Centennial Coal

Clarence Colliery

Long Term Reject Emplacement Strategy

November 2014

Centennial Coal
Environment Matters

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1. Introduction

Clarence Colliery operates the existing underground Clarence coal mine (**Clarence Mine**), near the village of Clarence in NSW, for and on behalf of the joint venture companies who own it. Approval to commence activities at the Clarence Mine was originally granted in 1976.

Clarence Colliery is an underground partial pillar extraction mine that commenced operations in 1979. Clarence Colliery has existing development approvals in place enabling production of up to 3 million tonnes per annum (**Mtpa**), but currently produces approximately 2.5 Mtpa. Coal is extracted from the Katoomba Seam and there are reserves for approximately 25 years of operations at existing extraction rates.

The mine is located approximately 15 kilometres (**km**) east of Lithgow in the Western Coalfields of NSW. The mine entry and primary surface facilities are accessed from the Bells Line of Road. The mine produces coal predominantly for the export market railing product coal to Port Kembla for shipping, however the mine also produces a product coal for the domestic market. Coal to the domestic market is transported via road in haul trucks and is limited to 200,000 tonnes per annum (**tpa**).

The mine entry and primary surface facilities within the existing Mining Leases (approximately 7735 hectares) are located in the Wollangambe River, Bungleboori Creek and Farmers Creek catchments, with a small area in the north west of the lease (approximately 20 hectares) draining to the Wolgan River. The Clarence Colliery pit top is located adjacent to the Blue Mountains National Park within the Wollangambe Catchment. Consequently there is a high level of scrutiny on environmental management, in particular the potential for a pollution incident off site.

To reach market specifications, Clarence Colliery processes coal at its onsite Coal Handling and Preparation Plant (**CHPP**). The CHPP was originally designed and built in the late 1970's and can process up to 650 tonnes per hour. A waste product from the coal processing is reject material. The generation of reject material is a necessary component of coal processing as it enables Clarence Colliery to meet market product quality specifications. Therefore the management of reject material now and into the future will continue to be an essential function of the Clarence Coal Mine. To this end, the ability to secure areas and emplace the reject material over the life of the mine is fundamental to the ongoing mining activities.

2. Scope and Purpose

The purpose of this report is to

- provide an overview of the current reject emplacement facilities located at Clarence Colliery;
- provide some details as to the geochemistry of the reject material;
- provide details of the future proposed reject emplacement opportunities in the short, medium and long term;
- develop a strategy for the preferred long term reject emplacement facility; and
- comply with Condition 24A of Clarence's development consent (set out below)

Clarence Colliery received approval for its Reject Emplacement Area VI in June 2014. Condition 24A states:

The Applicant shall prepare and implement a long term Reject Management Strategy for the project to the satisfaction of the Secretary. This plan must be:

a) prepared in consultation with SCA, EPA and OEH;

b) consider alternatives to reject emplacement, including beneficial re-use and underground disposal; and

c) be submitted to the Secretary for approval by the end of November 2014.

This report has been developed using information available at the time of writing. Expected coal quality (and therefore reject production) over the mining lease has been generated from the geological model current as at November 2014.

Expected market product specification has been estimated based on historic records and is considered current as at November 2014. Annual production rates are based on a maximum of 2.6 Mtpa.

3. Reject Emplacement Activities

3.1 Background

The requirement for reject emplacement facilities is a function of coal quality, coal production and market specifications which may change from time to time. More recently, Clarence Colliery has been producing coal for markets that demand an ash content of

- Domestic ash is 16% no cake; and
- Export varies with 15 - 16% ash with no filter cake, 18% with filter cake and 20% Run of Mine only.

Moisture content should not exceed 10%.

Historically, Clarence has produced an average of 144,811 tonnes of reject material per annum. Since 2008, the generation of reject material has steadily increased:

- 2008 – 150,132 tonnes
- 2009 – 77,126 tonnes
- 2010 – 121,378 tonnes
- 2011 – 183,095 tonnes
- 2012 – 192,324 tonnes
- 2013 – 227,094 tonnes
- 2014 – 117,693 as at 1 November 2014

The increasing reject generation may be a factor of the increased production over the years and more recently (especially in 2013), the increased mining activity in the western portion of the mining lease (discussed further below) which is of a lower quality. The reduced volumes in 2014 are more likely a result of mining activities within the 800 and 900 Areas which are located in areas where there are generally more favourable coal qualities.

3.2 Reject Material

Twelve reject samples were taken from various reject emplacement areas at Clarence during 2013 to determine the characteristics of the reject material. The objective of this project was to gain an understanding of the potential risk for acid metalliferous drainage (**AMD**). The analysis was carried out by GHD.

Based on a consideration of all data assessed by GHD, the reject to be emplaced at REAVI is likely to have a potential for minor AMD production, although the risk is considered low due to the low mean concentration of reactive sulfide, as determined by chromium reducible sulfur analysis on the 12 geochemical samples reported herein (0.02%). The inherent capacity of reject to neutralise this acidity however, is limited due to minimal concentrations of readily available neutralising carbonate minerals. Therefore, the mineral waste requires appropriate management through the operational, closure and post-closure mine stages to minimise potential impacts to the environment.

This is important information as it highlights the need to consider acid neutralisation management strategies and/or leachate water treatment in the design of any reject emplacement facility. Additionally, it highlights the need for a robust water

management strategy to contain and treat water to an acceptable standard prior to its release off site.

3.3 Current Reject Management

Clarence Colliery currently has approval for the development of a number of reject emplacement facilities. Each reject emplacement facility is described below with a brief description of its status.

REA I and II – completed and partially rehabilitated.

REA III – 1.74 Mt. Still in operation.

REA IV – 0.54 Mt (approximately). Completed, capped and topsoiled. Trees have been placed across the contour and planning is underway to revegetate the area.

Photographs of the rehabilitation activities at REA IV are provided in **Plates 1** and **2**. This demonstrates Clarence's commitment towards progressive rehabilitation where REA facilities are no longer in use.

Plate 1. Rehabilitation of REA IV

Plate 2. Rehabilitation of REA IV

Figure 2 presents the location of these REAs.

Figure 1. Location of Reject Emplacement Areas at Clarence

Clarence Colliery does not produce tailings. Fines material is passed through a filter press to recover the water component. The fine coal material (referred to as filter cake) is also recovered and stored on site to be blended with product coal for sale. Approval has recently been procured to transport 100,000 tpa to the west to supply a local customer.

Clarence manages its reject emplacement activities in accordance with MP-2478 Reject Emplacement Management Plan, Slope Stability Management Plan, Topsoil Management Plan, Water Management Plan and associated safe work procedures. Key considerations in the design and construction of emplacement facilities at Clarence Colliery include:

- Slope stability – batters usually 3H:1V to ensure a stable structure, transferred, placed and compacted to approximately 1.7 t/m^3. Targeted factors of safety for slope stability should be around 2;
- Water management – clean and dirty water need to be separated with clean water diverted around the disturbed areas. Leachate water from the REA is diverted underground for mixing with underground water make so that the water stream going into the water treatment plant is a consistent quality;
- Leachate water adequately captured and diverted underground to ensure a consistent water quality feed to the water treatment plant;
- Progressive construction – to ensure minimal areas are cleared as necessary;
- Fit for purpose machinery monitored through daily inspections;
- Performance monitoring – regular engineering assessments of the emplaced material are conducted, visual inspections and surveys of batter slopes, sporadic compaction testing, water quality testing of leachate material, inspection and maintenance of constructed drains, rehabilitation monitoring using Land Function Analysis techniques;
- Spontaneous combustion and compaction management;
- Early Rehabilitation planning – vegetation and topsoil cleared shall be stockpiled on site and utilised at the nearest most available time, regular seed collection from site and propagation of seed;
- Contractor management; and
- Surface transport and communication.

It is noted that recent compaction testing (carried out in July 2014) has confirmed a compaction rate of 1.65 t/m^3. These results are consistent with previous compaction testing completed in the last 12 months. Whilst there is no formal compaction procedure in place, operator practice has demonstrated that compaction of the reject is adequately managed. Currently, the practice (demonstrated as successful) is as follows:

- end stack material;
- flatten with big pusher; and
- roll material in using rubber tyres on the machine.

3.4 Projected Reject Generation

This section explores the determination of a worst case annual reject production. **Table 1** below presents a preliminary estimate of reject production for the longer term. **Table 1** has considered several "yields" and assumes the following:

- Annual run of mine coal production is 2.6 Million tonnes (**Mt**);
- Run of mine coal available in the deposit is approximately 50 Mt;
- Life of Mine based on the above production is estimated to be 20 - 25 years.

Average yield at the washery for the January – December 2013 period was 85.8% which is very low. This yield was probably a result of the mining activities within the 700 Area where the seam has a projected ash content of 20 - 22%. In addition to this, the mining practice produced considerable dilution due to the natural variability in the seam height and current practice which limits cutting height to 3m. Since October 2013 (when Clarence moved out of the 700 Area after completing extraction of the 716 panel), average yield increased to 91%. Average yield at the washery for the January to November 2014 has been 90%, an improvement on the average yield from 2013. This is most certainly a reflection of the coal quality extracted from the 700W area of the mine. Projected life of Mine yield is 94%. For this reason, **Table 1** presents a range of yields varying between 90 - 94% to estimate potential reject volumes. This includes a blend of ROM coal and washed coal which is usual practice at Clarence.

Table 1. Estimated Reject Material Generation for Life of Mine

Yield	ROM Production	LoM Total Reject	Annual Reject t (100% washed)	Annual Reject t (60% washed)
90%	2.6 Mt	5.13 Mt	260,000	156,000
	2.0 Mt	5.13 Mt	200,000	120,000
92%	2.6 Mt	4.1 Mt	208,000	124,800
	2.0 Mt	4.1 Mt	160,000	96,000
94%	2.6 Mt	3.1 Mt	156,000	93,600
	2.0 Mt	3.1 Mt	120,000	72,000

Note: based on 51.3 Mt of available coal with production varying between 2.0 – 2.6 Mtpa

The annual average reject production over a six year period is around 158,500tonnes. This is similar to a 90% yield, washing 60% of the run of mine coal product. To this end, an annual forward projection rate of 156,000 tpa will be used with a maximum worst case scenario of 250,000 tpa for the purposes of this report. The annual forward projection is slightly higher than the average 2,600 tonnes per week currently being experienced over the 2014 period to date. For this reason, the annual forward projection rate of 156,000 tpa is considered to be a reasonable assumption.

Based on preliminary estimations and performance from the first half of 2013, it would be prudent for Clarence to plan for sufficient capacity based on 250,000 tonnes reject material per annum, based on a 20 year mine life. This is obviously a worst case scenario, but reasonable for planning purposes. This should be reviewed annually.

Over the next five years, most of the mining activity will take place in the 900 Area and the 800 Area. The mining schedule has been set up so that two units will develop/extract panels in the 900 Area and two units will develop/extract panels in the 800 Area (as is currently the case). The objective of this schedule is to blend the coal quality from the two separate areas of the mine to produce a consistent stream of reject material. Whilst the geological model indicates that coal quality will be variable across the remainder of the mining lease, two panels producing in each area of the mine is likely to standardise the generation of reject material. To this end, securing sufficient cost effective reject emplacement solutions is vital for the ongoing Clarence mining operation.

3.5 Reject Management Considerations

In terms of managing a Reject Emplacement Area, the following needs to be in place.

- Engineering Design and sequencing completed by a qualified and experienced Geotechnical / Dams Engineer. Detailed design must be generally consistent with the terms of any approvals issued;
- Water Management Plan – diversion of clean water around the emplacement facility;
- Knowledge of the geochemistry of the reject material to adequately plan for leachate treatment and potential risks from storing the material;
- Adequate containment and treatment of leachate water;
- Compaction Procedures and spontaneous combustion management;
- Surface transport and communication management;
- Reject Emplacement Management Plan – including inspection and survey schedules, inspection formats, training requirements, roles and responsibilities, engineering assessments, communication rules, other monitoring; procedures, etc
- CHPP Stockpile Management Plan;
- Ensure REAs are included in the Mine Operating Plan and that an Approved Plan is current and signed off by the Mine Manager;
- Slope Stability Management Plan;
- Current Risk Assessment;
- Rehabilitation Management Plan – including clearing and stockpiling material from site for use in the rehabilitation, and monitoring of completed rehabilitation;
- Development consent in place issued under the Environmental Planning and Assessment Act 1979;
- S100 Approval (Coal Mines Health and Safety Act 2002) in place prior to construction;

- Construction and Environmental Management Plan;
- If reject material is to be directed to a third party, the Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A (The coal washery rejects general exemption 2009) must be complied with, alternatively, an exemption must be in place;
- A mining lease exists over the REA and associated infrastructure; and
- The Environment Protection Licence covers the reject emplacement area.

These have been highlighted to provide a list of operational requirements at Clarence Colliery. This provides a quick reference when considering the future operational needs of an emplacement facility.

4. Future Emplacement Considerations

4.1 Background

Clarence requires a strategy to ensure sufficient capacity is available to safely manage reject material. Clarence has a short-medium term solution and has assessed a number of options for a longer term solution. This Section presents the medium term solution and also presents a range of options for longer term management.

4.2 Short – Medium Term Reject Management

In the medium term (2 – 4 years), Clarence proposes to emplace reject material into the REA VI which is currently (as at November 2014) under construction. Commissioning should take place during late November 2014.

The REA VI will provide capacity for 500,000 – 550,000 tonnes. At an annual projection of 156,000 tpa there should be sufficient capacity for 3.5 years. However, should the generation of reject material equal that produced in 2013, the life of the new emplacement facility could be as short as 2 years. This highlights the importance of the mining schedule and managing activities across two separate areas of the mine. Projected average ash in the 800 Area is expected to be 14-16% and projected average ash in the 900 Area is expected to be 16-18%. Careful mining of the resource is likely to produce a ROM coal stream with ash anticipated to be around 17% (+/- 1.5% with some dilution due to seam height variation). For this reason, it is highly unlikely that 250,000 tpa will be produced.

Without being too conservative, it could be expected that REA VI will reach capacity by the end of 2017 if full utilisation commences in November 2014. This means that Clarence needs to confirm its longer term reject emplacement management ready for implementation by the end of 2017. Since 2012, Clarence has been working toward a Longer Term Reject Emplacement Strategy. This is further detailed in **Section 5** and is the subject of this report. Clarence has also considered a number of longer term alternatives (see **Section 4.3**), but believes that the solution presented in **Section 5** is superior as it has greater potential to cost effectively deliver a sustainable long term solution and delivers a superior outcome at the end of its life.

A number of options have been considered in an effort to plan for future requirements. **Section 4.3** includes all options considered with specific detail regarding those options considered not to be viable for Clarence. It is important to document these options as it provides some context in support of the preferred options. This includes a short and medium term (2 – 3 years), and longer term option (3+ years).

4.3 Future Reject Emplacement Management Options

The future options that have been considered include:

- Utilisation of the approved Reject Emplacement Area V located within the Clarence Mine Rail Loop;
- Coal Reject Emplacement at the neighbouring Sand and Kaolin Operations;
- Emplacement of Coal Reject within Underground workings at Clarence Mine;

- Emplacing material into the Rocla Quarry;
- Beneficial re-use of the reject material;
- Emplacing material into available void space at the Hanson's Quarry; and
- 'Do Nothing'.

The following documents the options considered but deemed to be unsatisfactory for Clarence. The rationale behind the decision making process (as at November 2014) is also provided.

4.3.1 Reject Emplacement Area V

Clarence Colliery currently has approval to develop the REA V. Despite this, Clarence does not wish to commission REA V at this time because it is not a cost effective solution to emplace reject material. Utilising REA V will involve interactions with critical business infrastructure including the Clarence Colliery rail loop and rail loading facilities required to transport product coal to export markets presenting a significant risk to continued operations.

In addition to the business interruptions, a 66kV powerline has been constructed through the REA V footprint since it was originally approved in the mid 1990's. The powerline traverses through the middle of REA V which would require the following prior to its commissioning:

1. Relocation of the 66kV powerline; OR

2. Reduction in approved capacity to allow emplacement to occur around the powerline if it is not relocated.

Relocating the 66kV powerline will add to the project cost and likely incur an additional time delay of approximately 12 – 18 months to procure the relevant approvals.

REA V (as it is currently approved) covers an area of approximately 6 hectares and offers a capacity of approximately 0.48 Mt. Compared to REA VI, REA V requires a larger area of vegetation clearance for less capacity. If the powerline is not relocated, capacity of REA V will be reduced by approximately 25 – 30%. A clearance of at least 20 m either side of the powerline centre will need to be retained for a safe buffer for heavy vehicles working in proximity to the powerline. The benching of reject material would need to occur either side of the powerline as opposed to continuous benching substantially reducing available capacity. Two entries will need to be developed to avoid heavy vehicle interaction directly underneath the powerline. Additionally, access along the power line will need to be retained to ensure Endeavour Energy can still access the powerline for servicing and vegetation clearance.

At a maximum and highly conservative coal reject production rates of up to 250,000 tpa, REA V would reach its approved capacity of 480,000 tonnes in less than 2 years (assuming the 66kV powerline was relocated). The costs associated with commissioning REA V for such a potentially short life is not considered to be economically sound at this time particularly where a more cost effective solution with

minimal (acceptable) environmental and social impacts is potentially available (subject to approval).

Initial use of the REA V could occur within 3 – 6 months, however it would most likely take 8 – 10 months to construct and commission the infrastructure to fully develop and utilise the remainder of the REA V. The REA V will provide no more than 2 – 3 years capacity (and less than the REA VI).

Capital infrastructure requirements to facilitate the emplacement of Coal reject in REA V would likely include (as approved):

- 300 m – 400 m of additional conveyor from the CHPP to a location inside the rail loop. There will also be associated gantry installations, drivages and transfers;
- Installation of a 250 tonne hopper inside the rail loop;
- Clearing the site of vegetation, topsoil and subsoil;
- Safe crossing over the rail loop;
- Clarence Colliery would also have to complete the required environmental assessments and potentially obtain the relevant planning approvals for the infrastructure upgrades.

Clarence Colliery does not wish to commission REA V at this time because it is not a cost effective solution to reject emplacement. Utilising REA V will involve interactions with critical business infrastructure including the Clarence Colliery rail loop and rail loading facilities required to transport product coal to export markets presenting a significant risk to continued operations. Having said that, REA V has been highlighted as a suitable short term contingency should the preferred longer term reject emplacement be delayed for any reason.

4.3.2 Rocla Quarry

The concept of emplacing reject at the disused Clarence Rocla Quarry has been explored. The final void left by sand mining operations is located approximately 1.5 kilometres south-east of Clarence Colliery and would provide a reject emplacement capacity of approximately 600,000 tonnes (**Figure 2.6**). The establishment of this facility requires the purchase of the quarry, installation of infrastructure in order to facilitate the transport of reject material and the management of environmental impacts (noting that the facility is in very close proximity to the Blue Mountains National Park). It is noted that the downstream section of the quarry contains a Temperate Highland Peat Swamp on Sandstone (**THPSS**), a State and Federally listed Endangered Ecological Community. This would mean great care would need to be taken to transfer leachate water and storm water runoff back to Clarence to avoid a discharge in to the THPSS. Additionally, there are several THPSS located in between Clarence and the Rocla Quarry that would need to be avoided. The Newnes Kaolin Sand Quarry lease also lies between the Clarence Mine and the Rocla Quarry which shares a boundary with the Blue Mountains National Park.

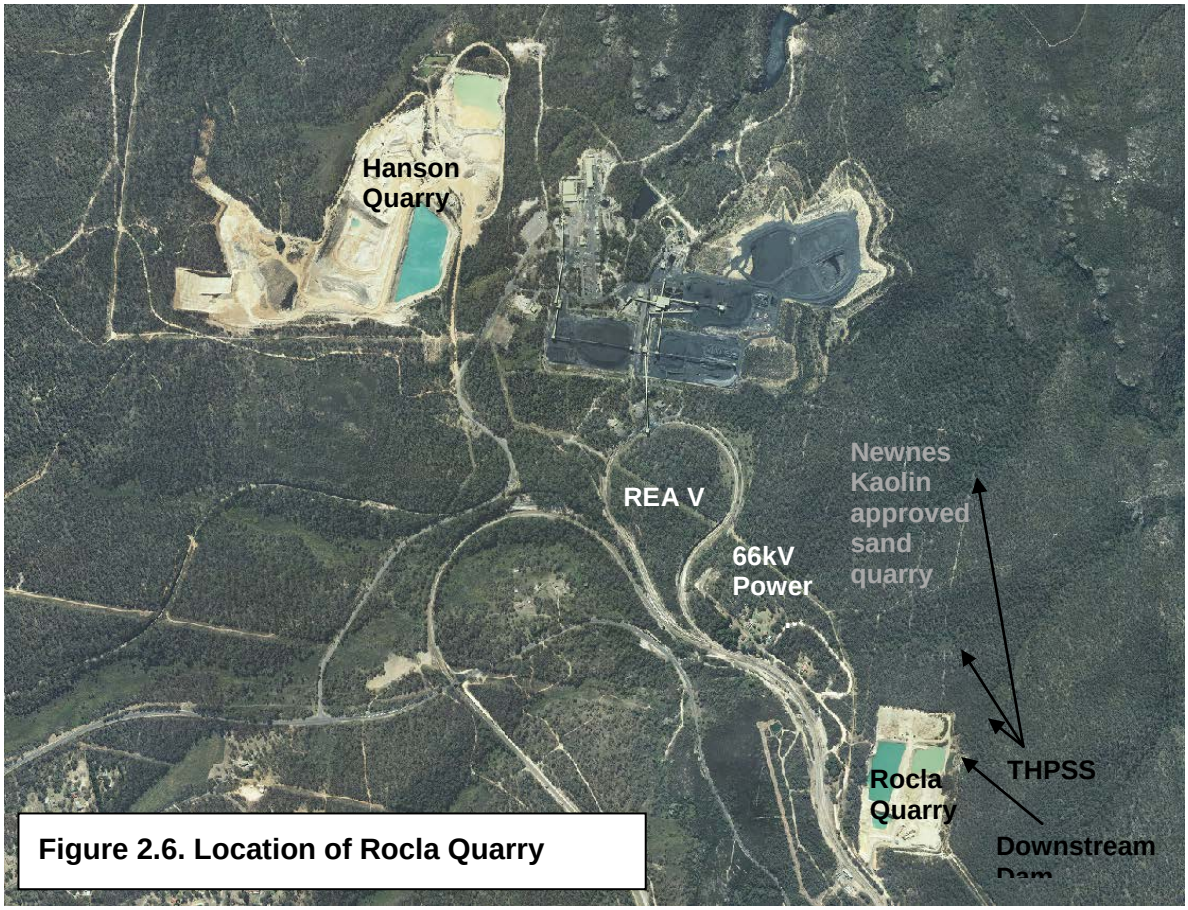

Figure 2.6. Location of Rocla Quarry

To utilise the Rocla Quarry, Clarence Colliery will need to:

- Construct a 1.5 kilometre haul road (conveyor structure would be problematic given the need to avoid THPSS).
- Construct a 1.5 kilometre water pipeline and associated pumping infrastructure to transport leachate water back to the site so that it can be treated by the Clarence Colliery Water Treatment Plant.

Centennial Coal Company Limited will also need to complete the required environmental assessments and obtain the relevant planning approvals for the emplacement of material and infrastructure upgrades. At a highly conservative maximum coal reject production rate of up to 250,000 tpa, the site could reach its capacity of 600,000 tonnes in 2.4 years. At a projected reject production rate of 156,000 tpa, the life of the emplacement area could be extended to 3.8 years.

The costs and environmental risks associated with this alternative for such a potentially short life is not considered to be economically sound at this time particularly where a more cost effective solution with minimal (acceptable) environmental and social impacts is available (subject to approval).

4.3.3 Emplacing Reject Material Underground

Underground disposal of fine rejects materials has previously been undertaken at Northern Coal Services (NCS) (Newstan Washery at that time). Fine coal rejects materials were pumped, via surface pipelines to underground workings through a number of boreholes, into disused and abandoned coal workings. This process proved to be a cost effective method of rejects disposal however, it was suspended in 2008 when fine rejects materials started to discharge from surface openings as the underground voids were progressively filled. This discharge of fines materials led to compliance and potential pollution issues.

The uncontrolled discharge of fines material resulted in the suspension of all underground emplacement of fine coal rejects material at NCS. The main contributing factors to this event were:

- Inability to inspect voids prior to pumping activities;
- Unknown condition of abandoned mining voids,
- Poor understanding of standing water levels in abandoned mining voids;
- Inability to accurately predict the capacity of the mining void; and
- Unpredictable dispersion characteristics of coal fines rejects after discharge from borehole.

A trial into the underground disposal was conducted at Western Coal services in the mid 1990's, however the project was abandoned due to technical difficulties with blocked boreholes and high process water requirements.

A study into the potential emplacement of coal fines into underground voids at Airly was conducted in April 2014. The study was conducted by GHD on behalf of Centennial Airly. The study affirmed that the technical risks associated with the underground emplacement of coal washery fines presented unacceptably high risks to the project in the current operating circumstances.

Metropolitan Mine carried out a trial of pumping a reject paste to areas of disused void. The trial and subsequent underground emplacement targeted specific areas at Metropolitan Colliery including:

- abandoned mine roadways accessible by mine personnel;
- abandoned mine roadways inaccessible to mine personnel but accessible by fill depending on flow characteristics;
- limited access to previously extracted longwall areas; and
- future longwall areas.

These investigations confirmed that underground emplacement was technically possible on a small scale, however the costs were significantly higher than traditional emplacement methodologies.

Whilst the operating cost can be three to four times more than typical surface emplacement, underground emplacement of reject material may be viable in some situations. Backfilling of mine workings might seem to be an obvious solution to mine

waste management, however it is a relatively complex endeavour and operations require detailed multi-disciplinary engineering solutions to develop site specific processes and methods, compared to more common practices of disposal of mine wastes on surface.

There are some challenges associated with underground emplacement of rejects including but not limited to the following:

- Challenges arising from the actual proportions between the fine and coarse reject waste streams compared with the optimal proportions. The ideal ratio for achieving a good mixture of coarse reject to dewatered tailings on a dry mass basis is about 3.3:1 (for a coarse to fine split at 2 mm, and assuming spherical particles). Too low a coarse: fine ratio may require underground bulkheads to contain the excess tailings. Too high a coarse: fine ratio may result in excessive wear and pumping costs;
- Requirement for flocculants and/or other additives;
- Delivering the rejects materials to underground, via pipelines, requires boreholes to the underground workings, and moving the discharge point to effectively fill the underground voids;
- The requirement to move the discharge point will require that areas are inspected and ventilated;
- Potential risk to the ongoing underground operations from flooding and inundation;
- Potential Acid Metalliferous Drainage (AMD) from the material pumped underground;
- Potential for liquefaction of excess fines;
- Potential groundwater impact from the seepage of excess process water;
- High maintenance input required to maintain pump and pipeline;
- Considerable energy required to pump rejects materials to underground voids and return the water recovered to the plant for reuse; and
- Possible emergence of seepage on the surface generated from disposal in shallow mining voids.

To enable this option would require the construction of infrastructure to manage the fines materials and to pump to the discharge points. This infrastructure includes:

- mixing Plant (including a mixing tank);
- centrifugal slurry pumps and pipelines to discharge the slurry from CHPP into the underground voids;
- the construction of underground bulkheads;
- the ability to ventilate and inspect previously abandoned areas of the mine;
- work force and supporting ancillary services;
- inspection programs to make sure emplaced rejects do not impact on the existing underground water management system of free drainage to sumps and pumps (which is currently the case at Clarence);

- surface pipeline with discharge borehole or, underground pipework that would need to traverse long distances to “non goafed” areas; and
- water management infrastructure, including sumps and transfer pumps and pipelines within the reject emplacement working area.

The pumping of reject material underground is not considered viable at this time due to local geological conditions, groundwater management (wet or flooded conditions underground), the economic environment and the rate of reject production.

4.3.4 Hanson Quarry

The Hanson Quarry is located less than 1 km from the Clarence mine. Whilst Hanson is an operational sand quarry, it extracts resource from discrete cells within its approved area. Clarence has been in discussions with Hanson since 2012 and it is understood, that Hanson’s Quarry will have available capacity for reject emplacement by 2017. Hanson’s report that by 2017, approximately 1,000,000 m^3 of capacity would be open void space available for reject emplacement in an initial “cell”. At a current compaction rate of 1.7 t/m^3, approximately 1.7 Mt of capacity could potentially be available initially. This could provide up to 11 years of capacity (using 156,000 tpa) or seven years of capacity at a worst case scenario of 250,000 tpa. These estimations are only for the first cell with Hanson over time, excavating more sand material potentially providing additional capacity as resource is extracted. This could leave further capacity available for future reject emplacement which is an attractive option for Clarence’s future reject emplacement requirements.

The above mentioned timeframe is favourable for Clarence’s reject management requirements. Furthermore, there are old workings underneath the Hanson Quarry which provides the opportunity to direct dirty water directly underground as opposed to transferring leachate water back to Clarence via a surface pipeline. To this end, Clarence has considered two options of transporting reject material from Clarence including a trucking option and a conveying option.

Trucking of Reject Material

Clarence has considered the trucking of reject material from the Clarence Mine to the Hanson Quarry. The activities would require the following:

- the campaign trucking of 30 tonne sized trucks;
- operating on one 8 hour shift per day, 11 months of the year;
- dual lane haul road;
- water management infrastructure including borehole for leachate water drainage into the Clarence underground; and
- a formal crossing at the Clarence Entrance road and a formal crossing at the Hanson Entrance road. This may take the form of stop signs, boom gates and traffic lights or overpasses.

Conveying of Reject Material

Clarence has also considered the conveying of reject material from the Clarence Mine to the Hanson Quarry. The activities would require the following:

- low profile enclosed conveyor, transfers with access road overpasses;
- engage contractors to push out reject material every 2 days for 2 – 3 hours;
- light vehicle access road alongside the conveyor route; and
- water management infrastructure including surge dam and borehole for leachate water drainage into the Clarence underground.

Trucking versus Conveyor

The risks associated with utilising a haul road and a conveyor system were considered in a Risk Assessment which is discussed in **Section 5.** With vehicle movements along the Clarence and Hanson Entrance roads being (during peak hours) 62 vehicles per hour (May 2013, 7am – 9am), there are significant risks associated with potential heavy vehicle interaction where the haul road would cross the Clarence and Hanson Entrance roads. It is noted that the haul road would cross the primary access for Hanson along which they dispatch sand product between the hours of 4am – 12 midnight.

4.3.5 Beneficial Re Use of Clarence Rejects

Reject material has been used in the past as a component of road base. A trial was carried out in 2010 by Weston Matrix who combined fly ash material with Springvale coal rejects. The composite material was to be used for a road project at Glanmire near Bathurst. The blending site was located adjacent to the Centennial “Coal Services” and adjacent to the power station where both fly ash and reject material could be transported at minimum cost. Numerous studies were carried out to ensure the reject material was stable (chemically) and had sufficient strength to act as a road base.

The most attractive components of the above mentioned project was the proximity to:

- fly ash supplies;
- reject material supplies;
- available space for material preparation; and
- the road base project.

It is understood that the proposed trial for RMS at Glanmire did not proceed. Weston Matrix did however proceed with a trial for Lithgow City Council (LCC) on a rural road. From all accounts the trial was successful but their processing plant was dismantled due to lack of commitment from either LCC or RMS as to future use of the product.

The most expensive part of producing the road base is the transportation of the materials to a suitable mixing and preparation facility and then transportation of the

road base material to the project site. These are usually determined on a case by case basis. The chemical and mechanical properties of the reject material to be used would also be considered on a case by case basis depending on the environmental sensitivity of the project site. Clarence requires a consistent market for up to 250,000 tpa (worst case) however, it is more likely that 156,000 tpa would be produced. Any lack of commitment from stakeholders regarding the supply, acceptance and use of the reject material from Clarence would be extremely problematic for the business.

For this reason, beneficial use of reject material for road base is not a reliable business case for Clarence's continual mining operations particularly when contracts for the material for potentially up to 250,000 tpa would be required. The lack of reliability, translates into a lack of business certainty which is not a suitable solution for Clarence at this time.

4.3.6 "Do Nothing"

The "do nothing" option would result in extreme operational difficulties compromising the ongoing business. This is not an acceptable option.

5. Future Reject Emplacement Strategy

Alternatives for future reject emplacements that have been considered and determined to be preferred options include:

1. Complete construction and utilise REA VI;
2. Explore available capacity (cell 1) with the neighbouring Hanson's Quarry, undertake the necessary assessments and monitoring, procure the relevant approvals over the next 2 – 3 years to emplace reject material into available void space at the Hanson Quarry. It is anticipated that the potential exists for void capacity for the life of Clarence;
3. Within 4 years explore the possibility of processing a proportion of the reject material for re-use as road base. This will include better understanding of infrastructure requirements and investigating the potential for contractors to operate a batching plant;
4. Within 5 years explore the ongoing relationship with Hanson's Quarry to better understand ongoing available capacity for reject emplacement;
5. Within 5 years review the ability and available technology for Clarence to potentially emplace reject material in the underground workings; and

This Longer Term Strategy is a high level concept paper documenting Clarence's long term intention in terms of its reject emplacement activities. Clarence still needs to ascertain as to whether an exemption is required for Clarence to emplace reject material in nearby voids, underground or for alternate beneficial uses.

The Coal Washery Rejects Levy, Operational Guidance Note, prepared by the Department of Environment and Climate Change in 2009, provides guidance on the application of the NSW Government's coal washery rejects levy. The levy is intended to encourage generators to pursue more environmental appropriate uses for the material. Applications for coal washery rejects to be exempt from the Coal Washery Rejects levy fall into three categories considered in the order of preference as outlined below:

- Active mine rehabilitation;
- Derelict mine rehabilitation;
- Resource recovery.

The first category (as listed above) is consistent with Clarence's preferred option, that being rehabilitating an active quarry. From Clarence's perspective, the project offers substantial benefits for Clarence, Hanson and the environment including:

- The emplacement site is in very close proximity to Clarence;
- Rehabilitation outcomes will be designed to improve the stability of the site including appropriate drainage, capping and revegetation using seed harvested from the site or near environs;
- Rehabilitation outcomes and contouring will be carefully designed such that the material is contoured for landscaping integration;
- Leachate and dirty water can be directly transferred to the underground for mixing prior to delivery to the water treatment plant for treatment minimising the risk of dirty water entering the clean water catchment and minimising the

risk of leachate water entering the Hanson Quarry water management system;

- Flexibility to emplace the reject volumes produced by the mine which may vary from year to year;
- No slurry or dirty water pipelines; and
- No impact on public transport routes.

Based on the factors set out above, Clarence's preferred and proposed Longer Term strategy is to emplace reject material into the available void space at the Hanson Quarry and rehabilitate the area, striving to reach similar landforms that existed prior to the commencement of quarrying activities. In parallel, investigate ongoing and alternative reject emplacement opportunities.

Prior to completing this report, Clarence carried out a Risk Assessment on the proposed Longer Term Strategy with personnel from the Hanson Quarry. The outcomes from the Risk Assessment are discussed in **Section 5.1**. A Memorandum of Understanding is currently in place between Clarence and Hanson's providing commitment to the project concept. A longer term agreement is currently being negotiated between the parties.

5.1 Emplacement of Reject at Hanson Quarry

A Risk Assessment was carried out on the 5th March 2014 to assess the business risks associated with the project to both Clarence and Hanson's Quarry. The Risk Assessment was carried out in accordance with the Centennial Risk Management Standard, using Stature Dyadem. Attendance at the Risk Assessment included personnel from Clarence and the Hanson Quarry with the objective of assessing the risks to both Clarence and Hanson of the concept project "Delivery and emplacement of Clarence reject material into available void space at the Hanson Sand Quarry". To this end, the risks associated with trucking the reject material and conveying the reject material were assessed.

The outcome from this Risk Assessment was used to:

- Inform the decision making process as to whether the project should proceed beyond concept stage;
- Identify the risk profiles from trucking of reject and conveying of reject material to inform decision making;
- Support any future agreement between Hanson and Clarence Colliery to allow further work for the engineering design and potential environmental impacts;
- Identify the risks to the concept project that require further planning and consideration; and
- Identify any risks or hazards that might compromise the project.

The primary outcome from the Risk Assessment will inform the decision making process to determine if the project is feasible for both Clarence and Hanson's Quarry. The secondary outcome from the Risk Assessment was to identify any additional controls required to manage any knowledge gaps to better inform decision making.

Table 2 provides a brief summary of the risk profile. The highest risk to the project is the procuring of approvals and the second highest risk was the heavy vehicle / light

vehicle interaction associated with the trucking option. The risk from inadequate environmental and rehabilitation controls / outcomes were also assessed with a large proportion of these assessed in the moderate to significant category. This means that substantial planning in this area is required to ensure adequate controls and performance monitoring is in place for the best possible outcome.

Table 2. Summary of Risk by Ranking

Risk Ranking	Trucking	Conveyor	Approvals	Environment/ Rehabilitation
Extreme	0	0	2	0
High	3	0	2	0
Significant	0	1	2	1
Moderate	1	0	1	6
Low	1	1	0	0

The primary decision from the Risk Assessment was that the conveyance of reject material is superior solution to transporting the reject from Clarence to Hanson's Quarry. For this reason, conveying material is the preferred option and along with emplacement and rehabilitation of the emplaced rejects will constitute the Longer Term Strategy.

5.2 Hanson's - Knowledge Gaps and Assumptions

At this very early stage of planning, Clarence and Hanson's have identified a number of knowledge gaps that need to be clarified. It is noted that Hanson's Quarry is an operational sand quarry located less than 1 km to the west of Clarence Colliery. Hanson produces approximately 1,000 t of sand product a day and dispatches product via haul trucks. The list of knowledge gaps that require address is provided below.

Potential operational restrictions at Hanson's Quarry (the potential for the Clarence proposal to impose on Hanson existing procedure or impact on existing approved requirements):

- Noise;
- Lighting;
- Hours of operation;
- Procedures and standards of work (Quarry vs coal);
- Contractor / sub-contractor;
- Access / egress;
- Traffic management plans;
- Transport of reject material – by conveyor;
- Interaction with other surface infrastructure both at Clarence and Endeavour;
- Reject dumping and rehandling to emplacement area;
- Vehicle interactions;
- Performance measures and auditing;
- Final capacity available;
- Availability and capacity of future void space.

Commercial and / or titles:

- Long term arrangements between Hanson's and Clarence;
- Statutory jurisdiction;
- Rehabilitation securities and liabilities;
- Establishment of infrastructure and costs;
- Establishment / operational costs model;
- Environmental assessment / monitoring costs;
- Mining lease and potential for native title.

Environmental:

- Interaction with Hanson's approval conditions;
- Available baseline monitoring and design of additional monitoring;
- Availability of suitable capping material;
- Leachate management and quality;
- Groundwater impacts / management – specific emphasis on the Newnes Plateau Shrub Swamp;
- Need for low permeability base and supply of adequate material;
- Environmental protection licence and interactions;
- Surface water management and adequate soil and erosion controls;
- Geochemistry of reject material – leachate predictions;
- Adequate rehabilitation strategy and footprint ensuring there is an improvement to the existing approved rehabilitation commitments;
- Long term arrangements allowing for seed collection from the Hanson site for future rehabilitation requirements.

Each of these unknowns has been considered in terms of setting a preliminary timeframe and project milestones.

It is noted that this Longer Term Reject Emplacement Strategy is subject to change depending on the following matters:

- Change in market conditions may result in alternate emplacement options becoming more cost effective;
- Improvements in technology may result in alternate emplacement options becoming more attractive and cost effective;
- Change in Government Policy may result in beneficial re-use options becoming more attractive and certain;
- Change in marketing arrangements may result in substantially less reject or substantially more reject material being produced, resulting in changes to the strategy;
- Inability to reach a long term agreement with Hanson Quarry to emplace reject material within available voids.

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