricultural land within the rail loop.

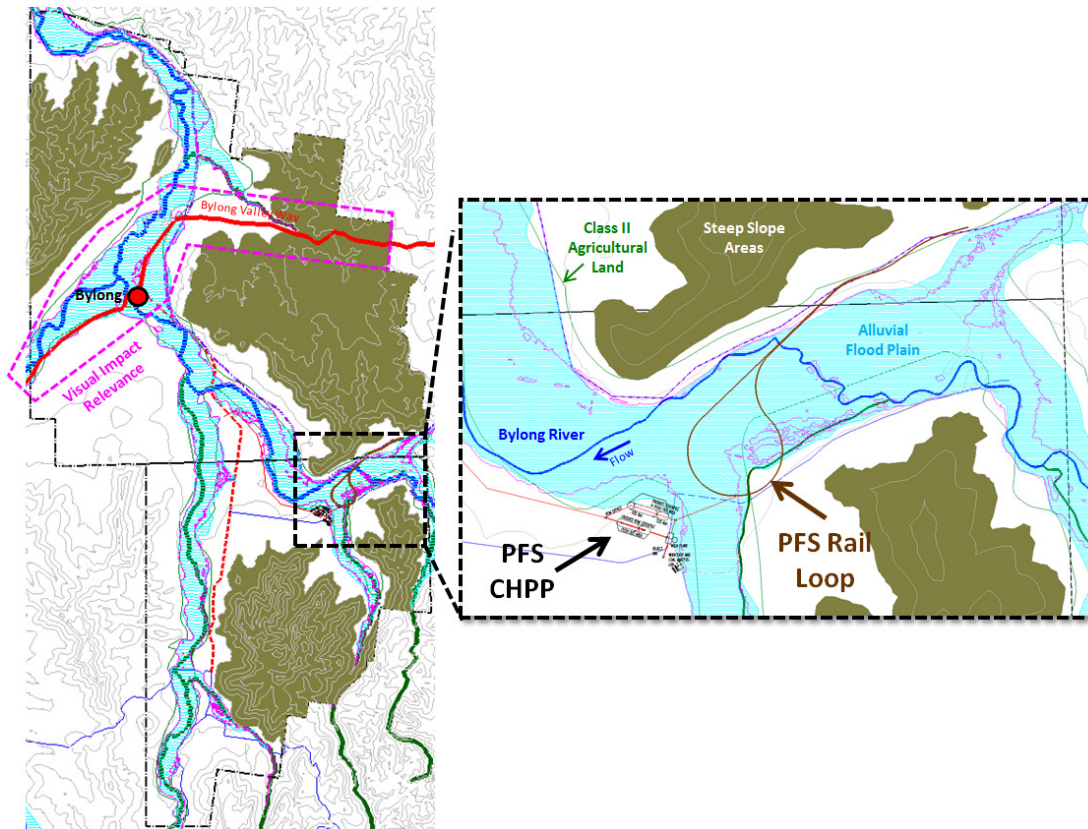


Figure 6 PFS Infrastructure Location and relevant Gateway considerations

Another important consideration with the PFS infrastructure design (and other designs) was potential influences on the “Natural Sequence Farming” as conducted by a private landholder within this area. Discussions with the relevant landholder provided perspective of future designs and input into future location selection processes.

Post completion of the PFS, a process of mine redesign was implemented through another layer of feasibility studies, namely by way of a further Options Study, to identify a selected “approvable mine plan” to take through the rigor of a Feasibility Study. Within this study, siting of the rail loop and relevant infrastructure again adopted a least impact philosophy while attempting to balance mine layout suitability and satisfy project economics. Additionally, with the luxury of hindsight, the PFS infrastructure location impacts the site verified BSAL mapping for the site to date.

From a visual perspective, having ruled out a southern infrastructure option, a central locality within both authorisations was identified to result in the preferred location over a northern option. From a



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visual perspective there is a natural screening to the broader surroundings as a direct result of the topography within the area.

Groundwater and Surface Water

Site infrastructure can have implications to both surface water and groundwater. Two main areas are considered relevant for siting of infrastructure in terms of surface and groundwater:

- Run-off – potential implications to surface water systems and indirectly to any connected or associated groundwater systems (i.e. aquifers). Of primary significance within the Bylong area is that of the alluvial aquifers related to rivers and creeks within the area. Infrastructure design has focused on minimising overlap with these mapped alluvial areas.
- Interactions with surface water systems – potential to change surface water and associated groundwater flows (and possible quality) with knock on affects to associated agricultural lands. Infrastructure design has taken into account flood modeling so as to generally avoid predicted flood zones (and associated alluvials) and as a result be outside areas of possible surface water interaction.

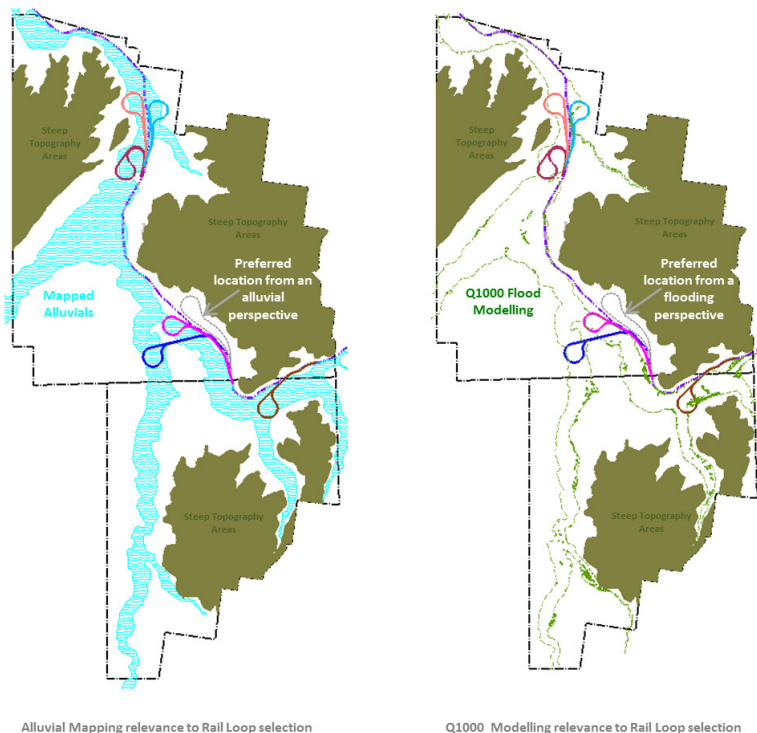


Figure 7 Rail Loop locations and relevance of alluvials and flood extents

The majority of locations considered for the rail loop locations ultimately overlapped mapped alluvial aquifer systems or crossed the modeled flood plain. This is a direct result of the incumbent topography of the area. This is compounded by additional engineering issues attributed to construction of significantly high embankments for the rail loops necessary to satisfy grade requirements to tie into the existing ARTC line which hugs the escarpments (i.e. at an elevation much greater than the lower flood and alluvial flood plains). This inadvertently results in potential

Level 2, 66 Hunter Street Sydney NSW Australia 2000 **T:** (61 2) 9300 3333 **F:** (61 2) 9221 6333

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“damming” across the flood plains. Through numerous trade-off studies, one location presented as suitable in being positioned outside the flood plain. This location notably is the highest capital cost option as a direct result of excavations attributed to constructing a rail loop in steepened grades immediately adjacent to an escarpment.

BSAL

At the commencement of Feasibility Studies, the Gateway process was only just being introduced with legislation being enacted in October 2013. The extent of BSAL changed throughout the process of mine design. Best attempts were made to avoid BSAL where possible. The starting point of design weighed heavily on original Class II agricultural land mapping followed by the more recent BSAL criteria.

Ultimately, following final mine design and infrastructure location selection, more detailed site verified BSAL mapping is undertaken on the selected mine plan layout. Ultimately, over the changing and iterative process there is a likelihood of small parcels of BSAL that may eventuate within designated mine layouts that may not be practically avoided without causing other substantial flow-on environmental, mine safety and practicality issues.

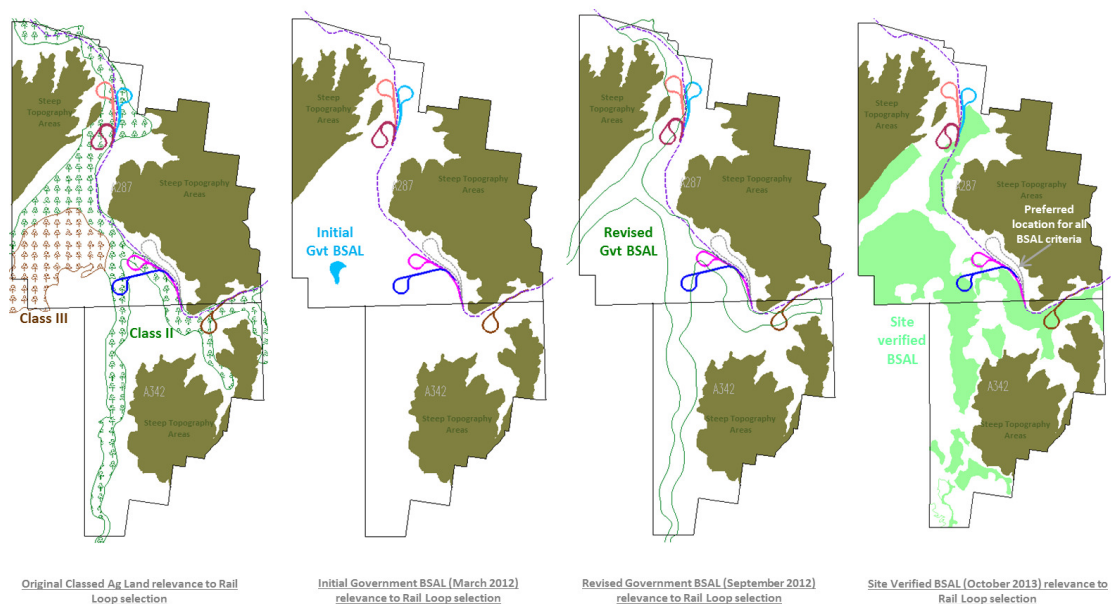


Figure 8 Evolving BSAL mapping relevant to infrastructure

The selected rail loop location for the Project is deemed to best satisfy all Gateway requirements as well as address the majority of other constraints from an EIS perspective. The selected rail loop is located outside mapped flood plains as well as not impacting any area of verified BSAL. Certain other mine infrastructure (i.e. CHPP and MIA's) has then been sited within the rail loop or adjoining the rail loop as best as possible to further satisfy the abovementioned criteria. In addition, infrastructure for open cut mining areas has been sited to minimise impacts to BSAL, adjacent to mining areas elevated above the flood plain.

5. Selected Option Justification

Every effort has been made to locate infrastructure so as to limit Gateway criteria impacts. Major forms of mine infrastructure such as rail loop, CHPP and permanent MIA's have been positioned to avoid BSAL as best as possible while taking into consideration limiting impacts to groundwater, surface water and visual amenity from major public vantage points. During the Feasibility Study, final footprints can be modified slightly to mitigate further impacts as much as reasonably practical. Due to the nature of mining and the diverse spread of an operation some minor infrastructure will overlay mapped BSAL to some small extent. Every effort will be made to minimise impacts and attempt to preserve the land as best as possible.

The indicative mine infrastructure layout is as follows:

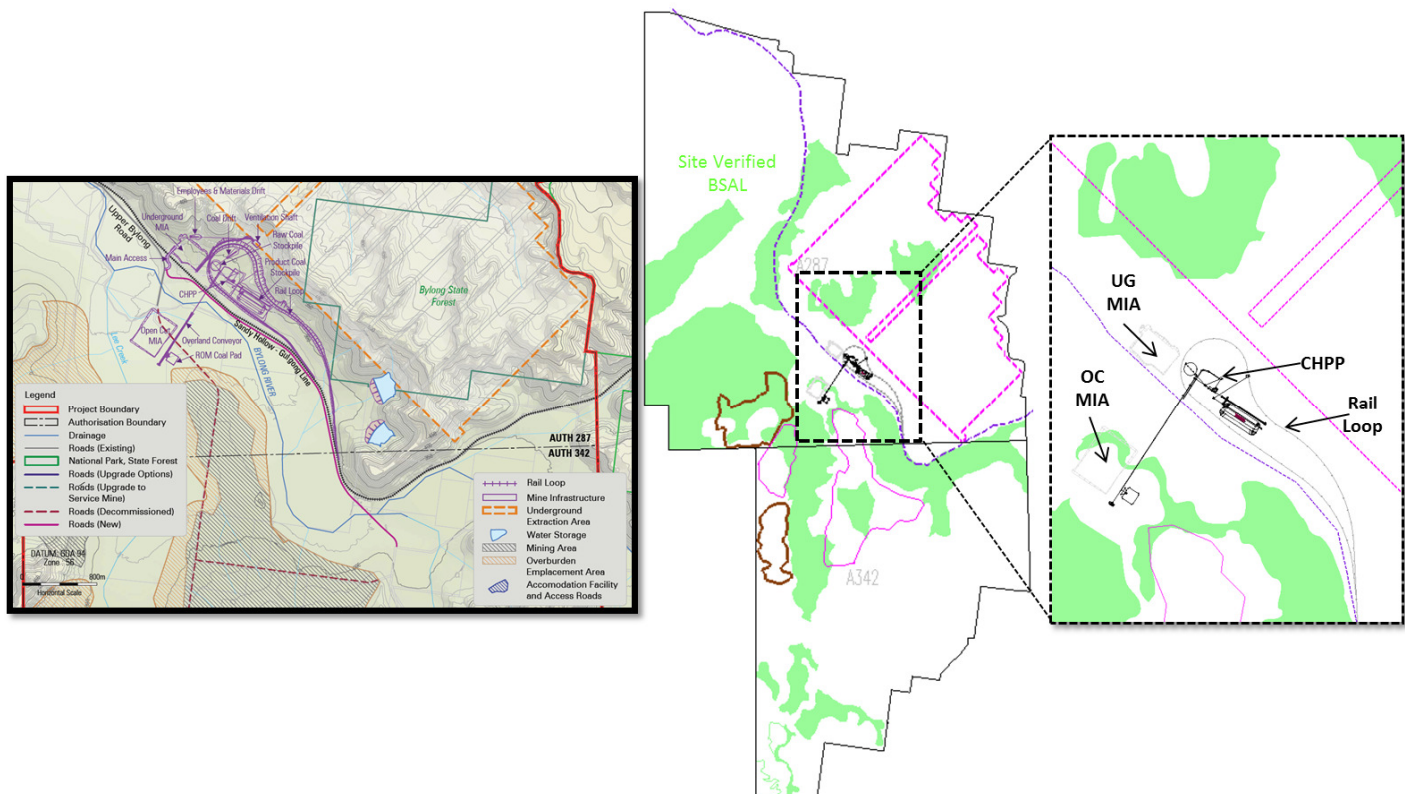


Figure 9 Overall mine infrastructure and relevant BSAL

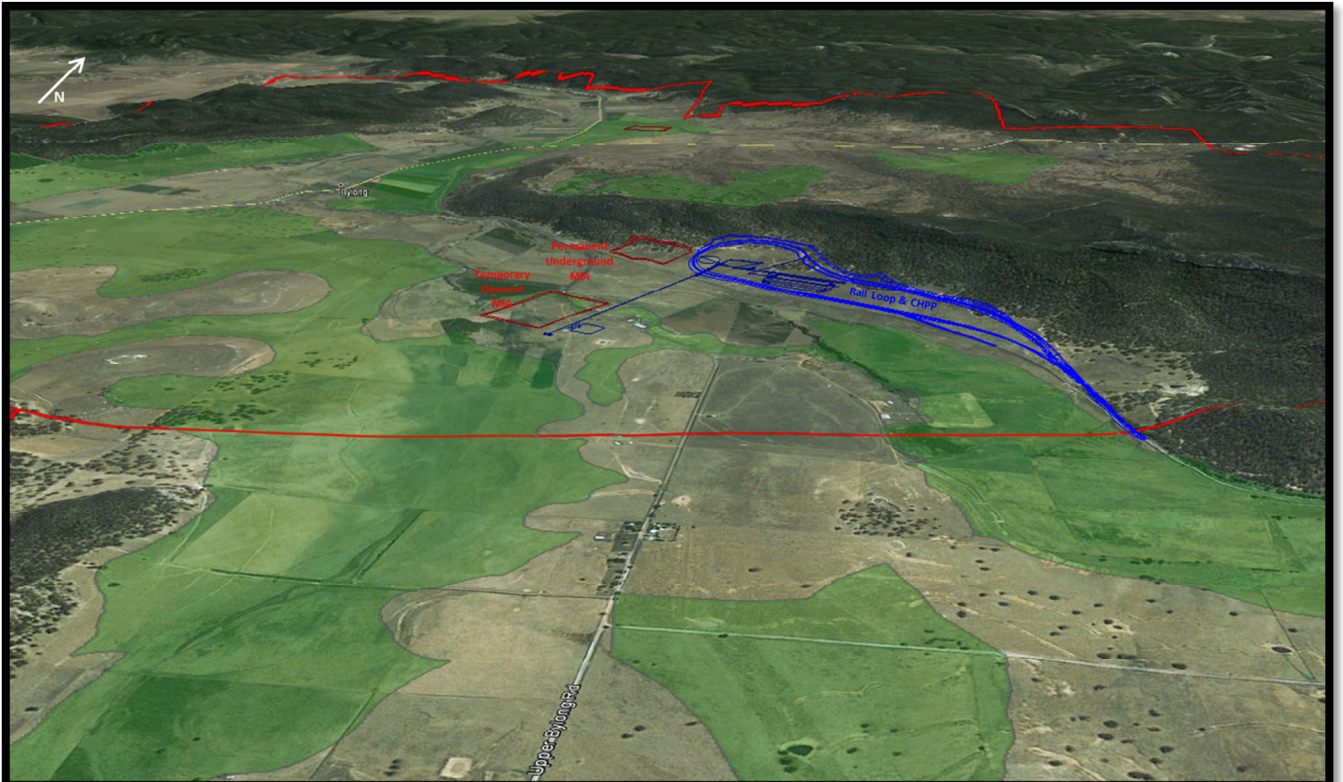


Figure 10 Google Earth view with relevant major infrastructure and BSAL

The abovementioned principles are utilised for the siting of relevant opencut and underground mining areas that go hand in hand with the mine infrastructure covered within this report.

Bylong Mine Plan Justification

Version 2

Cockatoo Coal Limited

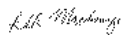
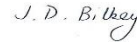
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Authorisations				
Name		Position	Signature	Date
Prepared By:	Ron Siwinski	Executive Consultant		11/12/2013
Reviewed By:	Rob Mackenzie	Executive Consultant		11/12/2013
Update By:	John Bilkey	Senior Mining Engineer		10/1/2014

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Executive Summary

Cockatoo Coal Limited (CCL) on behalf of KEPCO has requested RungePincockMinarco Limited (RPM) to provide a Mine Plan Justification report in relation to the Bylong Coal Project (the Project). The report is a summation of the mine planning logic that has been applied to arrive at the Project Mine Plan. RPM understands the content from this report will be included in the Project Gateway Certificate Application being prepared by Hansen Bailey for submission by KEPCO during January 2014.

The Project proposes the development of mining operations and supporting infrastructure, including coal processing within A287 and A342 which are located in the Bylong Valley approximately 230 km north west of Newcastle. The Project proposes initial open cut (OC) mining from 2 OC mining areas for 8 years with UG longwall mining for approximately 23 years at a rate of 5 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal.

The Project has already progressed through a number of mine planning stages including concept and Pre-Feasibility Studies and a recently completed Options Study (OS). Each of these studies has successively analysed various combinations of mining, coal processing and infrastructure to arrive at a selected development, hereafter referred to as Project Mine Plan.

The evolution of mine planning and eventual selection of Option 6C as the preferred development strategy was driven by project economics as well as numerous environmental considerations and constraints, including all of the following:

- Underground (UG) mining,
 - UG mining is highly constrained by alluvial flood plains and Biophysical Strategic Agricultural Land (BSAL).
 - UG mining is not proposed in any areas of alluvial flood plain or strategic cropping zones as no subsidence is permitted in alluvial flood plain areas,
 - subsidence control must be exercised under Tal Tal Mountain,
- Open cut mining,
 - PFS Pits 6 & 7 excluded – too close to both Bylong Village and the Bylong Valley Way,
 - PFS Pits 2, 3 & 4 excluded – too close to creeks and sensitive alluviums,
 - PFS Pit 1 modified to ensure:
 - a buffer of 250 m from the centre line of the Bylong and Growee rivers,
 - a minimum buffer of 100 m for Lee Creek and a 500 m drainage corridor along Lee Creek (at points where disturbance is located on both sides of the creek),
 - avoid OC cut development within 1 km of the centre of Bylong township,
 - minimise disturbance to Class II arable lands as mapped under the Land and Soil Classification system,
 - avoid open cut development within 50 m of the toe of steeper terrain and escarpments, and
 - The OC pit to be a minimum of 150 m from the supplied alluvium limit lines in line with the DIPNR Aquifer Interference Policy 2005 – stream aquifer guidelines.

The selected Option6C proposes to extract coal from the Ulan and Coggan seams by open cut (OC) mining methods and from the Coggan seam by UG mining methods.

The following summarises the key features of Option 6C:

- production of approximately 5 Mtpa ROM from both OC and UG mining,
- OC mining from Year 1 to Year 8 inclusive (OC pits shown in Figure 4),
 - OC mining in PFS Pit 1 and PFS Pit 5,
 - no mining in PFS Pits 2, 3, 4, 6 or 7,
 - 2 overburden emplacements; Northwest OEA and Southwest OEA,
- UG mining commencing in Years 5 to 27 (UG areas shown in Figure 2),
 - UG mining in PFS Area 1, PFS Area 2 and PFS Area 3,

- no mining in PFS Areas 1,3 & 4, and
- one wash plant of 5 Mtpa ROM capacity to accommodate processing of both OC and UG mining coal.

In the recommended Bylong Option 6C mine plan, approximately 160 ha of Biophysical Strategic Agricultural Land (BSAL) are disturbed within the limits of Pit 1 and Pit 5 and the associated out of pit overburden emplacements.

The recommended Option 6C sacrifices 60Mt ROM coal (compared to the PFS estimate) by not mining OC Pits 2, 3, 4, 6 and 7 and UG Area 4 and also by reducing the size of OC Pit 1 to meet environmental constraints listed above.

Ultimately, CCL believes that Option 6C represents a responsible development strategy balancing economic extraction and environmental impacts.

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1. Introduction

Korea Electric Power Company (KEPCO) is seeking to develop the Bylong Coal Project (the Project). Cockatoo Coal Limited (CCL) has been appointed as the project manager and are seeking the relevant planning approvals for the Project Development. The Project comprises Authorisations A287 and A342, approximately 230 km northwest of Newcastle. The Project has already progressed through concept and Pre-Feasibility Study (PFS) and proposes to extract coal from the Ulan and Coggan seams by OC mining methods and from the Coggan seam by UG mining methods.

The PFS was carried out for CCL and KEPCO by mining consultants Golder Associates and a report was issued in July 2012. The PFS was undertaken on the basis of maximising resource recovery and included operations in up to 7 OC pits and 4 UG mining areas.

Recent NSW Government policy changes, including implementation of the Strategic Regional Land Use Policy and the Aquifer Interference Policy, warranted a review of the overall mine plan in an Options Study (OS), prior to the commencement of a Feasibility Study (FS). The intention of the OS was to review a number of alternatives in mine planning as well as coal quality, coal preparation and surface infrastructure, in order to identify a preferred project planning option for the FS.

Parsons Brinckerhoff was engaged by CCL to carry out the Options Study in order to select the preferred mine plan. Specialist sub-consultants for the study were RungePincockMinarco for mine planning and QCC Resources for coal quality and for the coal handling and preparation plant (CHPP).

The Options Study was completed in November 2013 and issued to Cockatoo Coal Limited. A recommended option was identified and is now presented as the basis for project development Feasibility Study. The key elements of the recommended option, Option 6C, were as follows:

- OC mining in 2 of the original 7 OC pits, Pit 1 (subject to some reduction to address environmental issues) and Pit 5, commencing in 2017 and continuing through 2024,
- UG mining commencing in 2021 in UG Area 2 and continuing into Area 1 and Area 3 through 2060. Area 4 is not proposed to be mined due to its small size.
- one washplant to process coal from both OC and UG mining, and
- production capacity approximately 5 Mtpa run-of-mine (ROM) coal.
- Figure 4 following shows the location of the OC mines and Figure 2 shows UG Area 1, Area 2 and Area 3.
- This document presents the logic behind the selected plan in the form of a Mine Plan Justification, as required to accompany the Bylong Gateway Certificate Application.

2. Options Study

As stated above, the PFS assumed that all 7 OC pits would be mined. A site layout drawing from the PFS is reproduced here in Figure 1.

Following initial feedback from Department of Planning and Infrastructure (DP&I) that this mine plan had potential issues, the Options Study was undertaken with a view to determining the preferred option(s) to carry forward to a Bylong Feasibility Study giving the best possible compromise between economic and environmental outcomes. The Options Study, dated 8 November 2013, is a significant document of 584 pages, describing project options relating to mining, both UG and OC, CHPP, and project infrastructure. This Mine Plan Justification summarises the Options Study in relation to mining only; which includes overburden emplacement.

CCL and KEPCO, in conjunction with their various specialist consultants, defined the following options to be assessed in the Options Study:

- option 1 - UG mining only,
- option 2 - UG mining with OC mining (in Pit 1 and Pit 5) commencing in year 5, and
- option 3 - UG mining with OC mining (in Pit 1 and Pit 5) commencing concurrently.

In May 2013, CCL further requested the study team to assess the economic value/net present value (NPV) of OC Pits 6 and 7. Noting that the estimated mine life of Pits 1 and 5 is approximately 8 years, the options associated with OC 6 and OC 7 were therefore defined as follows:

- option 4 - as in Option 2 above but with Pit 6 and Pit 7 commencing in year 13, and
- option 5 - as in Option 3 above but with Pit 6 and Pit 7 commencing in year 9 once the main OC pits have been mined.
- it is important to note that the inclusion of Pit 6 and Pit 7 into the study was purely for the determination of NPV. The study team noted the proximity of these pits to Bylong village and Bylong Valley Way and it was agreed that overall mine planning to cater for these pits would not be carried out since the environmental impacts would likely be unacceptable.
- as a result, a sixth option was defined which resulted in improved project economics while not increasing environmental impact. This option (Option 6) entails OC mining in Pit 1 and Pit 5 followed by an UG operation commencing in year 5. The study team started with Option 6A and finally settled on Option 6C, which was the subject of an engineering and cost estimation exercise during August 2013.

The adverse impacts removed from the project by this options assessment process were generally as follows:

- PFS Pits 6 & 7 – too close to both Bylong Village and the Bylong Valley Way, and
- PFS Pits 2, 3 & 4 – too close to creeks and sensitive alluviums, and mined quantities too small.
- UG Area 4 – too small for economic mining.

A key criterion for mine planning is generally to maximise resource utilisation; i.e. recover the greatest possible amount of coal from a resource subject to economic and environmental constraints. By removing 5 of the 7 original potential OC pits and one UG mining area from the proposed plan, the Project is sacrificing some economic coal, in order to reduce potential environmental impacts.

Figure 1 - PFS Site Layout

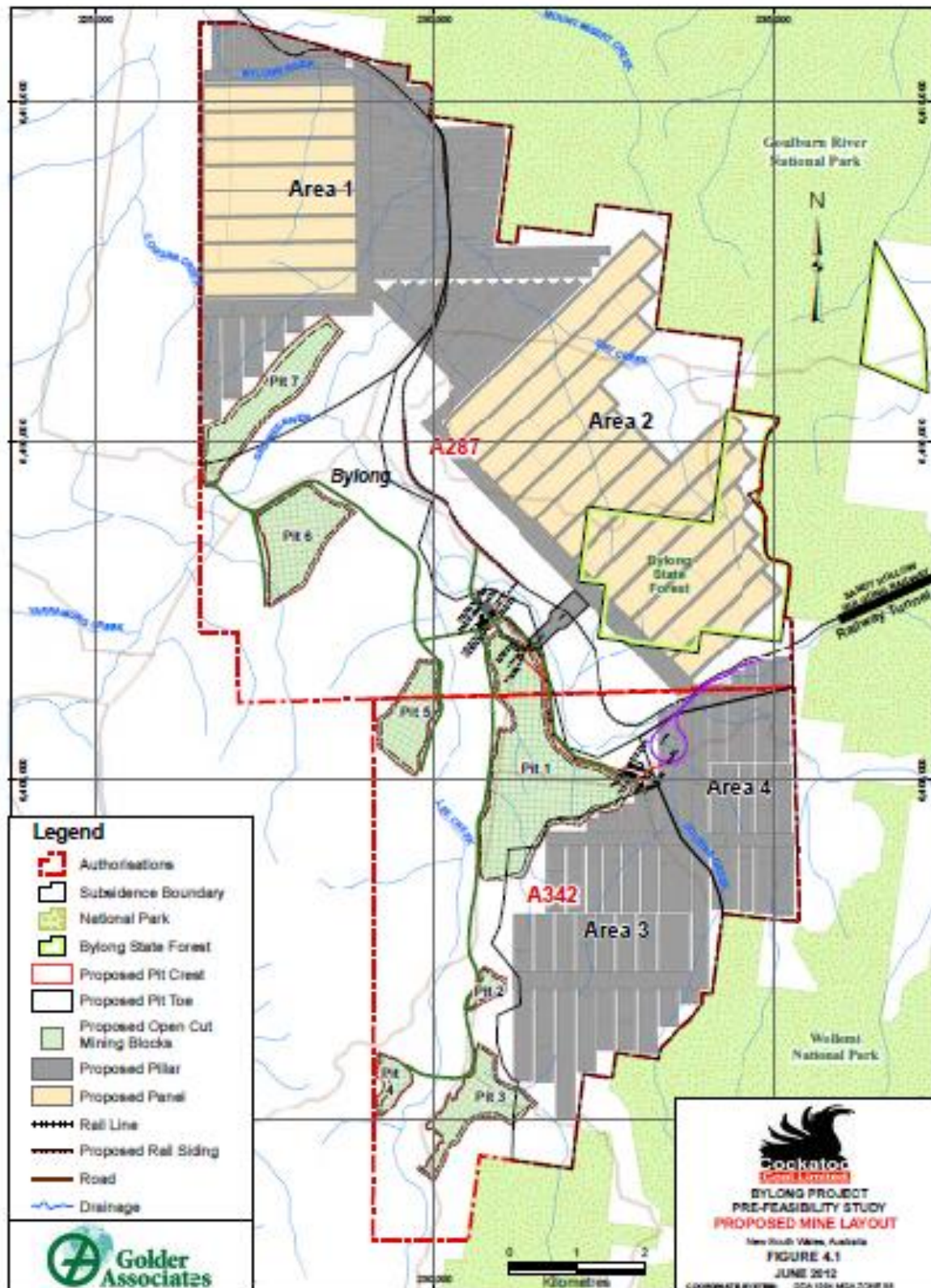


Table 1 - Summary of Options Considered

Option no.	Description	Status
Option 1	UG mining in all areas (area 2, then area 1 and then area 3). Infrastructure in the central location.	Not Current, due to unsatisfactory NPV
Option 2	UG mining in all areas with OC mining in pits 1 and 5 commencing in year 5.	Not Current, due to unsatisfactory NPV
Option 3	UG mining in all areas with OC mining in pits 1 and 5 commencing concurrently.	Not Current, due to unsatisfactory NPV
Option 4	UG mining in all areas with OC mining in pits 1 and 5 commencing in year 5 and then OC mining in pits 6 and 7 in year 13.	Not current due to a negligible impact on option 2's NPV
Option 5	UG mining in all areas with OC mining in pits 1 and 5 commencing concurrently and then OC mining in pits 6 and 7 in year 9.	Not current due to a negligible impact on option 3's NPV
Option 6C	OC mining in pits 1 and 5 with UG mining commencing in year 5 (Area 2, then Area 1 and then Area 3). UG mine accessed via drifts in the vicinity of the UG MIA and CHPP.	Current Plan
Option 7	OC mining in pits 1 and 5 with UG mining commencing in year 5 (area 2, then area 1 and then area 3) and more OC operations commencing in year 9 in pits 6 and 7. UG mine accessed via drifts in the vicinity of the UG MIA and CHPP.	Not current due to a negligible impact on Option 6C's NPV

For completeness, Option 7 entails the mining of OC Pit 6 and Pit 7 once pits 1 and 5 have been mined. No economic modelling has been carried out on this option as it has been found that bringing this additional coal into the model in year 9 has negligible effect on the NPV, and re-introduces the negative environmental impacts of mining Pit 6 and Pit 7.

From an infrastructure point of view, a preferred surface infrastructure location was identified in the centre of the leases, on land that is not currently owned by KEPCO. This has generally been termed the 'Central' option.

As a fall back for Option 1, a surface infrastructure location was also considered on land that is currently owned by KEPCO. This land is generally in the north western portion of the northern lease and has been termed the 'Northern' option.

2.1 Underground Options

2.1.1 Methodology

The UG section of the Options Study consisted of an options analysis to identify and evaluate alternative mining options, better understand the nature of the deposit and identify any potential areas where the existing mine plan could be improved. Following the technical review of the PFS it became clear that a broader study would need to be conducted. The scope of this broader study was to:

- review the available technical data and analysis conducted to date, identify shortfalls in the available information, and identify any technical concerns or potentially high risks to the Project,
- conduct appropriate studies to gain an understanding of the fundamental characteristics of the deposit, and
- recommend an optimal UG mine plan having considered a wide range of mining options developed from alternative mining methods, access locations, panel orientations and layouts.

Following the technical review, a margin ranking exercise was conducted to identify the key characteristics of the resource, to understand which areas should be targeted early in the mining schedule and those that should be left until the end or potentially omitted altogether.

The completion of the margin ranking enabled the commencement of an options identification stage in which a range of mine layouts were drawn up for each of the four target UG areas (Areas 1, 2, 3 and 4). This process was conducted as far as possible with an unconstrained viewpoint to avoid the exclusion of potentially viable mine designs. These layouts were rated by RPM's engineers and the most attractive options for each area were shortlisted.

Scheduling of the shortlisted layouts provided the time dimension necessary to conduct economic evaluation. Care was taken to eliminate bias from the analysis and as such the scheduling input parameters were fixed for all schedules. As part of the scheduling process high level equipment requirements were estimated to provide the input for initial and recurring equipment costs within the schedule.

Finally, a financial evaluation was conducted on each of the shortlisted layouts. The schedule outputs provided coal flow and activity information which, when combined with input unit cost rates, enabled operational costs to be estimated. Capital costs were estimated from planned activity and equipment requirement schedules and revenues from coal flow and market prices.

A final selection of the preferred mine plan was made primarily from the outcomes of the economic evaluation.

2.1.2 Exclusive Areas

UG mining on the Bylong lease area is highly constrained by a series of surface and subsurface features. These features include items such as alluvial flood plains and BASL. For the purposes of the margin ranking exercise, all areas affected by these constraints were removed from the analysis. In addition, it was determined that a minimum depth of cover of 80 m represented a practical lower limit to UG mining and as such these blocks were removed as well. The UG areas are almost exclusively contained under the hills that bound the Bylong Valley. The surface relief makes for a very uneven distribution of surface cover, which is quite different from many other UG mines in Australia.

2.1.3 Margin Ranking

The margin ranking study was aimed at building an understanding of cost and revenue drivers and determining their relative impact on cash margin across the Bylong deposit. Whilst the absolute margin value is important to determine whether an area is economically viable, it is the relativities between block margins that drive design, scheduling and thus, development decisions.

The results of the analysis suggest that the northern portion of Area 2 includes cash negative material. Even though there are a number of productivity and cost related drivers used in the model, this result is largely driven by low product revenue in this region. The change in this zone from a low ash (16%) product to a high ash (22%) ash product has a significant impact on cash margins. All other areas considered, including the remainder of Area 2 and all of Areas 1, 3 and 4, show cash positive margins and are therefore included as UG options.

2.1.4 Mine Layouts

A range of mining layouts and strategies were developed investigating primarily different panel orientations and access options. The optimal layouts were shortlisted and further developed with the aim of identifying the single optimal layout to take forward to the Feasibility Study stage. A number of constraints that each layout would need to comply with were identified prior to the commencement of the layout generation phase. These constraints were as follows:

- longwall operations would be targeted first with board and pillar operations used in those areas unsuitable for longwall mining methods or where resource was not exploited by a particular longwall layout,
- spontaneous combustion represents the primary risk to the UG operation and as such no more than two of the four target mining areas may be connected through the UG workings and simultaneously operated,
- where possible UG operations would be constrained to depths of cover greater than 80 m,

- no subsidence in alluvial areas, and
- subsidence control must be exercised under Tal Tal Mountain.

Subject to the constraints listed, nineteen (19) layouts were prepared. Each layout was confined to one or two of the target UG mining areas. It is notable that Area 4 is only ever laid out in conjunction with either Area 2 or Area 3, it is not deemed to be of sufficient size to warrant a specific layout of its own.

Shortlisting of the 19 options was achieved by assessing and comparing each alternative against the selection criteria. The impartiality of the rating system underpins the credibility of the outcome and for this reason the selection criteria were determined prior to the development of the layouts.

The selection criteria included resource recovery, target high margin coal early, practicality of the layout, orientation to joints, orientation to faults, orientation to horizontal stress, seam dip, surface subsidence, development ratio, ventilation and gas management, spontaneous combustion, system flexibility, conveyor transfer angles, conveyor complexity, and time to first longwall coal.

Each layout was scored independently by four engineers with the layouts ranked in order from highest to lowest score. Three layouts were selected for each area based upon their ranking.

Ultimately, 3 UG mining layouts within Area 2 were chosen to carry forward to options assessment; designated Layout 19c, Layout 5c and Layout 16c.

2.1.5 Options Assessment

A production schedule was developed for each of the three shortlisted layouts utilising RPM's XPAC scheduling software. The key inputs into the schedule are mining sequence, rate (allowing for mining conditions and location in the panel) and production time, cutting horizon, loss and dilution.

Each of these layouts chosen, Layout 19c, 5c and 16c, are in mining Area 2. The Area 2 layouts formed the basis for detailed assessment, with the findings/results then being applied to mining Area 1 and mining Area 3.

For each layout in Area 2, economic assessment was completed which included the following UG planning aspects:

- production scheduling,
- productivity rating,
- ventilation,
- mining equipment, and
- manpower.

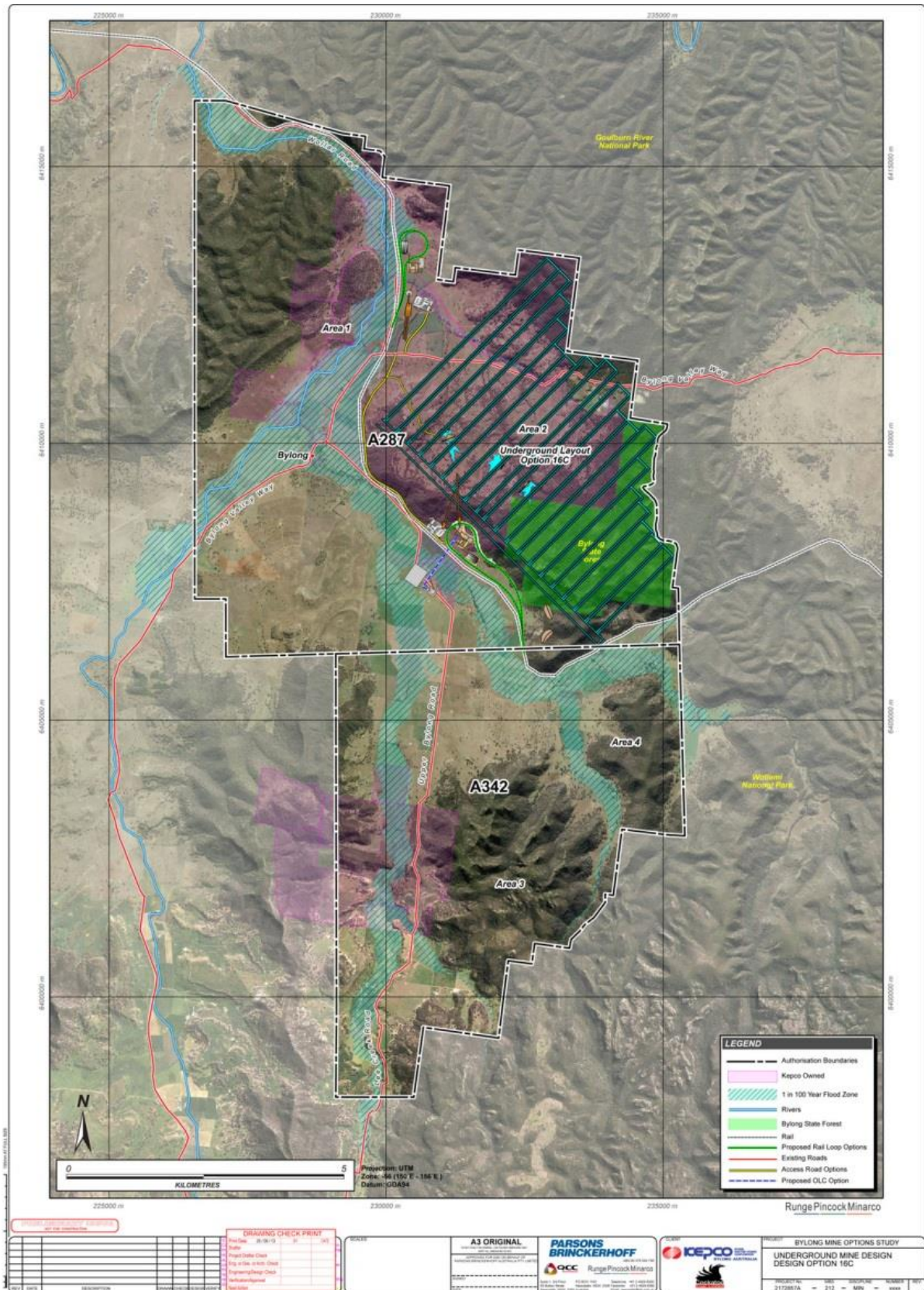
Finally, economic assessment resulted in Layout 16c being selected as the preferred UG mining option. Layout 16c is shown in Figure 2.

2.1.6 Underground Summary

The preferred UG mining option has the following key characteristics (UG areas and Layout 16C shown in Figure 2):

- UG mining commences in Area 2, progresses to Area 1, then to Area 3,
- UG Area 4 is not mined,
- production approximately 5 Mtpa ROM coal,
- predominantly longwall mining operations,
- no subsidence in alluvial areas, and
- subsidence controls under Tal Tal Mountain.

Figure 2 - Underground Mining Layout 16c



2.2 Open Cut Options

2.2.1 Methodology

The mine planning completed in the Options Study for open cut mining was based on information that was provided in the PFS and an updated March 2013 geological model.

OC mining potential exists in the valley areas associated with the Bylong River, Growee River and Lee Creek. The OC potential is constrained by subcrop zones, offset from alluviums associated with the drainage areas and escarpments that are prevalent within the authorisation.

A total of seven (7) OC pits were outlined in the PFS (see Figure 1). RPM examined the deposit characteristics, pit designs and production schedules associated with Pit 1 and Pit 5, which constituted Option 2 and Option 3 of the Options Study. Pit 6 and Pit 7 were also examined and combined with Pit 1 and Pit 5 to Study Option 4 and Option 5.

Pit 2, Pit 3 and Pit 4 as outlined in the PFS were not examined or considered by RPM in developing OC mining options. This was primarily for the purpose of minimising potential environmental impacts as these pits were in close proximity to creeks and sensitive alluviums. Pit 1 was also modified to reduce environmental impacts.

2.2.2 Pit Design

For the Options Study, RPM examined the OC pit limits provided for Pit 1 and Pit 5 and redesigned the OC pit wall crest limits. In the PFS, it is stated the pit limits were designed to:

- provide a buffer of 250 m from the centreline of the Bylong and Growee rivers,
- provide a minimum buffer of 100 m for Lee Creek and a 500 m drainage corridor along Lee Creek (at points where disturbance is located on both sides of the creek),
- avoid OC development within 1 km of the centre of Bylong township,
- minimise disturbance to Class II arable lands as mapped under the Land and Soil Classification system, and
- avoid OC development within 50 m of the toe of steeper terrain and escarpments.

In addition, RPM designed the OC pit to be a minimum of 150 m from the supplied alluvium limit lines. This is in line with the DIPNR Aquifer Interference Policy 2005 – stream aquifer guidelines. The effect of this additional constraint is that the pit shell footprint of Pit 1 is smaller than that used in the PFS while the Pit 5 footprint is effectively unchanged. Figure 3 shows the extent of the Pit 1 footprint used in the Options Study compared to that used in the PFS.

It can be seen that the area of Pit 1, and subsequently the mineable coal quantities contained within Pit 1, have both been reduced to accommodate the additional constraints imposed by DIPNR Aquifer Interference Policy 2005 but also in line with the predicted flood levels for the Bylong River and Lee Creek water courses. This is illustrated in Table 2, with a significant reduction in insitu coal quantity, from 39.8 Mt to 28.2 Mt, with a resulting increased in insitu strip ratio, from 4.2 bank cubic metres (bcm) of overburden/tonne (t) of insitu coal to 4.6 bcm/t.

Table 2 - Pit 1 Insitu Quantities

Pit 1	Geological Model	Overburden Mbcm	Coal Mt	Strip Ratio bcm/t
PFS Table 4.1	March 2012	139.3	32.1	4.3
PFS pit shell	March 2013	165.4	39.8	4.2
RPM pit shell	March 2013	128.8	28.2	4.6

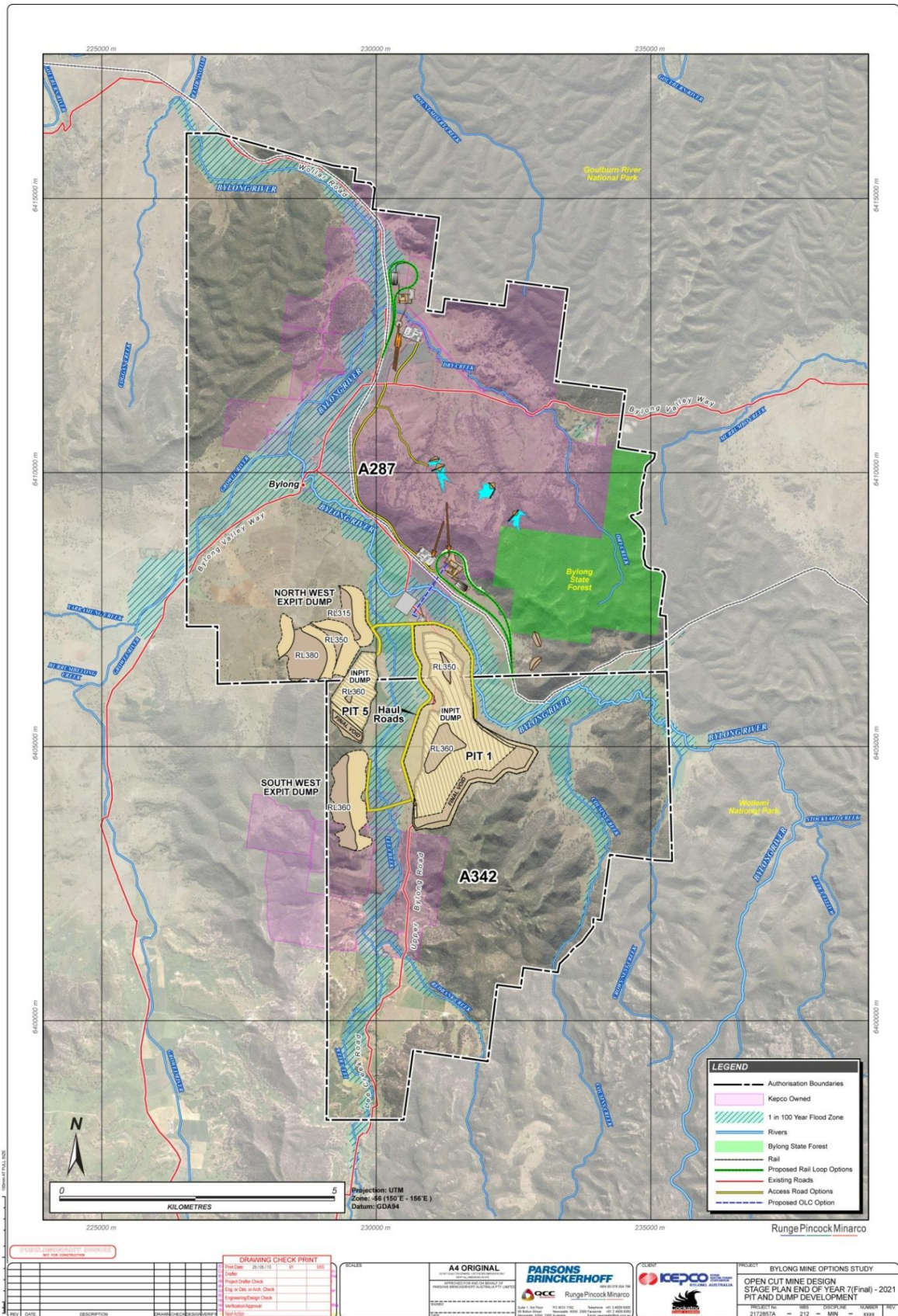
2.2.3 Overburden Emplacement

The disposal of overburden from OC Pit 1 and Pit 5 will both require ex-pit and in-pit emplacement. Ex-pit overburden emplacement will be required during the box cut development of both Pit 1 and Pit 5. Ex-pit emplacement areas have been identified from those used in the PFS and these areas have been used for the ex-pit emplacement volumes associated with this Options Study. The locations are:

- immediately south of Pit 5 and to the west of Pit 1, identified as the Southwest Ex-Pit Emplacement, and
- to the northwest of Pit 5 identified as the Northwest Ex-Pit Emplacement.
- These areas are illustrated in Figure 4.
- The quantities of overburden planned for each emplacement location are:
 - Southwest OEM = 16.4 Mlcm,
 - Northwest OEM = 41.4 Mlcm,
 - Pit 1 In-pit OEM = 167.8 Mlcm,
 - Pit 5 In-pit OEM = 31.9 Mlcm,
 - Total All OEM's = 257.5 Mlcm.

Whilst ex-pit emplacement on the surface is unavoidable during early development of any OC mine, the Bylong Project mine plan achieves the placement of approximately 78% of all overburden back into the mining void. This is a good result by industry standards and successfully minimises the amount of surface disturbance caused by overburden emplacement.

Figure 4 - Open Cut Stage Plan End Year 7



2.2.4 Open Cut Summary

Option 6C, which is the current preferred mining option, includes OC mining of both Pit 1 and Pit 5. This is a significant change from the earlier PFS, where OC mining was included for seven pits; Pit 1 through Pit 7 inclusive. The changes were made for the following reasons:

- PFS Pits 6 & 7 – too close to both Bylong Village and the Bylong Highway, and
- PFS Pits 2, 3 & 4 – too close to creeks and sensitive alluviums, and reserves too small.

In addition, RPM required the OC pit to be a minimum of 150 m from the supplied alluvium limit lines. This is in line with the DIPNR Aquifer Interference Policy 2005 – stream aquifer guidelines. The effect of this additional constraint is that the pit shell footprint of Pit 1 is smaller than that used in the PFS while the Pit 5 footprint is effectively unchanged. This is illustrated in Table 2, with a significant reduction in insitu coal quantity.

The final mine plan also minimises the total amount of surface disturbance by maximising the amount of overburden material placed back into the mining void; approximately 78% of total overburden.

2.3 Additional Open Cut Study

2.3.1 Background

The Options Study described in this report was completed and issued on 8 November 2013.

In September 2012, the NSW Government released the Strategic Regional Land Use Policy (the Policy) which applies state-wide in areas where there is high value agricultural land and increasing activity in the coal and coal seam gas industries. Under the Policy, State significant development proposals related to mining that are likely to impact on areas of Strategic Agricultural Land (SAL), both Biophysical Strategic Agricultural Land (BSAL) or Critical Industry Cluster (CIC) areas are subject to a new Gateway process.

Land was mapped as Strategic Agricultural Land (SAL) in the Upper Hunter and New England North West Strategic Regional Land Use Plans (SRLUPs) which were also released in September 2012. The legislation was amended in October 2013 to allow applicants to lodge application for a Gateway Certificate. The Upper Hunter SRLUP is relevant to the Project and mapped BSAL within the Bylong Authorisation areas on a regional basis. This regional mapping covered the alluvial boundaries – consistent with the Project teams understanding of the land that conformed to BSAL and the mine plan constraints that had been applied.

In April 2013, the NSW Government released guidelines for the Verification of BSAL. Extensive soils field work has been completed across the Authorisation boundaries since 2011, and was finalised in April 2013. Verified Mapping of BSAL was finalised in July 2013. This verified mapping has identified areas of BSAL within the OC mining areas, including in areas where the OEAs have been designed.

In the recommended Bylong Option 6C mine plan, Pit 1 and Pit 5 overly approximately 91 ha of BSAL. Also, there are approximately 33 Mbcm of overburden materials placed in area overlying approximately 70 ha of BSAL. Therefore, CCL initiated a review of the Option 6C mine plan with a view to determining:

- If the Option 6C Mine Plan can be reasonably modified so as to avoid any overburden emplacement over BSAL, and
- The potential environmental outcomes of relocating overburden emplacement.

2.3.2 Methodology

There are two designated overburden emplacement areas in Option 6C, the Northwest OEA and the Southwest OEA. The Northwest OEA overlies BSAL, while the Southwest OEA does not. Therefore, the emphasis was placed on removing the Northwest OEA and placing all of the overburden materials into the Southwest OEA.

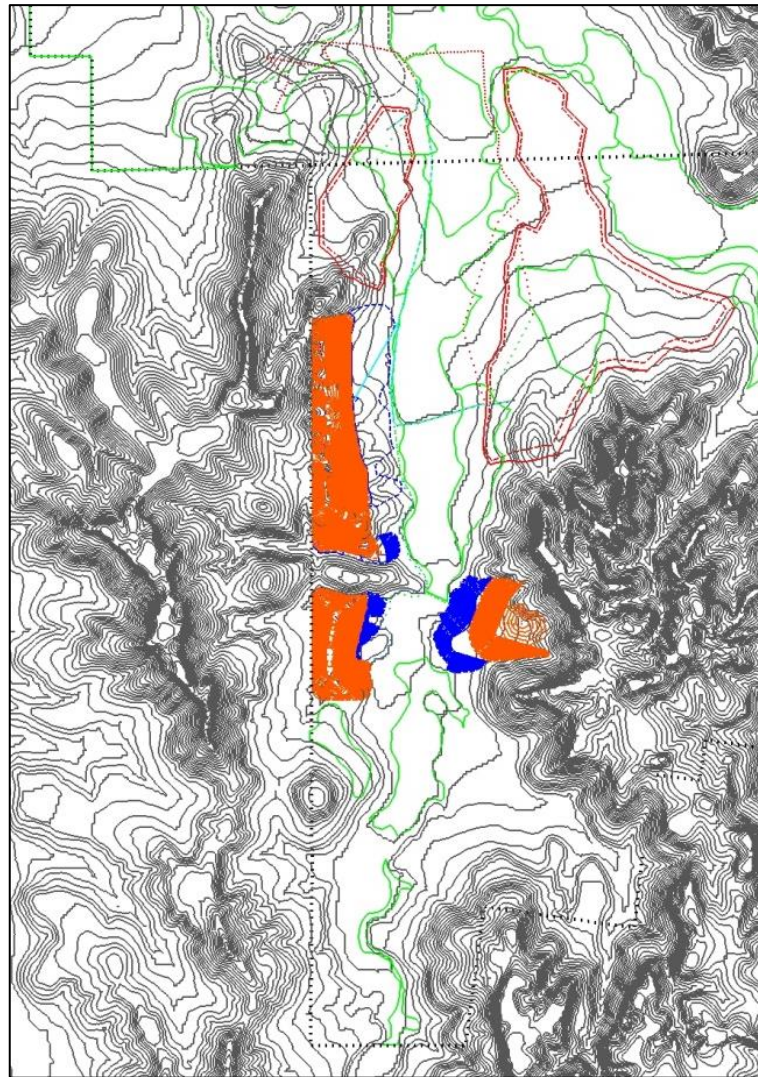
Three possible revised Southwest OEA's were identified; SW OEA1, SW OEA2 and SW OEA3. The first two, SW OEA1 and SW OEA2, were discarded on environmental impact grounds; the revised

OEA's would cross drainage lines and would require complex expensive surface water diversions. It was the considered opinion that the impact of these water diversions would likely be greater than the impacts of dumping over BSAL.

Whilst SW OEA1 and SW OEA2 were analysed, the results are not given here as these revisions were discarded as environmentally unacceptable. As such, SW OEA3 is the only reasonable alternative that is described here in this letter report.

The layout for SW OEA3 is given in Figure 5.

Figure 5 - SW OEA3



2.3.3 Outcomes

From Figure 5, it can be seen that the footprint of the Southwest OEA has increased significantly from the Option 6C footprint; see Figure 4.

A comparison of some key elements of the Option 6C overburden emplacement plans with the SW OEA3 plan is given in Table 3.

Table 3 - OEA Key Elements

Characteristic	Option 6C	SW OEA3
No of Active Working Areas	4	7
Total OEA Footprint	410 ha	420 ha
Maximum OEA Elevation	RL380	RL420
OEA Shape	Single Peak Emplacement	Series of Peaks and Valleys
Total Length of Expit Haul Roads	8 km	11 km

The table illustrates:

- SW OEA3 has more active working areas, a larger footprint, is more elevated, and is more complex in shape,
- SW OEA3 is therefore more difficult to manage to ensure practical environmental controls,
- more complex terrain results in additional environmental water retention structures, and
- greater length of haul roads will result in more noise, more dust, and greater haulage cost.

Other relevant outcomes of the study of SW OEA3 were:

- SW OEA3 goes into higher elevations and areas of steeper slopes. Steeper slopes normally require more significant environmental management systems to better control such factors as potential soil erosion and land rehabilitation,
- high level economic analysis suggests an increase in overall costs of approximately \$0.30/bcm overburden for 46 Mbcm during the first two years, which equates to \$3.30/t product coal of OC mining over this time due primarily to higher overburden haulage costs,
- the narrower overburden emplacement area may result in less operational flexibility and therefore less opportunity to schedule sensitive operations for either day or night operations.

A summary comparison of Option 6C and SW OEA3 is given in Table 4.

In view of the many environmental constraints already allowed for in the Option 6C mine plan along with the relative costs/benefits of revising the overburden emplacement plans to avoid BSAL, it is felt that Option 6C as presented remains the preferred mining option. Relocating overburden emplacement appears to create as many new environmental issues as it solves.

Table 4 - Comparison of Option 6C and Sw OEA3

Characteristic	Option 6C	SW OEA3
BSAL Disturbed	70 ha	None
OEA Footprint	410ha	420ha
Total Length of Haul Roads	8 km	11 km; longer haulage results in higher cost, more noise, more dust
Operational Complexity	-	more complex, making environmental management more difficult
Terrain	-	Steeper terrain means more difficult environmental management and rehabilitation

2.3.4 Off-Lease Overburden Emplacement

In the process of identifying alternative areas where additional overburden could be placed, rather than placing it over BSAL, it became apparent that there are potential areas which are off-lease; i.e. west of the current tenement boundary. RPM therefore studied a further off-lease alternative to use as a direct comparison with on-lease emplacement sites. This was designated as SW OEM4.

It is understood that it is possible to obtain approval for off-lease overburden emplacement through a Mining Lease for Mining Purposes Authorisation.

A brief summary of the outcomes of the off-lease alternative is:

- Two areas identified west of the lease boundary where overburden material could be placed,
 - one area 19 ha holding 3.3 Mbcm,
 - one area 12 ha holding 5.0 Mbcm,
 - these substitute for 53 ha of SW OEA3 area holding 7 Mbcm,
 - net result is a reduction of approximately 22 ha of disturbed area,
- off-lease areas are basically valley fills, meaning lower emplacement height and therefore more efficient sound buffers, and
- off-lease areas are generally closer to the pits, meaning less haulage distance; i.e. less cost, less noise, less dust.

On balance, it would appear that placing overburden off-lease offers potential for minimising environmental impacts while also reducing truck haulage costs. These conclusions are not confirmed as there has been no detailed environmental assessment of the potential impacts.

2.4 Option Study Summary

Beginning with 3 main options, the Options Study ultimately tested 7 options; defined as Options 1, 2, 3, 4, 5, 6C and 7 (see Table 1). The work concentrated mainly on Options 1, 2, 3 and 6C; with outcomes given as follows. Options 1, 2, 3 and 6C all have identical UG and OC mine plans. The only differences between the options are the sequencing of mining.

2.4.1 Option 1 - Underground Mine Only Commencing in 2017

The mine plan developed for Option 1 is the result of the UG mining evaluation described. The mine plan is based on the adoption of UG mine Layout 16c for Area 2, and similar layouts for Area 1 and Area 3. There is no plan to mine Area 4. All UG mining is from the Coggan seam only.

The UG mine plan has a total ROM tonnage of 138.5 Mt; comprising 86.3 Mt in Area 2, 28.3 Mt in Area 1 and 23.9 Mt in Area 3.

Initial mining is from Area 2 in the period 2017 until 2039 with an average annual output of 4.5 Mtpa ROM peaking at 5.6 Mtpa ROM in 2037.

Area 1 is mined following Area 2 from 2039 until 2047 with an average annual output of 3.5 Mtpa ROM peaking at 4.3 Mtpa ROM in 2045.

Area 3 is mined after Area 1 from 2047 until 2056 with an average annual output of 2.5 Mtpa ROM peaking at 3.3 Mtpa ROM in 2054.

For the life of the UG mine, a single wash plant module with a nominal 5 Mtpa ROM coal capacity will be sufficient to process the ROM coal to product. Coarse reject and tailings from the CHPP will need to be retained in surface storages that are constructed specifically for this purpose and described in the infrastructure section.

2.4.2 Option 2 - Underground Mining in 2017 followed by Open Cut Mining in 2021

The mine plan developed for Option 2 is the identical UG mine plan as outlined above complemented by OC mining commencing in year 5; 2021.

The OC mine plan is the outcome of that presented earlier. In summary, OC mining is planned in Pit 1 and Pit 5 for a total of 29.9 Mt ROM and 167.5 Mbcm of overburden at a strip ratio of 5.6:1 (bcm/t ROM). OC mining is planned over a 7 year period from 2021 until 2027 at a nominal 5.0 Mtpa ROM rate. OC ROM coal is from the Ulan and Coggan seams. OC mining will complement the UG mining operation when it is at full production. The ROM production from the Option 2 schedule will be a nominal 10 Mtpa for a period of 7 years from 2021 to 2027.

In total, 168.4 Mt ROM will be mined over the 40 year mine life, the mine life being determined by the duration of UG mining.

For Option 2, a second CHPP module of 5 Mtpa will need to be added in 2021 to provide a nominal 10 Mtpa capacity to process the ROM coal to product. The design envelope of the CHPP will need to be able to handle the washability characteristics of both the Ulan and Coggan seams. The life of one of the modules of the CHPP will only be 7 years as a single module CHPP will be sufficient to handle the ROM coal production for the UG operation when OC mining from Pit 1 and Pit 5 is complete.

2.4.3 Option 3 - Underground Mining and Open Cut Mining Commencing in 2017

The mine plan developed for Option 3 is the identical UG mine plan as outlined in 2.4.2 above complemented by OC mining commencing in year 1 or 2017. Similarly the OC mine plan is the outcome of that presented earlier with OC mining planned in Pit 1 and Pit 5 for a total of 29.9 Mt ROM and 167.5 Mbcm of overburden at a strip ratio of 5.6:1 (bcm/t ROM).

OC mining is planned over a 7 year period from 2017 until 2023 at a nominal 5.0 Mtpa ROM rate. OC ROM coal is produced from the Ulan and Coggan seams. OC mining will complement the UG mining operation as it ramps up in production during the development phase of 2017 to 2019 and then when it is at full production producing from both development and longwall retreat. The ROM production from the Option 3 schedule will be a nominal 10 Mtpa for a period of 7 years from 2017 to 2024 although there will be a ramp up over the first 2 years of the OC schedule and a ramp down in the last year of the OC schedule.

In total, 168.4 Mt ROM will be mined over the 40 year mine life, the mine life being determined by the duration of UG mining.

For Option 3, two CHPP modules of 5 Mtpa will need to be provided from 2021 to provide a nominal 10 Mtpa capacity to process the ROM coal to product. The design envelope of the CHPP will need to be able to handle the washability characteristics of both the Ulan and Coggan seams. The life of one CHPP module will only be 7 years however as a single CHPP module will be sufficient to handle the ROM coal production for the UG operation when OC mining from pit 1 and pit 5 is complete.

2.4.4 Option 6C - Open Cut Mining Commencing in 2017 followed by Underground Mining in 2021

The mine plan developed for Option 6C commences with OC mining in 2017 followed by UG mining 5 years later in 2021. The analysis of Options 1, 2 and 3 outcomes indicate the Project would benefit from the higher margin OC operation in the earlier years. Also, because of the relatively short life of the 29.9 Mt ROM coal OC operation, keeping the CHPP to a single wash-plant module would be beneficial to project capital cost and therefore overall project economics.

The development strategy behind Option 6C therefore is to commence with OC mining of Pit 1 and Pit 5 and merge the UG mine plan of Option 1 with the OC schedule. The UG mine plan as outlined earlier is that used for Option 6C but commencing in 2021.

Similarly the OC mine plan is the outcome of that presented earlier with OC mining planned in Pit 1 and Pit 5 for a total of 29.9 Mt ROM and 167.5 Mbcm of overburden at a strip ratio of 5.6:1 (bcm/t ROM). OC mining for Option 6C is planned over an 8 year period from 2017 until 2024 at a nominal 5.0 Mtpa ROM rate. The slightly longer duration of OC mining in Option 6C compared to Options 2 and 3 (8 years compared with 7 years) is to provide a smoother combined OC and UG ROM coal schedule to match the CHPP requirements of a single wash-plant module at a nominal 5 Mtpa.

In total, 168.4 Mt ROM will be mined over the 44 year mine life (4 years longer than Options 1, 2 and 3), the ultimate mine life being determined by the duration of UG mining.

For Option 6C, a single CHPP wash-plant module of 5 Mtpa will need to be provided from 2017 to provide a nominal 5 Mtpa capacity to process the ROM coal to product. The design envelope of the CHPP will need to be able to handle the washability characteristics of both the Ulan and Coggan seams. The Ulan and Coggan seams are mined in the OC and only the Coggan seam in the UG.

During the 8 year operating life of the OC, disturbed areas will be progressively rehabilitated so that one year after completion of OC operations, all disturbed areas apart from the reject emplacement space in Pit 1 will have been rehabilitated. At the conclusion of UG mining, the pit void will have been filled with reject. The pit will be capped with rehandled overburden from the nearby south-west out-of-pit emplacement, and both the capped in-pit emplacement and disturbed south-west out-of-pit emplacement will be finally rehabilitated.

2.5 Recommended Mine Plan

The mine plan recommended after the Options Study is Option 6C as described above in Section 2.4.4.

The key features of Option 6C are as follows:

- production approximately 5 Mtpa ROM from both OC and UG mining,
- OC mining 2017 to 2024 inclusive,
 - OC mining in PFS Pit 1 (with some modification to better address environmental issues) and PFS Pit 5,
 - OC pits shown in **Error! Reference source not found.**,
 - no mining in PFS Pits 2, 3, 4, 6 or 7,
 - 2 overburden emplacements; northwest OEA and southwest OEA,
- UG mining commencing in 2021 to 2060,
 - UG mining in PFS Area 1, PFS Area 2 and PFS Area 3,
 - UG Areas shown in Figure 2,
 - no mining in PFS Area 4, and
- One wash plant of 5 Mtpa ROM capacity to accommodate processing of both OC and UG mining coal.

The evolution of mine planning and eventual selection of Option 6C as the preferred development strategy was driven by project economics as well as numerous environmental considerations, including all of the following:

- Underground (UG) mining,
 - UG mining is highly constrained by alluvial flood plains and BSAL. All areas affected by these constraints were removed from the Options Study,
 - no subsidence permitted in alluvial areas,
 - subsidence control must be exercised under Tal Tal Mountain,
- OC mining,
 - PFS Pits 6 & 7 – too close to both Bylong Village and the Bylong Valley Way,
 - PFS Pits 2, 3 & 4 – too close to creeks and sensitive alluviums,
 - a buffer of 250 m from the centreline of the Bylong and Growee rivers,
 - a minimum buffer of 100 m for Lee Creek and a 500 m drainage corridor along Lee Creek (at points where disturbance is located on both sides of the creek),
 - avoid OC development within 2 km of the centre of Bylong township,
 - minimise disturbance to Class II arable lands as mapped under the Land and Soil Classification system,
 - avoid OC development within 50 m of the toe of steeper terrain and escarpments, and

- the OC pit to be a minimum of 150 m from the supplied alluvium limit lines in line with the DIPINR Aquifer Interference Policy 2005 – stream aquifer guidelines.

In the recommended Bylong Option 6C mine plan, Pit 1 and Pit 5 overly approximately 91 ha of Biophysical Strategic Agricultural Land (BSAL). Also, there are approximately 33 Mbcm of overburden materials placed in area overlying approximately 70 ha of BSAL.

The recommended Option 6C sacrifices substantial coal by mining only Pit 1 and Pit 5 and also by reducing the size of Pit 1 to avoid sensitive alluviums.

Ultimately, CCL believes that Option 6C represents a responsible development strategy balancing economic extraction with environmental impacts.