



# WHITEHAVEN COAL LIMITED

## Rocglen Coal Mine Extension Project

Project Application under Part 3A of the EP&A Act 1979

### Environmental Assessment

**Volume 1 – Main Text**

Volume 2 - Appendices (A-L)

Volume 3 - Appendices (M-R)

February 2011

WHM01-008



**GSS ENVIRONMENTAL**  
Environmental, Land and Project  
Management Consultants

# **Rocglen Coal Mine Extension Project Project Approval 10\_0015 Environmental Assessment**

Prepared on behalf of:

**Whitehaven Coal Limited**



By:-

**GSS Environmental**



**GSS ENVIRONMENTAL**  
Environmental, Land and Project  
Management Consultants

Project Director: Andrew Hutton

Project Manager: Eryn Bath

Date: February 2011

Level 1, 241 Denison Street  
BROADMEADOW NSW 2292

PO Box 907  
HAMILTON NSW 2303

Phone: 02 4920 3000

Fax: 02 4961 3360

Web: [www.gssenvironmental.com](http://www.gssenvironmental.com)

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# Submission of Environmental Assessment (EA)

Prepared under Part 3A of the *Environmental Planning and Assessment Act 1979*

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## **EA Prepared By:**

Name: Eryn Bath  
Associate Environmental Planner

Qualifications: Graduate Diploma Environmental Engineering  
Bachelor of Environmental Science

Company: GSS Environmental

Address: PO Box 907, Hamilton NSW 2303

## **Development Application:**

Proponent Name: Whitehaven Coal Limited

Proponent Address: PO Box 600, Gunnedah NSW 2380

Land to be Developed: Lot 1 in DP 787417;  
Lots 1 and 4 in DP 1120601; and  
Public roads and road reserves.

Wean Road, Gunnedah NSW 2380  
Parish of Tulcumba  
County of Nandewar  
Local Government Area of Gunnedah

Development Description: Rocglen Coal Mine Extension Project

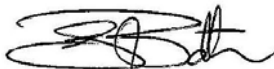
## **Declaration:**

We hereby certify that we have prepared the contents of this document and to the best of our knowledge:

- It addresses the Director-General's Requirements provided to the Proponent in March 2010 under Section 75F of the *Environmental Planning and Assessment Act 1979*;
- It contains all available information that is relevant to the environmental assessment of the proposed development to which the document relates; and
- It is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

Name: GSS Environmental  
Eryn Bath

Signature:



Date: February 2011

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## EXECUTIVE SUMMARY

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### INTRODUCTION

This Environmental Assessment (EA) has been prepared to support an application by Whitehaven Coal Limited (Whitehaven) for a new Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to expand operations at the company's Rocglen Coal Mine in the Gunnedah Basin of northern New South Wales (NSW).

The Rocglen Coal Mine (formally known as Belmont Coal Project) was originally approved by the Minister on the 15 April 2008 under Project Approval PA 06\_0198. It was classified as a Major Project in accordance with the former *State Environmental Planning Policy (Major Projects) 2005* and, subsequently, was determined under Part 3A of the EP&A Act.

Following further drilling and definition of the local geological features, as well as additional reviews of the mine plan, Whitehaven now propose to expand operations at Rocglen in order to maximise resource recovery and allow for improved mine progression. The Project, if approved, would permit up to 5 million tonnes (Mt) of coal, not previously considered in the life of mine plan, to be extracted. This represents an increase in coal recovery from Rocglen by close to 30 percent. At a maximum recovery rate of 1.5 Mt run-of-mine (ROM) coal annually, this will increase the projected life of the operation for coal extraction by up to four years.

### APPROVED MINE OPERATION

The Rocglen Coal Mine was originally approved by the Minister on the 15 April 2008 under Project Approval PA 06\_0198. It was classified as a Major Project in accordance with the former SEPP (Major Projects) 2005 and, subsequently, was determined under Part 3A of the EP&A Act. The mining lease (ML 1620) was issued for the Rocglen operation in June 2008 and coal production subsequently commenced in late 2008. Approximately 1.5 million tonnes of coal per annum (Mtpa) is mined using truck and excavator method. The coal is transported approximately 30 km by road to the Whitehaven Coal Handling and Preparation Plant (CHPP) for selective washing and subsequent transport by rail to the Port of Newcastle or by road to domestic customers.

On the 27 May 2010, the Minister issued an approval under Section 75W of the EP&A Act to modify PA 06\_0198 (06\_0198 MOD 1). This modification permitted Whitehaven to undertake unplanned emergency earthworks to stabilise the eastern highwall following slipping adjacent to a fault structure in the north eastern portion of the approved open cut pit. The areas required to be worked to achieve a stable highwall were partially outside of the open cut limit approved under PA 06\_0198.

In summary, the activities approved at Rocglen under PA 06\_0198 (and subsequent modification, PA 06\_0198 MOD 1) are:

- **Coal Mining by Open Cut Mining Methods** – extraction of coal by open cut mining methods within an area of approximately 114 hectares. This involves the extraction of three separate coal seams, being the Upper Glenroc, Lower Glenroc and Belmont Seams, at a production rate of 1.5 Mtpa. The pit extensions approved for stabilisation works under PA 06\_0198 MOD 1 have a combined area of approximately 2.05 hectares, giving a total approved open cut area of approximately 116.05 hectares.
- **Auger Mining** – extraction of additional coal reserves that are uneconomical to extract by open cut mining methods using auger mining techniques.

- **On-Site Coal Processing** – transfer of mined coal by haul truck to a coal handling and processing area located immediately south of the limit of open cut pit for crushing, screening and loading into trucks for transport off-site.
- **Transportation** – transportation of crushed and screened coal approximately 30 km to the Whitehaven CHPP, via a purpose built section of road between Rocglen and Hoad Lane, and from Hoad Lane via an established coal haulage route for selective washing, stockpiling and dispatch by both rail and road. A proportion of the coarse and fine reject material from the CHPP is approved to be backloaded to Rocglen for placement in the mined-out areas of the open cut.
- **Relocation of Public Roads** – relocation of sections of Wean Road (not yet undertaken) and Jaeger Lane (completed) to allow for open-cut mining activities and infrastructure within these areas.
- **Rehabilitation** – progressive use of out-of-pit and in-pit overburden emplacements to shape and recreate the landform comparable to that of the pre-mining environment. Approximately 84.4 hectares of the disturbed area is to be restored as rehabilitated native vegetation with the remaining 152.6 hectares to be restored to rehabilitated agricultural land.
- **Biodiversity Offset Strategy** – offsetting the disturbance to remnant native vegetation through the protection and rehabilitation of approximately 195.3 hectares of land, comprising the protection of 44.9 hectares of remnant woodland, enhancement planting and rehabilitation to 90.4 hectares and an additional 60 hectares within the Whitehaven Regional BioBank Site.

Based on the open cut reserves at the time of approval and a maximum production rate of 1.5 Mtpa, the Rocglen Coal Mine was anticipated to have a production life for coal extraction of between seven to ten years.

## PROJECT DESCRIPTION

Following further drilling and definition of local geological features, as well as additional reviews of the mine plan, Whitehaven proposes to expand operations at the Rocglen Coal Mine in order to maximise resource recovery and allow for improved mine progression.

The objectives of the Rocglen Coal Mine Extension Project are to:

- Develop the on-going open cut operations with a focus on:
  - maximising resource recovery and maintaining continuity of coal production from the existing Rocglen Coal Mine beyond the currently projected life of mine;
  - maximising the use of existing infrastructure; and
  - securing on-going employment opportunities and socio-economic flow-on benefits;
- Provide additional out-of-pit emplacement area to accommodate overburden material from the existing operations and proposed pit expansion; and
- Continue to conduct mining at Rocglen in an environmentally responsible manner to ensure the potential for adverse impact is minimised.

While Whitehaven undertook preliminary feasibility assessments for several development layout options (both within the Project Site and extending beyond the Project Site), the proposed configuration was selected as the optimal option in light of mining efficiency, operational, environmental, economic and land ownership considerations.

The following table summarises and compares the primary components of the existing Rocglen Coal Mine operation approved under PA 06\_0198 (including PA 06\_0198 MOD 1) and those of the proposed Rocglen Extension Project to be assessed and determined under Part 3A of the EP&A Act.

**Major Components of the Approved Operation and Proposed Project**

Aspect	Existing Approved Rocglen Coal Mine Operation	Proposed Rocglen Extension Project
Project Site Area	Approximately 366 hectares.	An additional 94 hectares of land, bringing the total area to approximately 460 hectares.
Production	Extraction and processing of up to 1.5 Mt of ROM coal per year.	No change.
Coal Seams	Upper Glenroc, Lower Glenroc and Belmont.	No change.
Mine Life	Between seven and ten years.	Up to an additional four years over the originally anticipated seven to ten years.
Vegetation Removal	Progressive campaign approach, with the extent of clearing undertaken in each campaign just sufficient for the subsequent year of mine development.	No change.
Soil Stripping and Stockpiling	Topsoil and subsoil stripping is undertaken separately to 15 cm and 35 cm, respectively, using open bowl scrapers and placed directly on mined, backfilled and reshaped areas awaiting rehabilitation or in designated stockpile areas adjacent to the areas of surface disturbance.	Methodology will generally remain the same with different varying depths of topsoil and subsoil suitable for stripping and different designated stockpile areas.
Overburden and Interburden Management	Overburden is blasted and loaded into trucks for transfer and placement in one of the two out-of-pit emplacement areas (Northern and Western Emplacement Areas) or in-pit within completed sections.	Methodology will remain the same with expansion of the Northern Emplacement Area's footprint and height to accommodate a maximum of 12 Mbcm (15 Mlcm) of material from current operations and proposed pit expansion.
Coal Extraction	Open cut mining methods (truck and excavator), with extraction of additional reserves uneconomical to extract by open cut methods using auger mining techniques.	No change.
Open Cut Area	Approximately 114 hectares, plus 2.05 hectares approved for emergency highwall stabilisation works (PA 06_0198 MOD 1).	Expansion of the open cut design limit by approximately 50 hectares to a total area of approximately 164 hectares.
Resource Recovery	Up to approximately 15 Mt of ROM coal.	Up to an additional 5 Mt of ROM coal.
Coal Processing	Transfer of mined coal by haul truck to a coal handling and processing area located immediately south of the limit of the open cut pit for crushing, screening and loading into trucks for transport off-site.	No change.
Coal Storage	Stockpiling of up to 150,000 tonnes of ROM coal on site.	No change.
Infrastructure	Site offices, workers amenities, workshop, fuel farm, coal crushing and handling plant, truck loading bin, weighbridge and surface water management system.	No additional building improvements. The surface water management system will be updated to effectively cater for the expanded operations.

Product Coal Transport	All crushed and screened coal is transported approximately 30 km to the Whitehaven CHPP, via an established coal haulage route, for selective washing, stockpiling and dispatch by rail and road.	No change.
Site Services	Systems in place for potable water, operational water, power, communications, fuel and explosives.	No change.
General Waste	Systems in place to manage general wastes, routine maintenance consumables, waste oils and grease, sewage and hydrocarbon-contaminated water.	No change.
Coal Rejects	A proportion of the coarse and fine coal rejects are approved to be returned from the Whitehaven CHPP to Rocglen for placement in the mined-out areas of the open cut.	No change.
Equipment	Various items of earthmoving and mining equipment throughout the life of the project.	The only change to the current fleet will be the addition of one 1250 excavator in the pit to enable cleaner and more efficient mining of coal (smaller machine).
Hours of Operation	Mining operations are permitted to occur 24 hours a day, Monday to Saturday, with the exception of public holidays.	No change.
Employment	54 full-time jobs, with flow on employment for truck drivers (coal haulage contract) and additional indirect employment.	No change to employment levels, however employment positions would be maintained for the additional 4 years of project life.
Rehabilitation	<p>While the major portion of rehabilitation activities would occur close to the cessation of mining, progressive rehabilitation will be undertaken through the life of the mine.</p> <p>Of the total anticipated disturbance area, approximately 84.4 hectares is to be restored as rehabilitated native vegetation (36 percent), with the remaining 152.6 hectares to be restored to rehabilitated agricultural land (64 percent).</p>	<p>Methodology will essentially remain the same, with the primary differences being the configuration of the final landform and final land use.</p> <p>Of the total anticipated disturbance area, it is proposed to restore approximately 206 hectares as rehabilitated bushland (58 percent), 147 hectares as rehabilitated pasture (41 percent), with the remaining 5 hectares comprising the retained highwall of the final void (1 percent).</p>
Biodiversity Offsetting	A <i>Biodiversity Offset Strategy</i> resulting in the protection and rehabilitation of approximately 195.3 hectares, comprising the protection of 44.9 hectares of remnant woodland, enhancement planting and rehabilitation to 90.4 hectares and an additional 60 hectares within the Whitehaven Regional BioBank Site.	Revised <i>Biodiversity Offset Strategy</i> to compensate for the Project impacts and the impacts to the previously approved offset areas (i.e. cumulative impacts) on a 'like for like' basis with the equivalent of over 525 hectares of vegetation within the Whitehaven Regional BioBank Site. The <i>Strategy</i> will provide an offset to impact ratio of 4.75:1.
Road Relocations	The relocation of sections of Wean Road and Jaeger Lane.	Further relocation of the Jaeger Lane section only.
Environmental Management	A comprehensive set of environmental management plans and monitoring programs.	The current environmental management plans and monitoring programs will be reviewed and updated as required.

The primary components of the Project, over and above the current operations, to be assessed and determined under Part 3A are summarised in the below dot-points. It is intended that the Rocglen Extension Project will be fully integrated with the remaining operational life of the current approved Rocglen mine, which will enable Whitehaven to operate under a single Project Approval over the life of the Project.

- **Expansion of Open Cut Pit** – expansion of the open cut pit design limit in order to access up to an additional 5 Mt of coal not previously considered in the life of mine plan. This will increase coal recovery at Rocglen by close to 30 percent. The footprint of the open cut pit will increase by approximately 50 hectares to a total open cut mined area of approximately 164 hectares. Coal will continue to be extracted from the expanded pit at the approved production rate of 1.5 Mtpa and using the open cut mining methods approved at Rocglen.
- **Extension to Life of Mine** – it is anticipated that coal extraction activities will occur for approximately 11 years following the issue of Project Approval and the subsequent issue of a new or amended mining lease. This represents an increase to the projected life of mine, for coal extraction, of up to four years.
- **Expansion of Northern Emplacement Area** - expansion in the footprint and height of the out-of-pit Northern Emplacement Area in order to accommodate a maximum of 12 million bank cubic meters (Mbcm), or approximately 15 million loose cubic metres (Mlcm) accounting for swell, of overburden from the current operations and proposed pit expansion. The maximum design height of the expanded Northern Emplacement Area will be 50 metres above pre-mining landform, which is the approximate height of the adjacent ridge to the west of the Project Site at 340 metres Australian Height Datum (AHD). Early re-profiling and revegetation of the external batter slopes of the emplacement area will be undertaken to minimise visual impacts and limit erosion and downstream sedimentation.
- **Replacement of Soil Stockpile Areas** – the soil stockpiling areas identified as the Northern and Southern Soil Stockpile Areas will be replaced by the proposed Eastern and Western Soil Stockpile Areas to cater for the expanded open cut pit and Northern Emplacement Area. While all of the topsoil currently in the Northern Stockpile Area will be relocated, the majority of subsoil in this area will remain and will be covered with overburden due to sufficient soil material being available for rehabilitation from the expanded operation. The material to be relocated will be placed in either proposed new designated soil stockpile areas or placed directly onto areas available for rehabilitation.
- **Revised Rehabilitation and Mine Closure** - Whitehaven will continue to adopt a progressive approach to rehabilitation throughout the life of the mine. The rehabilitation and mine closure methodologies will essentially remain as currently approved under PA 06\_0198, with the primary differences being the configuration of the final landform and final land use. Of the total anticipated disturbance area of approximately 358 hectares, it is proposed to restore approximately 206 hectares as rehabilitated bushland (58 percent), 147 hectares as rehabilitated pasture (41 percent), with the remaining 5 hectares comprising the retained highwall of the final void (1 percent).
- **Revised Biodiversity Offset Strategy** – a revised *Biodiversity Offset Strategy* has been prepared to compensate for the Project impacts and the impacts to the previously approved offset areas (i.e. cumulative impacts) on a 'like for like' basis with the equivalent of over 525 hectares of vegetation within the Whitehaven Regional BioBank Site. The *Strategy* will provide an offset to impact ratio of 4.75:1. The Whitehaven Regional BioBank Site is in the final stages of registration by the DECCW as a BioBank Site under Part 7A of the *Threatened Species Conservation Act 1995* (TSC Act). It will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks (via a BioBanking Agreement registered on the land title in-perpetuity).

- **Other Minor Project Related Works:**

- Altered surface water management to effectively cater for the expanded operations;
- Relocation of the Mine Water Dam to cater for the expanded open cut pit;
- Relocation of a section of Jaeger Lane (that has already been relocated under PA 06\_0198) to cater for the expanded Northern Emplacement Area;
- Removal of the building improvements within the “Glenroc” property, which is owned by Whitehaven, to cater for the expanded Northern Emplacement Area;
- Relocation of the meteorological station and high volume air sampler (HVAS) used to monitor the concentration of particulate matter less than 10 micrometres (PM<sub>10</sub>) located within the “Glenroc” property to elsewhere within or adjacent to the Project Site to ensure adequate separation from the expanded Northern Emplacement Area and optimal operation; and
- Realignment of an existing overhead powerline, owned by Country Energy, to ensure adequate separation distances from the expanded Northern Emplacement Area and Eastern Soil Stockpile Area.

The Project does not involve any change to the coal production rate, methods of coal extraction, hours of operation, coal handling and processing techniques, site servicing, general waste management or employment. The only change to the current mine fleet will be the addition of one 1250 excavator in the pit to enable cleaner and more efficient mining of coal (smaller machine).

## **CONSULTATION AND ISSUE IDENTIFICATION**

The key project-related issues warranting detailed investigation and discussion were identified through:

- The environmental context of the Project Site and surrounding locality;
- The legislative framework applicable to the Project;
- A pre-project risk assessment;
- Outcomes of consultation undertaken with various government agencies, including the Director-General's Requirements (DGRs) issued by the NSW Department of Planning (DoP), and other relevant stakeholders; and
- Specialist studies completed as part of the preparation of the EA.

## **KEY ENVIRONMENTAL ISSUES AND ASSESSMENT**

The assessment of the Rocglen Extension Project has been multi-disciplinary and involved consultation with various government agencies, surrounding landholders and community groups. Emphasis has been placed on anticipation and prevention of potential environmental and social impacts, with management strategies, mitigation measures and monitoring activities identified to keep potential impacts to a minimum.

### **Air Quality**

PAEHolmes (2011) undertook an air quality assessment for the Project.

Total dust emissions due to proposed mining operations were estimated by analysing the activities taking place at the site during three mine plan scenarios, these being Years 1, 5 and 10 of the expanded operation. While annual production remains constant throughout the life of the mine, the amount of overburden waste generated varies significantly from year to year, as does the surface area of exposed pit and emplacement areas. As mining progresses from north to south it was also necessary to capture a scenario at each end of this spectrum.

In summary, the air quality modelling predictions for annual average PM<sub>10</sub>, total suspended particulate matter (TSP) and dust deposition, including non-mining background levels, indicate acceptable air quality impact at all privately-owned residences throughout the life of the mine (as proposed).

The incremental 24-hour average PM<sub>10</sub> criterion of 50 µg/m<sup>3</sup> is predicted to be exceeded at “Yarrowonga” and “Belah” by 10 µg/m<sup>3</sup>. Further analysis undertaken by PAEHolmes (2011) on the “Yarrowonga” and “Belah” properties determined that the criterion would be exceeded on 32 occasions and four occasions, respectively. However these properties are already owned by Whitehaven and, as such, the acquisition criterion becomes irrelevant.

PAEHolmes note that it is not possible to accurately predict the cumulative 24-hour PM<sub>10</sub> concentrations using dispersion modelling due to the variability in ambient levels and spatial and temporal variation in any day to day anthropogenic activity. There are currently no continuous measurements of PM<sub>10</sub> available in the area that can be considered ‘background’.

In terms of making a crude estimate of a background 24-hour average PM<sub>10</sub> level, PAEHolmes consider it reasonable to use data from the HVAS at “Roseberry”. The 70<sup>th</sup> percentile (22 µg/m<sup>3</sup>) provides a simplistic indication of PM<sub>10</sub> concentrations in the absence of anomalous data due to extreme events such as bushfires and dust storms. However it does still provide a conservatively high estimation of 24-hour average background PM<sub>10</sub> concentrations as contributions from the existing Rocglen operation are included. Using it as a background and adding it to modelling results also assumes that this level of 22 µg/m<sup>3</sup> will occur every day, which is clearly not the case as by definition it will be lower for 70 percent of the time.

The 70<sup>th</sup> percentile approach leads to predicted exceedances of the 50 µg/m<sup>3</sup> criterion at “Yarrowonga” “Yarrari”, “Belah”, “Roseberry” and “Surrey”. Of these residences, only “Roseberry” and “Surrey” are not currently owned by Whitehaven. Exceedances at these two properties are only predicted for operations in Year 10. PAEHolmes (2011) carried out further analysis for “Roseberry” and “Surrey” to determine how many times exceedance may occur, when added to a background of 22 µg/m<sup>3</sup>. For the 24-hour average PM<sub>10</sub> concentration to exceed 50 µg/m<sup>3</sup> at these residences, a predicted concentration must be 29 µg/m<sup>3</sup>. A time series analysis indicates that there is only one day of the year at each residence when 29 µg/m<sup>3</sup> is predicted to be exceeded, with the majority of values estimated to be less than 15 µg/m<sup>3</sup>. Using this conservative approach, the mine is predicted to comply with the DoP’s acquisition criterion at both “Roseberry” and “Surrey”.

Whitehaven will continue to take reasonable and practicable measures to prevent or minimise the generation and dispersal of particulate matter. A range of complementary air pollution management strategies, mitigation measures and monitoring activities are currently employed at Rocglen, and these will continue to be implemented for the Rocglen Extension Project.

Furthermore, as part of the Project, Whitehaven commits to install and operate a real-time PM<sub>10</sub> monitor (fitted with a weather station). As recommended by PAEHolmes, it is proposed to locate this monitor at the “Roseberry” residence, co-located within one of the existing HVAS. This would enable comparisons between both monitors and also provide real-time information for the majority of privately owned residences, which are to the south of the mine.

## Noise

Spectrum Acoustics (2010) undertook an assessment of operational noise levels and off-site road traffic noise levels associated with the Rocglen Extension Project. Noise modelling was conducted for four atmospheric conditions, these being daytime calm (neutral); inversion; prevailing wind (all times) from south; and prevailing wind (all times) from north north-west. Noise models were generated for three operational scenarios, being Years 1, 5 and 10 of the expanded operation, which are considered to be the worst case in terms of noise generation and potential impacts.

Exceedance of the criterion have been predicted at "Costa Vale" during Years 1 and 5, with the primary contributing noise sources being trucks depositing overburden on the expanded Northern Emplacement Area and, to a lesser extent, topsoil spreading activities (daytime only). Noise mitigation to achieve compliance at "Costa Vale" would require all trucks to be retro-fitted with attenuator packages. Whitehaven has advised that while this may be technically feasible, it would be impractical given the large cost involved and the fact that "Costa Vale" is now owned by Whitehaven and is, as such, considered project-related.

In terms of potential sleep disturbance, impacts at "Retreat" were assessed as the most impacted receiver in the Year 1 scenario (apart from "Costa Vale"). Maximum noise levels estimated from individual sources at "Retreat" are more than 10 dB below the 45 dB(A) sleep disturbance 'screening' level and are also no greater than the total LAeq level from the entire mine.

The nearest receiver to the public road section of the coal haul route between Rocglen and the Whitehaven CHPP is "Brooklyn", which is set-back from Blue Vale Road approximately 70 metres. Coal trucks from the Whitehaven's Canyon (now closed), Tarrawonga and Rocglen mines all pass this receiver. The measured traffic noise levels at "Brooklyn" range from 3 to 9 dB below the 60 dB(A) criterion. The Project will not alter the total number of trucks passing "Brooklyn" and therefore off-site traffic noise levels are expected to remain compliant with the applicable criterion.

Whitehaven will continue to take reasonable and practicable measures to prevent or minimise noise generation and propagation. A range of complementary noise management strategies, mitigation measures and monitoring activities are currently employed at Rocglen, and these will continue to be implemented for the Rocglen Extension Project.

## Blasting and Vibration

An assessment of ground vibration and airblast overpressure associated with blasting has been undertaken by Spectrum Acoustics (2010). Historical blast monitoring results show no exceedances of either the applicable ground vibration or blast overpressure criteria at the nearest residences surrounding the Project Site. On this basis, Spectrum Acoustics (2010) concludes that no significant blasting impacts are expected as a result of the Rocglen Extension Project.

Since coal production commenced at Rocglen in late 2008, there has only been one occasion when complaints have been received about blasting. On the 24 April 2009, four separate residents contacted Whitehaven to report a significant loud bang and vibration at their residences. Three out of the four residents advised that previous blasting had not resulted in any impact at their property.

Rocglen has two statutory blast monitoring locations, being the "Rosberry" point of interest (POI) and "Costa Vale" POI. On checking with Orica Mining Services (Orica), Whitehaven's blasting contractor, it was discovered that they had failed to properly initiate the blast monitors and therefore did not capture any wave trace data for this particular blast.

As a result of the complaints and Orica's subsequent assessment report, Whitehaven now ensures that meteorological conditions are analysed prior to blasting to avoid times when the potential for impact is heightened, and also endeavours to blast at around midday over the winter period to avoid temperature inversions.

All blasting at Rocglen is designed to satisfy relevant environmental and safety criteria with respect to airblast overpressure and ground vibration, initially using conservative predictive models and subsequently using site laws developed and refined on the basis of operational experience.

### **Surface Water**

GSSE (2010c) has undertaken a surface water assessment for the Rocglen Extension Project, requiring a site wide approach and the re-development of a suitable surface water management system for the expanded operation. GSSE (2010c) concludes that if the surface water management strategies and mitigation measures identified and discussed within the assessment are implemented and maintained, it is anticipated that there would be minimal impact on surface water downstream of the Project Site as a result of the Rocglen Extension Project.

A detailed daily time step water balance indicates that the site has adequate water supply primarily through the rainfall runoff captured in sediment basins, which can be supplemented through the use of bore water when required. Overall the calculations indicate that the site will be relatively well balanced.

The model indicates that use of bore water is highly dependent on the water management practices adopted. Assuming controlled discharge is undertaken to draw down the dirty water dams, the typical bore water usage will be 40 to 50 megalitres per year (ML/year) and will be within the licensed entitlement of 120 ML/year.

The model indicates that the number of overflow discharges is also highly dependent on the water management practices adopted. Assuming controlled discharge is undertaken, likely average annual overflow discharges of one day is expected, which will occur under extreme rainfall events (greater than the license threshold of 38.4 mm in 5 days). In practice the mine pit would provide substantial additional on-site storage (temporarily), which would reduce the potential for overflow discharge to occur.

A new *Site Water Management Plan* will be prepared in accordance with regulatory requirements and conditions of consent. It will be developed in accordance with the *Blue Book (Volume 1 and Volume 2E)* and will address potential impacts, management strategies and mitigation measures. Key changes to be integrated into the existing surface water management system are:

- Additional water management controls to deal with water from the increased disturbance footprint in the northern area of the site;
- Additional water management controls to address total suspended solids (TSS) issues during wet weather discharge;
- Relocation of the Mine Water Dam; and
- More effective diversion of clean water from off-site catchments to the east.

Sections of drainage lines that are or will be impacted upon by the mining operation will be rehabilitated post-mining generally in accordance with Section 5.3.3 of the *Blue Book (Volume 1)* and the *Guidelines for Controlled Activities – In-Stream Works* (DWE 2008, as cited in GSSE 2010c) for watercourse rehabilitation and riparian zone rehabilitation.

## Groundwater

Douglas Partners (2010) was commissioned to address hydrogeological (groundwater) issues associated with the Project. Douglas Partners (2010) confirmed and updated the conceptual hydrogeological model derived by RCA Australia for Rocglen in 2002 and 2007, and subsequently constructed and calibrated a revised numerical groundwater flow model in order to assess impact on the surrounding groundwater system and assess the quantum of groundwater seepage that may occur into the pit.

Apart from the groundwater levels recorded for monitoring bore WB-05, which is likely to be anomalous and affected by nearby pumping, it is apparent that the mine has had very little impact on surrounding groundwater levels over the period mid 2008 to present.

Numerical groundwater modelling results indicate high drawdowns in close proximity to the mine site, with relatively low impacts to the east of the faulting. The predicted impacts on the alluvium are also low, however slightly higher in the alluvium immediately south of the pit in the case that a permeable fault was present to the west of the site. The extent of the impacts on groundwater head are expected to be less than previously predicted by RCA Australia (2007) for areas outside of the areas of faulting.

Flow rates into the pit are generally expected to decrease as mining continues in the northern end of the pit, however are expected to increase as the mining progresses to the south due to the increased area of the pit, and because the flow is less restricted by the faulting at the northern end of the pit.

The range of possible inflows to the pit, based on the credible range of parameters, ranges from 1,057 to 3,381 m<sup>3</sup>/day. It is unlikely that the annual flow rates into the pit will exceed the existing groundwater interference licence of 700 ML/year (1,918 m<sup>3</sup>/day). It is noted however that there is some uncertainty in the site conditions, in particular to the south west of the site, and flows greater than 700 ML/year may be possible if adverse conditions occur. Therefore a robust on-going monitoring program and updating of the predictive model are recommended as mining continues.

It is expected that once mining is complete, recharge of groundwater and rainfall infiltration into the final void will result in the formation of a water table within the backfill. It is likely that this will eventually lead to the formation of surface water in the southern part of the pit with the locally deeper final surface level. The inflow to the pit will be offset by evaporation from the area of surface water and therefore it is unlikely that the groundwater levels within the pit will ever fully recover to pre-development levels. It is estimated that the final equilibrium water levels may take 20 to 50 years to occur and would also be subject to variations according to climatic conditions.

The existing groundwater management strategies, mitigation measures and monitoring activities employed at Rocglen will continue to be implemented for the Rocglen Extension Project. Additional actions recommended by Douglas Partners (2010) to improve monitoring outcomes will also be implemented.

## Flora and Fauna

RPS (2010a) was engaged to undertake a flora and fauna assessment of the Rocglen Extension Project. In addition to a review of existing literature and available vegetation mapping, RPS employed a variety of field survey techniques while on site between the 8 and 12 February 2010 to record a representative sample of flora and fauna species across the site.

Ground truthing of the vegetation within the Project Site, and within the adjacent "Yarrowonga" and nearby "Greenwood" properties, identified five vegetation communities.

It is expected that the Project will result in the removal of 5.9 hectares of the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC) along Wean Road (note that a large portion of Wean Road occurs within areas covered by the original mine approval) and Jaeger Lane, and 10.9 hectares of derived native grassland of the EEC from the within the Project Site. Habitat critical to the survival of this EEC has not been gazetted within the TSC Act or Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). Therefore the Project is not likely to impact any habitat critical to this community.

The importance of the patch of White Box Yellow Box Blakely's Red Gum Woodland EEC to be removed is considered to be 'medium'. The Project is not expected to extensively modify abiotic factors such as ground or surface water levels such that it affects other areas of White Box Yellow Box Blakely's Red Gum Woodland EEC. The revised *Biodiversity Offset Strategy* prepared for the Project provides a 'maintain or improve' outcome for the removal of this vegetation community.

A small stand (approximately 0.14 hectares) of Brigalow trees (*Acacia harpophylla*) is present within the proposed mine expansion area. The presence of this species is not definitive but is indicative of the EEC "Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions EEC" listed under the TSC Act. In summary, it is considered that the existing stand of Brigalow is not viable due to its small size, lack of recruitment, depauperate condition, isolation and lack of an adequately sized gene pool for continued survival. Again, the revised *Biodiversity Offset Strategy* prepared for the Project provides a 'maintain or improve' outcome for the removal of this vegetation community.

Suitable habitat for two cryptic threatened flora species, Finger Panic Grass (*Digitaria porrecta*) and Tricolour Diuris (*Diuris sheaffiana*), may occur in the local area. RPS (2010a) undertook the field surveys during the January to February flowering period for Finger Panic Grass (when it is most likely to be detected). Surveys for Tricolour Diuris during the flowering period of September to November were not possible, however the proposed removal of a relatively small area of 'moderate' potential habitat relative to the availability of nearby similar habitat areas would be unlikely to significantly impact the species.

No threatened flora species were observed during previous flora surveys by Geoff Cunningham Natural Resource Consultants (2007b) or by the recent flora surveys by RPS (2010a).

A total of 100 fauna species were recorded by RPS (2010a), comprising nine frogs, nine reptiles, 64 birds and 18 mammals. While no species listed on the EPBC Act were recorded, five threatened fauna species listed on the TSC Act were recorded. Potential habitat exists for a further 13 threatened fauna species listed on the TSC Act. Of the 14 threatened species and 10 migratory species listed on the EPBC Act protected matter database search results, none were identified in the Project Site. However potential habitat exists for two of the threatened species and seven of the migratory species.

No threatened flora species were observed within the Project Site, and it is therefore considered that the Project will not have any significant effect on locally occurring threatened flora species. The Project is also unlikely to significantly affect any threatened, migratory or protected fauna species occurring within the subject site or any locally occurring threatened flora species.

An assessment of the applicability of the EPBC Act to the Rocglen Extension Project was included in the *Flora and Fauna Assessment* (RPS 2010a). RPS (2010a) undertook an on-line search of the EPBC Act Protected Matters Search database (3 January 2010) to generate a list of those matters of National Environmental Significance (NES) within 40 km of the Project Site. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed will have, or is likely to have, a significant impact upon a matter of NES, or on the environment of Commonwealth land.

Following submission of a referral in late May 2010, the Rocglen Extension Project was found to be considered a 'controlled action' under the EPBC Act. In summary, the then Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA), which is now known as the Commonwealth Department of Sustainability, Environment, Water, Population and Community (SEWPaC), advised the following:

*The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.*

*The project will be assessed through an accreditation of Part 3A of the New South Wales Environmental Planning and Assessment Act 1979.*

All efforts will be made by Whitehaven to avoid disturbance of the vegetation communities within the Project Site and to maintain and enhance as much of the existing remnant vegetation on-site as possible. Whitehaven already employs a range of complementary flora and fauna management strategies and mitigation measures, and these will continue to be implemented for the Rocglen Extension Project. Furthermore, a revised *Biodiversity Offset Strategy* has been prepared by Eco Logical Australia (2010) to compensate for the Project impacts and the impacts to the previously approved offset areas (i.e. cumulative impacts) on a 'like for like' basis with the equivalent of over 525 hectares of vegetation within the Whitehaven Regional BioBank Site. The *Strategy* will provide an offset to impact ratio of 4.75:1.

### **Aboriginal Heritage**

An assessment of Aboriginal cultural heritage issues associated with the Rocglen Extension Project has been undertaken by RPS (2010b). Consultation with Aboriginal stakeholders was in accordance with the NSW Department of Environment, Climate Change and Water's (DECCW) 2004 *Interim Community Consultation Requirements* (ICCRs).

Field survey identified three stone artefacts sites within the Project Site, comprising one isolated find and two artefact scatters. In addition, two scarred trees identified on the DECCW's Aboriginal Heritage Information Management System (AHIMS) database as NPWS #20-4-0194 and NPWS #20-4-0195, recorded by Appleton (2007), are located on the eastern road reserve of Wean Road.

All efforts will be made by Whitehaven to minimise disturbance within the Project Site. The site already operates under an *Aboriginal and Cultural Heritage Management Plan* (ACHMP) prepared by Whitehaven (2008c) under PA 06\_0198 and employs a range of management strategies and mitigation measures, and these will continue to be implemented.

If impact to the three stone artefacts identified within the Project Site is unavoidable, a surface salvage will be undertaken in accordance with Section 3 of the ACHMP (Whitehaven 2008c). Artefacts salvaged will be transferred to relevant Aboriginal groups under a Care and Control Permit under Section 85A of the NP&W Act. Protective measures designed to prevent damage to the scarred trees will be enacted upon as per recommendations in Appleton (2007) and the ACHMP (Whitehaven 2008c). Whitehaven has restricted the proposed mine extension in this area and has committed to ensuring that no disturbance to the scarred trees or immediate surrounds will occur as a result of the Project. Additional management strategies, mitigation measures and consultation activities will be undertaken by Whitehaven as recommended by RPS (2010b).

### **Visual Amenity**

The impact of the Project on the visual amenity of the local area is considered to be relatively low and acceptable. GSSE has undertaken a visual amenity assessment considering the post-mining outlooks from five residences (both privately owned and project-related) in close proximity to the mine.

While the existing topography and remnant vegetation generally contained within road reserves around the Project Site offer natural screening, distant views of the expanded Northern Emplacement Area will be seen from surrounding residences. There is no additional coal handling or significant infrastructure improvements proposed.

Early re-shaping and revegetation of the external batter slopes of the emplacement area will be undertaken in Years 1 and 2 of the expanded operation to, amongst other things, minimise visual impacts. While the expanded Northern Emplacement will extend above the tree line, the post-mining landform is expected to be consistent with the ridgeline contained within the Victory State Forest and, as such, when fully revegetated, it will not present a significant impact on the visual amenity of the area.

A range of management strategies and mitigation measures, including rehabilitation activities and lighting controls, will continue to be implemented to minimise the potential for visual impact.

### **Greenhouse Gas Emissions**

Emissions of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) will be the most significant greenhouse gases for the Rocglen Extension Project. These gases are formed and released during the combustion of fuels used on-site and from fugitive emissions occurring during the mining process due to the fracturing of coal seams.

PAEHolmes (2011) undertook a comparison with the baseline 1990 Australian emissions, which are reported under the Kyoto Protocol as 547.7 Mt CO<sub>2</sub>-e (DCC 2008, as cited in PAEHolmes 2011). Comparing the average annual Scope 1 emissions from Rocglen, against the 1990 baseline, results in a 0.02% increase from 1990 levels. The annual greenhouse emissions for NSW in 2007 were 151.6 Mt (DCC 2009, as cited in PAEHolmes 2011). Average annual Scope 1 emissions from Rocglen represent an approximate increase of 0.06%. PAEHolmes (2011) concludes that there are not likely to be any measurable environmental effects due to the emissions of greenhouse gases from the Rocglen Extension Project.

A *Greenhouse and Energy Efficiency Plan* was prepared by Denis Cooke & Associates in June 2009 for Rocglen in accordance with PA 06\_0198, and it will continue to be implemented. This Plan is designed to promote continuous change and sustainable improvement in energy management and efficiency.

### **Traffic and Transport**

All coal mined at Rocglen will continue to be transported approximately 30 km by road to the Whitehaven CHPP, as currently approved under PA 06\_0198, for selective washing, stockpiling and dispatch by rail to the Port of Newcastle or by road to domestic customers. A proportion of the coarse and fine reject material from the Whitehaven CHPP is approved to be backloaded to Rocglen for placement in the mined-out areas of the open cut. This is proposed to continue under the Rocglen Extension Project.

The bulk of the truck fleet consists of 40 tonne capacity B-double trucks and the occasional semi-trailer. An average of 120 loads (4,800 tonnes) of coal is dispatched daily at the maximum production rate of 1.5 Mtpa. This equates to between 17 and 24 movements per hour over a typical operational day, with dispatch of coal permitted under PA 06\_0198 between 7.00 am and 9.15 pm Monday to Friday and between 7.00 am and 5.15 pm on Saturdays.

The Project does not involve any change to the coal production rate, transport fleet, hours of coal haulage or coal haulage route used between Rocglen and the Whitehaven CHPP. On this basis, the Project does not pose any additional annual impacts upon the local road network or traffic volumes, nor does it pose any additional conflict with other road users.

The Project will result in an extension to the life of the Rocglen operation, which will necessitate on-going coal transport for a number of years beyond what was originally approved under PA 06\_0198. The use of the road network for this extended period will be covered under the arrangements of the existing road maintenance agreement with Gunnedah Shire Council to ensure the subject roads continue to be adequately maintained.

Furthermore, a range of complementary traffic management strategies and mitigation measures will continue to be implemented by Whitehaven for the Rocglen Extension Project.

### **Socio-Economic Considerations**

To assess the socio-economic implications of the original Rocglen Coal Mine development, R.W. Corkey & Co. (2007) built on the results of a previous socio-economic study completed by Key Insights and Castlecrest Consulting for a similar scale coal mine development known as East Boggabri Coal Mine in 2005. The key findings and conclusions of R.W. Corkey & Co.'s (2007) assessment have been used in consideration of the Rocglen Extension Project.

While the Rocglen Extension Project does not involve any increase to the coal production rate or employment, it is anticipated that the Project will enable open cut mining for approximately 11 years following the issue of Project Approval and the subsequent issue of a new or amended mining lease. This represents an increase to the projected life of the mine, for coal extraction, of up to four years, which, in turn, will secure on-going employment opportunities and socio-economic flow-on benefits over this time.

Notable positive socio-economic benefits include, but are not limited to, the following:

- Maintenance of direct employment levels (54 full-time jobs) and indirect employment levels for up to an additional 4 years;
- Training opportunities for local people, including young people and indigenous people, in a growth industry (mining);
- Stimulus to local businesses, particularly in Gunnedah, including motel and hotel trade, cafes and restaurants, mining-related servicing and engineering business, and general surplus spending activity such as gyms, cinema, recreational goods and services, beauty salons, and hair dressers;
- Contribution of close to \$21 million per year of operation to the local and regional economies through wages, payments to contracting companies and expenditure of other local goods and services;
- Contribution of close to \$46 million per year of operation to the NSW, Australian and global economies through income tax, royalties, payroll tax, payments to rail-related contracting companies and expenditure of other goods and services; and
- Community-based and charitable contributions ensuring that the economic benefits of the Rocglen Coal Mine are not restricted to the company, employees and various levels of government.

The Project does not pose any notable social impacts over and above those assessed and approved under PA 06\_0198. Potential social issues primarily relate to noise emissions, traffic generation and the temporary cessation of agricultural activities within the Project Site. Each of these issues has been appropriately addressed within the EA, with no significant or limiting factors identified.

## **CONCLUSION**

Whitehaven has shown a commitment to the principles of Ecological Sustainable Development (ESD) and understands that social, economic and environmental objectives are interdependent. Whitehaven also acknowledges that a well designed and effectively managed operation will avoid significant and/or costly environmental impact or degradation. The suite of environmental management plans and monitoring programs employed at Rocglen are designed to demonstrate environmental due diligence and to implement procedures that provide on-going management and monitoring of the mine operation in-line with the objectives of ESD.

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## 1.0 INTRODUCTION

### 1.1 Overview

This Environmental Assessment (EA) has been prepared to support an application by Whitehaven Coal Limited (“the Proponent”) for a new Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to expand operations at the company’s Rocglen Coal Mine in the Gunnedah Basin of northern New South Wales (NSW) (see **Figure 1**). A copy of the project application form is contained within **Appendix A**.

The Rocglen Coal Mine (formally known as Belmont Coal Project) was originally approved by the Minister on the 15 April 2008 under Project Approval PA 06\_0198. It was classified as a Major Project in accordance with the former *State Environmental Planning Policy (Major Projects) 2005* and, subsequently, was determined under Part 3A of the EP&A Act. A copy of the original Project Approval is contained within **Appendix B**. The mining lease (ML 1620) was issued for the Rocglen operation in June 2008 and coal production subsequently commenced in late 2008.

Following further drilling and definition of the local geological features, as well as additional reviews of the mine plan, Whitehaven now propose to expand operations at Rocglen in order to maximise resource recovery and allow for improved mine progression. The Project, if approved, would permit up to 5 Mt of coal, not previously considered in the life of mine plan, to be extracted. This represents an increase in coal recovery from Rocglen by close to 30 percent. At a maximum recovery rate of 1.5 Mt run-of-mine (ROM) coal annually, this will increase the projected life of the operation for coal extraction by up to four years.

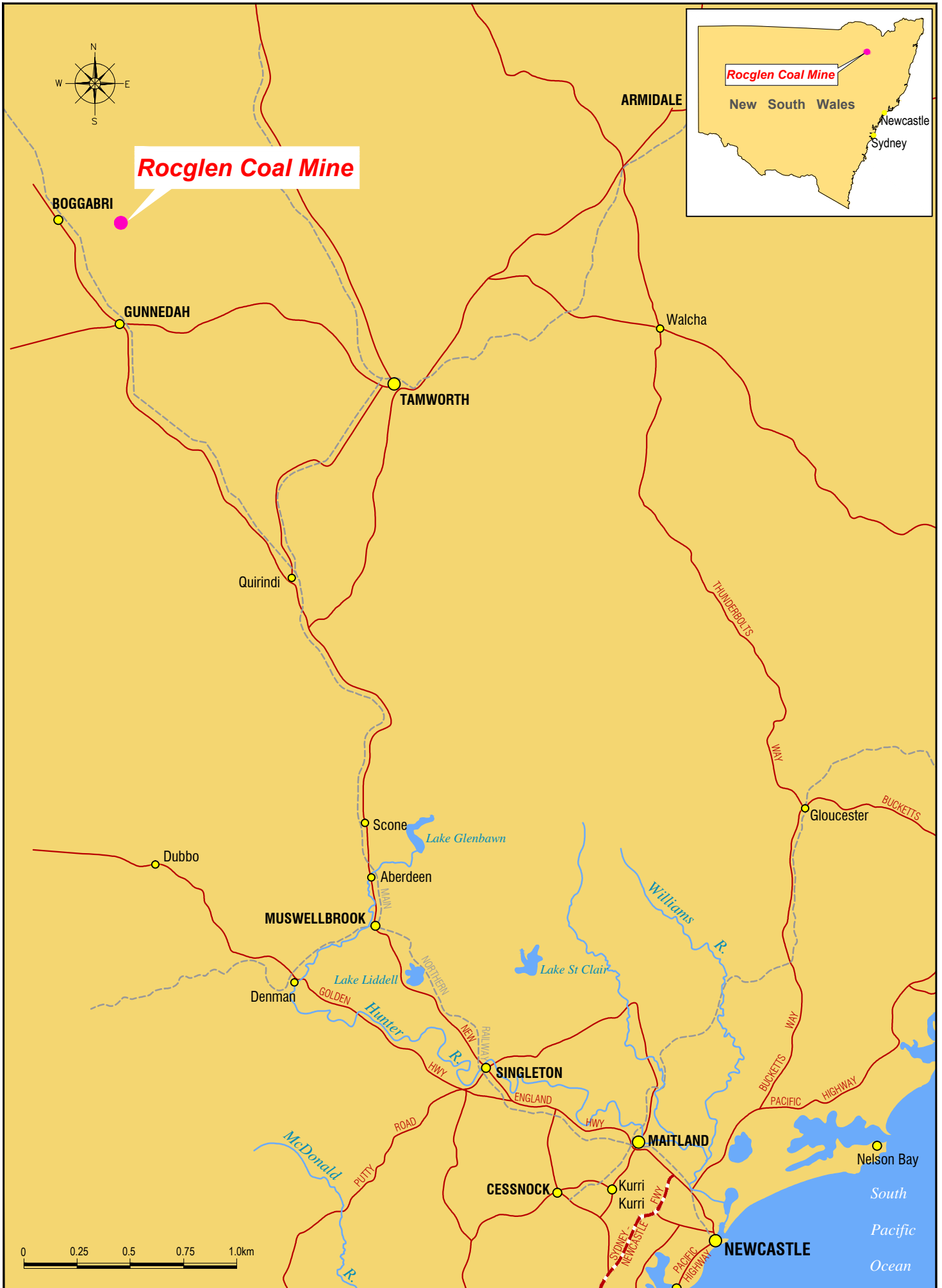
A Preliminary Environmental Assessment (PEA) for the Rocglen Coal Mine Extension Project was submitted to the NSW Department of Planning (DoP) in December 2009, with the Director-General’s Requirements (DGRs) issued in March 2010. Consultation has also been undertaken with other relevant local and state government agencies, local Aboriginal groups and surrounding residents. The methods and outcomes of this consultation are outlined below in **Section 2.0**.

In addition to describing the Project, this EA contains relevant background information and a description of the existing environment and current approved mining operations at Rocglen. It includes a comprehensive and relevant assessment of the planning, development, operation, rehabilitation and environmental management and monitoring matters to a level of detail commensurate with the scale of the Project, industry standards and the legislative framework under which the Project is permitted.

### 1.2 Project Site

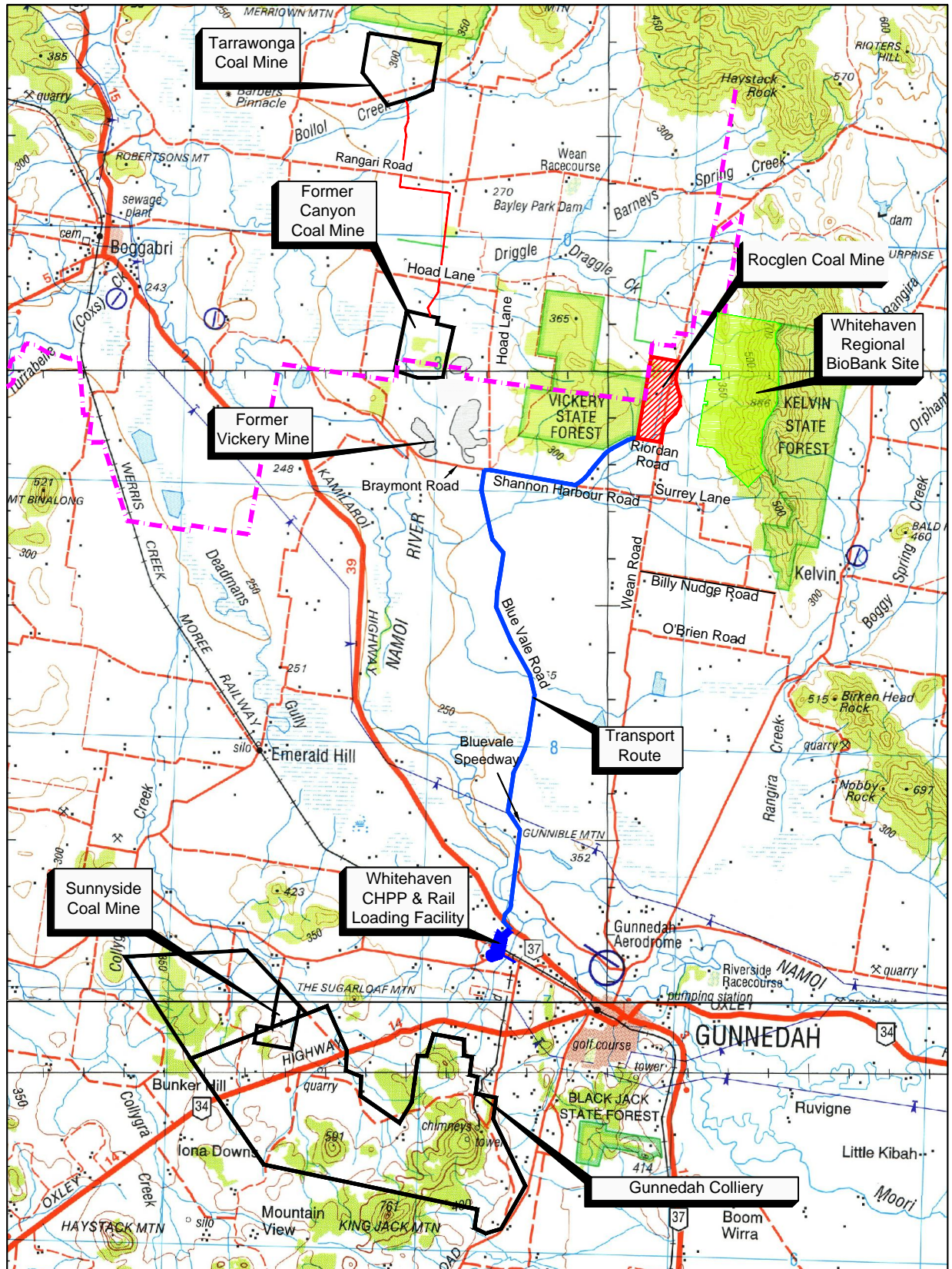
The Rocglen Coal Mine is located in the Gunnedah Basin of northern NSW, approximately 320 kilometres (km) north-west of Newcastle. **Figure 2** positions the mine in its regional setting on Wean Road approximately 25 km north of Gunnedah and 23 km south-east of Boggabri.

The Project Site is defined on **Figure 3** and encompasses the areas within which mining and mining-related activities are currently approved under PA 06\_0198 (see **Section 1.6**) and those additional areas that are subject to the new Part 3A Project Application (see **Section 1.7**). As evident, the Project Site extends beyond the bounds of the existing mining lease identified as ML 1620.



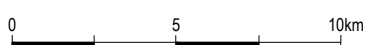
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Rocglen Coal Mine Extension Project  
 Locality Plan



**LEGEND**

- Current Mine Lease Boundary
- Approved Transport Route
- - - Gunnedah / Narrabri Shire Boundary

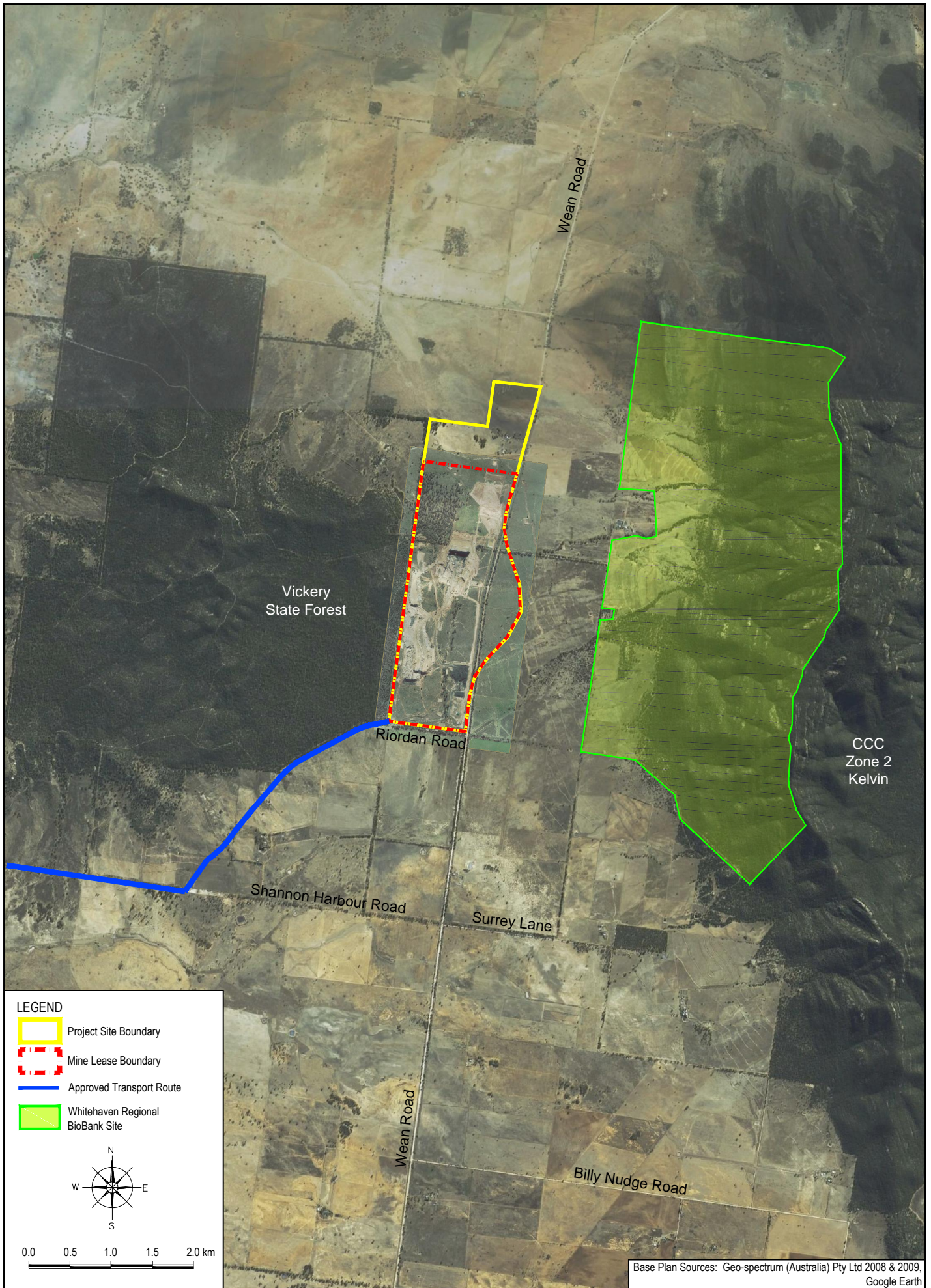


Base Plan Source: RWC 2007  
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Rocglen Coal Mine Extension Project  
Regional Setting  
**FIGURE 2**



Base Plan Sources: Geo-spectrum (Australia) Pty Ltd 2008 & 2009, Google Earth

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### 1.3 The Proponent

Whitehaven Coal Limited (Whitehaven) is a publicly listed mining company formed to explore and develop the coal resources within the Gunnedah Region of NSW. The company is now the leading coal producer in the Gunnedah Basin, employing over 250 people, and is listed on the Australian Securities Exchange (ASX:WHC).

Whitehaven has an interest in tenements covering approximately 427 square kilometres (km<sup>2</sup>) within northwest NSW. In addition to the Rocglen Coal Mine, the Whitehaven Group operates three open cut mines, being Tarrawonga, Werris Creek and Sunnyside, and is developing the Narrabri North underground mine. The company's Canyon Coal Mine (open cut) is currently undergoing final rehabilitation.

The company also operates the Whitehaven Coal Handling and Preparation Plant (CHPP) and rail loading facility, located approximately 6 km west of Gunnedah.

### 1.4 Project Team

GSS Environmental (GSSE) has prepared this EA on behalf of Whitehaven including the completion of a number of detailed assessments. The following external consultants undertook specialist studies to assist in the assessment of the Project:

- PAEHolmes – Air Quality Impact Assessment;
- Spectrum Acoustics – Noise and Vibration Impact Assessment;
- Douglas Partners – Hydrogeological Assessment;
- RPS – Flora and Fauna Assessment and Cultural Heritage Survey and Assessment; and
- Eco Logical Australia (ELA) – Biodiversity Offset Strategy.

The assessment of surface water, soils and land resources, visual amenity, and rehabilitation and mine closure were undertaken by GSSE's in-house consultants.

Mine design and annual sequencing information has been provided by Whitehaven's contracted mining engineering company MMG Civil, and preliminary geotechnical assessment of the proposed final highwall stability has been undertaken by Whitehaven's contracted geotechnical engineering company GE Holt and Associates (GHA).

Whitehaven's Mr Brian Cullen (General Manager – Technical Services) and Mr Danny Young (Group Environmental Manager) provided direction in terms of project scope, technical input and assisted in finalising the EA.

### 1.5 Environmental Assessment Structure

The purpose of this EA is to enable consideration of the implications of proceeding with the Rocglen Coal Mine Extension Project. The EA has been prepared in accordance with the EP&A Act and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The matters addressed within the EA are presented in a manner that clearly addresses the specific requirements of the Director-General (DGRs), as well as the requirements of other consulted government agencies.

The EA is presented in two volumes, with Volume 1 containing the main text and Volume 2 containing additional supporting information including the specialist assessment reports.

In summary, Volume 1 of the EA is structured as follows:

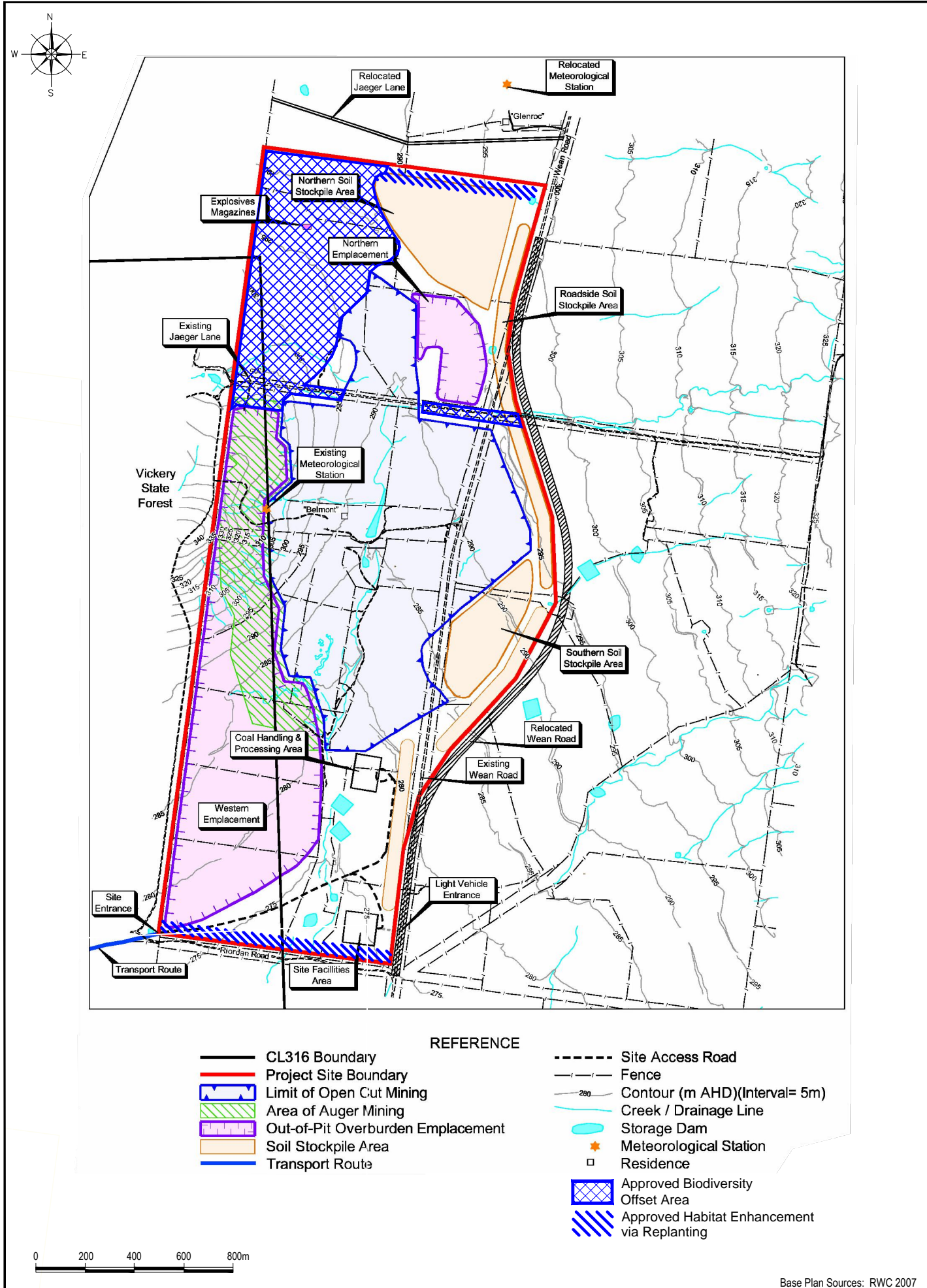
- Section 1:** introduces the Proponent and the Project team involved in producing the EA, outlines the Project background, provides a summary of the primary Project components, and nominates the approval pathway.
- Section 2:** outlines the process used to identify and prioritise the issues to be addressed within the EA, including stakeholder consultation activities and project risk assessment.
- Section 3:** provides an overview of the Project Site in terms of locality, land ownership, surrounding land uses, climate, topography, geology and soils.
- Section 4:** provides a description of the existing approved operations.
- Section 5:** provides a detailed description of the proposed Project.
- Section 6:** describes the planning approval and environmental legislative framework for the Project, including the applicability of Commonwealth and State legislation, as well as local planning instruments.
- Section 7:** contains a description of the existing environment and an assessment of the potential environmental issues/impacts relevant to the Project, including cumulative impacts.
- Section 8:** lists the Statement of Commitments proposed to be adopted throughout the life of the Project in order to mitigate potential adverse impacts and ensure appropriate management and monitoring.
- Section 9:** outlines the justification for the Project and contains the conclusion to the EA.
- Section 10:** lists the reference documents referred to within the EA.
- Section 11:** lists abbreviations used within the EA.

## 1.6 Approved Mine Operations

The Rocglen Coal Mine (formally known as Belmont Coal Project) was originally approved by the Minister on the 15 April 2008 under Project Approval PA 06\_0198. It was classified as a Major Project in accordance with the former SEPP (Major Projects) 2005 and, subsequently, was determined under Part 3A of the EP&A Act. A copy of the original Project Approval is contained within **Appendix B** and the approved mine layout is shown on **Figure 4**.

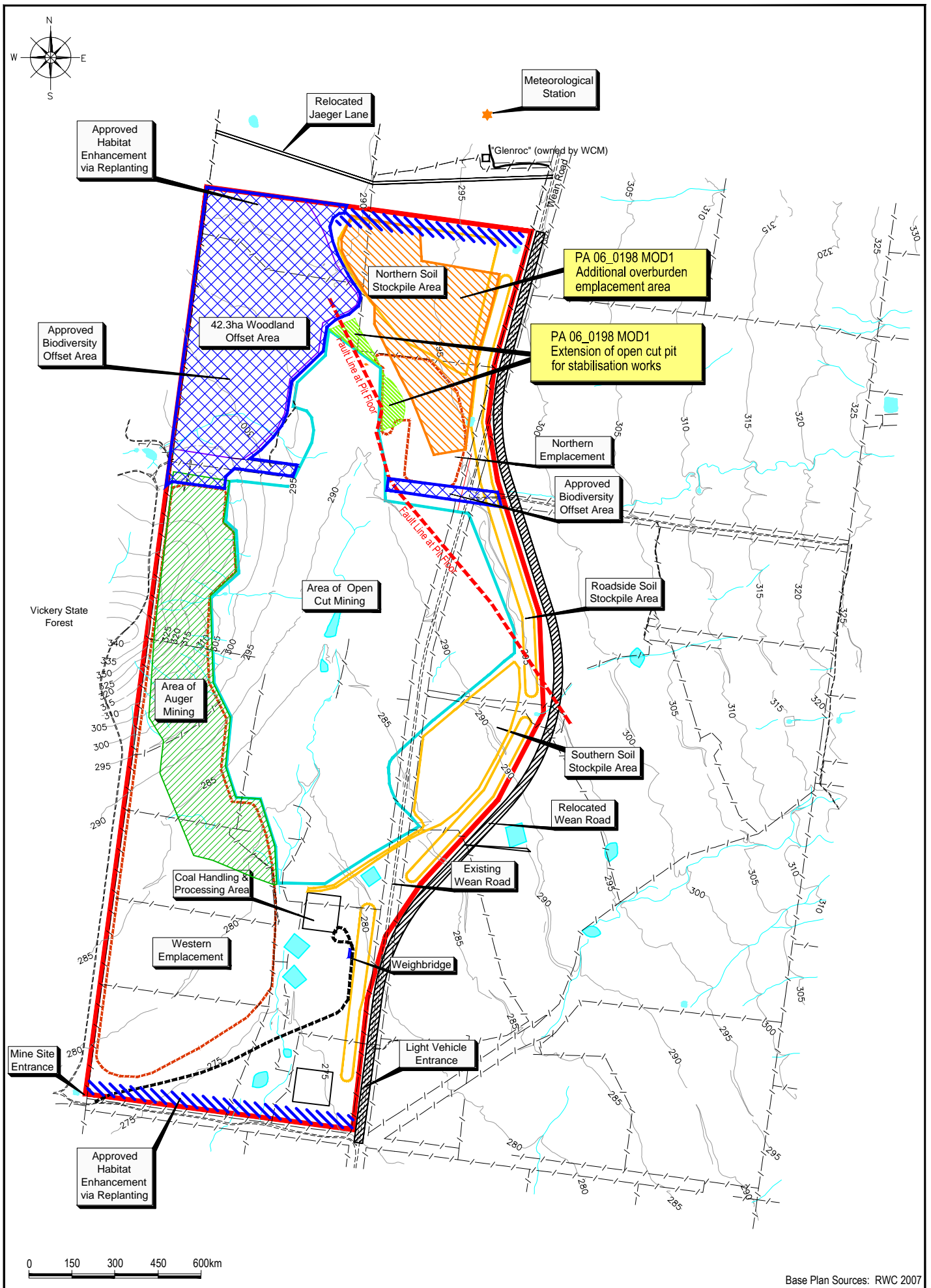
The mining lease (ML 1620) was issued for the Rocglen operation in June 2008 and coal production subsequently commenced in late 2008. Approximately 1.5 million tonnes of coal per annum (Mtpa) is mined using truck and excavator method. The coal is transported approximately 30 km by road to the Whitehaven CHPP for selective washing and subsequent transport by rail to the Port of Newcastle or by road to domestic customers.

On the 27 May 2010, the Minister issued an approval under Section 75W of the EP&A Act to modify Project Approval PA 06\_0198 (06\_0198 MOD 1). This modification permitted Whitehaven to undertake unplanned emergency earthworks to stabilise the eastern highwall following slipping adjacent to a fault structure in the north eastern portion of the approved open cut pit. The areas required to be worked to achieve a stable highwall were partially outside of the open cut limit approved under PA 06\_0198. A copy of the Notice of Modification is contained within **Appendix C** and the works approved under the modification are shown on **Figure 5**.



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Rocglen Coal Mine Extension Project  
Approved Mine Layout (PA 06\_0198)



Base Plan Sources: RWC 2007

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In summary, the activities approved at Rocglen under Project Approval PA 06\_0198 (and subsequent modification, PA 06\_0198 MOD 1) are:

- **Coal Mining by Open Cut Mining Methods** – extraction of coal by open cut mining methods within an area of approximately 114 hectares. This involves the extraction of three separate coal seams, being the Upper Glenroc, Lower Glenroc and Belmont Seams, at a production rate of 1.5 Mtpa. The pit extensions approved for stabilisation works under PA 06\_0198 MOD 1 have a combined area of approximately 2.05 hectares, giving a total approved open cut area of approximately 116.05 hectares.
- **Auger Mining** – extraction of additional coal reserves that are uneconomical to extract by open cut mining methods using auger mining techniques.
- **On-Site Coal Processing** – transfer of mined coal by haul truck to a coal handling and processing area located immediately south of the limit of the open cut pit for crushing, screening and loading into trucks for transport off-site.
- **Transportation** – transportation of crushed and screened coal approximately 30 km to the Whitehaven CHPP, via a purpose built section of road between Rocglen and Hoad Lane, and from Hoad Lane via an established coal haulage route for selective washing, stockpiling and dispatch by both rail and road. A proportion of the coarse and fine reject material from the CHPP is approved to be backloaded to Rocglen for placement in the mined-out areas of the open cut.
- **Relocation of Public Roads** – relocation of sections of Wean Road (not yet undertaken) and Jaeger Lane (completed) to allow for open-cut mining activities and infrastructure within these areas.
- **Rehabilitation** – progressive use of out-of-pit and in-pit overburden emplacements to shape and recreate the landform comparable to that of the pre-mining environment. Approximately 84.4 hectares of the disturbed area is to be restored as rehabilitated native vegetation with the remaining 152.6 hectares to be restored to rehabilitated agricultural land.
- **Biodiversity Offset Strategy** – offsetting the disturbance to remnant native vegetation through the protection and rehabilitation of approximately 195.3 hectares of land, comprising the protection of 44.9 hectares of remnant woodland, enhancement planting and rehabilitation to 90.4 hectares and an additional 60 hectares within the Whitehaven Regional BioBank Site.

Based on the open cut reserves at the time of approval and a maximum production rate of 1.5 Mtpa, the Rocglen Coal Mine was anticipated to have a production life for coal extraction of between seven to ten years.

## 1.7 Project Overview

Following further drilling and definition of local geological features, as well as additional reviews of the mine plan, Whitehaven proposes to expand operations at the Rocglen Coal Mine in order to maximise resource recovery and allow for improved mine progression.

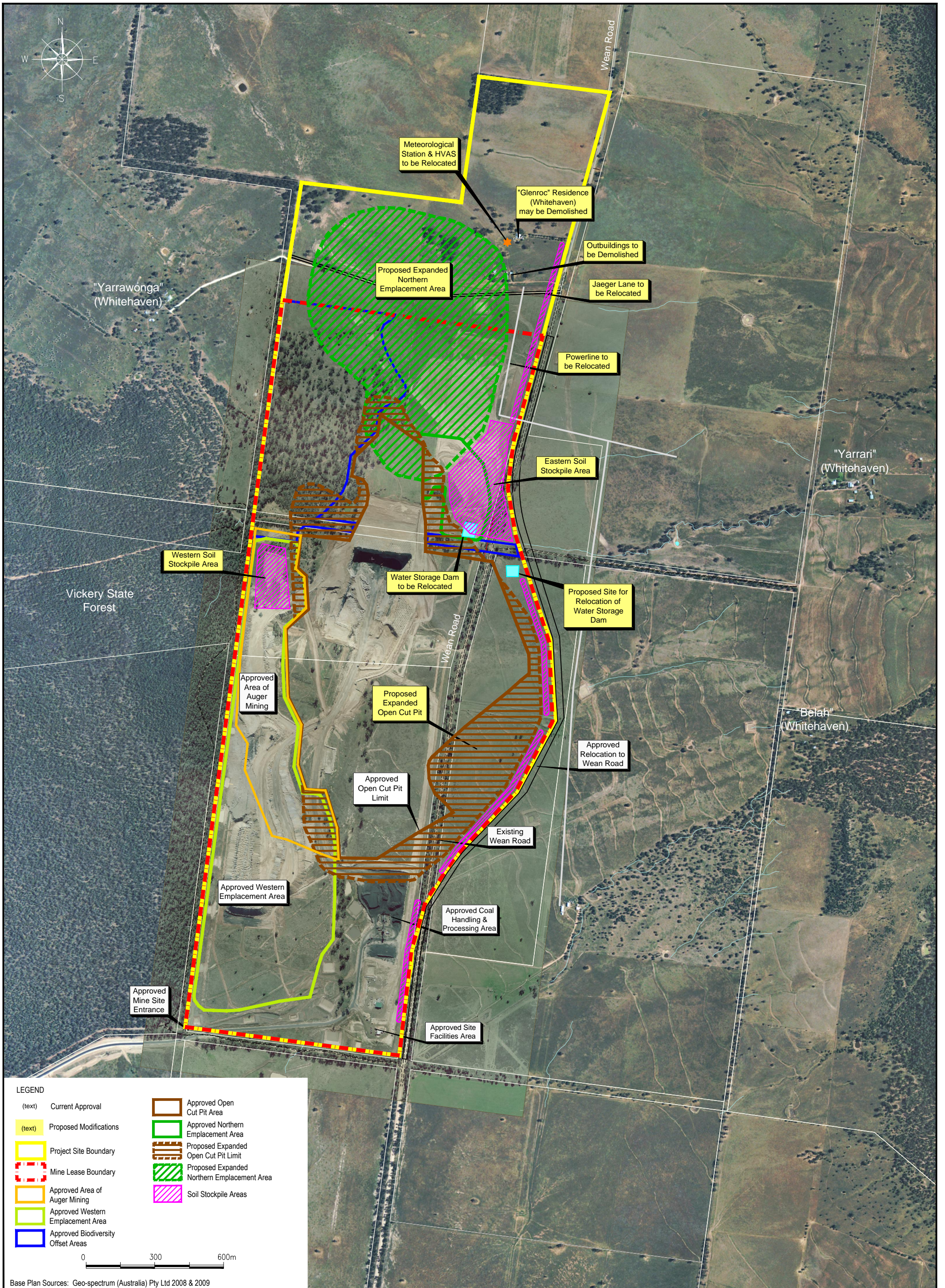
The objectives of the Rocglen Coal Mine Extension Project are to:

- Develop the on-going open cut operations with a focus on:
  - maximising resource recovery and maintaining continuity of coal production from the existing Rocglen Coal Mine beyond the currently projected life of mine;

- maximising the use of existing infrastructure; and
- securing on-going employment opportunities and socio-economic flow-on benefits;
- Provide additional out-of-pit emplacement area to accommodate overburden material from the existing operations and proposed pit expansion; and
- Continue to conduct mining at Rocglen in an environmentally responsible manner to ensure the potential for adverse impact is minimised.

The primary components of the Project, over and above the current operations, to be assessed and determined under Part 3A are summarised in the below dot-points. It is intended that the Rocglen Extension Project will be fully integrated with the remaining operational life of the current approved Rocglen mine, which will enable Whitehaven to operate under a single Project Approval over the life of the Project. **Figure 6** illustrates the layout of the Project Site as proposed under the Rocglen Extension Project.

- **Expansion of Open Cut Pit** – expansion of the open cut pit design limit in order to access up to an additional 5 Mt of coal not previously considered in the life of mine plan. This will increase coal recovery at Rocglen by close to 30 percent. The footprint of the open cut pit will increase by approximately 50 hectares to a total open cut mined area of approximately 164 hectares. Coal will continue to be extracted from the expanded pit at the approved production rate of 1.5 Mtpa and using the open cut mining methods approved at Rocglen.
- **Extension to Life of Mine** – it is anticipated that coal extraction activities will occur for approximately 11 years following the issue of Project Approval and the subsequent issue of a new or amended mining lease. This represents an increase to the projected life of mine, for coal extraction, of up to four years.
- **Expansion of Northern Emplacement Area** - expansion in the footprint and height of the out-of-pit Northern Emplacement Area in order to accommodate a maximum of 12 million bank cubic meters (Mbcm), or 15 million loose cubic metres (Mlcm) accounting for swell, of overburden from the current operations and proposed pit expansion. The maximum design height of the expanded Northern Emplacement Area will be 50 metres above pre-mining landform, which is the approximate height of the adjacent ridge to the west of the Project Site at 340 metres Australian Height Datum (AHD). Early re-profiling and revegetation of the external batter slopes of the emplacement area will be undertaken to minimise visual impacts and limit erosion and downstream sedimentation.
- **Replacement of Soil Stockpile Areas** – the soil stockpiling areas identified as the Northern and Southern Soil Stockpile Areas will be replaced by the proposed Eastern and Western Soil Stockpile Areas to cater for the expanded open cut pit and Northern Emplacement Area. While all of the topsoil currently in the Northern Stockpile Area will be relocated, the majority of subsoil in this area will remain and will be covered with overburden due to sufficient soil material being available for rehabilitation from the expanded operation. The material to be relocated will be placed in either proposed new designated soil stockpile areas or placed directly onto areas available for rehabilitation.
- **Revised Rehabilitation and Mine Closure** - Whitehaven will continue to adopt a progressive approach to rehabilitation throughout the life of the mine. The rehabilitation and mine closure methodologies will essentially remain as currently approved under PA 06\_0198, with the primary differences being the configuration of the final landform and final land use. Of the total anticipated disturbance area of approximately 358 hectares, it is proposed to restore approximately 206 hectares as rehabilitated bushland (58 percent), 147 hectares as rehabilitated pasture (41 percent), with the remaining 5 hectares comprising the retained highwall of the final void (1 percent).



Base Plan Sources: Geo-spectrum (Australia) Pty Ltd 2008 & 2009  
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- **Revised Biodiversity Offset Strategy** – a revised *Biodiversity Offset Strategy* has been prepared to compensate for the Project impacts and the impacts to the previously approved offset areas (i.e. cumulative impacts) on a 'like for like' basis with the equivalent of over 525 hectares of vegetation to be offset within the Whitehaven Regional BioBank Site. The *Strategy* will provide an offset to impact ratio of 4.75:1. The Whitehaven Regional BioBank Site is in the final stages of registration by the DECCW as a BioBank Site under Part 7A of the Threatened Species Conservation Act 1995 (TSC Act). It will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks (via a BioBanking Agreement registered on the land title in-perpetuity).
  
- **Other Minor Project Related Works:**
  - Altered surface water management to effectively cater for the expanded operations;
  - Relocation of the Mine Water Dam to cater for the expanded open cut pit;
  - Relocation of a section of Jaeger Lane (that has already been relocated under PA 06\_0198) to cater for the expanded Northern Emplacement Area;
  - Removal of the building improvements within the "Glenroc" property, which is owned by Whitehaven, to cater for the expanded Northern Emplacement Area;
  - Relocation of the meteorological station and high volume air sampler (HVAS) used to monitor the concentration of particulate matter less than 10 micrometres (PM<sub>10</sub>) located within the "Glenroc" property to elsewhere within or adjacent to the Project Site to ensure adequate separation from the expanded Northern Emplacement Area and optimal operation; and
  - Realignment of an existing overhead powerline, owned by Country Energy, to ensure adequate separation distances from the expanded Northern Emplacement Area and Eastern Soil Stockpile Area.

The Project does not involve any change to the coal production rate, methods of coal extraction, hours of operation, coal handling and processing techniques, site servicing, general waste management or employment. The only change to the current mine fleet will be the addition of one 1250 excavator in the pit to enable cleaner and more efficient mining of coal (smaller machine).

## 1.8 Project Approval Process

Coal mining is a class of development listed in Schedule 1 of the SEPP (Major Development) 2005 as requiring approval under Part 3A of the EP&A Act and determination by the Minister for Planning.

While the Rocglen Coal Mine operates under the provisions of an existing Part 3A Project Approval, consultation with the DoP has confirmed that the Rocglen Extension Project is outside the bounds of a Section 75W modification. On this basis, this EA has been prepared to accompany an application to the Minister for Planning seeking a new Project Approval under Part 3A of the EP&A Act. A copy of the project application form is contained within **Appendix A**.

Refer to **Section 6.2.1** for further details regarding the approval process under Part 3A of the EP&A Act.

## 2.0 CONSULTATION AND ISSUE IDENTIFICATION

### 2.1 Identification of Issues

The key project-related issues warranting detailed investigation and discussion were identified through:

- The environmental context of the Project Site and surrounding locality (see **Sections 3.0** and **7.0**);
- The legislative framework applicable to the Project (see **Section 6.0**);
- A pre-project risk assessment (see **Section 2.2**);
- Outcomes of consultation undertaken with government agencies, including the DGRs issued by the DoP, and other relevant stakeholders (see **Section 2.3**); and
- Specialist studies completed as part of the preparation of the EA (see **Section 7.0**).

Please note that pre-project risk assessment and consultation with government agencies were undertaken on the basis of a project scope that included the transportation of a portion of the coal mined at Rocglen to Whitehaven's Canyon site. This has subsequently been removed from the scope of the Rocglen Extension Project, with all coal mined at Rocglen to continue to be transported to the Whitehaven CHPP as currently under PA 06\_0198.

### 2.2 Pre-Project Risk Assessment

A pre-project risk assessment (broad brush) was conducted by GSSE and Whitehaven personnel in order to:

- Identify those issues relating to the Rocglen Extension Project that represent the greatest risk to the local environment and surrounding populace; and
- Assist in setting (and justifying) priorities for the level of assessment required to address each identified risk in the EA.

A qualitative risk assessment methodology, which was developed in accordance with the requirements of the *Australian Standard AS/NZS 4360:2004 – Risk Management*, was utilised to provide a consistent and reliable approach.

The various identified project-related issues were assessed in light of the mitigation measures and management strategies already in place at Rocglen. Where the individual risks were considered unacceptable, or where a knowledge gap was identified, specialist studies were commissioned and additional mitigation measures and/or management responses were nominated.

The risk register developed as part of this process to document the findings and outcomes is contained within **Appendix D**. This register was also appended to the PEA issued to the DoP and other consulted government agencies. The key environmental issues identified include, but are not limited to, the following:

- Groundwater;
- Flora and Fauna;
- Cultural Heritage;
- Noise and Vibration;
- Surface Water;
- Traffic and Transport;
- Visual Amenity;
- Soils and Land Capability;
- Air Quality (including greenhouse gas); and
- Rehabilitation and Mine Closure.

While the risk assessment did not identify any high risk issues (Level V), a number of issues ranked as medium risks (Level III and IV). **Section 7.0** contains a comprehensive assessment of these and other issues, as investigated and reported on by GSSE and various specialist consultants.

## 2.3 Consultation

### 2.3.1 Overview

Whitehaven has undertaken consultation with local and state government agencies, local Aboriginal groups, the Rocglen Community Consultative Committee (CCC), surrounding residents and Country Energy in the preparation of this EA. A stakeholder consultation log was maintained as a record of the consultation activities undertaken. **Table 1** provides a summary of the consultation.

**Table 1 – Stakeholder Consultation**

Date	Stakeholder <sup>1</sup>	Purpose <sup>1</sup>
11 November 2009	Rocglen CCC	Preliminary outline of the proposed extension to Rocglen operations
18 November 2009	Country Energy	Seek advice with regards to the proposed realignment of an overhead powerline
10 December 2009	DoP	Presentation of the PEA and discussion regarding project and approval pathway
22 January 2010	DoP	Provision of electronic copy of the PEA
22 January 2010	DECCW, NOW, I&I NSW, Namoi CMA and Council	Provision of PEA, with cover letter
27 January 2010	RTA	Provision of PEA, with cover letter
3 February 2010	DoP	Querying timing for issue of DGRs and any issues
10 February 2010	Rocglen CCC	Provision of updated detail regarding the Project and EA preparation
15 February 2010	I&I NSW	Discussion regarding configuration options for final landform, including final void
23 February 2010	DoP	Presentation of Whitehaven's projects requiring planning approval, which included reference to the Rocglen Project
18 March 2010	DoP	Advise approval under the EPBC Act may be necessary and that a referral to the DEWHA was intended to be made
26 March 2010	Surrounding residents	Issue of Community Newsletter outlining the Project and approval procedure
29 March 2010	I&I NSW	Presentation of Whitehaven's projects requiring planning approval and subsequent I&I NSW engagement, which included reference to the Rocglen Project
12 May 2010	Rocglen CCC	Provision of updated detail regarding the Project and EA preparation
18 May 2010	DEWHA	Referral lodged under the provisions of the EPBC Act
14 July 2010	DoP, DECCW, NOW, I&I NSW, RTA, Namoi CMA and Council	Submission of the EA for Adequacy Review
16 July 2010	Surrounding residents	Community newsletter
10 November 2010	Rocglen CCC	Provision of updated detail regarding the Project and EA preparation

<sup>1</sup> – see below sections for abbreviations

### 2.3.2 Agency Consultation

During a meeting held in December 2009, Whitehaven's Brian Cullen (General Manager – Technical Services) presented the DoP's David Kitto (Director, Major Development Assessment) with the PEA for the Rocglen Coal Mine Extension Project and discussed matters surrounding the Project. It was agreed that a new Project Application under Part 3A of the EP&A Act was the most appropriate approval pathway, with the DoP indicating that the DGRs would likely be issued without the need to undertake a Planning Focus Meeting (PFM).

In January 2010, the DoP requested that the PEA be provided to the following agencies:

- NSW Department of Environment, Climate Change and Water (DECCW);
- NSW Office of Water (NOW);
- NSW Department of Industry and Investment (I&I NSW);
- NSW Roads and Traffic Authority (RTA);
- Gunnedah Shire Council (Council); and
- Namoi Catchment Management Authority (CMA).

Following consultation with these agencies, the DoP issued the DGRs in March 2010 outlining the general requirements and key issues to be addressed within the EA. The DGRs and formal correspondences received from the other consulted agencies are contained within **Appendix E**.

As noted in **Table 1**, additional government agency consultation has been undertaken. Particular reference is made to the following:

- Verbal consultation with the I&I NSW's Julie Moloney (Senior Project Officer, Development Coordination) in February 2010 regarding configuration options for the final landform and final void; and
- Verbal consultation with the DoP's Carl Dumpleton and John Ross in March 2010 to advise that an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) may be necessary and that a referral to the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA), which is now known as the Commonwealth Department of Sustainability, Environment, Water, Population and Community (SEWPaC), was intended to be made (see **Section 6.1.1**).

In relation to the last dot-point, and following submission of this EA to the DoP for Adequacy Review in July 2010, the then DEWHA (now SEWPaC) issued correspondence on the 10 August 2010 confirming that the Project is a controlled action under Section 75 of the EPBC Act and that the accredited process for this action is the Part 3A assessment process. As a result, supplementary requirements were issued by the DoP to ensure that the Commonwealth's requirements for environmental assessment were addressed. A copy of the correspondence issued by the then DEWHA and the DoP is contained within **Appendix E**.

**Table 2** provides a summary of the issues raised by each of the government agencies consulted and a reference to which section in this EA that each issue has been addressed.

**Table 2 – Issues Raised by Government Agencies**

<b>Development Issue / Assessment Requirement</b>	<b>EA Section</b>
<b>NSW Department of Planning (Director-General's Requirements)</b>	
<b>General Requirements:</b>	
Executive Summary	Executive Summary
Existing and approved development	Section 4.0
Existing environmental management and monitoring regime	Section 4.18 and Appendix H
Detailed description of all aspects of project	Section 5.0
Need for the project	Section 5.1
Alternatives considered	Section 9.3.4 (no economically feasible alternatives available)
Likely interactions with existing and proposed operations	Sections 5.0 and 7.0
Plans of any proposed building works	Figure 6 (plus additional figures throughout EA) (no additional building improvements)
Risk assessment	Section 2.2 and Appendix D
A statement of commitments	Section 8.0
A conclusion justifying the project on economic, social and environmental grounds	Section 9.0
A signed statement from author of the EA	Cover pages
<b>Detailed Assessment of Key Issues:</b>	
Biodiversity	Sections 5.8 and 7.7, and Appendices K and L
Surface water	Section 7.5 and Appendix M
Groundwater	Section 7.6 and Appendix R
Soil	Sections 3.12 and 7.1, and Appendix G
Noise and blasting	Sections 7.3 and 7.4, and Appendix Q
Rehabilitation, final landform and final void management	Section 5.7 and Appendix J
Air quality	Section 7.2 and Appendix P
Visual	Section 7.10
Traffic and transport	Section 7.12
Heritage	Sections 7.8 and 7.9, and Appendix O
Greenhouse gases	Section 7.11 and Appendix P
Social and Economic	Section 7.15
Consultation activities	Section 2.3
Approval under the Commonwealth EPBC Act	Section 6.1.1, and Appendices K and N
<b>NSW Department of Planning (supplementary requirements to cover the requirements of the then Commonwealth Department of Environment, Water, Heritage and the Arts)</b>	
General Information on the background of the controlled action	Entire EA, particularly Sections 4.0, 5.0 and 6.1.1
A description of the controlled action	Section 5.0
An assessment of all relevant impacts of the controlled action with reference to the <i>EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance (2009)</i>	Entire EA, particularly Sections 5.0 and 6.1.1, and Appendix K
Proposed safeguards and mitigation measures	Sections 5.0, 7.0 and 8.0
Offsets	Sections 5.8 and 7.7.8, and Appendix L
Other approvals and conditions	Sections 4.0 and 6.0, and Appendices B and C
Economic and social matters	Sections 7.15 and 9.3

Environmental record of the proponent proposing to take the action	See Section 6 of EPBC Referral previously lodged with the then DEWHA
Information sources	Section 10 (reference list)
Consultation	Section 2.3
<b>NSW Department of Environment, Climate Change and Water</b>	
Impacts on air quality	Section 7.2 and Appendix P
Greenhouse gas emissions	Section 7.11 and Appendix P
Impacts of noise and vibration	Sections 7.3 and 7.4, and Appendix Q
Impacts on water quality and quantity	Sections 7.5 and 7.6, and Appendices M and R
Impacts on biodiversity and specifically threatened species and their habitat	Sections 5.8 and 7.7, and Appendices K and L
Impacts on Aboriginal cultural heritage values	Section 7.8 and Appendix O
Impacts of the project on Native Vegetation	Sections 5.8 and 7.7, and Appendices K and L
Design and layout of facilities to minimise impact and achieve ambient goals	Sections 5.0, 7.0 and 8.0
Actions that will be taken to avoid or mitigate environmental impacts, or compensatory measures to minimise unavoidable impacts	Sections 5.0, 7.0 and 8.0
Potential requirement to vary the existing EPL	Sections 6.2.2 and 7.5.7
<b>NSW Office of Water</b>	
Adequate and secure water supply	Section 7.5.5 and Appendix M
Site water demands, water sources, water disposal methods and water storage structures in the form of a water balance	Section 7.5 and Appendix M
Methods to maximise water efficiency	Section 7.5 and Appendix M
Proposed water management based on site water balance with reference to existing and proposed extraction and storage of groundwater	Sections 7.5 and 7.6, and Appendices M and R
Existing and proposed water licensing requirements	Sections 7.5.7 and 7.6.2, and Appendices M and R
Impact on adjacent licensed water users, basic landholder rights, or groundwater-dependent ecosystems	Sections 7.5 and 7.6, and Appendices M and R
Requirements to intercept groundwater and predicted dewatering volumes, water quality and disposal/retention methods	Section 7.6 and Appendix R
Zone of influence (cone of depression) and associated impacts on the local and regional groundwater systems	Section 7.6 and Appendix R
Impact on groundwater and surface water due to construction of water storages	Appendices M and R
Impact on groundwater or surface water due to the operation of infrastructure that stores or produces potential contaminants	Sections 7.5 and 7.6, and Appendix M
Mitigating and monitoring requirements to address surface and groundwater impacts	Sections 7.5 and 7.6, and Appendices M and R
Impact on watercourses and drainage lines	Section 7.5 and Appendix M
<b>NSW Department of Industry and Investment</b>	
Mining Titles	Section 6.2.2
Brief summary of information contained within Resource/Reserve Statement	Section 3.14
Environmental – detailed rehabilitation strategy	Section 5.7 and Appendix J
Agriculture – approach to pasture and grazing management, including environmental and socio-economic impacts on agricultural activities	Sections 5.7, 7.1 and 7.15, and Appendix J
Fisheries Conservation and Aquaculture – aquatic ecological assessment	Section 7.7 and Appendix K (no areas of significant aquatic habitat identified)
Fisheries Conservation and Aquaculture – hydrological impacts	Sections 7.5 and 7.6, and Appendices M and R
Fisheries Conservation and Aquaculture – riparian buffer zones	Appendix M

<b>NSW Roads and Traffic Authority</b>	
<p>The RTA states:</p> <ul style="list-style-type: none"> <li>As it appears that there will be no increase in traffic generation the previous conditions would be adequate.</li> <li>RTA does not envisage any road works will be required on the Kamilaroi Highway for the development.</li> <li>If a revised study is considered necessary than it should include a review of the transport route that assesses the impacts on road safety, traffic management, pavements, infrastructure and transport. The specific issues listed below should also be considered:</li> </ul>	Section 7.12
If considered necessary, as revised traffic study	Not considered necessary. See Section 7.12
<b>Gunnedah Shire Council</b>	
Council states that the requirements would be essentially the same as the original proposal - being, that the Wean Road deviation be sealed throughout and dedicated as the public Wean Road. The existing Wean Road for the deviation section would need to be closed.	Noted
<b>Namoi Catchment Management Authority</b>	
Soils and Land Capability	Sections 3.11, 3.12 and 7.1, and Appendix G
Surface water	Section 7.5 and Appendix M
Groundwater	Section 7.6 and Appendix R
Flora and Fauna	Section 7.7, and Appendices K and L
Cultural Heritage	Section 7.8 and Appendix O
Traffic and Transport	Section 7.12
Noise and Vibration	Sections 7.3 and 7.4, and Appendix Q
Air Quality	Section 7.2 and Appendix P
Visual Amenity	Section 7.10
Site Services	Section 4.11
Waste Management	Section 4.12
Rehabilitation	Section 5.7 and Appendix J
Social and Economic Considerations	Sections 7.15 and 9.3

Whitehaven will continue to consult with the relevant government agencies, as necessary, to discuss any issues through the Project assessment and commissioning phases, as well as during normal operation.

### 2.3.3 Community Consultation

The Project Site is located in an area that is removed from any urban areas and has a relatively low density of surrounding residences, with the nearest non-Project related dwelling located in excess of 2.8 km from the Project Site.

Whitehaven undertook community consultation with regards to the Rocglen Extension Project as outlined below.

#### Rocglen Community Consultative Committee

The Rocglen CCC, which comprises representatives from local government and the community, was established under the existing Project Approval (PA 06\_0198) for the existing Rocglen mining operation. As listed in **Table 1**, the Rocglen CCC has been provided with briefings regarding the Project on the 11 November 2009, 10 February 2010, 12 May 2010 and 10 November 2010. No reportable outcomes or issues stemmed from the CCC briefings.

### Community Newsletters

As listed in **Table 1**, community newsletters were distributed in March 2010 and July 2010 to the following surrounding privately-owned residences:

- “Roseglass”;
- “Penryn”;
- “Retreat”;
- “Roseberry” (project-related, see **Section 3.6**);
- “Surrey”;
- “Carlton”;
- “Brolga”;
- “Braemar”; and
- “Wundurra Stud”.

The newsletters were also distributed to the residences located within the surrounding properties owned by Whitehaven, being “Glenroc”, “Costa Vale”, “Yarrowonga”, “Yarrari”, “Belah” and “Stratford”, which are deemed project-related.

The community newsletters, copies of which are contained within **Appendix F**, provided an introduction to the Project, the key environmental assessment issues, the approval pathway, consultation activities, status of the Project, and contact details for further information. There were no reportable outcomes or issues stemming from the community newsletters, with Whitehaven not receiving any subsequent queries from these, or other, residents.

### 2.3.4 Aboriginal Community Consultation

Consultation with Aboriginal stakeholders was undertaken by RPS, who was engaged to undertake the Cultural Heritage Survey and Assessment for the Rocglen Extension Project, in accordance with the DECCW’s 2004 *Interim Community Consultation Requirements (ICCRs)*. While the new consultation guidelines titled *Aboriginal Cultural Heritage Consultation Requirements for Proponents* were released in April 2010, the DECCW has advised the consultation commenced for projects prior to the 12 April 2010 can continue under the ICCR process. In these circumstances, the Proponent is not required to recommence consultation under the new 2010 guidelines.

There were 12 Aboriginal stakeholder groups that registered an interest in consultation for the Project following the advertisement and notification process commenced in January 2010 under Stage 1 of the ICCRs. These groups are:

- Red Chief Local Aboriginal Land Council (RCLALC);
- Bigundi Biame Gunnedarr Traditional People (BBGTP);
- Gunida Gunyah Aboriginal Corporation (GGAC);
- Min Min Aboriginal Corporation (MMAC);
- Aboriginal Native Title Consultants (ANTC);
- Cobronwonga Consultants (CC);
- Ellilewis Cultural Heritage Consultations (EHC);

- Giwiirr Consultants (GC);
- Hunter Valley Consultants (HVC);
- Mingga Consultants (MC);
- Upper Hunter Heritage Consultants (UHHC); and
- Bullem Bullem Consultants (BBC).

Letters in accordance with Stage 2 of the ICCRs were sent to the registered stakeholders advising of the survey and detailing the proposed survey methodology. The RCLALC, BBGTP, GGAC and MMAC participated in the field survey that was undertaken on the 2 March 2010.

RPS provided a copy of the draft *Cultural Heritage Survey and Assessment* to the RCLALC, BBGTP, GGAC and MMAC for review and comment, in accordance with Stage 3 of the ICCRs, on the 6 May 2010. Three written responses were received by the 4 June 2010, with the fourth response received by the 10 June 2010. For further details refer to **Section 7.8**.

### **2.3.5 Other Stakeholder Consultation**

Consultation was also undertaken with Country Energy in November 2009 seeking advice on the preferred route for the realignment of an existing overhead powerline to make way for the expanded Northern Emplacement Area. Country Energy confirmed, via email correspondence, that the preference for realignment is along the eastern edge of the (realigned) Wean Road reserve and advising of related easement requirements.

## 3.0 SITE DESCRIPTION

### 3.1 Locality

The Rocglen Coal Mine is located in the Gunnedah Basin of northern NSW, approximately 320 km north-west of Newcastle. **Figure 2** positions the mine in its regional setting on Wean Road approximately 25 km north of Gunnedah and 23 km south-east of Boggabri.

### 3.2 Project Site

The Project Site is defined on **Figure 3** and encompasses the areas within which mining and mining-related activities are currently approved under PA 06\_0198 (see **Section 4.0**) and those additional areas that are subject to the new Part 3A Project Application (see **Section 5.0**). As evident, the Project Site extends beyond the bounds of the existing mining lease identified as ML 1620.

The Project Site covers an area of approximately 460 hectares within the Parish of Tulcumba, County of Nandewar and Local Government Area (LGA) of Gunnedah. It incorporates all or part of the following land parcels:

- Lot 1 in DP 787417;
- Lots 1 and 4 in DP 1120601; and
- Public road reserves.

### 3.3 Zoning

Under the provisions of the *Gunnedah Local Environmental Plan 1998 (as amended)* (LEP), the Project Site is located within zone No. 1(a) Rural (Agricultural Protection). Mining is a permissible land use within this zone with development consent.

All land adjoining the mine site is also zoned No. 1(a), with the exception of the Vickery State Forest immediately to the west which is zoned No. 1(f) Forests.

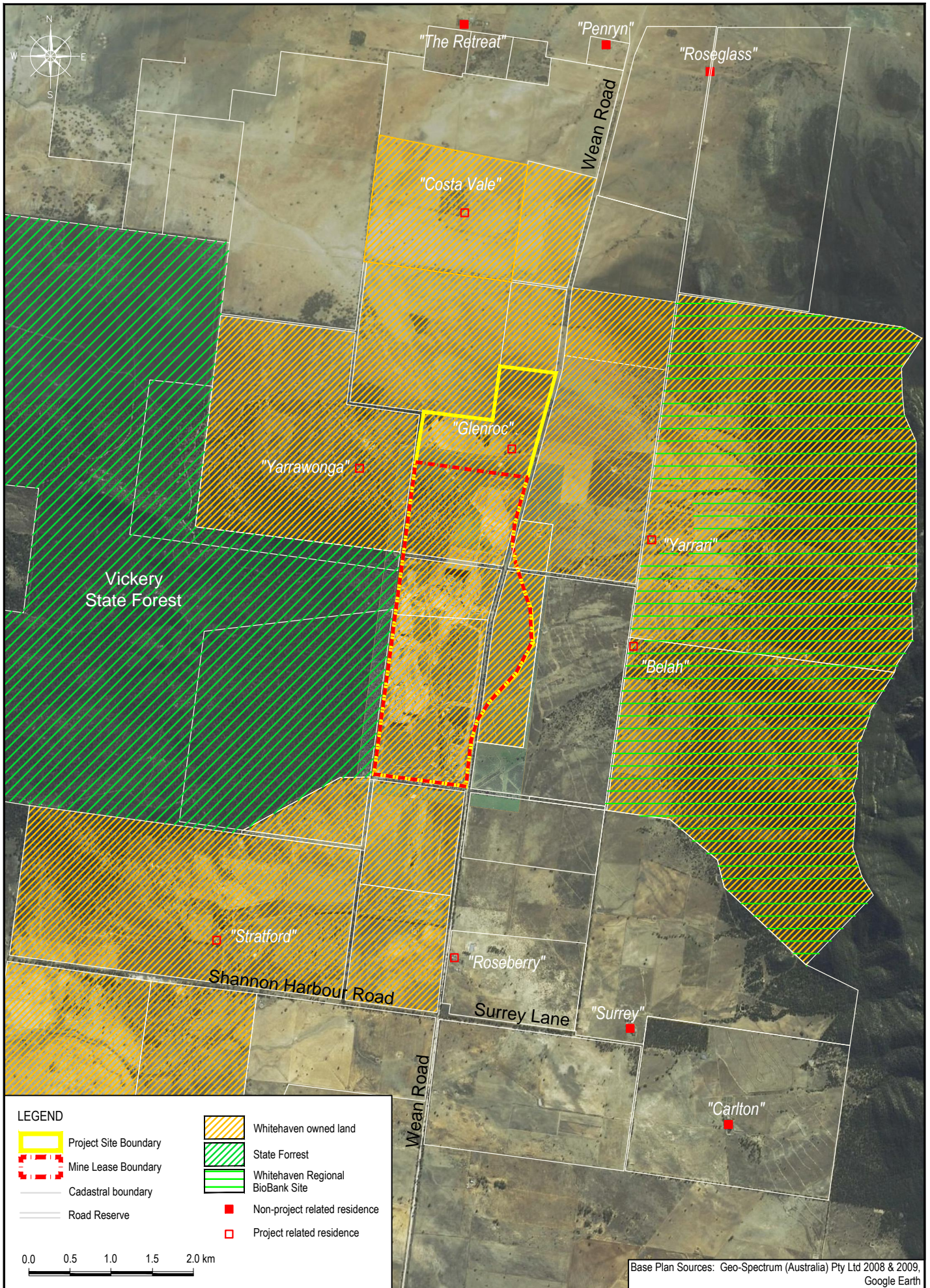
### 3.4 Land Ownership

Land ownership within the Project Site and surrounds is shown on **Figure 7**. As evident, Whitehaven currently owns all freehold land within the Project Site, being Lot 1 in DP 787417 and Lots 1 and 4 in DP 1120601, as well as the surrounding properties identified as "Glenroc", "Costa Vale", "Yarrowonga", "Yarrari", "Belah", "Brentry", "Stratford" and that part of the "Roseberry" property contained within the bounds of the Project Site.

The remaining properties are privately owned. As outlined in **Section 2.3.3**, Whitehaven has been undertaking consultation with these landholders in relation to the Project.

The Vickery State Forest adjoining the Project Site to the west is owned by the Crown.

The remaining land within and surrounding the Project Site occurs as public road reserves.



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### 3.5 Existing Land Use

The majority of the Project Site, being that area within ML 1620, is utilised for the open cut coal mining and mining-related activities of the current Rocglen operation under PA 06\_0198. The northern extent of the Project Site, outside of ML 1620, is utilised for traditional agricultural pursuits comprising a combination of livestock grazing and crop cultivation. As evident on **Figure 3**, the majority of the Project Site has been disturbed by historic land clearing, long-term agricultural production and/or coal mining. Successive years of such disturbance have limited the presence of remnant vegetation to relatively small scattered areas, isolated stands and individual trees.

The Vickery State Forest adjoins the Project Site to the west and is declared under the *Brigalow and Nandewar Community Conservation Area Act 2005* to be within Community Conservation Area (CCA) Zone 4 Vickery. NSW State Forests (Gary Miller 2010, pers. comm.) advised that the Vickery State Forest has multiple uses as per responsibilities under the *NSW Forestry Act 1916*, including general management, fire protection/management, thinning for non-commercial purposes, recreation and timber harvest from time to time on a long-term cycle (i.e. 30 to 40 years). NSW State Forests further advised that there are no current plans for timber harvest in the foreseeable future.

Approximately 3.5 km to the east of the Project Site is the CCA Zone 2 Kelvin. In accordance with the *Brigalow and Nandewar Community Conservation Area Act 2005* this land, which was formally known as the Kelvin State Forest, is reserved under the *National Parks and Wildlife Act 1974* as Aboriginal area. This area, along with the Vickery State Forest, is identified on **Figures 2 and 3**.

The *Whitehaven Regional Biodiversity Offset Strategy* provides for the long-term conservation of approximately 1,500 hectares of land owned by Whitehaven to the east of the Project Site. This area of land, which is now known as the Whitehaven Regional BioBank Site (see **Figures 2 and 3**), is in the final stages of registration by the DECCW as a BioBank Site under Part 7A of the TSC Act. It will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks (via a BioBanking Agreement registered on the land title in-perpetuity).

The remaining land area within the vicinity of the Project Site is characterised by traditional agricultural production comprising a combination of livestock grazing and crop cultivation.

There is no land use within or surrounding the Project Site that is considered to be incompatible or sensitive to the proposed Rocglen Extension Project.

### 3.6 Surrounding Residences

The Project Site is located in an area that is removed from any urban areas and has a relatively low density of surrounding residences, with the nearest non-Project related dwelling located in excess of 2.8 km from the Project Site.

Within a distance of 4 km from the external boundaries of the Project Site there are twelve residences within the surrounding rural properties (see **Figure 7**). Six of these residences, being those on "Glenroc", "Costa Vale", "Yarrowonga", "Yarrari", "Belah" and "Stratford", are owned by Whitehaven and hence are classified as project-related. While the "Roseberry" property is privately owned, it is considered project-related in accordance with a negotiated private agreement between the landholder and Whitehaven. This agreement includes specific conditions/limits for noise and dust, along with a commitment to formally consult with the Owner, at least once every three months, to assess whether the Owner is satisfied or otherwise with Whitehaven's activities at the mine and to investigate and respond to any issues identified.

The approximate distances from each residence to the existing and proposed areas of activity within the Project Site are listed in **Table 3**.

**Table 3 – Proximity of Surrounding Residences**

Residence Property Name	Landholder	Approximate Separation Distance To (metres) <sup>1</sup> :		
		Limit of Open Cut Mining	Coal Handling and Processing Area	Out-of-Pit Emplacement Area
“Retreat”	Private	4,700	6,800	4,000
“Penryn”	Private	4,700	6,800	4,000
“Roseglass”	Private	4,900	6,800	4,200
“Costa Vale”	Whitehaven (project-related)	2,900	4,900	2,100
“Glenroc”	Whitehaven (project-related)	Residence within the Project Site		
“Yarrowonga”	Whitehaven (project-related)	900	2,600	600
“Yarrari”	Whitehaven (project-related)	1,600	2,400	1,500
“Belah”	Whitehaven (project-related)	1,000	1,700	2,100
“Stratford”	Whitehaven (project-related)	2,900	2,900	2,100
“Roseberry”	Private <sup>2</sup> (project-related)	2,400	2,000	1,900
“Surrey”	Private	3,500	3,200	3,400
“Carlton”	Private	4,800	4,400	4,700

1 – All distances scaled from aerial photography and rounded down to the nearest 100 metres.

2 - “Roseberry” is subject to a negotiated private agreement between the landholder and Whitehaven

Of the non project-related residences, “Retreat” and “Penryn” appear to be the closest residences to the north at approximately 4 km from the proposed Northern Emplacement Area, and “Surrey” appears to be the closest residence to the south at approximately 3.2 km from the approved Western Emplacement Area.

### 3.7 Surrounding Mining Operations

The Project Site is located in an area that is relatively isolated from other mining or extractive industry operations. The nearest operational mine is identified as Tarrowonga at approximately 15 km from Rocglen. Other mines within the vicinity are either closed and rehabilitated (former Vickery Mine and former Gunnedah Colliery), or are currently undergoing final rehabilitation (former Canyon Coal Mine). These sites are identified on **Figure 2**.

We are unaware of any other extractive industry operations and/or proposed new mines within the surrounding neighbourhood.

### 3.8 Meteorology

The Project Site is situated in the Namoi River Valley between the tropical and temperate climatic zones, and between the belts of the subtropical highs and the zone of mid latitude westerlies (R.W. Corkery and Co. (RWC) 2007). Synoptic highs dominate the climate in summer, and low pressure systems pass at regular intervals bringing milder temperatures and winds from the southerly quadrant (RWC 2007). The climate is also influenced by the substantial mountain range within the CCA Zone 2 Kelvin to the east of the Project Site and to a lesser extent Bull Mountain within the Vickery State Forest to the west.

The meteorology data for the Project Site have been sourced from a combination of long-term data collected by the Bureau of Meteorology (BoM) in Gunnedah at Station 055023 (Gunnedah Pool) and Station 055024 (Gunnedah Resource Centre) and a weather station established within the Project Site by Whitehaven in 2002.

#### 3.8.1 Temperature, Rainfall, Evaporation and Humidity

Long-term average data for temperature, rainfall, evaporation and relative humidity has been sourced from the abovementioned BoM stations and is summarised in **Table 4**.

**Table 4 – Long-Term Meteorological Conditions**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dev	Annual
<b>Mean Monthly Maximum Temperature (°C) – BoM Station 055023 for years 1876 to 2010<sup>1</sup></b>												
34.0	32.9	30.7	26.4	21.3	17.6	16.9	18.9	22.8	26.7	30.3	33.0	26.0
<b>Mean Monthly Minimum Temperature (°C) – BoM Station 055023 for years 1876 to 2010<sup>1</sup></b>												
18.3	18.1	15.8	11.4	7.1	4.3	3.0	4.1	6.9	10.7	14.1	16.8	10.9
<b>Mean Monthly Rainfall (mm) - BoM Station 055023 for years 1876 to 2010<sup>1</sup></b>												
71.3	66.5	48.1	37.7	42.4	43.9	42.2	41.3	39.8	55.2	60.9	68.6	618.2
<b>Mean Monthly Evaporation (mm) – BoM Station 055024 for years 1948 to 2010<sup>1,2</sup></b>												
238.7	190.4	186.0	129.0	83.7	57.0	58.9	86.8	120.0	164.3	201.0	241.8	1752.0
<b>Mean Monthly 9am Relative Humidity (%) – BoM Station 055023 for years 1876 to 2010<sup>1</sup></b>												
60	65	65	67	73	78	77	71	65	61	59	58	67
<b>Mean Monthly 3pm Relative Humidity (%) – BoM Station 055023 for years 1940 to 2010<sup>1</sup></b>												
43	45	44	46	51	55	53	48	43	43	40	40	46

1 - downloaded from BoM Website June 2010

Red = Highest Value Blue = Lowest Value

2 - based on daily data

The following broad observations are made:

#### Temperature

The local climate is characterised by very warm to hot summers and cool to mild winters. Mean monthly maximum temperatures range between 34.0 and 16.9 degrees Celsius (°C), with January being the warmest month. Mean monthly minimum temperatures range between 18.3 and 3.0 °C, with July being the coolest month. Autumn and spring are generally mild with sporadic temperature fluctuations.

**Rainfall**

Rainfall is, on average, relatively evenly distributed throughout the year, with the warmer months (November to February, inclusive) being slightly wetter than the remainder of the year. The wetter months have a reasonably low number of mean rain days suggesting the higher volumes of rainfall are associated with higher intensity storms falling over shorter periods of time (GSSE 2010c). The area is also quite susceptible to extended periods of drought.

A statistical review of rainfall records by GSSE (2010c) within the region has identified that for a dry year (10th percentile) the annual rainfall is 392.5 mm, for a medium year (50th percentile) the annual rainfall is 578.0 mm, and for a wet year (90th percentile) the annual rainfall is 752.0 mm.

**Evaporation**

Mean monthly evaporation exceeds mean monthly rainfall throughout the year, with mean annual evaporation exceeding mean annual rainfall by a factor of nearly three. Evaporation is greatest during the warmer months of November to March, inclusive, with mean monthly rates exceeding 185 mm.

**Relative Humidity**

The area has a moderate relative humidity, with the winter months tending to be slightly more humid than other times of the year. The mean 9.00am and 3.00pm relative humidity is 67% and 46%, respectively.

**3.8.2 Atmospheric Stability**

The term atmospheric stability refers to the dispersive capacity of the atmosphere. The Pasquill-Gifford scheme classifies the atmosphere into six (sometimes seven) classes:

- Class A occurs in the day with light winds and strong solar radiation with strong convection; dispersion is rapid;
  - Class D, also known as ‘neutral conditions’, occurs with moderate to strong winds and/or overcast skies; again dispersion is rapid;
  - Class F (and G) occurs under light winds with clear skies at night. These conditions are conducive to the formation of ground-based inversions and as such; dispersion is slow; and
  - Classes B and C are intermediate between A and D, and E is intermediate between D and F
- (PAEHolmes 2011).

**Table 5** shows the frequency of occurrence of the stability classes expected in the area, using the 2006/2007 data from the on-site weather station, as determined by PAEHolmes (2011).

**Table 5 – Frequency of Atmospheric Stability Classes 2006/2007**

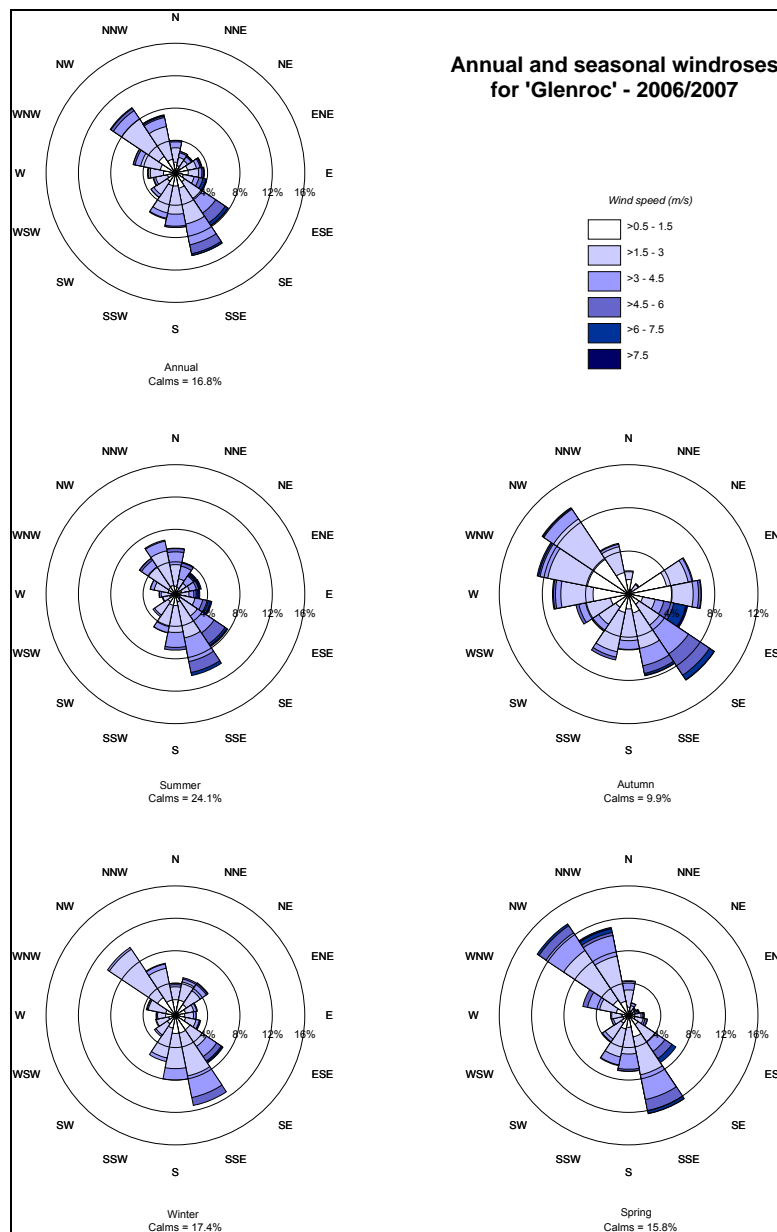
Stability Class	Percentage Occurrence (%)
A	22.1
B	7.7
C	7.5
D	25.9
E	12.8
F	24.0
Total	100.0

The most common stability class in the area was determined to be Class D at 25.9%. Under these conditions, pollutant emissions disperse rapidly. There is also a significant proportion of Class A (rapid dispersion) and Class F (slow dispersion) stabilities, indicating a wide variety of dispersion scenarios.

### 3.8.3 Wind

The weather station located within the Project Site records 15-minute values of temperature, wind speed, wind direction and sigma-theta (a measure of the fluctuation of the horizontal wind direction). Data from March 2006 to February 2007 (inclusive) were used for this assessment as this was the most recent and complete data set available that contained all necessary parameters. Annual and seasonal windroses have been prepared by PAEHolmes (2011) from these data and are shown on **Figure 8**.

According to PAEHolmes (2011), the most common winds are from the north-west and south-eastern quadrants. This pattern of wind is evident in all seasons to various degrees, with a little more variation in the autumn months. Very few winds blow from the southwest or northeast, likely due to the channelling effects of the surrounding terrain. The percentage of calms (winds less than or equal to 0.5 m/s) throughout the year is relatively high, at almost 17% annually. The mean wind speed for 2006/2007 data was 2.3 metres per second (m/s).



Source: PAEHolmes (2011)

**Figure 8 – Annual and Seasonal Windroses 2006/2007**

## **3.9 Topography**

### **3.9.1 Regional Topography**

The Project Site lies within the Namoi River Basin in an area representative of the transition from the higher broken country to the northeast and south associated with the Nandewar, Great Dividing and Liverpool Ranges and the open plains to the west (RWC 2007). The predominate topographical features are level floodplains of the Namoi River, Mooki River and Cox's Creek, which are generally long corridors up to 40 km across that become slightly undulating as they expand across the landform, and residual hill ridge systems.

While the majority of the area is characterised by floodplains and slope of less than 15 degrees, areas within the adjoining Vickery State Forest and nearby CCA Zone 2 Kelvin comprise slopes over 25 degrees and 45 degrees, respectively. Elevations in the region vary from 1,094 metres Australian Height Datum (AHD) approximately 35 km east of the Project Site, to 250 metres AHD within the Namoi River Valley approximately 12 km southwest of the Project Site, with isolated peaks elsewhere (RWC 2007).

### **3.9.2 Local Topography**

The Project Site is situated within a small north-south tending valley between the isolated elevated areas of Vickery State Forest to the west and the CCA Zone 2 Kelvin to the east, with elevations in these areas extending to approximately 490 metres AHD and 885 metres AHD, respectively. The valley widens to the north and south ultimately forming part of the Namoi River floodplain.

The Project Site lies within the valley floor with gentle slopes generally between 1 and 5 degrees, and elevations generally ranging between approximately 280 and 300 metres AHD. The rises to the east and west direct runoff into the valley floor with a central crest within the Project Site separating flows to the north and south.

## **3.10 Surface Hydrology**

The Project Site is located within the Namoi River catchment area and lies within a central crest of the valley floor between the hills of the Vickery State Forest and the CCC Zone 2 Kelvin.

Prior to mining operations, there were several drainage lines that would have entered the site from the east and drained into the two ephemeral drainage lines that lie within the Project Site. These drainage lines originate from the ridgeline within the CCC Zone 2 Kelvin and run down into the valley floor. Agricultural activities on the neighbouring land to the east of the current alignment of Wean Road have heavily modified the drainage paths, which now flow into the Project Site via a series of contour drains and dams. The runoff from the eastern catchment is split in two, with Jaeger Lane being the approximate catchment divide. The runoff from the northern section is directed around the northern end of the current mine boundary, and the runoff from the southern section reports to the approved water management system within the mine site.

The catchment lying to the west of the Project Site within the Vickery State Forest, which previously entered a central drainage line within the Project Site, has been temporarily diverted around the existing mining operations. A second order ephemeral drainage line has been diverted to the north and into the head waters of Driggle Draggie Creek with a commitment made to re-instate after the completion of mining. To the south, a clean water diversion diverts runoff from the Vickery State Forest around the existing mine operations and back into the central drainage line to the south of the mining area.

Within the existing approved mining area there are currently two major catchments that generally drain north or south. Water is discharged from the site through two licensed discharge points (LDP 11 in the south and LDP 12 in the north) held under the site's current Environmental Protection Licence (EPL 12870). As runoff exits from the south of the Project Site, it reports to the Namoi River via an un-named depression that flows generally in a southerly direction before turning west into the Namoi River approximately 10 km from the Project Site. To the north, runoff from the Project Site reports to Driggle Draggie Creek, which subsequently flows to the Namoi River via Barbers Lagoon drainage line approximately 14 km from the Project Site.

Overall the surface hydrology within and immediately surrounding the Project Site (with the exception of the State Forest areas) has been heavily disturbed by past agricultural activities and altered as a result of the present mining operations. No drainage lines within the Project Site were found to contain significant riparian vegetation with the majority of the drainage lines having poorly defined bed and banks.

### 3.11 Land Management Units

In accordance with the publication *Land Management Units in the Namoi Catchment* (Namoi CMA 2009), as cited in GSSE (2010a), the Project Site comprises the following two primary Land Management Units (LMUs):

#### **Central Mixed Soil Floodplains (0 to 2% Slope)**

This LMU is dominated by a mixture of alluvial soils and very extensive meander plains, with a land capability classification range of 2 to 7. The soils are highly variable with Black Earths, Brown and Grey Clays, Red-Brown Earths and with minor Chernozems and hardsetting duplex soils, depending on the parent material contributing to the alluvium.

Localised extensive shallow saline groundwater is generally not a feature of this LMU, however deep fresh irrigation aquifers are found beneath where the alluvium sits on a coarse gravel fill over basement material. Recharge is generally thought to be from surface streams with gravel beds that are well connected to the underlying aquifers.

Land use is generally a mosaic of cropping and grazing on native or improved pastures, which is largely determined by the fertility and tilth of the soil. Timber generally occurs as isolated or scattered trees, with occasional open woodland. Native vegetation is mainly Bimble Box, White Box, Rough-Barked Apple, River Red Gum and Myall, with localised treeless plains dominated by Plains Grass.

#### **Central Black Earth Floodplains (0 to 1% Slope)**

This LMU is characterised by the Black Earth floodplains existing in association with the major rivers and creeks in the central part of the catchment. It generally has a land capability classification of 2, 7 or 8. Floodways generally have a slope of less than 2% and are dominated by very extensive black plains, with minor swamp and outwash areas.

Soils include deep Black Earths, Brown or Grey clays and some Earthy Sands. Some floodways are farmed, others are managed as pasture and some retain native vegetation of grasses, understory, River Red Gum, Myall and Grey, Yellow or Bimble Box. The floodplain is intensively farmed and largely cleared of vegetation.

This LMU is a dynamic environment and subject to inundation and severe erosion. Shallow saline groundwaters can be locally extensive, and deep fresh irrigation aquifers are found beneath where the alluvium sits on a coarse gravel fill over basement material. Most of this LMU is used for cropping (with significant irrigation areas), with a minor portion used for grazing on native and improved pastures.

Refer to **Section 7.1** for further details and assessment of land capabilities and agricultural suitabilities within the Project Site.

### 3.12 Soil Survey

GSSE (2010a) undertook a soil survey and land resource assessment for the Rocglen Extension Project in order to assist Whitehaven plan and implement appropriate post-mining rehabilitation. A copy of the *Soil Survey and Land Resource Assessment* is contained within **Appendix G**.

Survey methodology comprised the use of aerial photography and topographic mapping, previous soil survey results, stratified observations, field sampling and laboratory analysis. Five soil profile sites were assessed across the Project Site, with subsurface exposure generally undertaken by backhoe excavation of test pits to a depth of approximately 1.2 metres. The test pit locations were selected to provide representative profiles of the soil types encountered during the survey. The soil layers were generally distinguished on the basis of changes in texture, structure and colour, and soil colours were assessed according to the Munsell Soil Colour Charts (Macbeth, 1994). Soil profiles were also observed through the use of surface exposures located in existing erosion gullies, creek banks, roadway cuttings and dams.

Soil profiles within the Project Site were assessed generally in accordance with the *Australian Soil and Land Survey Field Handbook Soil Classification Procedures* (McDonald et al. 1998, as cited in GSSE 2010a). Soil layers at each profile site were also assessed according to a procedure devised by Elliot and Veness (1981, as cited in GSSE 2010a) for the recognition of suitable topdressing material, which assesses soils based on grading, texture, structure, consistence, mottling and root presence. This procedure remains the benchmark for land resource assessment in the Australian coal mining industry.

Collected soil samples were analysed by the NSW Department of Lands' Soil and Water Testing Laboratory (Scone NSW). The soil laboratory results are appended to the report within **Appendix G**. Samples were analysed for a range of parameters to establish the suitability of surface and near-surface soil horizons as potential growth media in rehabilitation and to identify high value soils, and, conversely, soils that may have properties that are deleterious to vegetation establishment.

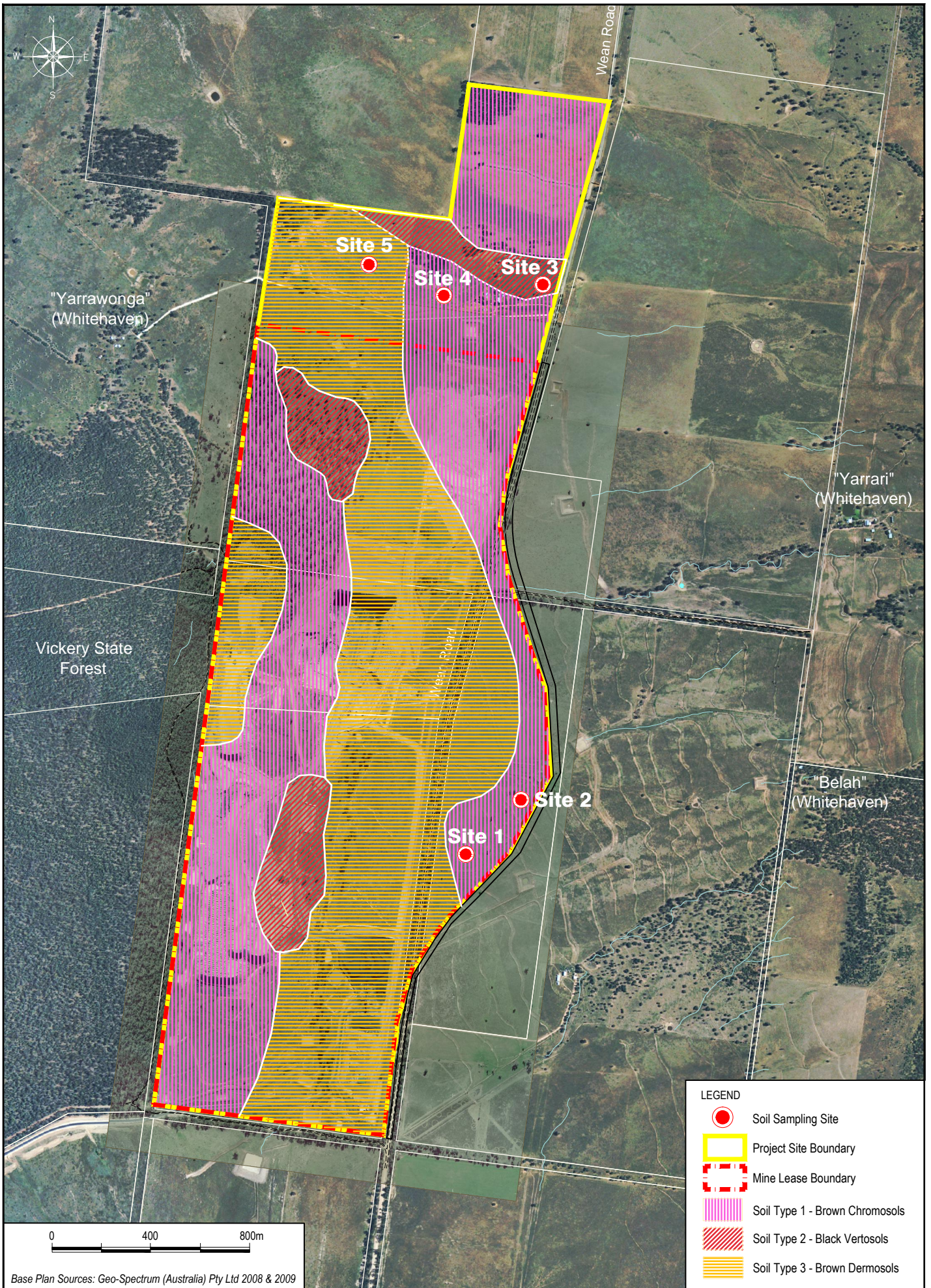
The location of soil profiles and the distribution of soil units within the Project Site are shown on **Figure 9**. Sites 1 and 2 were from lower to mid slope sites east of the current Wean Road alignment, and Sites 3, 4 and 5 were located on lower lying valley floor sites west of Wean Road in the general area of the "Glenroc" residence. The following three soil units were identified and mapped within the Project Site:

#### **Soil Unit 1 - Brown Duplex Sandy Loams (Eutrophic Brown Chromosol)**

**Description** – The Project Site encompasses approximately 204 hectares of this soil unit on the midslope. The Brown Duplex Sandy Loam soils generally consist of dark brown fine sandy loams with a clear wavy change to strong brown clays. These well-drained soils are moderately strongly alkaline at depth, and are generally non saline with moderate fertility characteristics. The topsoil and subsoil are non-sodic.

**Land Use** - The land overlying these soils is currently grazed, but has been cropped for many years. Due to severe erosion in the past, graded banks and waterways have been constructed. There are scattered silver ironbark, grey box with wire grass and spear grass native pastures.

**Management** - The top 0.25 metres of this soil unit is suitable for stripping and can be reused as a topdressing material in rehabilitation. The subsoil, down to a depth of 1.05 metres, is suitable as an intermediate layer between overburden and topdressing in rehabilitation. The subsoil below this depth is not recommended for rehabilitation purposes due to the limiting factors of weathered rock. This soil requires standard erosion and sediment control measures if disturbed.



Rocglen Coal Mine Extension Project  
Soil Units and Sampling Sites

**FIGURE 9**

### **Soil Unit 2 - Self Mulching Black Earths (Self Mulching Black Vertosol)**

**Description** – The Project Site encompasses approximately 38 hectares of this soil unit on lower slopes in drainage lines predominately within grazing land. Black Earths of very dark brown clayey topsoil and sub-surface soil overlies dark brown clayey subsoils. These moderately-drained soils are strongly alkaline and are generally slightly saline to saline at depth, however have excellent fertility characteristics. The topsoil is non-sodic whilst the subsoil is sodic.

**Land Use** - The land overlying these soils includes open grazing farmland. The vegetation consist of isolated poplar box with warrego summer grass and various *Stipa* spp and *Panicum* spp native pastures.

**Management** - The top 0.6 metres of this soil unit is suitable for stripping and can be reused as a topdressing material in rehabilitation. The lower layers are generally unsuitable for reuse as topdressing or an intermediate layer due to the limiting factors of salinity, high sodicity and high alkalinity. This soil requires standard erosion and sediment control measures if disturbed, however given the sodicity at depth, if the topsoil is removed, it may lead to dispersion and erosion in wet conditions.

### **Soil Unit 3 - Sodic Brown Alluvial Clays (Calcic Brown Dermosol)**

**Description** – The Project Site encompasses approximately 218 hectares of this soil unit on the lower slopes, flats and floodplain of the higher quality grazing and cropping soil. The Brown Alluvial Clays also exhibit crusty surfaces and scattered gravel. These moderately well drained soils are strongly alkaline in the upper layers and moderately alkaline at depth. The soils are slightly saline in the subsurface but have good fertility characteristics throughout. The topsoil is marginally sodic tending to be highly sodic in the subsoil.

**Land Use** - The land overlying these soils is used for high quality grazing and cropping activities. Therefore, the vegetation ranges from various crops to improved and native pastures. The occasional poplar box and yarran trees are present.

**Management** - The top 0.25 metres of this soil unit is suitable for stripping and can be reused as a topdressing material in rehabilitation. However any sections with clay topsoil and all subsoil is texturally unsuitable for use as a topdressing and therefore not recommended for rehabilitation purposes. The high sodicity levels in the subsoil indicate this soil is not recommended for use as an intermediate layer between overburden and topdressing, as the risks associated with erosion are high. This soil requires standard erosion and sediment control measures if disturbed, however given the sodicity at depth, if the topsoil is removed, it may lead to dispersion and erosion if exposed to wet conditions over time.

## **3.13 Geology**

The information contained within the below sections has been sourced from the I&I NSW's website and from RWC (2007).

### **3.13.1 Regional Geology**

The Project Site is located in the Gunnedah Basin, which forms the central part of the Sydney-Gunnedah-Bowen Basin system extending along the eastern margin of Australia. The Gunnedah Basin covers an area of just over 15,000 square kilometres and comprises rocks of Permian and Triassic age. The basin is in part unconformably overlain by the Jurassic-Cretaceous strata of the Surat Basin.

The Gunnedah Basin is a foreland basin with sediments unconformably overlying deformed and metamorphosed Ordovician to Devonian Lachlan Fold Belt strata in the west and abutting Devonian to Carboniferous New England Fold Belt strata to the east, along the east dipping Hunter-Mooki Thrust. As shown on **Figure 10**, the Boggabri Ridge is a major structural feature dividing the basin into sub-basins, with the Project Site located within the south-eastern extent of the Maules Creek Sub-basin.

Adjacent to the Project Site is the Hunter-Mooki Fault System, which forms a prominent ridge of carboniferous rocks that have been overthrust onto the younger coal measures strata.

### 3.13.2 Local Geology

The principal local structure in the area of the Project Site, which is an important control on coal distribution, is a north-northwest oriented asymmetrical anticline that plunges and flattens to the south. Dips in the south range from four to six degrees to the west and 20 degrees to the east. In the north of the deposit, a syncline is developed to the east of the anticline, and appears to be bounded by steeply dipping and faulted strata.

The overburden within the Project Site comprises a deeply weathered section of interbedded claystone, siltstone, sandstone, conglomerate and tuffaceous claystone (see **Figure 11**). The depth of weathering is generally between 30 and 40 metres on the crest and western limb of the anticline, however increases to between 45 and 68 metres on the eastern limb of the anticline. A thin soil layer is underlain by between 4 and 14 metres of light olive brown clay that is variably stained yellow and orange by secondary iron oxides. On the eastern side of the deposit, this clay layer often grades into a weathered cream to greenish grey claystone unit that varies from 2 metres to almost 20 metres thick, with the thicker intersections being on the crest and eastern flank of the anticline. Interbedded conglomerate, sandstone, siltstone and coal lie below the clay and claystone layers.

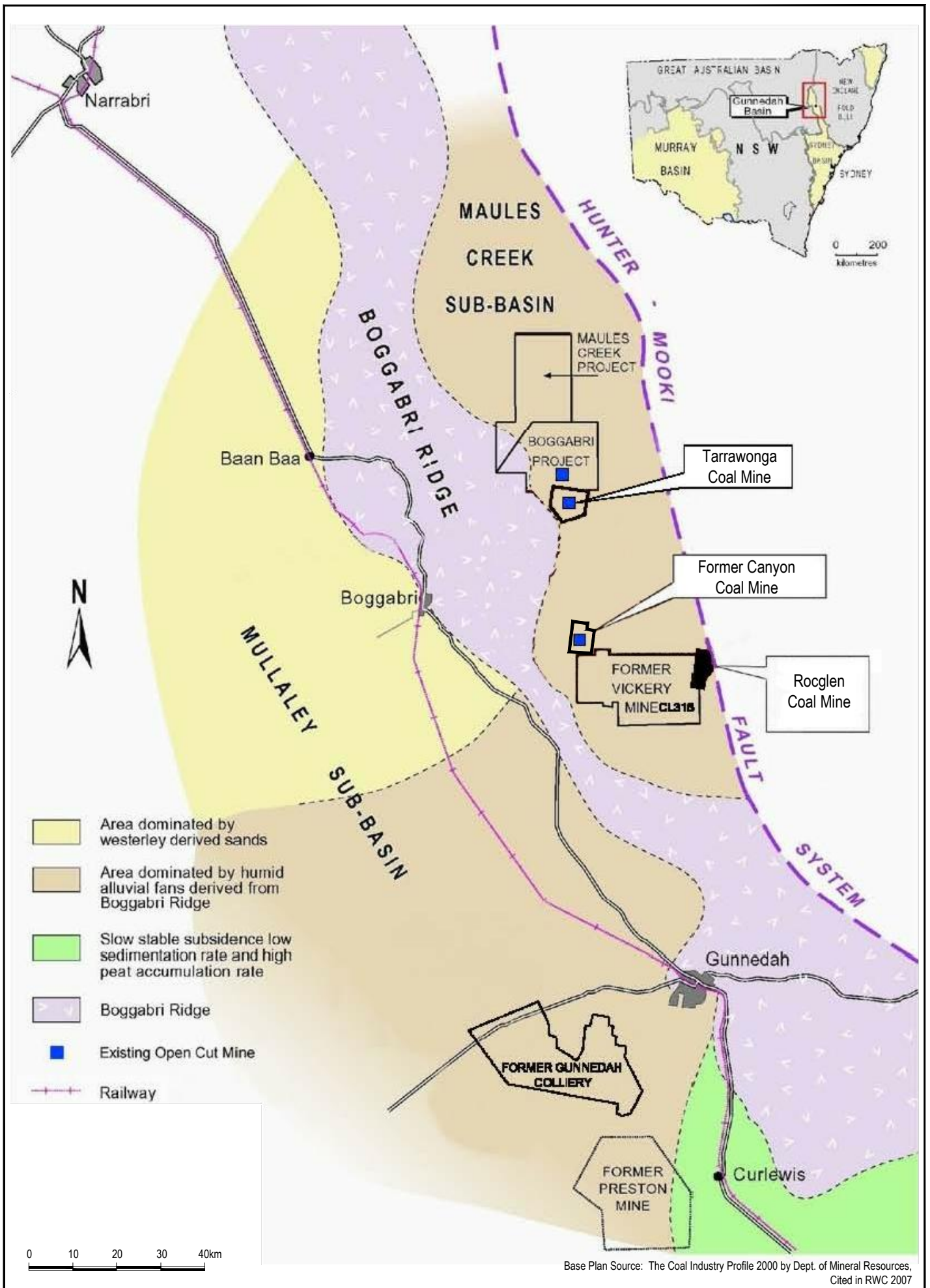
### 3.14 Coal Resources

Whitehaven was granted an Exploration Licence (EL 5831) over the area incorporating the Project Site in April 2001 and, since that time, has undertaken several exploration drilling campaigns. Within the area, and as shown on **Figures 11** and **12**, there are three mineable coal seams, which are identified as, in descending order, the Upper Glenroc, Lower Glenroc and Belmont Seams. All three seams appear to thicken on the eastern limb of the anticline, although many of the thicker intersections are artificially inflated by steeper dips. These three seams have an average combined thickness of up to 17 metres. **Table 6** lists the average thicknesses of the three seams (where present) within the Project Site, as advised by Whitehaven.

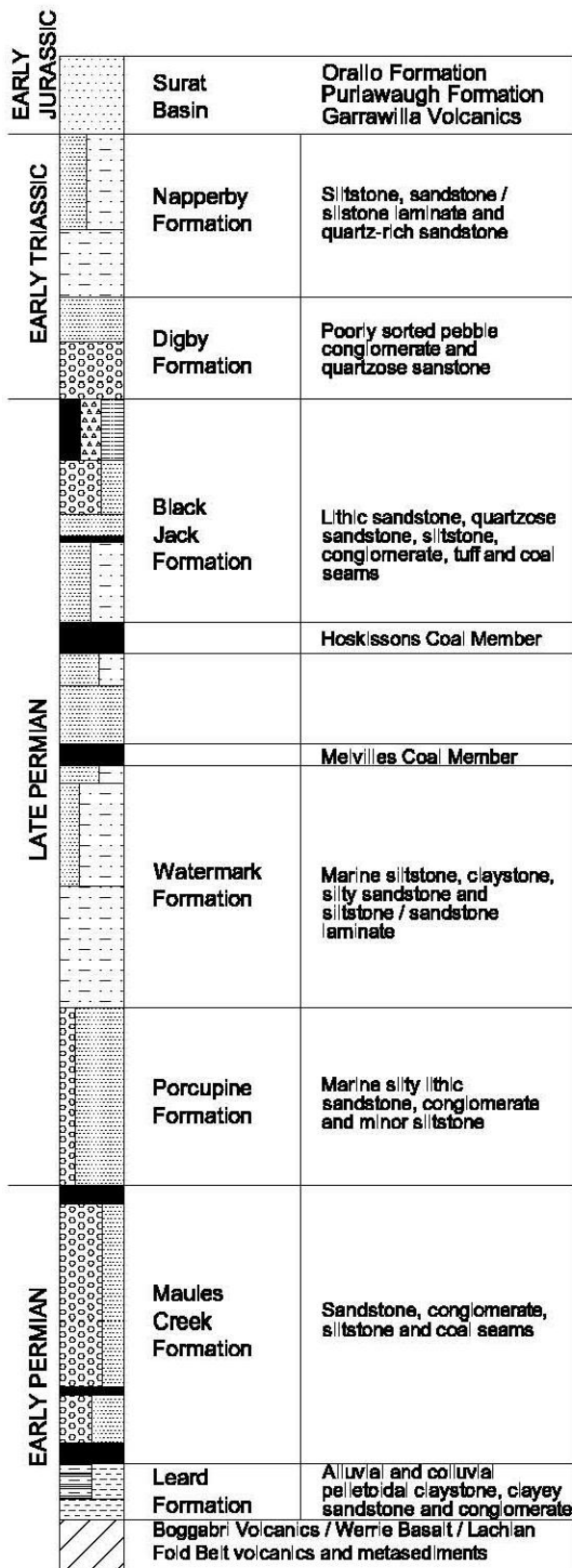
**Table 6 – Coal Seam Thicknesses**

Coal Seam	Minimum Thickness (metres)	Maximum Thickness (metres)	Average Thickness (metres)
Upper Glenroc	0.80	5.95	2.65
Lower Glenroc	0.85	5.30	2.00
Belmont	4.22	12.00	7.00

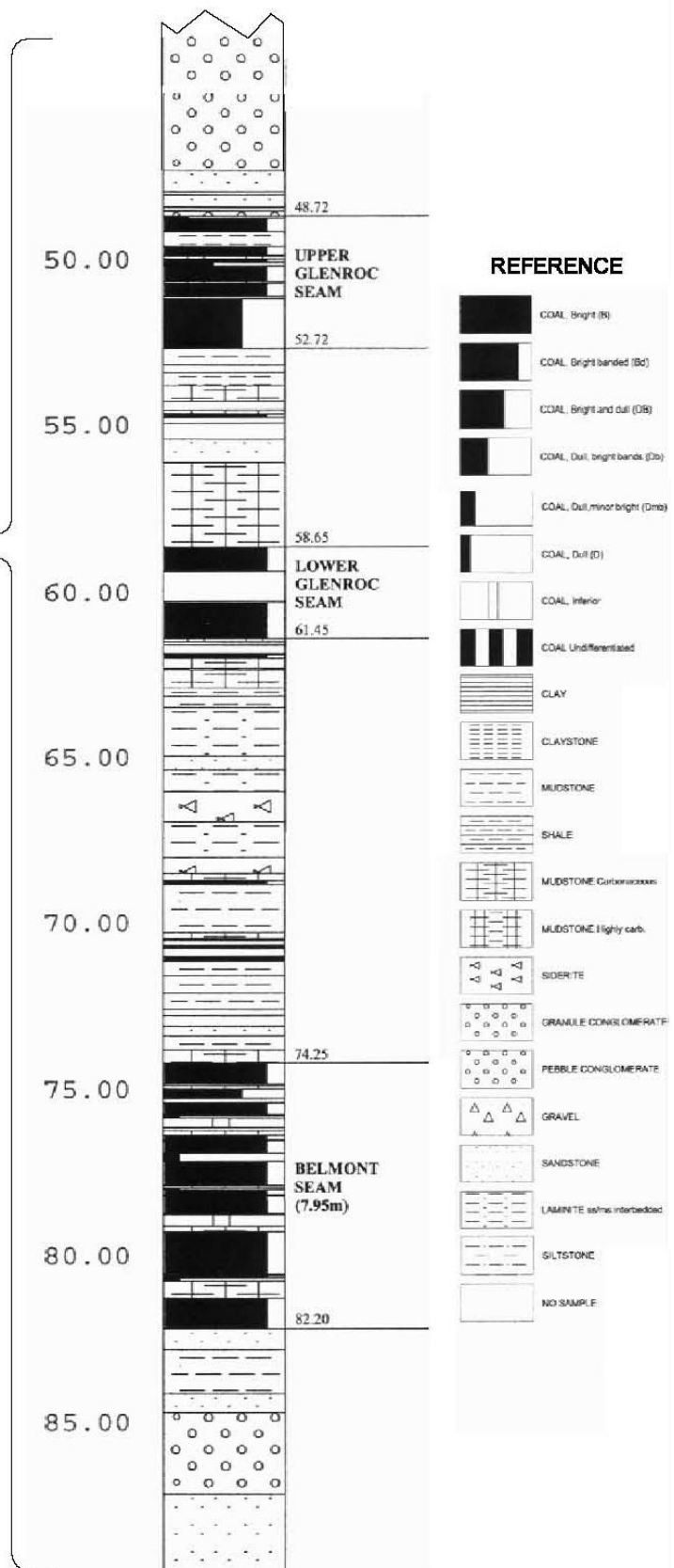
As the thicker coal sequences are often associated with thinner interburden, some quite thick coalesced sequences (up to 17 metres) have developed in some areas. However, along the crest of the anticline the coal has been uplifted and now lies within the oxidation zone with the Upper and Lower Glenroc Seams, and, in places, the Belmont Seam, having been removed completely by the weathering process.



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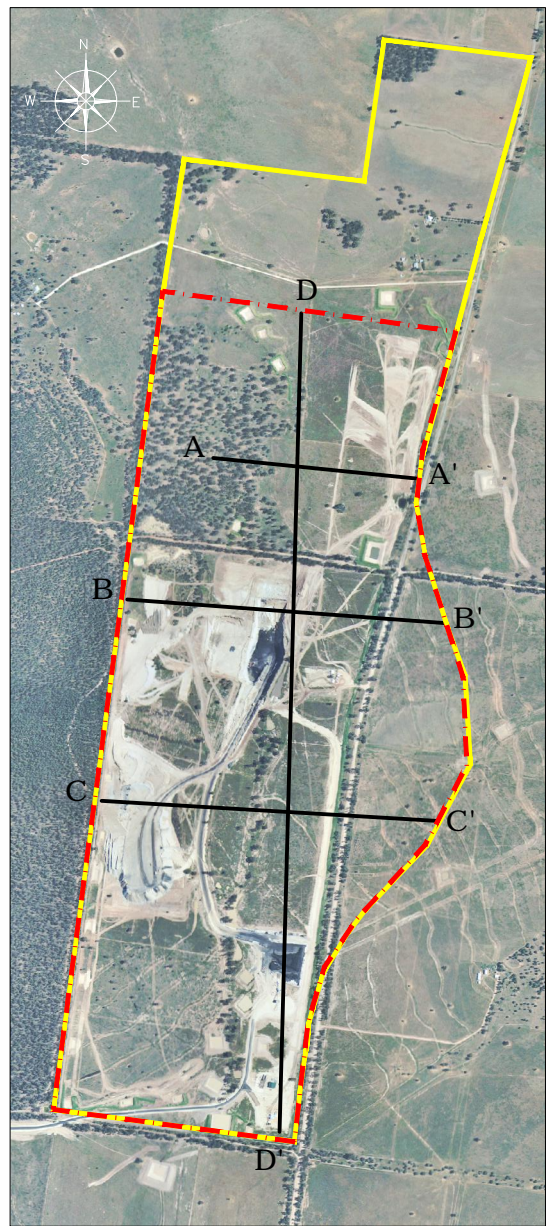


(a) General Stratigraphic Sequence - Gunnedah Basin

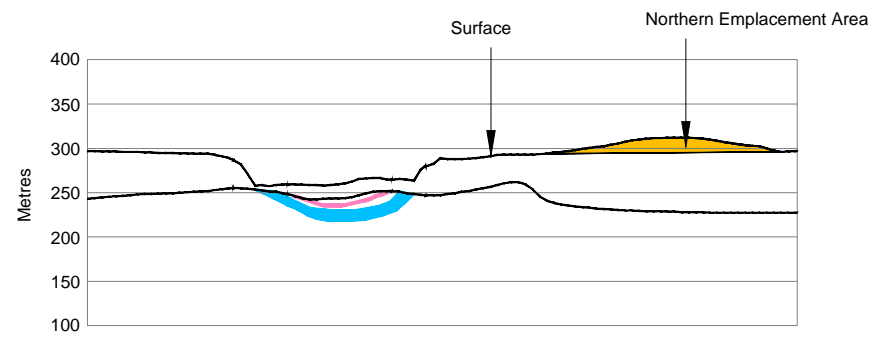


(b) Stratigraphic Section - Proposed Belmont Coal Mine

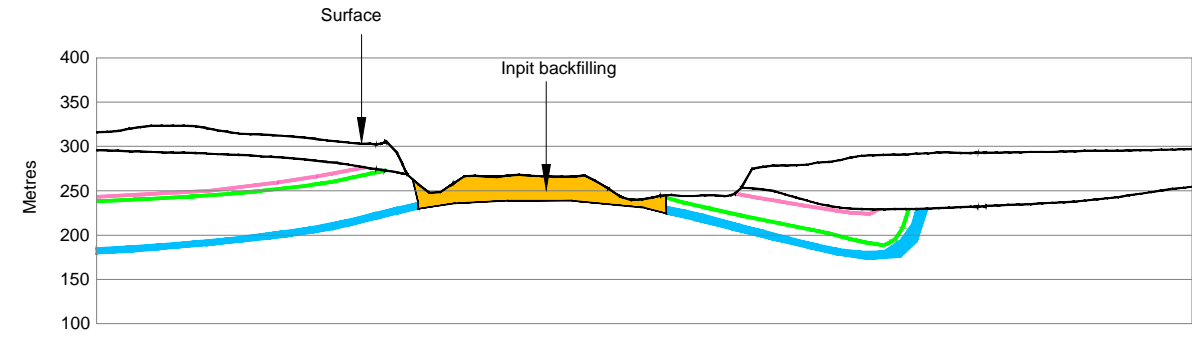
Base Plan Source: Belford Dome Resource Consultants, Cited in RWC 2007



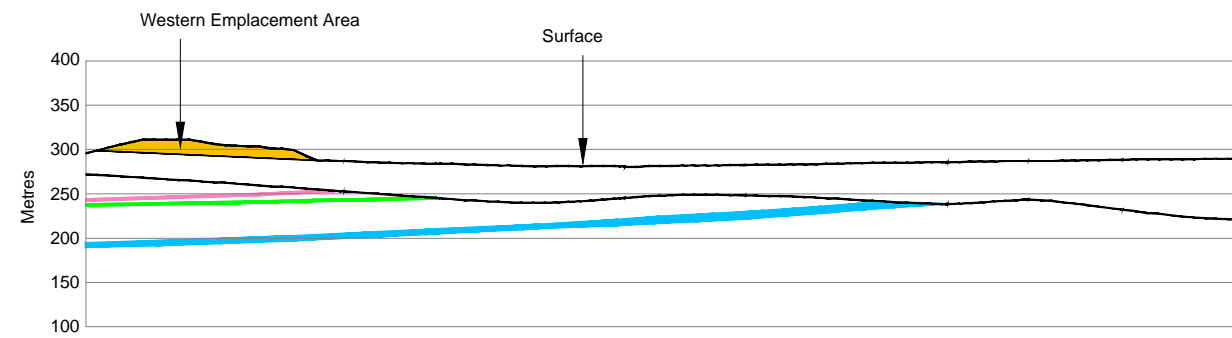
PLAN showing SECTION LOCATIONS



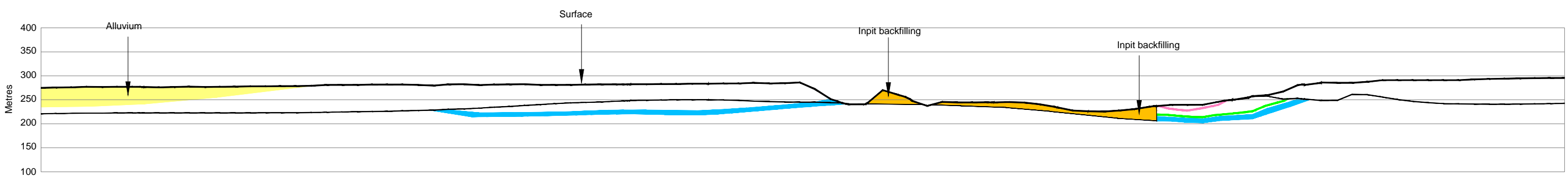
SECTION A - A'



SECTION B - B'



SECTION C - C'



SECTION D - D'

- LEGEND:
- Upper Glenroc Seam
  - Lower Glenroc Seam
  - Belmont Seam

As outlined above in **Section 3.13.2**, the overburden within the Project Site comprises a deeply weathered section of interbedded claystone, siltstone, sandstone, conglomerate and tuffaceous claystone (see **Figure 11**). The interburden strata comprises interbedded conglomerate, sandstone and siltstone.

Coal resources within the Project Site have been estimated by seam for an average vertical ratio of around 5.5 bcm of overburden per in-situ tonne of coal, as calculated at the base of the Belmont Seam.

Cumulatively, between the three economical seams, it is estimated that an in-situ resource of up to approximately 18.5 Mt is currently available within the Project Site. This comprises up to 13.5 Mt remaining for recovery under the original Project Approval PA 06\_0198 (the original EA prepared by R.W. Corkery & Co. in 2007 states an identified in-situ resource of 14.18 Mt, with a further 0.48 Mt available should auger mining proceed) and up to an additional 5 Mt not previously considered in the life of mine plan and proposed to now be extracted as part of the Rocglen Extension Project.

Core quality sampling and analysis has also been undertaken as part of previous exploration activities. **Table 7** presents a summary of the coal quality results.

**Table 7 – Recoverable Coal Quality**

Coal Seam	Density	Moisture (%)	Ash (% adb <sup>1</sup> )	Volatile Matter (% adb <sup>1</sup> )	Specific Energy (kcal/kg <sup>2</sup> )	Total Sulfur (% adb <sup>1,2</sup> )
Upper Glenroc	1.4	3.2	9.3	35.9	7105	0.40
Lower Glenroc	1.4	3.7	9.2	34.7	7010	0.38
Belmont	1.4	3.1	9.4	36.0	7105	0.41

Source: Belford Dome Resources Consultants, as cited in R.W. Corkey & Co. (2007)

1 – air dried basis, 2 – average values

The quality information indicates that the coal, including the coal reject material, has a low sulphur content and therefore a low potential propensity for spontaneous combustion.

## 4.0 APPROVED MINE OPERATIONS

### 4.1 Background

The Rocglen Coal Mine (formally known as Belmont Coal Project) was originally approved by the Minister on the 15 April 2008 under Project Approval PA 06\_0198. It was classified as a Major Project in accordance with the Major Projects SEPP and, subsequently, was determined under Part 3A of the EP&A Act. A copy of the original Project Approval is contained within **Appendix B** and the approved mine layout is shown on **Figure 4**.

The mining lease (ML 1620) was issued for the Rocglen operation in June 2008 and coal production subsequently commenced in late 2008. In summary, approximately 1.5 Mtpa of coal is mined using truck and excavator method. The coal is transported approximately 30 km by road to the Whitehaven CHPP for selective washing and subsequent transport by rail to the Port of Newcastle or by road to domestic customers.

On the 27 May 2010, the Minister issued an approval under Section 75W of the EP&A Act to modify Project Approval PA 06\_0198 (06\_0198 MOD 1). This modification permitted Whitehaven to undertake unplanned emergency earthworks to stabilise the eastern highwall following slipping adjacent to a fault structure in the north eastern portion of the approved open cut pit. It was determined that stabilisation works were required to ensure the long-term stability and safety of the highwall, which would in-turn enable on-going extraction efforts at the northern end of the approved open cut. The areas required to be worked to achieve a stable highwall were partially outside of the open cut limit approved under PA 06\_0198. A copy of the Notice of Modification is contained within **Appendix C** and the works approved under MOD 1 are shown on **Figure 5**.

The following sections provide an overview of the activities approved at Rocglen under the original Project Approval PA 06\_0198 and subsequent modification (MOD 1).

### 4.2 Vegetation Clearing

Clearing of vegetation is undertaken using a progressive campaign approach, with the extent of clearing undertaken in each campaign just sufficient for the subsequent year of mine development. Where practical, the clearing campaigns, particularly the removal of trees, are scheduled in the late summer to autumn period in order to minimise the potential impacts on fauna that may utilise the area scheduled for disturbance.

Clearing of larger vegetation is undertaken by chainsaw felling or bulldozer pushing with the bulldozer blade positioned just above ground to minimise soil disturbance. Smaller vegetation, such as pasture, crop stubble and/or shrubs, is retained and collected with topsoil during soil stripping activities. Where required, weed spraying is conducted prior to soil stripping activities.

Once felled, all logs and branches are cut/broken into manageable lengths and timber suitable for farming purposes (for example, fencing and firewood) is retrieved. The remainder is placed on mined-out surfaces within the Project Site that have been shaped as part of the on-going rehabilitation program and are to be restored to native vegetation, or stockpiled for use in subsequent rehabilitation activities. The use of the clearing debris in rehabilitation assists in vegetation establishment, provides fauna habitat and assists in reducing erosion. Large stumps and tree roots are buried within the replaced overburden.

Temporary diversion banks and catch drains are installed prior to any clearing activities, where necessary, to prevent erosion and sedimentation.

### 4.3 Soil Stripping and Stockpiling

As recommended by Geoff Cunningham Natural Resource Consultants (2007a), topsoil is generally stripped to a depth of approximately 15 centimetres (cm) and subsoil to a depth of 35 cm. Topsoil and subsoil stripping is undertaken separately using open bowl scrapers that lift the appropriate layer of material, transport and place it either:

- Directly on mined, backfilled and reshaped areas awaiting rehabilitation; or
- In designated topsoil and subsoil stockpile areas adjacent to the areas of surface disturbance.

The stockpiles have been established on available cleared land within the Project Site in locations that minimise the haul distance for placement and subsequent respreading, as well as in positions to visually screen mining operations from Wean Road. Where possible, stockpiles are also positioned to capitalise on surface topography and water management structures in order to avoid stockpile erosion. Additional protective earthworks and/or silt fencing (or similar) are installed where necessary.

Topsoil and subsoil from the sites of storage dams, sediment basin or other water management structures are pushed aside to enable their construction, and, on completion of construction activities, replaced on the completed surfaces and revegetated.

Topsoil and subsoil stockpiles are left with a rough surface to avoid any unnecessary mechanical working of the soil, and are constructed such that, wherever practicable, the upslope batter toe is positioned parallel to the contour. The stockpiles are progressively seeded to reduce erosion loss, improve structure and water permeability, increase soil aeration and assist in maintaining the soil's biological viability.

Subsoil stockpiles are generally established to a maximum height of approximately 3 metres, with topsoil stockpiles limited to approximately 2 metres.

### 4.4 Overburden and Interburden Management

The removal of overburden and interburden is the main earthmoving activity undertaken within the Project Site. As outlined in **Section 3.13.2**, the overburden and interburden removed comprises a deeply weathered section of interbedded claystone, siltstone, sandstone, conglomerate and tuffaceous claystone.

Where the overburden overlying the uppermost coal seam is sufficiently weathered, it is ripped and removed by scraper and/or pushed up by bulldozer and loaded into haul trucks by an excavator. As the overburden hardens with depth and cannot be economically ripped, the material is drilled and blasted before loading into haul trucks by an excavator. Where present, interburden between the coal seams is also blasted. All blasting is performed in accordance with the *Blasting Monitoring Program* (Whitehaven Coal Mining 2008a).

Following ripping or blasting, haul trucks transport the overburden material to the nominated out-of-pit or in-pit emplacement. The two out-of-pit emplacement areas, known as the Northern and Western Emplacement Areas, are located adjacent to the limit of mining (see **Figure 4**). The Northern and Western Emplacements were originally approved under PA 06\_0198 with footprints of approximately 8 and 75 hectares, respectively, and with batter slopes at a vertical to horizontal ratio of approximately 1 to 4 (1V:4H).

The project modification PA 06\_0198 MOD 1 permitted the extraction of the additional overburden material from the fault zone and emplacement of it within a disturbed area comprising approximately 23 hectares to the north and east of the stabilisation works (see **Figure 5**) originally approved for overburden emplacement and subsoil stockpiling. The subsoil stockpiled within this area was covered with overburden due to sufficient material being available for rehabilitation purposes from the Rocglen Extension Project.

Both the Northern and Western Emplacement Areas are nearing capacity. In-pit emplacement occurs within and over the finished areas of the open cut to form the final landform.

#### 4.5 Coal Mining by Open Cut Methods

PA 06\_0198 approved the extraction of coal by open cut mining methods within an area of approximately 114 hectares (see **Figure 4**). This involves the extraction of three separate coal seams, being the Upper Glenroc, Lower Glenroc and Belmont Seams, within 25 mine development blocks at a production rate of 1.5 Mtpa.

Given that the project was approved to produce up to 1.5 Mt ROM coal annually, and based on an estimated mine life of seven to ten years, the potential resource recovery under PA 06\_0198 is up to approximately 15 Mt. The original EA prepared by R.W. Corkery & Co. in 2007 states an identified in-situ resource of 14.18 Mt, with a further 0.48 Mt available should auger mining proceed (i.e. a total resource of 14.66 Mt).

The project modification PA 06\_0198 MOD 1 permitted the widening of the face of the open cut, outside of the approved limit, to establish a highwall within competent material that will enable development of the pit in a safe and efficient manner. The pit extensions for stabilisation works (see **Figure 5**) have a combined area of approximately 2.05 hectares, giving a total approved open cut area of approximately 116.05 hectares.

The open cut mine is being developed using haulback mining methods, involving the sequential removal of vegetation, soil, overburden and interburden above and between the coal seams, coal removal and progressive backfilling and rehabilitation of mined-out areas. To remove the coal, benches are developed along the length of coal seams by blasting and removal of the overburden and interburden. As sufficient coal is exposed, it is ripped, excavated and transported to the ROM pad within the on-site coal handling and processing area.

#### 4.6 Auger Mining

PA 06\_0198 permitted the extraction of additional coal reserves that are uneconomical to extract by open cut mining methods using auger mining techniques within an area between the western boundary of the Project Site and the western extent of the open cut pit (see **Figure 4**). Auger mining enables coal to be extracted without the need for overburden or interburden removal. The auger mining method approved under PA 06\_0198 involves the drilling of a series of gently dipping 1.5 metre diameter holes into the Belmont Coal Seam for a distance of between 60 and 200 metres. Each hole, drilled at right angles to the final highwall, will be separated by a web or septum pillar that would support the overlying strata. To date there has been no auger mining undertaken within the Rocglen site.

#### 4.7 Mine Life

Based on the identified coal reserves at the time of approval (see **Section 4.5**) and a maximum production rate of 1.5 Mtpa, the Rocglen Coal Mine was anticipated to have a production life for coal extraction of between seven to ten years.

A reduction in open cut coal production in any year would result in the mine development blocks being reached over a longer time frame (i.e. an extension in mine life).

#### **4.8 On-Site Coal Preparation**

The mined coal is transferred by haul truck to the coal handling and processing area located immediately south of the limit of the open cut pit (see **Figure 4**) for crushing, screening and loading into trucks for transport off-site. This area covers approximately 3 hectares and includes the ROM coal stockpiles, coal loading hopper, primary crusher, size reduction screen, conveyor, and the production and batch weigh bin. It has a capacity for up to 150,000 tonnes of coal to be maintained in the stockpiles, with a smaller area designated to the stockpiling of crushed coal up to 30,000 tonnes.

ROM coal is either loaded directly into the coal loading hopper or placed in one of several ROM coal stockpiles (representing different quality coal). A primary crusher reduces the size of the coal and a conveyor transfers the crushed (and screened) coal to a product coal bin, from where trucks are loaded for dispatch of the coal to the Whitehaven CHPP. PA 06\_0198 permits a maximum annual ROM coal production of 1.5 Mtpa.

#### **4.9 Transportation**

Crushed and screened coal is transported approximately 30 km to the Whitehaven CHPP, via a purpose built section of road between the Rocglen Coal Mine and Hoad Lane, and from Hoad Lane via an established coal haulage route for selective washing, stockpiling and dispatch by both rail and road. The section of the road approved and constructed under PA 06\_0198 traverses the "Brentry" property, along the southern edge of Vickery State Forest with a further section of private road constructed across the "Stratford" property to link with Shannon Harbour Road. The transport route then incorporates a length of upgraded Shannon Harbour Road before intersecting with Hoad Lane. The transport route then joins a previously established coal haulage route along Hoad Lane, Blue Vale Road and the Kamilaroi Highway before entering the Whitehaven CHPP.

The bulk of the truck fleet consists of 40 tonne capacity B-double trucks and the occasional semi-trailer. An average of 120 loads (4,800 tonnes) of coal is dispatched daily at the maximum production rate of 1.5 Mtpa. This equates to between 17 and 24 movements per hour over a typical operational day, with dispatch of coal permitted under PA 06\_0198 between 7.00 am and 9.15 pm Monday to Friday and between 7.00 am and 5.15 pm on Saturdays.

Once reaching the Whitehaven CHPP, the coal is stockpiled for washing or placed directly on the by-pass stockpile and then either loaded into trains at the Whitehaven Rail Loading Facility for dispatch to the Port of Newcastle or loaded into trucks for road dispatch to domestic customers. These activities are covered by a separate development consent granted by Council, under the Minister's delegation, in October 2002.

A proportion of the coarse and fine reject material from the Whitehaven CHPP is approved to be backloaded to the Project Site for placement in the mined-out areas of the open cut.

#### **4.10 Relocation of Public Roads**

The limit of open cut mining approved under PA 06\_0198 requires the relocation of sections of Wean Road and Jaeger Lane. Specifically:

## **Wean Road**

Wean Road is approved to be realigned around the eastern perimeter of the Project Site over the "Roseberry" property in general accordance with Council's *Rural Local Roads Standard* and to the satisfaction of Council. To date, this realignment has not been undertaken.

## **Jaeger Lane**

Jaeger Lane, which provides access from Wean Road through the Project Site to the Vickery State Forest and "Yarrowonga" has been relocated to the north to provide continued access to "Yarrowonga". Access to the Vickery State Forest is retained at the southern end of the mining lease off Riordan Road. Application to formally close that section of Jaeger Lane within the Project Site has been made to the NSW Department of Lands and is pending approval.

## **4.11 Site Services**

### **4.11.1 Potable, Ablutions and Bathhouse Water**

Potable and ablutions water is sourced and transported by water tanker from the Gunnedah or Boggabri town water supply, with additional water collected from the roofs of the buildings within the site facilities area.

### **4.11.2 Operational Water Requirements**

Water for operational purposes, primarily dust suppression activities, is sourced from 'dirty' water run-off collected from on-site sediment basins, as well as any surface and/or groundwater that accumulates in the open cut mining pit. Additional operational water, when required, is sourced from licensed bores and clean surface water within the site's Maximum Harvestable Right Dam Capacity (MHRDC).

The annual volume of water required for dust suppression varies depending on the required frequency of water application to exposed surfaces and haul roads. However, based on the previous Annual Environmental Management Report (AEMR), water usage for general dust suppression is estimated to be approximately 0.25 megalitres per day (ML/day) on those days where rainfall is less than 5 millimetres. Dust suppression associated with the crushing facility is estimated to be approximately 0.015 ML/day.

### **4.11.3 Power**

The power requirements of the site are supplied by diesel-powered generators positioned at the site facilities and ROM facilities areas.

Flood lighting of mining activities after dark is provided by portable lighting towers with integrated diesel-powered generators.

### **4.11.4 Communications**

Communications to and from the site are available via external telephone landlines, mobile telephone service coverage and UHF radio. Internal communications are typically via UHF radios and hand-held radios.

### **4.11.5 Fuel**

On-site fuel storage and refuelling facilities for mobile equipment consist of two 68,000 litre self-bunded fuel tanks and an adjacent refuelling bay, which are located in the site facilities area. Total annual diesel usage is calculated to be around 6,750 kilolitres.

#### 4.11.6 Explosives

Bulk explosives (ammonium nitrate–fuel oil based) are used within the open cut with Nonel detonators used for blast initiation. The components of the bulk explosives, ammonium nitrate prill, emulsion and diesel, are generally transported to the site from the Orica Depot near Boggabri on the day of each blast.

### 4.12 Waste Management

#### 4.12.1 Production Waste

Production wastes comprise overburden and interburden from the development of the open cut and coarse and fine reject material from processing of the coal at the Whitehaven CHPP. The management of overburden and interburden is outlined above in **Section 4.4**.

At a ROM coal production rate of 1.5 Mtpa, annual coarse and fine reject production from Rocglen operations is approximately 300,000 tonnes and 85,000 tonnes, respectively. The management of these rejects at the Whitehaven CHPP is covered by a separate development consent granted by Council, under the Minister's delegation, in October 2002.

As previously stated, a proportion of the coarse and fine reject material generated at the Whitehaven CHPP from the processing of Rocglen coal is approved to be backloaded to the Project Site for placement in the mined-out areas of the open cut. The remaining quantity of reject material is disposed of at the former Gunnedah Colliery site and/or used for maintenance works around the Whitehaven CHPP.

#### 4.12.2 General Waste

Non-production wastes generated by Rocglen operations are:

- **General Wastes and Routine Maintenance Consumables** – all paper, general wastes and routine maintenance consumables from the daily servicing of equipment (for example, air filters) are disposed of in garbage bins located adjacent to the various site buildings. These bins are generally collected daily and the contents placed in a large waste skip bins positioned adjacent to the heavy vehicle maintenance building for removal by a licensed waste collector on a fortnightly basis. Recyclable ferrous and non-ferrous metals are collected for recycling on an irregular basis.
- **Waste Oils and Grease** – waste oils and grease from routine maintenance of mining and earthmoving equipment are removed from the equipment to bunded storage tanks by oil evacuation pumps. If emergency or breakdown maintenance of equipment is required outside of the maintenance workshop or hardstand/heavy vehicle parking area, oil and grease is pumped from the equipment to a tank on the service truck and subsequently transferred to the bulk waste oil storage tank at the maintenance workshop. Waste oils and grease stored at the maintenance workshop are collected by a licensed waste recycling contractor approximately once every two months. All parts and packaging is collected and transferred to the maintenance workshop for future recycling.
- **Sewage** – sewage generated by on-site staff amenities is managed via an on-site aerated waste water treatment system that enables irrigation of treated effluent on to nominated areas within the Mining Lease.
- **Hydrocarbon-Contaminated Water** – any hydrocarbon-contaminated water is collected in the oil/water separator and regularly removed from site by a licensed contractor.

### 4.13 Operational Equipment

**Table 8** presents the list of typical types and numbers of items of earthmoving and mining equipment anticipated to be used throughout the life of the project approved under PA 06\_0198.

**Table 8 – Typical Mining Equipment**

Item	Number in Operation	Function
Excavator (Hitachi EX1900)	1	Overburden and coal loading
Hitachi EX3600-6 - Excavator	1	Overburden loading
Excavator (CAT 330B)	1 (p/t)	Drainage, windrows
Rear Dump Truck (CAT 785)	6	Overburden/coal haulage
Bulldozer (CAT D10T)	1	Overburden/rip/push, clearing, emplacement maintenance
Bulldozer (CAT D9N)	1	Ripping/pushing for scrapers
Bulldozer (CAT D11R)	1	Overburden rip/push
Grader (CAT 14H)	1 (p/t)	Road maintenance
Grader (CAT 14H)	1	Road maintenance
Scraper (CAT 637D)	2	Campaign topsoil/subsoil removal and replacement
Scraper (CAT 631)	1	Campaign topsoil/subsoil removal and replacement
Drill Rig Terex SKF50	1	Campaign blasthole drilling
Water Truck (15,000 litre)	2	Dust suppression
Crushing Plant	1	Coal size reduction
Wheel Loader (CAT 988H)	1	Feeding/processing plant/product truck loading
Diesel-powered Lighting Tower	8	Light for evening, night operations
Fuel/Service Truck	1	Equipment refuelling/servicing
Forklift/Tyre Handler	1	Equipment handling

p/t – part-time

### 4.14 Operational Hours

Mining operations are permitted under PA 06\_0198 to occur 24 hours a day, Monday to Saturday, with the exception of public holidays. Operations currently comprise a day shift between 7am and 5pm and a night shift between 4.30pm and 2.30am.

Coal transport is permitted between 7am and 9:15pm Monday to Friday, and between 7am and 5:15pm on Saturdays.

### 4.15 Operational Employment

Approval of the Rocglen Coal Mine under PA 06\_0198 has generated employment for 35 full-time operators, 14 full-time fitters and five full-time staff. Furthermore, there is flow on employment for truck drivers (coal haulage contract) and additional indirect employment through service and supply from local businesses.

## 4.16 Rehabilitation

While the major portion of rehabilitation activities will occur close to the cessation of mining, Whitehaven must undertake progressive rehabilitation throughout the life of the mine. The out-of-pit and in-pit overburden emplacements will be progressively shaped to recreate a landform comparable to that of the pre-mining environment. The stripped and/or stockpiled soil resources will be placed over the shaped landform and the area seeded either with pasture species or native woodland vegetation dependent on the nominated final land use.

Approximately 84.4 hectares of the disturbed area is to be restored as rehabilitated native vegetation with the remaining 152.6 hectares to be restored to rehabilitated agricultural land. This provides an overall ratio of approximately 36% native vegetation to 64% agricultural land.

## 4.17 Biodiversity Offset Strategy

The flora and fauna assessments for the approved Rocglen Coal Mine (PA 06\_0198) were prepared by Geoff Cunningham Natural Resource Consultants (Cunningham 2007b) and Countrywide Ecological Service (2007), respectively.

Eight vegetation communities were identified by Cunningham (2007b) including three (Communities 4, 5 and 7) that were not mapped within the original boundaries of the Project Site. The vegetation communities and the original impacts of the Rocglen Coal Mine are listed in **Table 9**.

**Table 9 - Vegetation Communities and Original Project Impacts**

Vegetation Community	Location	Project Impacts (hectares)
1 - Narrow-leaf Ironbark – Pilliga Grey Box Community	Project Site	11.6
2 - Pilliga Grey Box – White Cypress Pine Community	Project Site	23.4
3 - Pilliga Grey Box – White Box – Yellow Box – White Cypress Pine Community	Project Site	1.3
4 - Pilliga Grey Box – Belah – Bull Oak Community	Off Site	-
5 - Bimble Box Community	Off Site	-
6 - Brigalow Community	Project Site	-
7 - Regenerating White Cypress Pine	Off Site	-
8 - Cleared Lands – Used for Grazing and / or Cultivation	Project Site	Unspecified
<b>Total</b>		<b>36.3</b>

In addition to these vegetation communities, seven threatened fauna species were observed including *Falco hypoleucos* (Grey Falcon), *Melanodryas cucullata* (Hooded Robin), *Mormopterus beccarii* (Beccaris Mastiff-bat), *Neophema pulchella* (Turquoise Parrot), *Pachycephala inornata* (Gilbert's Whistler), *Pomatostomus temporalis* (Grey-crowned Babbler) and *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat). No significant impact on these species was determined to be likely as a result of the original project proposal (Countrywide Ecological Service 2007)

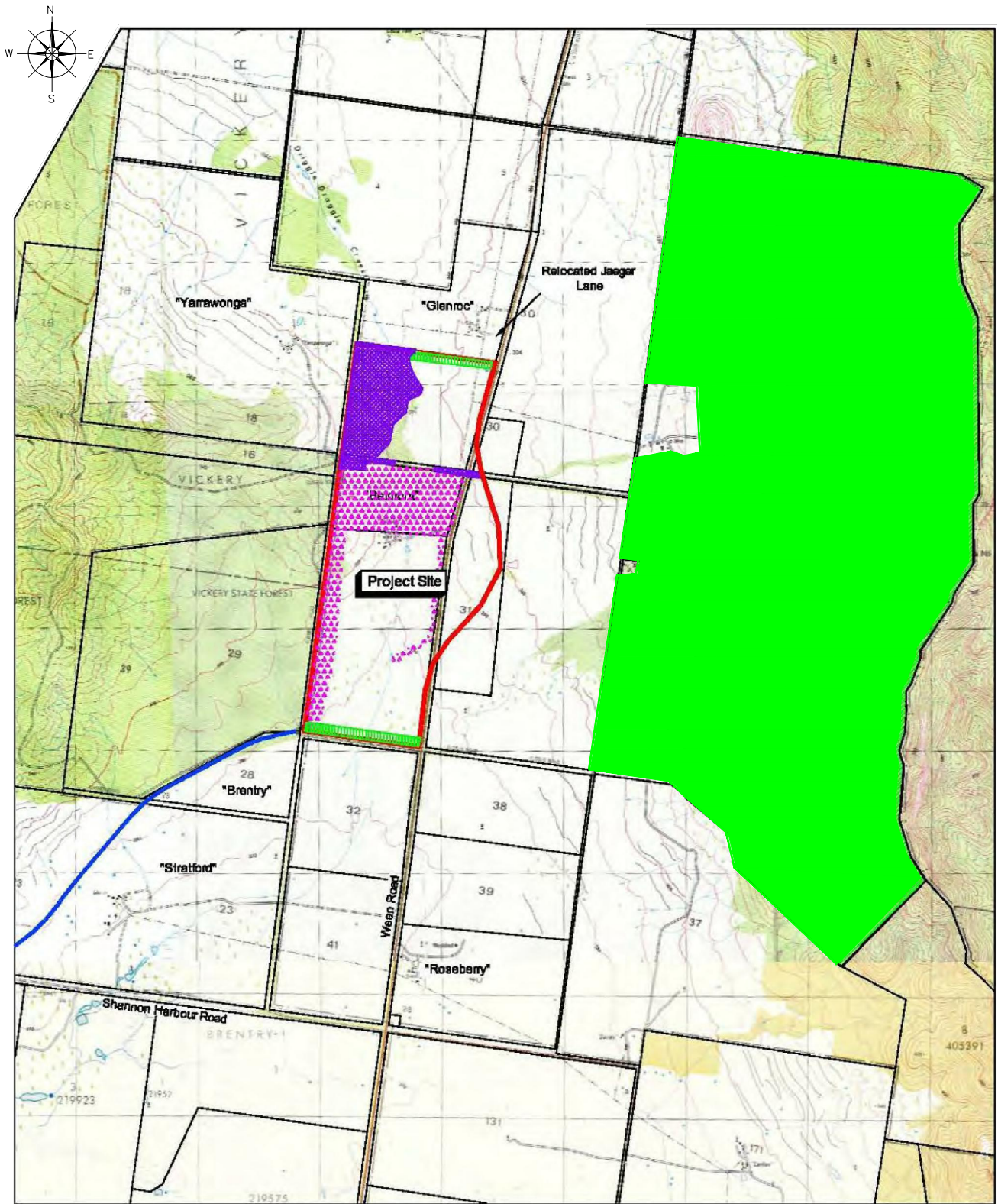
The assessment of impacts recommended that the *Biodiversity Offset Strategy* outlined in **Table 10** be implemented to compensate for the loss of the 36.3 hectares of native vegetation. This *Strategy*, which was included in the Project Approval PA 06\_0198 as Condition 27, resulted in the protection and rehabilitation of approximately 195.3 hectares, comprising the protection of 44.9 hectares of remnant woodland, enhancement planting and rehabilitation to 90.4 hectares and an additional 60 hectares within the Whitehaven Regional BioBank Site.

**Table 10 – Approved Biodiversity Offset Areas**

Item	Description	Offset Area (ha)
1	Community 2 (Pilliga Grey Box – White Cypress Pine Community) in the north western corner of the Project Site on the “Glenroc” property.	42.3
2	Establishment of a 50 metre wide habitat corridor between the proposed offset area and Wean Road along the northern boundary of the Project Site. The vegetation enhancement activities would focus on extending the offset area proposed above. To achieve this, a small section of the offset area would be planted with native tree and shrub species representative of those occurring within Community 2. This replanted section would then be continued using the same species to provide a 50 metre wide linkage with Wean Road.	2.6
3	Protection of 2.6 hectares of Community 3 (Pilliga Grey Box – White Box – Yellow Box – White Cypress Pine) at Jaeger Lane.	2.6
4	Establishment of a 50 metre wide habitat corridor within the Project Site on the northern side of Riordan Road. This corridor is located along the southern boundary of the Project Site. This vegetation enhancement activity would involve establishing Community 1 type vegetation along the western section (i.e. west of the drainage line) and a community typical of the species found in Community 2 on the eastern section that links with Wean Road.	3.8
5	Rehabilitation to native vegetation (within the disturbance footprint).	84
6	Protection of 60 hectares of vegetation in the Whitehaven Regional BioBank Site.	60
<b>Total</b>		<b>195.3</b>

The areas of remnant woodland to be protected with the Project Site (Items 1 and 3), the two habitat corridors to be established within the Project Site (Items 2 and 4), the area within the Project Site to be rehabilitated to native vegetation (Item 5) and the Whitehaven Regional BioBank Site (Item 6) are shown on **Figure 13**.

As previously advised, the Whitehaven Regional BioBank Site is in the final stages of registration by the DECCW as a BioBank Site under Part 7A of the TSC Act. It will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks (via a BioBanking Agreement registered on the land title in-perpetuity).



- REFERENCE**
- Project Site Boundary
  - Transport Route
  - ▨ Proposed Biodiversity Offset Area
  - ▨ Rehabilitated Woodland
  - ▨ Additional Habitat Enhancement through Replanting
  - Whitehaven Regional Biodiversity Offset Area (BioBank Site)  
Only 60 Ha of total area required for PA 06\_0198

0.0 0.5 1.0 1.5 2.0km

Source: Figure 4: Biodiversity Offsets for PA06\_0198 (Figure 5 of Cunningham 2007) - Eco logical Australia Pty Ltd

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## 4.18 Environmental Management and Monitoring

A comprehensive set of environmental management plans have been developed by Whitehaven (and engaged specialist consultants) and are implemented at Rocglen in accordance with PA 06\_0198 and EPL 12870. These plans are backed by an environmental monitoring network, which includes monitoring of meteorological conditions, air quality, noise, blasting, surface water and groundwater.

The existing environmental management plans and monitoring programs include:

- *Mining Operations Plan Amendment 1* (Whitehaven Coal Mining 2010);
- *Environmental Management Strategy* (Whitehaven Coal Mining 2008b);
- *Road Noise Management Plan, incorporating a Cumulative Road Noise Monitoring Program for the Rocglen, Canyon (Whitehaven) and Tarrawonga mines* (Spectrum Acoustics 2008);
- *Air Quality Monitoring Program, incorporating an Air Quality Monitoring Protocol* (Whitehaven Coal Mining 2009a);
- *Aboriginal and Cultural Heritage Management Plan* (Whitehaven Coal Mining 2008c);
- *Blasting Monitoring Program* (Whitehaven Coal Mining 2008a);
- *Noise Monitoring Program, incorporating a Noise Management Protocol* (Whitehaven Coal Mining 2008d);
- *Site Water Management Plan* (RCA Australia in conjunction with Soil Conservation Service 2009);
- *Environmental Monitoring Program* (Whitehaven Coal Mining 2009b); and
- *Greenhouse and Energy Efficiency Plan* (Denis Cooke & Associates 2009).

**Appendix H** contains the adopted schedule of monitoring activities from the *Environmental Monitoring Program* (Whitehaven Coal Mining 2009b) and a plan showing the locations of the monitoring sites.

## 5.0 PROJECT DESCRIPTION

### 5.1 Objectives

As part of the life of mine planning process at the Rocglen mine, further exploration drilling was undertaken at the site to better define the local geological features, as well as to provide additional data for inclusion in a review of the mine plan. This program identified additional economic coal reserves that could be accessed by an extension to the existing open cut. On this basis, Whitehaven proposes to expand operations at the Rocglen Coal Mine in order to maximise resource recovery and allow for improved mine progression.

The objectives of the Rocglen Coal Mine Extension Project are to:

- Develop the on-going open cut operations with a focus on:
  - maximising resource recovery and maintaining continuity of coal production from the existing Rocglen Coal Mine beyond the currently projected life of mine;
  - maximising the use of existing infrastructure; and
  - securing on-going employment opportunities and socio-economic flow-on benefits;
- Provide additional out-of-pit emplacement area to accommodate overburden material from the existing operations and proposed pit expansion; and
- Continue to conduct mining at Rocglen in an environmentally responsible manner to ensure the potential for adverse impact is minimised.

### 5.2 Outline

**Figure 6** illustrates the layout of the Project Site as proposed under the Rocglen Extension Project. While Whitehaven undertook preliminary feasibility assessments for several development layout options (both within the Project Site and extending beyond the Project Site), the proposed configuration was selected as the optimal option in light of mining efficiency, operational, environmental, economic and land ownership considerations. Specific refinements are outlined in the following sections.

**Table 11** summarises and compares the primary components of the existing Rocglen Coal Mine operation approved under PA 06\_0198 (including PA 06\_0198 MOD 1) and those of the proposed Rocglen Extension Project to be assessed and determined under Part 3A of the EP&A Act.

**Table 11– Major Components of the Approved Operation and Proposed Project**

Aspect	Existing Approved Rocglen Coal Mine Operation	Proposed Rocglen Extension Project
Project Site Area	Approximately 366 hectares.	An additional 94 hectares of land, bringing the total area to approximately 460 hectares. See <b>Figure 6</b> .
Production	Extraction and processing of up to 1.5 Mt of ROM coal per year.	No change.
Coal Seams	Upper Glenroc, Lower Glenroc and Belmont.	No change.
Mine Life	Between seven and ten years.	Up to an additional four years over the originally anticipated seven to ten years. See <b>Section 5.3</b> .

Vegetation Removal	Progressive campaign approach, with the extent of clearing undertaken in each campaign just sufficient for the subsequent year of mine development.	No change.
Soil Stripping and Stockpiling	Topsoil and subsoil stripping is undertaken separately to 15 cm and 35 cm, respectively, using open bowl scrapers and placed directly on mined, backfilled and reshaped areas awaiting rehabilitation or in designated stockpile areas adjacent to the areas of surface disturbance.	Methodology will generally remain the same with different varying depths of topsoil and subsoil suitable for stripping and different designated stockpile areas. See <b>Section 5.4</b> .
Overburden and Interburden Management	Overburden is blasted and loaded into trucks for transfer and placement in one of the two out-of-pit emplacement areas (Northern and Western Emplacement Areas) or in-pit within completed sections.	Methodology will remain the same with expansion of the Northern Emplacement Area's footprint and height to accommodate a maximum of 12 Mbcm (15 Mlcm) of material from current operations and proposed pit expansion. See <b>Section 5.5</b> .
Coal Extraction	Open cut mining methods (truck and excavator), with extraction of additional reserves uneconomical to extract by open cut methods using auger mining techniques.	No change.
Open Cut Area	Approximately 114 hectares, plus 2.05 hectares approved for emergency highwall stabilisation works (PA 06_0198 MOD 1).	Expansion of the open cut design limit by approximately 50 hectares to a total area of approximately 164 hectares. See <b>Section 5.6</b> .
Resource Recovery	Up to approximately 15 Mt of ROM coal. See <b>Section 4.5</b> .	Up to an additional 5 Mt of ROM coal. See <b>Section 5.6</b> .
Coal Processing	Transfer of mined coal by haul truck to a coal handling and processing area located immediately south of the limit of the open cut pit for crushing, screening and loading into trucks for transport off-site.	No change.
Coal Storage	Stockpiling of up to 150,000 tonnes of ROM coal on site.	No change.
Infrastructure	Site offices, workers amenities, workshop, fuel farm, coal crushing and handling plant, truck loading bin, weighbridge and surface water management system.	No additional building improvements. The surface water management system will be updated to effectively cater for the expanded operations. See <b>Sections 5.9.1, 5.9.2 and 7.5</b> .
Product Coal Transport	All crushed and screened coal is transported approximately 30 km to the Whitehaven CHPP, via a purpose built section of road between Rocglen and Hoad Lane, and from Hoad Lane via an established coal haulage route for selective washing, stockpiling and dispatch by both rail and road.	No change.
Site Services	Systems in place for potable water, operational water, power, communications, fuel and explosives.	No change.
General Waste	Systems in place to manage general wastes, routine maintenance consumables, waste oils and grease, sewage and hydrocarbon-contaminated water.	No change.

Coal Rejects	A proportion of the coarse and fine coal rejects are approved to be returned from the Whitehaven CHPP to Rocglen for placement in the mined-out areas of the open cut.	No change.
Equipment	As listed in <b>Table 8</b> , various items of earthmoving and mining equipment throughout the life of the project.	The only change to the current fleet would be the addition of one 1250 excavator in the pit to enable cleaner and more efficient mining (smaller machine). See <b>Section 5.6</b> .
Hours of Operation	Mining operations are permitted to occur 24 hours a day, Monday to Saturday, with the exception of public holidays.	No change.
Employment	54 full-time jobs, with flow on employment for truck drivers (coal haulage contract) and additional indirect employment.	No change to employment levels, however employment positions would be maintained for the additional 4 years of project life.
Rehabilitation	While the major portion of rehabilitation activities would occur close to the cessation of mining, progressive rehabilitation will be undertaken through the life of the mine.  Of the total anticipated disturbance area, approximately 84.4 hectares is to be restored as rehabilitated native vegetation (36 percent), with the remaining 152.6 hectares to be restored to rehabilitated agricultural land (64 percent).	Methodology will essentially remain the same, with the primary differences being the configuration of the final landform and final land use.  Of the total anticipated disturbance area, it is proposed to restore approximately 206 hectares as rehabilitated bushland (58 percent), 147 hectares as rehabilitated pasture (41 percent), with the remaining 5 hectares comprising the retained highwall of the final void (1 percent). See <b>Section 5.7</b> .
Biodiversity Offsetting	A <i>Biodiversity Offset Strategy</i> resulting in the protection and rehabilitation of approximately 195.3 hectares, comprising the protection of 44.9 hectares of remnant woodland, enhancement planting and rehabilitation to 90.4 hectares and an additional 60 hectares within the Whitehaven Regional BioBank Site. See <b>Section 4.17</b> .	Revised <i>Biodiversity Offset Strategy</i> to compensate for the Project impacts and the impacts to the previously approved offset areas (i.e. cumulative impacts) on a 'like for like' basis with the equivalent of over 525 hectares of vegetation to be offset within the Whitehaven Regional BioBank Site. This will provide an offset to impact ratio of 4.75:1. See <b>Section 5.8</b> .
Road Relocations	The relocation of sections of Wean Road and Jaeger Lane.	Further relocation of the Jaeger Lane section only. See <b>Section 5.9.3</b> .
Environmental Management	A comprehensive set of environmental management plans and monitoring programs.	The current environmental management plans and monitoring programs will be reviewed and updated as required. See <b>Sections 7.0 and 8.0</b> .

It is intended that the Rocglen Extension Project will be fully integrated with the remaining operational life of the current approved Rocglen mine, which will enable Whitehaven to operate under a single Project Approval over the life of the Project.

The Project is described in sufficient detail below to provide an overall understanding of the nature and extent of activities proposed over and above what is currently approved under PA 06\_0198. Detail has not been provided in this section with regards to a number of aspects relating to the existing mining operation, including vegetation removal, coal extraction methods, hours of operation, coal processing, coal storage, site servicing, general waste management and employment, given that these will continue to be undertaken on-site as approved under PA 06\_0198.

### 5.3 Mining Sequence and Mine Life

**Figure 14** shows the intended annual sequencing of coal mining within the open cut pit area, which will encompass the existing Rocglen open cut pit approved under PA 06\_0198 and the proposed pit expansions (see **Section 5.6**). As stated above, the Project will be integrated with the remaining operational life of the existing Rocglen mine, which should enable Whitehaven to operate under a single Project Approval over the life of the Project.

The annual sequencing of coal mining was developed in order to ensure the efficient mining of coal, minimise haul lengths and permit effective overburden emplacement (both out-of-pit and in-pit) to enable the progressive formation of the post-mining landform and reduce the amount of disturbed land at any one time. Most importantly, the annual mine sequencing was refined in order to ensure that following completion of coal extraction the size of the final void remaining at mine closure is minimised, the low walls and highwall can be appropriately battered and rehabilitated to ensure a stable landform, and is located and shaped to minimise possible geotechnical and safety issues.

Through maintaining the approved maximum 1.5 Mtpa production rate at Rocglen, it is anticipated that the proposed Rocglen Extension Project will enable open cut mining for approximately 11 years following the issue of Project Approval and the subsequent issue of a new or amended mining lease. This represents an increase to the projected life of the mine, for coal extraction, of up to four years. Year 1 of the Rocglen Extension Project will see mining in the northern tip of the open cut pit and it will generally advance in a southerly direction over the life of the mine concluding in Year 11.

Given that the original project was approved to produce up to 1.5 Mt ROM coal annually, and based on an estimated mine life of seven to ten years, the potential resource recovery under PA 06\_0198 is up to approximately 15 Mt. The original EA prepared by R.W. Corkery & Co. in 2007 states an identified in-situ resource of 14.18 Mt, with a further 0.48 Mt available should auger mining proceed (i.e. a total resource of 14.66 Mt).

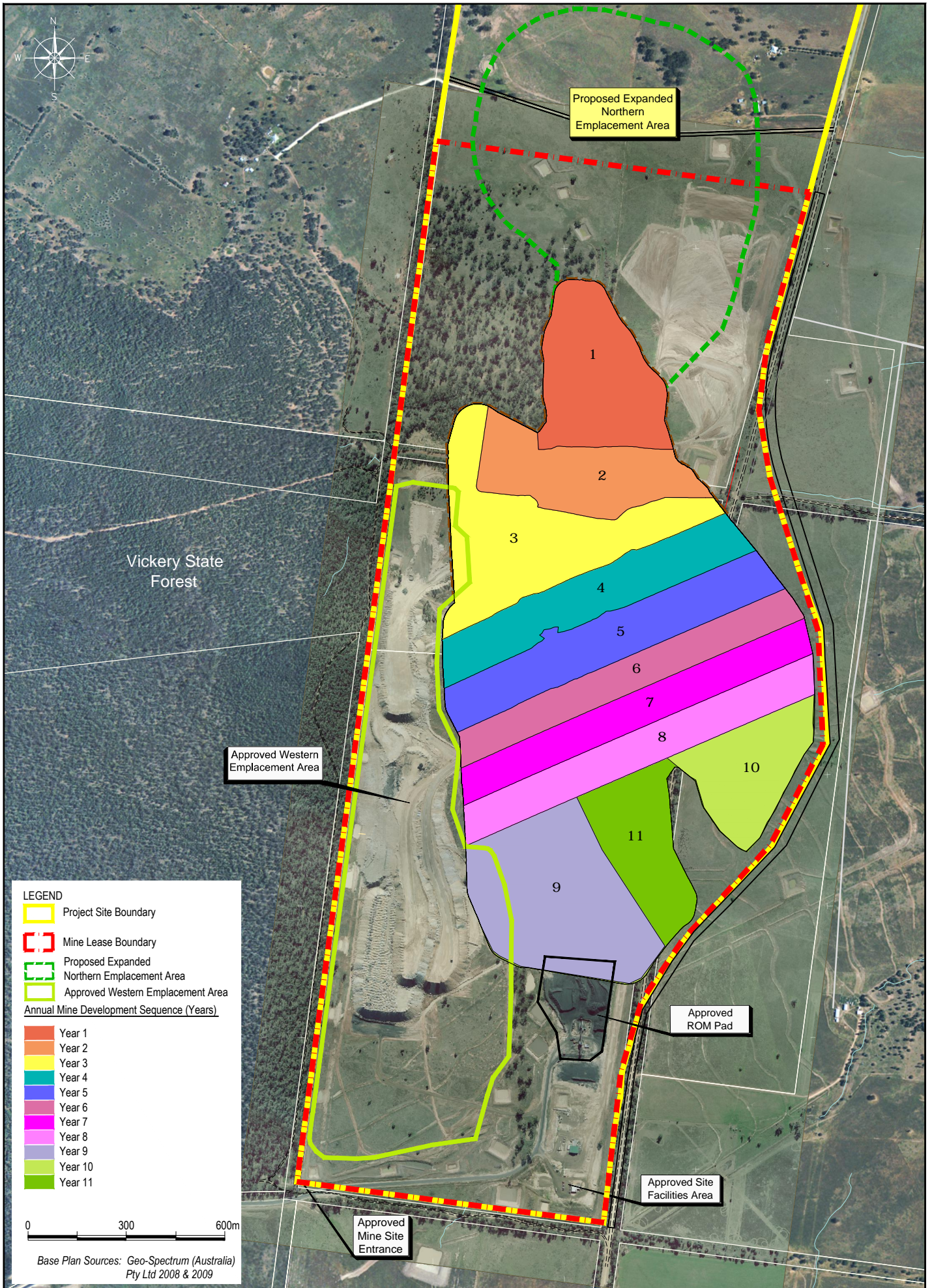
Cumulatively, between the three economical seams, it is estimated that an in-situ resource of up to approximately 18.5 Mt is currently available within the Project Site. This comprises up to 13.5 Mt remaining for recovery under the original Project Approved PA 06\_0198 (see above) and up to an additional 5 Mt not previously considered in the life of mine plan and proposed to now be extracted as part of the Rocglen Extension Project. A reduction in open cut coal production in any year, for example due to reduced demand or unfavourable geology being encountered, would not alter the mining sequence. Rather, it would simply reduce the extent of surface disturbance that year and, most likely, extend the mine life.

Mining operation are dynamic and the conceptual mine plan and mine sequence may be subject to changes as additional geological data is gathered or due to operational requirements or technological advances. On this basis, approval is sought for the general mining footprint and extent of associated activities presented below, with any refinements to the conceptual mine plan to be addressed as part of the Mining Operations Plan (MOP) process managed by the I&I NSW.

The conceptual mine layout and progression of mining operations over the life of the Project is represented indicatively by Years 1, 5 and 10 as shown on **Figure 15** and summarised below.

#### **Years 1 and 2 of Expanded Operation**

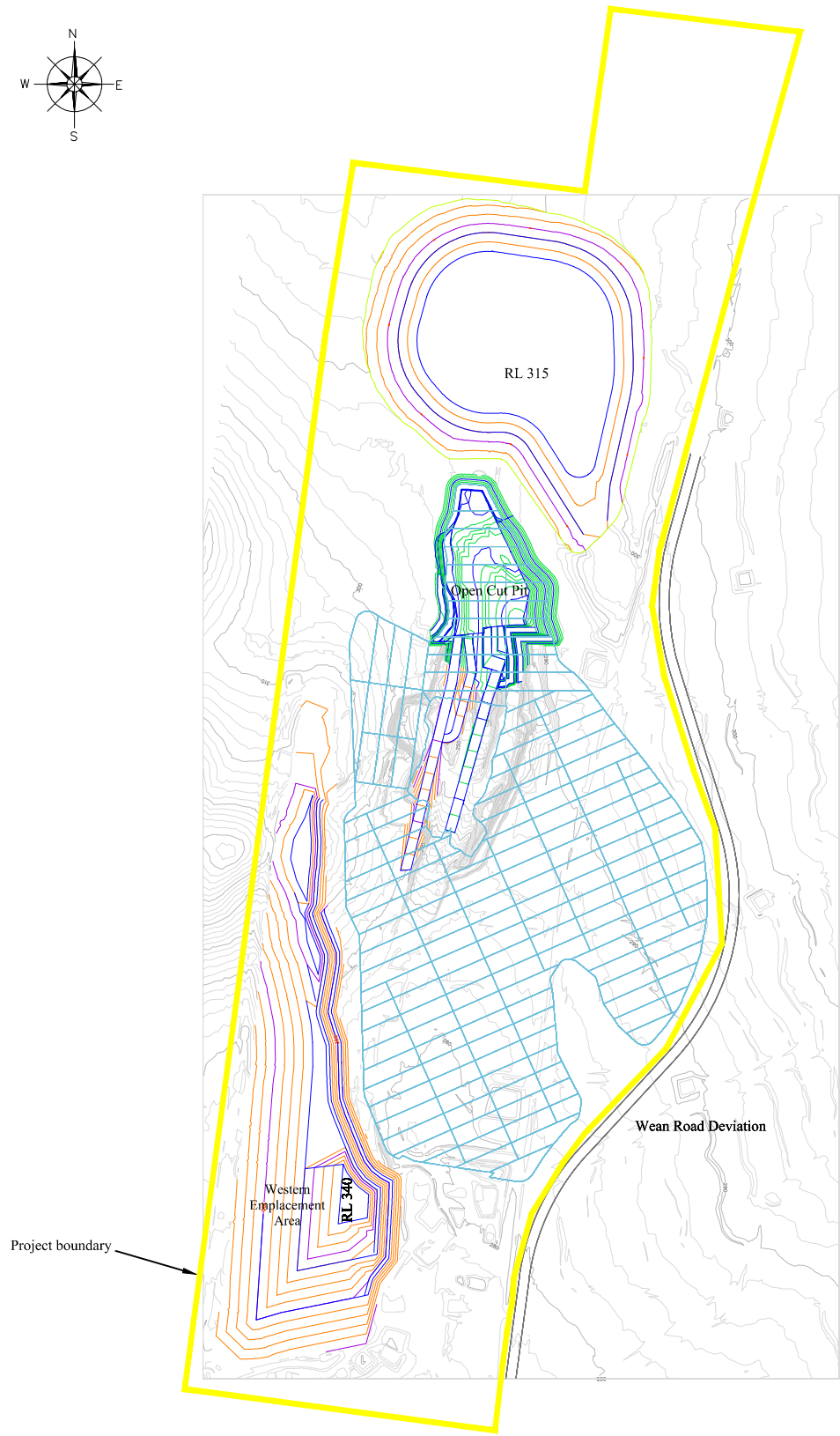
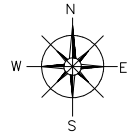
Mining will focus on the development of an access ramp through an area already being mined under PA 06\_0198, followed by coal extraction from the northern-most extent of the expanded pit and progressing in the southerly direction. All overburden material will be placed in the expanded out-of-pit Northern Emplacement Area.



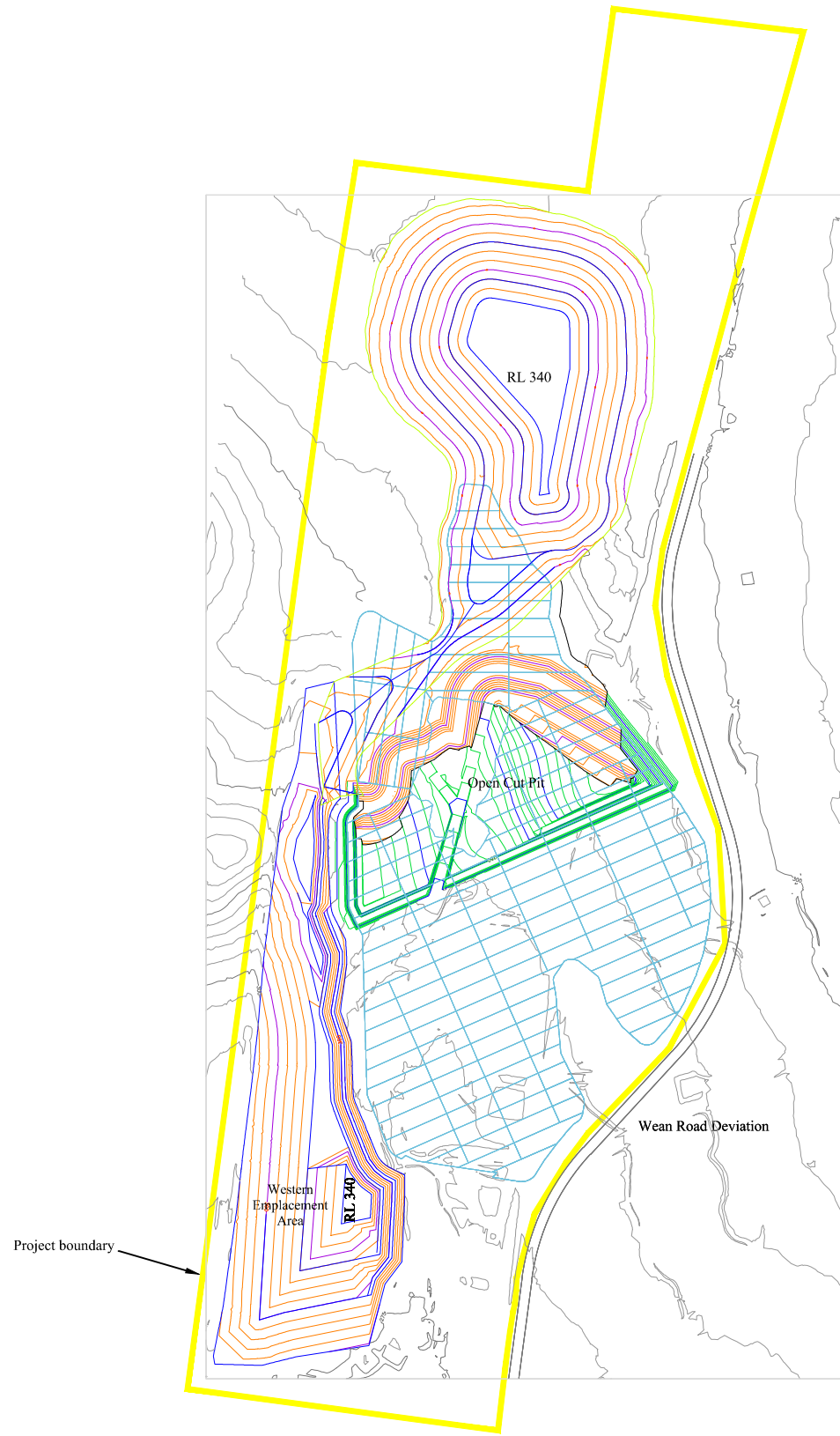
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Rocglen Coal Mine Extension Project  
Annual Mine Development Sequence

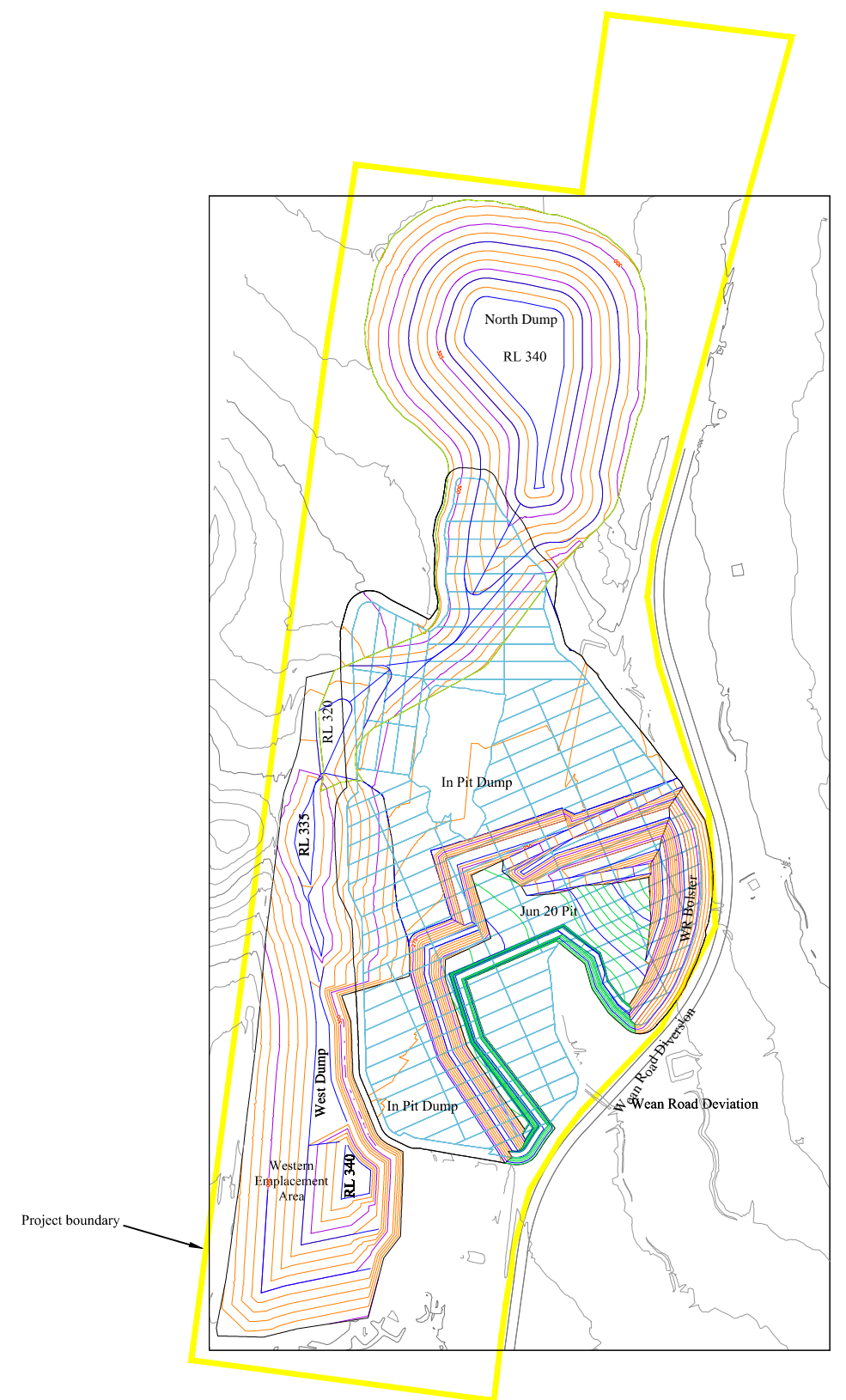
**FIGURE 14**



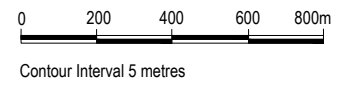
**Year 1 of Expanded Operation**



**Year 5 of Expanded Operation**



**Year 10 of Expanded Operation**



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Base Plan Source: MMG Civil P/L



Soil materials stripped ahead of the open cut area and under the expanded Northern Emplacement Area will be stockpiled in the proposed Eastern and Western Soil Stockpile Areas and placed in windrows along the Wean Road alignment to visually screen mining operations, as well as placed on completed reshaped areas within the Northern and Western Emplacements where available. The external boundaries of the Northern Emplacement Area will be formed and shaped by the end of Year 1, and subsequently topdressed and revegetated as soon as possible to minimise visual impacts and limit erosion and downstream sedimentation.

### **Years 3 to 5 of Expanded Operation**

Mining will continue to advance in a southerly direction, with all overburden material being placed out-of-pit in the expanded Northern Emplacement Area and in-pit within areas where coal extraction has been completed. Soil materials stripped ahead of the open cut area will be placed on completed reshaped areas within the Northern and Western Emplacements and open cut where available, and also stockpiled within the Eastern Soil Stockpile Area. Year 5 represents the final year that the Northern Emplacement Area will be utilised for overburden/interburden emplacement.

### **Years 6 and 7 of Expanded Operation**

Mining will continue to advance in a southerly direction, with all overburden material placed in-pit within areas where coal extraction has been completed. Soil material stripped ahead of the open cut area, as well as soil within the Eastern and Western Stockpile Areas, will be placed on completed reshaped areas within the open cut and Western Emplacement where available.

### **Year 8 of Expanded Operation**

Mining will continue to advance in a southerly direction, with the eastern pit limit adjacent to the realigned Wean Road. All overburden material will be placed in-pit within areas where coal extraction has been completed. Soil material stripped ahead of the open cut area will be placed on completed reshaped areas within the open cut and Western Emplacement where available.

### **Year 9 of Expanded Operation**

Mining will continue to advance in a southerly direction moving into the south-western corner of the pit limit. All overburden material will be placed in-pit within areas where coal extraction has been completed. Soil material stripped ahead of the open cut area will be placed on completed reshaped areas within the open cut. The southern-most limit of the pit will encompass the northern area of the current ROM pad, which will not be an issue given that this is nearing end of mine life and the majority of the ROM pad and entire product coal area will remain unaffected.

### **Years 10 and 11 of Expanded Operation**

Mining will move to the east splitting into two separate blocks around an area of unfavourable geology that will not be mined, with Year 10 focussing on the eastern-most block adjacent to the realigned Wean Road and Year 11 focussing on the block remaining between Year 9 and Year 10. Overburden material will be placed in-pit within areas where coal extraction has been completed, as well as on the eastern edge of the Western Emplacement. Soil material stripped ahead of the open cut area, as well as soil within the Eastern and Western Stockpile Areas, will be placed on all remaining completed reshaped areas within the open cut and Western Emplacement. At a maximum production rate of 1.5 Mtpa, Year 11 represents the end of mine life for coal extraction.

As indicated in the above mine sequencing, a progressive approach to rehabilitation of disturbed area within the Project Site will be adopted to ensure, where practicable, areas where mining or overburden emplacement are completed are reshaped as soon as possible and revegetated to provide a stable and self-sustaining final landform. Refer to **Section 5.7** for further details and illustrations.

## 5.4 Soil Stripping and Stockpiling

GSSE undertook a soil survey and land resource assessment for the Rocglen Extension Project in order to assist Whitehaven plan and implement appropriate post-mining rehabilitation. A copy of the *Soil Survey and Land Resource Assessment* (GSSE 2010a) is contained within **Appendix G**.

As part of this assessment, and as outlined and illustrated above in **Section 3.12**, GSSE identified three soil units within the Project Site. GSSE assessed these soil units using both field and laboratory analysis of key physical and chemical properties in order to determine:

- Their suitability for use as a final cover material on the post-mining landform; and
- The requirements for specific stripping and stockpiling techniques, including erosion and sediment control measures.

The following sub-sections outline the findings and recommendations of GSSE (2010a) with respect to soil stripping and stockpiling. The report in **Appendix G** should be referred to for full detail.

### 5.4.1 Topdressing Suitability and Availability

To assist in the assessment of soil material suitable for recovery and reuse in rehabilitation, GSSE (2010a) separated the soil into two categories:

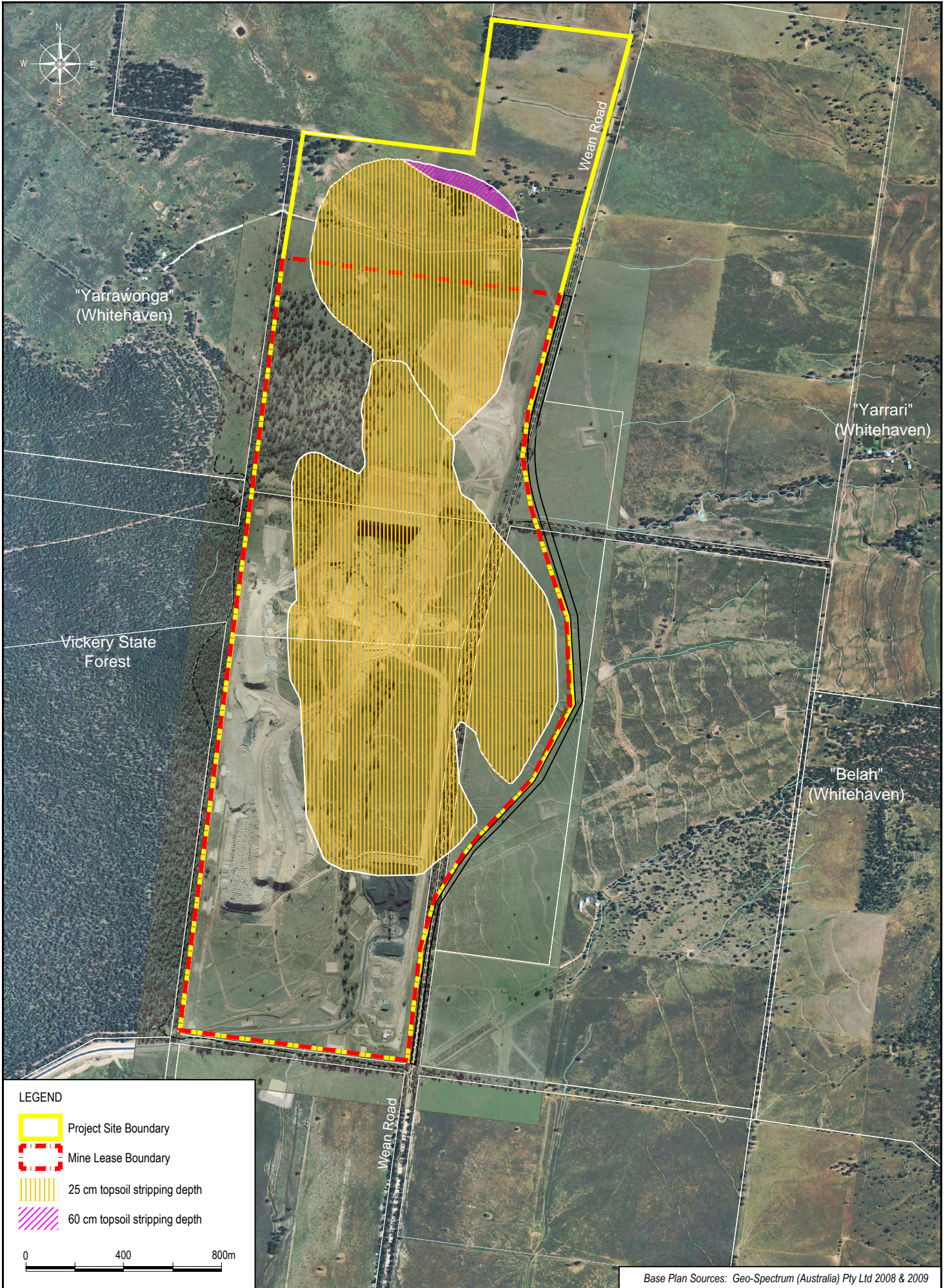
- (a) Subsoil for intermediate layering; and
- (b) Topsoil for topdressing.

In general the topdressing material is sourced from the upper horizon (topsoil) and the intermediate layer is sourced from the lower horizons (subsoil). Structural and textural properties of subsoils, dispersion potential, sodicity and acidity/alkalinity are the most common and significant limiting factors in determining the depth of soil that is suitable for reuse. **Table 12** lists the maximum stripping depths for each soil unit, as recommended by GSSE (2010a), together with the estimated land areas and soil material volumes.

**Table 12 – Topsoil and Subsoil Stripping Resources**

Material	Soil Type	Maximum Stripping Depth (cm)	Approximate Area (ha)	Approximate Volume (1,000m <sup>3</sup> )
Topsoil	Unit 1 - Brown Chromosol	25	66.7	166.8
	Unit 2 - Black Vertosol	60	16.3	97.8
	Unit 3 - Brown Dermosol	25	142.8	357.0
<b>Topsoil Total</b>			<b>225.8</b>	<b>621.6</b>
<b>Topsoil Volume (including 10% handling loss)</b>				<b>559.4</b>
Subsoil	Unit 1 - Brown Chromosol	80	66.7	533.6
	Unit 2 - Black Vertosol	0	16.3	0.0
	Unit 3 - Brown Dermosol	0	142.8	0.0
<b>Subsoil Total</b>			<b>225.8</b>	<b>533.6</b>
<b>Subsoil Volume (including 10% handling loss)</b>				<b>480.2</b>

**Figure 16** illustrates the recommended maximum topsoil stripping depths.



- LEGEND**
- Project Site Boundary
  - Mine Lease Boundary
  - 25 cm topsoil stripping depth
  - 60 cm topsoil stripping depth

0 400 800m

Base Plan Sources: Geo-Spectrum (Australia) Pty Ltd 2008 & 2009

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**Rocglen Coal Mine Extension Project  
Recommended Topsoil Stripping Depths**

**FIGURE 16**

Adherence to the recommended stripping depths, and allowing for a 10% handling loss, will yield approximately 559,400 cubic metres (m<sup>3</sup>) of topsoil material suitable for topdressing and 480,200 m<sup>3</sup> of subsoil material suitable for intermediate layering between the overburden and topdressing. Based on these volumes, sufficient material will be available to enable effective intermediate layering and topdressing for the rehabilitation of the Rocglen site.

#### 5.4.2 Erosion Potential

All soil samples collected by GSSE (2010a) were laboratory tested for dispersion, using the Emerson Aggregate Test (EAT), and sodicity using the Exchangeable Sodium Percentage (ESP). These tests indicate the susceptibility of a soil to losing its structure and binding capacity when wet, and therefore the erosion potential of the soil. The results showed the Sodic Brown Alluvial Clay (Unit 3 - Brown Dermosol) to have an ESP of 7.9, 12.6 and 6.5 in layers 1, 2 and 3, respectively. The other sites were determined to have non-sodic topsoil and non-sodic to sodic subsoil.

While appropriate erosion and sediment control measures will be put in place prior to surface disturbance for all soils, GSSE (2010a) recommends that particular attention be given to the Sodic Brown Alluvial Clays as the risk of erosion may be high once the subsoil is exposed. GSSE (2010a) further recommends that the sodic subsoils be placed in the overburden emplacement in areas where they are unlikely to be exposed as a result of rainfall and/or drainage for long periods of time. The use of non-sodic subsoil as an intermediate layer keyed in between the overburden and the topdressing is current practice on-site and will continue.

#### 5.4.3 Potential Acid Generating Material

GSSE (2010a) considers the potential for acid generation from regolith material (topsoil and subsoil) within the Project Site to be low. Acid Sulphate Soils (ASS), which are the main cause of acid generation within the soil mantle, are commonly found less than 5 metres above sea level, particularly in low-lying coastal areas such as mangroves, salt marshes, floodplains, swamps, wetlands, estuaries and brackish or tidal lakes. There has been little history of acid generation from regolith material in the Gunnedah or Boggabri areas, which are significantly removed from coastal areas.

#### 5.4.4 Stripping and Stockpiling Methods

Soil materials within the Project Site should be stripped, handled and stockpiled in a manner that minimises the potential for soil loss and structural deterioration. Topsoil and subsoil will continue to be stripped separately using open bowl scrapers to the depths recommended by GSSE (2010a) summarised in **Section 5.4**. As is the current practice, the material will be transported in the open bowl scrapers and placed either:

- Directly onto reshaped emplacement areas awaiting rehabilitation; or
- In designated topsoil and subsoil stockpile areas adjacent to the areas of surface disturbance.

The designated Eastern and Western Soil Stockpile Areas (see **Figure 6**) have been sited on available and already disturbed land within the Project Site, with consideration in the annual mine sequencing given to minimising the haul distances for placement and subsequent respreading. As committed to in the approved Rocglen operation (PA 06\_0198), windrows will be positioned along the realigned Wean Road to assist in visually screening the mining operations.

GSSE (2010a) recommends topsoil stockpiles be established to a maximum height of 3 metres. While there is generally no strict requirement on limiting the height of subsoil stockpiles, GSSE states that a maximum height of 3 metres is good practice.

The Eastern and Western Soil Stockpile Areas will comprise approximately 10 and 4 hectares, respectively, and will provide a combined soil storage volume of approximately 420,000 m<sup>3</sup> (based on 3 metre stockpile heights). It is noted that the boundaries of these stockpile areas are indicative and minor adjustments may be necessary to enable effective utilisation. If the stripped soil material exceeds the available storage volume at any point in time, the soil material will be either directly placed on completed reshaped areas for rehabilitation or temporarily stockpiled on the completed reshaped areas prior to re-spreading as additional areas become available for rehabilitation.

Topsoil and subsoil from the sites of water management structures (for example, sediment basins) will be pushed to the side of the structure to enable construction, and, on completion of construction, will be replaced on the completed surfaces and revegetated.

As recommended by GSSE (2010a), Whitehaven will implement the following additional handling techniques to minimise soil deterioration:

- Soil material will be maintained in a slightly moist condition during stripping, and will not be stripped in either an excessively dry or wet condition.
- If mining sequencing, equipment scheduling and weather conditions permit, stripped material will be placed directly onto reshaped emplacement areas and spread immediately to avoid the requirement for stockpiling.
- The surface of soil stockpiles will be left coarsely textured in order to promote infiltration and minimise erosion until vegetation is established, as well as to prevent anaerobic zones forming.
- Where long-term stockpiling is planned (that is, greater than 3 months) the stockpiles will be seeded and fertilised as soon as possible. An annual cover crop that produces sterile florets or seeds will be sown. A rapid growing and healthy annual pasture sward provides sufficient competition to minimise the emergence of undesirable weed species. The annual pasture species will not persist in the rehabilitation areas but will provide sufficient competition for emerging weed species and enhance the desirable micro-organism activity in the soil.
- Prior to re-spreading stockpiled material onto completed mining or overburden emplacement area, an assessment of weed infestation on stockpiles will be undertaken to determine if individual stockpiles require herbicide application and/or 'scalping' of weed species prior to spreading.
- A soil inventory will be maintained to ensure adequate material is available for planned rehabilitation activities.
- Where natural protection from surface runoff flows is not available or achievable, protective earthworks, such as contour banks, and/or straw bale protection will be installed. Silt fencing (or similar) will be installed immediately downslope of any stockpile area potentially susceptible to erosion and maintained until the stockpile is considered stable with an effective vegetation cover.

#### **5.4.5 Soil Re-Spreading**

As stated above, if mining sequencing, equipment scheduling and weather conditions permit, Whitehaven proposes to place stripped soil material directly onto reshaped emplacement areas and spread immediately to avoid the requirement for stockpiling. Whitehaven has adopted the general practice of including an intermediate layer of subsoil between the overburden material and the topdressing, which improves the water holding capacity of the rehabilitated landform and reinstates a more natural soil profile. This practice is proposed to be continued using appropriate subsoil and targeting areas being rehabilitated to pasture. For areas being rehabilitated to bushland, Whitehaven may preferentially reduce the subsoil replacement depth and/or exclude subsoil replacement in selected areas to establish trial areas to monitor bushland development in different soil profiles.

Where resources allow, topsoil and subsoil will each be spread to a nominal depth of between 100 to 150 millimetres (mm), giving a combined depth of soil material on the rehabilitated landform of between 200 and 300 mm. Stripped soil material should be spread, treated with fertiliser and seeded in one consecutive operation in order to reduce the potential for soil loss to wind and water erosion.

## 5.5 Expanded Northern Emplacement Area

The removal of overburden and interburden is currently, and will continue to be, one of the main activities undertaken within the Project Site. As summarised in **Section 4.5**, Whitehaven will continue to adopt the mining method of ripping, blasting, excavation and transportation of the overburden to either out-of-pit or in-pit emplacement areas as is currently undertaken on-site and approved under PA 06\_0198.

With both the current approved Northern and Western Emplacement Areas nearing capacity, it is proposed to expand the approved footprint and height of the Northern Emplacement Area to accommodate a maximum of 12 Mbcm of overburden. With a maximum anticipated swell factor of approximately 25%, the expanded emplacement area will hold approximately 15 Mlcm of overburden.

**Figure 6** shows the location and area of the Northern Emplacement Area as proposed to be expanded. While the illustrated footprint is considered indicative, it represents the maximum extent of area that will be required in the Northern Emplacement Area for the life of the mine.

The location and configuration of the proposed expanded Northern Emplacement Area has been developed and refined in order to minimise haul lengths and ensure the entire footprint is maintained within land owned by Whitehaven, as well as ensure that the post-mining landform of the emplacement area is consistent with the height of the adjacent ridge to the west of the Project Site.

The expanded Northern Emplacement Area will be developed using overburden extracted from the open cut mining pit in Years 1, 2, 3 and 5 of the expanded operation. Early re-shaping and revegetation of the external batter slopes of the emplacement area will be undertaken in Years 1 and 2 of the expanded operation to minimise visual impacts, limit erosion and downstream sedimentation, and minimise the projection of noise from overburden transportation and emplacement activities towards privately owned residences located to the north and north-east later in the mine life.

Overburden will be progressively dumped inside of the established extremities of the emplacement footprint using lifts to gradually raise it to its design height. By Year 6, dumping in the expanded Northern Emplacement Area will be completed and the landform will be reshaped, topdressed and revegetated.

The footprint of the Northern Emplacement will expand to approximately 75 hectares. While the majority of this land has been disturbed by historic land clearing, agricultural production and/or mining-related activities (soil stockpiling), establishment of the expanded emplacement area will necessitate the removal of some of the currently approved Western Biodiversity Offset Area (see **Section 5.8**).

The topsoil that is currently stockpiled within the approved Northern Stockpile Area will be relocated to the proposed Eastern Soil Stockpile Area or, where possible, placed directly onto completed reshaped areas available for rehabilitation. While all of the topsoil will be relocated, the subsoil in this area will remain and will be covered with overburden due to there being sufficient subsoil material available for rehabilitation from the expanded operations.

The elevation of the Northern Emplacement Area will increase to a maximum of 50 metres above pre-mining landform. As stated above, this has been planned so that the post-mining mining landform is consistent with the height of the adjacent ridge to the west of the Project Site at around 340 metres AHD. The batter slopes will be maintained at a vertical to horizontal ratio of approximately 1 to 6 (1V:6H), which is approximately 10 degrees.

## 5.6 Expanded Open Cut Pit

### 5.6.1 General

Whitehaven will continue to extract coal using the open cut mining methods currently used at the site and approved under PA 06\_0198. As outlined in the above sections, this involves the extraction of three separate coal seams, being the Upper Glenroc, Lower Glenroc and Belmont Seams, within the open cut pit using haulback mining methods at a production rate of 1.5 Mtpa. As sufficient coal is exposed, it is ripped, excavated and transported to the ROM pad within the on-site coal handling and processing area. The only change to current mining methods will be the addition of one 1250 excavator, which will be added to the mining fleet to enable cleaner and more efficient mining of coal from within the expanded pit area. This is the only proposed change to the current earthmoving and mining equipment used on-site (see **Section 4.13**).

In order to access up to an additional 5 Mt of coal not previously considered in the life of mine plan, it is proposed to expand the open cut pit design limit by approximately 50 hectares to a total open cut mined area of approximately 164 hectares. This will increase coal recovery at Rocglen by close to 30 percent.

The proposed areas of pit expansion are identified on **Figure 6**. While the majority of this land has been disturbed by historic land clearing, agricultural production and/or mining-related activities, expansion of the pit will necessitate the removal of some of the Western and Jaeger Lane Biodiversity Offset Areas approved under PA 06\_0198 (see **Section 5.8**).

### 5.6.2 Geotechnical Stability

GE Holt & Associates (GHA 2010) prepared a geotechnical report assessing the stability of the eastern highwall of the proposed expanded open cut pit adjacent to the approved Wean Road realignment. A copy of GHA's report is contained within **Appendix I**. The report discusses the issues involved in ensuring a safe and stable highwall design, analyses the likely stability of the final highwall adjacent to the road and provides recommendations to ensure the permanent integrity of Wean Road.

#### Geology

Generally the mine is developed on top of an anticline with the western limb steeper than the eastern. The eastern limb is interrupted by the Belmont Fault, which is a significant thrust fault. It tips the eastern dipping coal sequence up vertically, and has a deeply weathered fault breccia zone. In addition, there is a thick sequence of poorly consolidated clay and sand alluvials overlying the Permian coal measures.

The alluvials, deeply weathered rock and the Belmont fault zone will have a major influence on final wall stability. The location of the fault has been delineated more accurately by recent drilling, which has shown that the thrust is not a straight line from the northwest to southeast, rather it meanders along an irregular path in this direction and may have offshoots. It effectively cuts off the thick Belmont Seam so the pit limit has been set close to the fault structure.

#### Stability of Highwall

In order to maximise extraction of the coal contained in the Belmont Seam it will be necessary to push the highwall further to the east, from where the Belmont Fault cuts off the coal, to develop a stable highwall.

As indicated on Figure 2 in the geotechnical report (GHA 2011) in **Appendix I**, drilling indicates that the Belmont Fault will intersect the proposed eastern highwall at a very acute angle. This will necessitate cutback or flattening of the wall to ensure stability. Limitations of land ownership and the relocation limits for Wean Road mean that realigning Wean Road further to the east to accommodate a flattened highwall is not possible. Economic factors in excavating considerable quantities of fault affected overburden also affect such a consideration.

According to GHA (2011), the most stable orientation for a fault intersecting a highwall is when the fault is close to right angles to the wall, or at least intersects it at a very high angle. This reduces the area of instability to a little more than the width of the fault zone, and consequently it is a much simpler mining exercise to maintain stability. One possible way of achieving this is shown on Figure 3 of the geotechnical report (GHA 2011) in **Appendix I**. The actual point at which this will be necessary will become clearer as the pit is developed and the nature of the fault structure is more accurately known.

It is recommended that the eastern highwall be turned westward so that it intersects the fault zone at close to right angles allowing the turned highwall to be cut back until stability is achieved in the crushed rock and alluvium, without impacting on Wean Road. There would be a notch developed in the highwall. Once the turned highwall encounters sound rock, as it continues to the west, it can be turned again to develop parallel to the Belmont Fault until it reaches the planned pit limit. The width of unmined rock required to hold the Belmont Fault stable can be determined when the final layout of the highwall is being determined.

This sort of approach ensures that within 150 metres of Wean Road the Belmont Fault is buttressed by solid rock to the west, is stabilised within the pit crest and therefore cannot affect Wean Road. If there is no faulting in the highwall then mine development can continue to the crest limit, which is proposed to be approximately 50 metres from Wean Road.

As discussed in the geotechnical report (GHA 2011) within **Appendix I**, the open pit limits can be adjusted to ensure there is solid unmined ground to prevent the fault structures collapsing the ground in a manner that could affect Wean Road. Such adjustments will allow some flexibility if the fault structure changes location from that suspected at present.

In summary, the stability recommendations to be adopted by Whitehaven are:

- (a) When the Belmont Fault (or fault zone) is more than 150 metres from Wean Road, operations will mine through the Belmont Fault. The uppermost alluvial material and weathered rock on the eastern side of the fault will have individual face angles no steeper than 45 degrees;
- (b) Benching will be adopted at a maximum interval of 25 metres in alluvial, weathered rock and brecciated rock;
- (c) In fresh strata face angles will be designed at 75 degrees to pit bottom. If in following the upturned Belmont Seam down to pit bottom the floor rock is strong and competent, then the face will be developed on the dip slope without the need for benches in rock beneath the Belmont Seam;
- (d) The eastern end wall will be turned at right angles to the west when the eastern limit of the Belmont Fault zone reaches 150 metres from Wean Road;
- (e) The turned highwall in the fault zone will be notched to achieve a stable face. This notch will not approach Wean Road any closer than 150 metres without geotechnical advice;
- (f) A block of unmined ground will be left to contain the Belmont Fault zone and prevent it causing collapse back towards Wean Road. The size of this block of unmined ground will be determined by geotechnical investigation by the time a change in highwall direction is required; and
- (g) If the highwall is free of faulting mining will resume southeast towards the currently planned pit limit. Such mining will cease when the pit crest reaches 50 metres from Wean Road. If additional faulting is detected in this advancing face then the relevance of such structure on highwall stability will be investigated before continuation of highwall development.

Alterations to a mine plan are not uncommon in any mining operation affected by geology and sufficient flexibility is needed in the mine plan (and approval process) to accommodate changes in geological conditions. GHA (2011) states that this can be achieved by including trigger points for action in the MOP. It will be some years before the pit crest approaches within 150 metres of the realigned Wean Road providing time to monitor and amend highwall design should any other stability issues arise, without affecting land beyond the proposed pit shell. It is on this basis that Whitehaven will commit to undertaking progressive stability reviews and monitoring of geological conditions once the pit moves within 250 metres of the realigned Wean Road to ensure geotechnical stability and safe conditions. If any unfavourable conditions are observed or detected, a detailed assessment will be undertaken by a suitably qualified geotechnical engineer before mining is allowed to continue towards Wean Road. The exact location and nature of the Belmont Fault, the location of the Belmont Seam in relation to the fault and the stability of the highwall are just some of the issues that will become more accurately known as mining advances.

## 5.7 Rehabilitation and Decommissioning

While the major portion of rehabilitation and decommissioning activities will occur close to the cessation of mining, Whitehaven will continue to adopt a progressive approach to rehabilitation throughout the life of the mine. The rehabilitation and final land use approved under PA 06\_0198 at Rocglen is briefly outlined in **Section 4.16**.

To assist Whitehaven address mine decommissioning, final landform design, rehabilitation and post-mining land use for the Rocglen Extension Project, GSSE has prepared a *Rehabilitation and Decommissioning Strategy* (2011). Consideration has been given to the commitments made in the original EA, and the objectives and methodology are consistent with the principles approved for the current operation.

The *Rehabilitation and Decommissioning Strategy*, which is contained within **Appendix J**, is considered a dynamic document that will continually be reviewed and updated throughout the life of the Project. Within five years of the planned mine closure, a more detailed *Rehabilitation and Decommissioning Strategy* will be prepared.

The following sections outline Whitehaven's rehabilitation objectives and the primary components of rehabilitation necessary to achieve the desired final landform on completion of all mining and mining-related activities associated with the Rocglen Extension Project. The full *Rehabilitation and Decommissioning Strategy* (GSSE 2011) in **Appendix J** should be referred to for further detail.

### 5.7.1 General Rehabilitation Principles and Objectives

Whitehaven is committed to ensuring progressive rehabilitation of areas of disturbance (and sequencing activities to enable earliest revegetation consistent with operational requirements) within the Project Site. This is in order to minimise the areas of exposure and hence reduce the potential air quality impacts, erosion and sedimentation, and visibility of mining operations from surrounding residences and publically available vantage points.

It is proposed that progressive rehabilitation be undertaken on the site, with disturbed areas generally undergoing rehabilitation within one year of overburden placement and subsequently being re-profiled to the final landform. Rehabilitation of disturbed areas will involve the reshaping of the mining landforms, topdressing (including intermediate layering of subsoil where appropriate), installation of appropriate water management works and establishment of areas of native vegetation and pasture species as required to achieve the preferred post-mining land uses (see **Section 5.7.9**).

Short-term rehabilitation objectives include:-

- Minimise clearing/vegetation disturbance consistent with operational requirements;

- Schedule operations including overburden emplacement and shaping and revegetation to minimise visual exposure;
- Rehabilitate all areas of disturbance no longer required for mining-related operations;
- Apply appropriate soil material (topsoil/subsoil) to the final landform based on material availability and post-mining land use (see **Section 5.4**);
- Stabilise all earthworks, drainage lines and disturbed areas in order to minimise erosion and sedimentation; and
- Control vermin, feral animals and noxious weeds.

The overall long term mine rehabilitation objective is to provide a low maintenance, geotechnically stable and safe landform that blends in with the surrounding topography and provides a mixture of rehabilitated bushland with areas of grazing consistent with the pre-mining conditions. Specific long-term objectives include:

- Re-establishing land to either pasture or bushland over the areas disturbed by the mine;
- Increasing the area of land allocated to bushland through the revegetation of those areas disturbed by the mine and the maintenance of remnant and degraded native vegetation and/or habitat corridors on the mine site;
- Provide habitat for fauna and corridors for fauna movement within the final landform;
- Develop and implement a long-term and regionally integrated *Biodiversity Offset Strategy*; and
- Monitor rehabilitation success in terms of physical and biological parameters.

### 5.7.2 Decommissioning and Mine Closure

The *Rehabilitation and Decommissioning Strategy* (GSSE 2011) contained within **Appendix J** outlines the key aspects relating to the decommissioning and closure of the Rocglen site and should be referred to for further detail in this regard.

The principal objectives of mine closure planning considered include:

- Providing an overall framework for mine closure including rehabilitation and decommissioning strategies that are consistent with the current mine closure plan and the expectations of the I&I NSW;
- Establishing clear and agreed criteria, which can be used to provide the standard against which the final mine rehabilitation and post mining land use can be assessed;
- Reducing or eliminating adverse environmental effects once the mine ceases operation;
- Ensuring closure is completed in accordance with good industry practice; and
- Ensuring the closed mine does not pose an unacceptable risk to public health and safety.

Specific assessments and methodologies have been included for:

- Decommissioning of infrastructure, plant and buildings
- Bulk earthworks and rehabilitation of the site; and
- Post-mining land use (land capability and agricultural suitability).

### 5.7.3 Progressive Rehabilitation

Whitehaven will continue to adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, topdressed and vegetated to provide a stable landform. The progressive formation of the post-mining landform and the establishment of a vegetative cover will reduce the amount of disturbed land at any one time and also reduce the visibility of mine-related activities from surrounding properties and roads. Early reshaping and revegetation of the external batter slopes of the emplacement areas is particularly important and has been targeted as a priority.

It is proposed that disturbed areas generally undergo rehabilitation within one year of overburden emplacement and reshaping. **Table 13** summarises the progressive rehabilitation of the site on an annual basis, and **Figures 17 to 20** illustrate this annual sequencing.

**Table 13 – Progressive Annual Rehabilitation Schedule**

Year Rehabilitation to be Undertaken	Area (ha)
Year 1 of Expanded Operation	Rehabilitation commences
Year 2 of Expanded Operation	33
Year 3 of Expanded Operation	14
Year 4 of Expanded Operation	11
Year 5 of Expanded Operation	14
Year 6 of Expanded Operation	26
Year 7 of Expanded Operation	13
Year 8 of Expanded Operation	26
Year 9 of Expanded Operation	11
Year 10 of Expanded Operation	25
Year 11 of Expanded Operation	11
End of Mine Life	174
<b>Total</b>	<b>358</b>

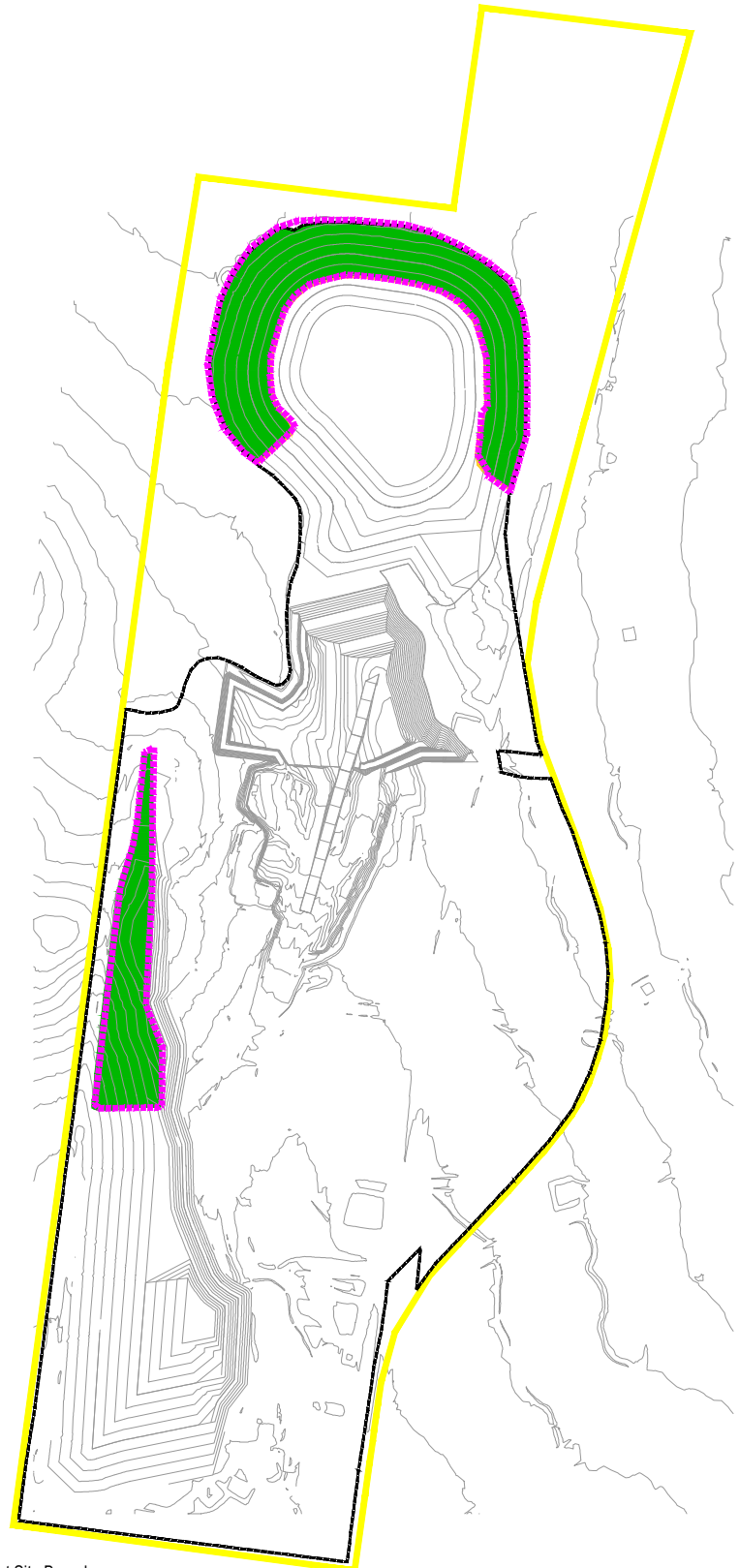
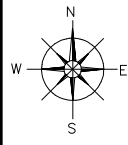
### 5.7.4 Revegetation

The revegetation approach to be adopted for each component area within the Project Site is based on the successful rehabilitation already undertaken at Rocglen and other Whitehaven mines. Additional site-specific input in terms of flora, fauna, soil and surface water management has been sourced from the specialist consultants engaged to investigate and report on these issues for the Rocglen Extension Project.

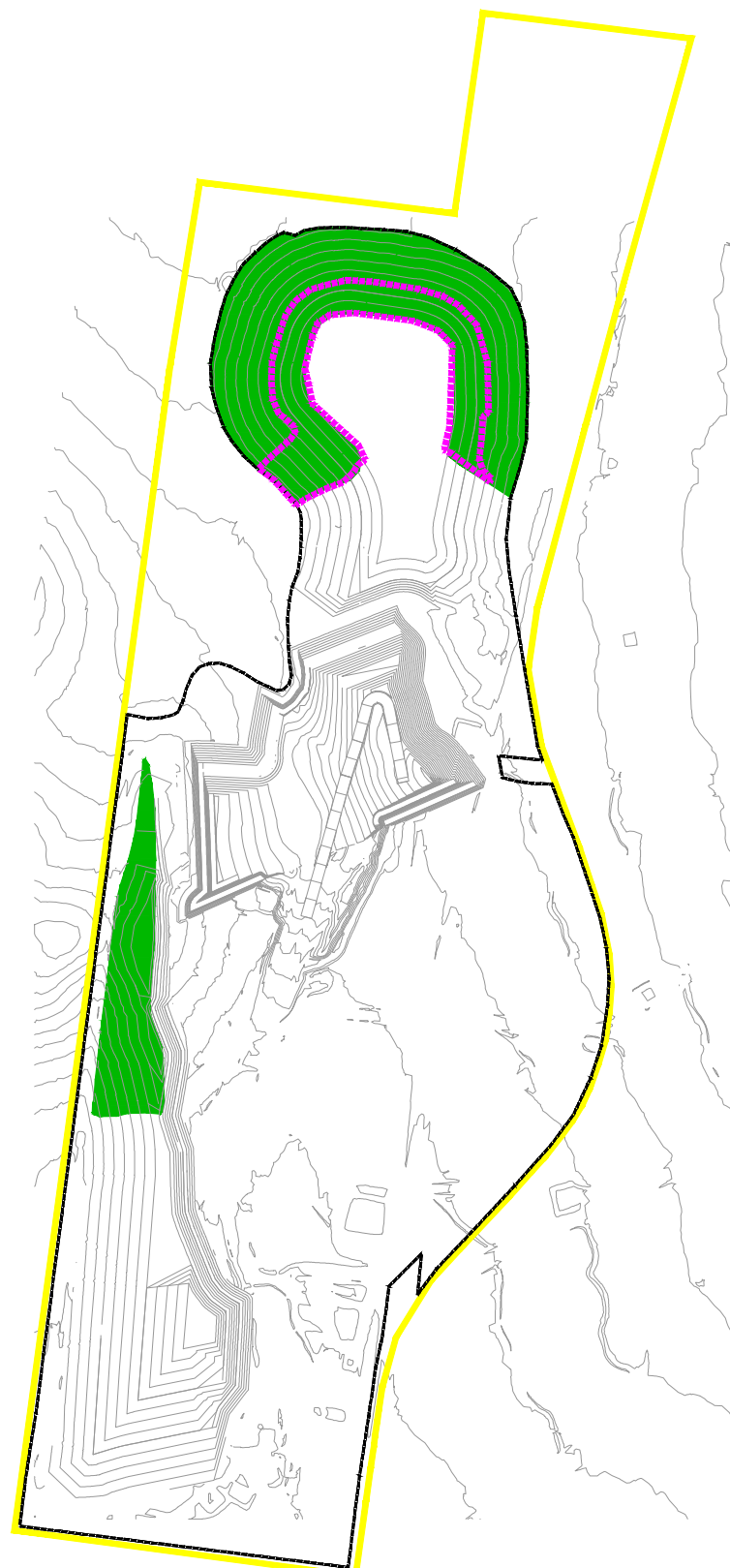
#### Overburden Placement and Shaping

Placement and shaping of overburden to the nominated area at slopes with gradients around 10 degrees will be undertaken in a manner which, wherever practicable, ensures that any friable or weathered materials are placed below the subsoil and topsoil layers in order to provide a cover of more competent material and avoid the exposure of large rocks on the final surface. Any coarse coal rejects placed in the mine void will be covered with at least 3 metres of overburden material.

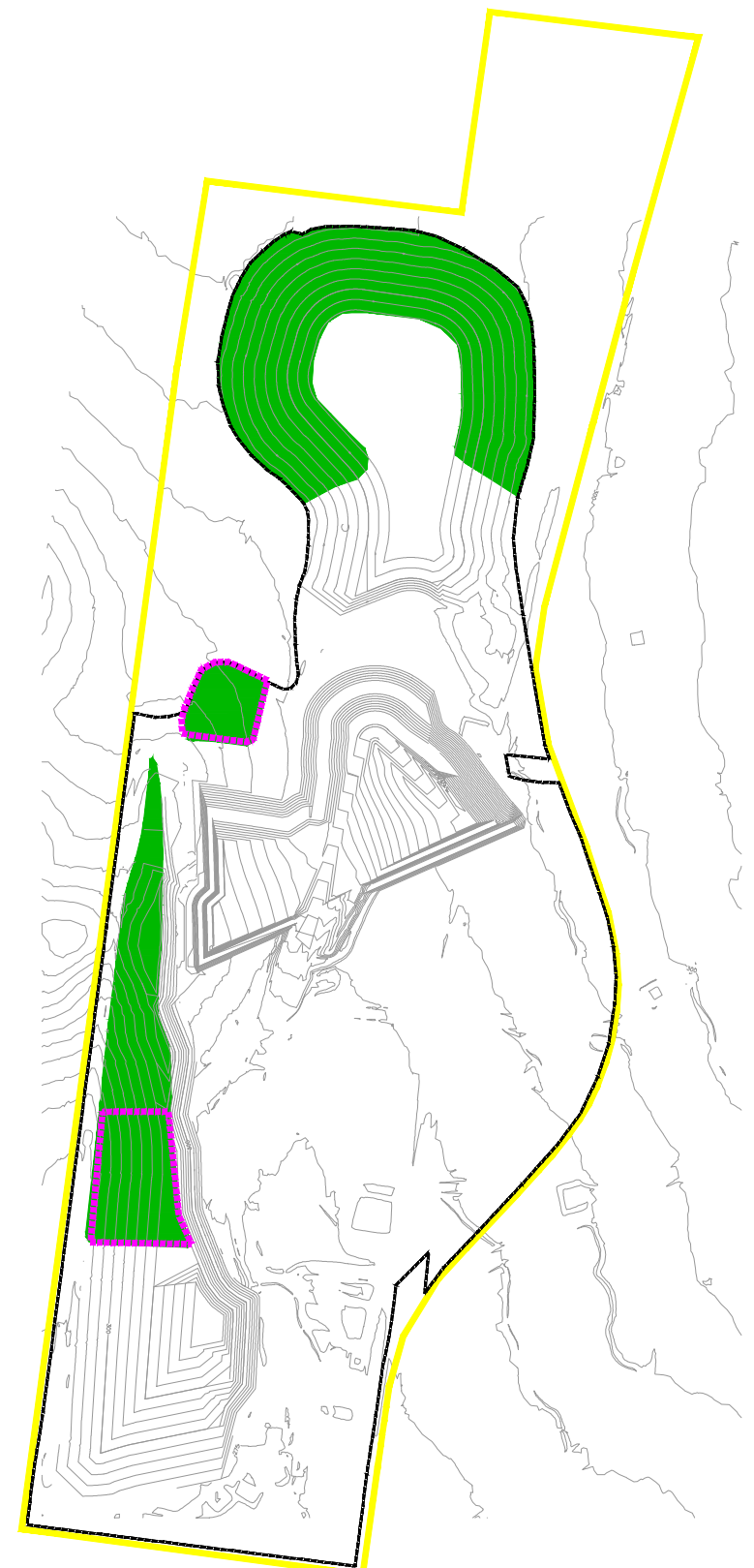
An initial assessment of overburden materials did not identify any risk of acid generation or soluble salt formation, and as such no specific handling or storage requirements are considered necessary.



Rehabilitated Areas - Year 2







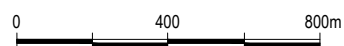
Rehabilitated Areas - Year 3



Rehabilitated Areas - Year 4

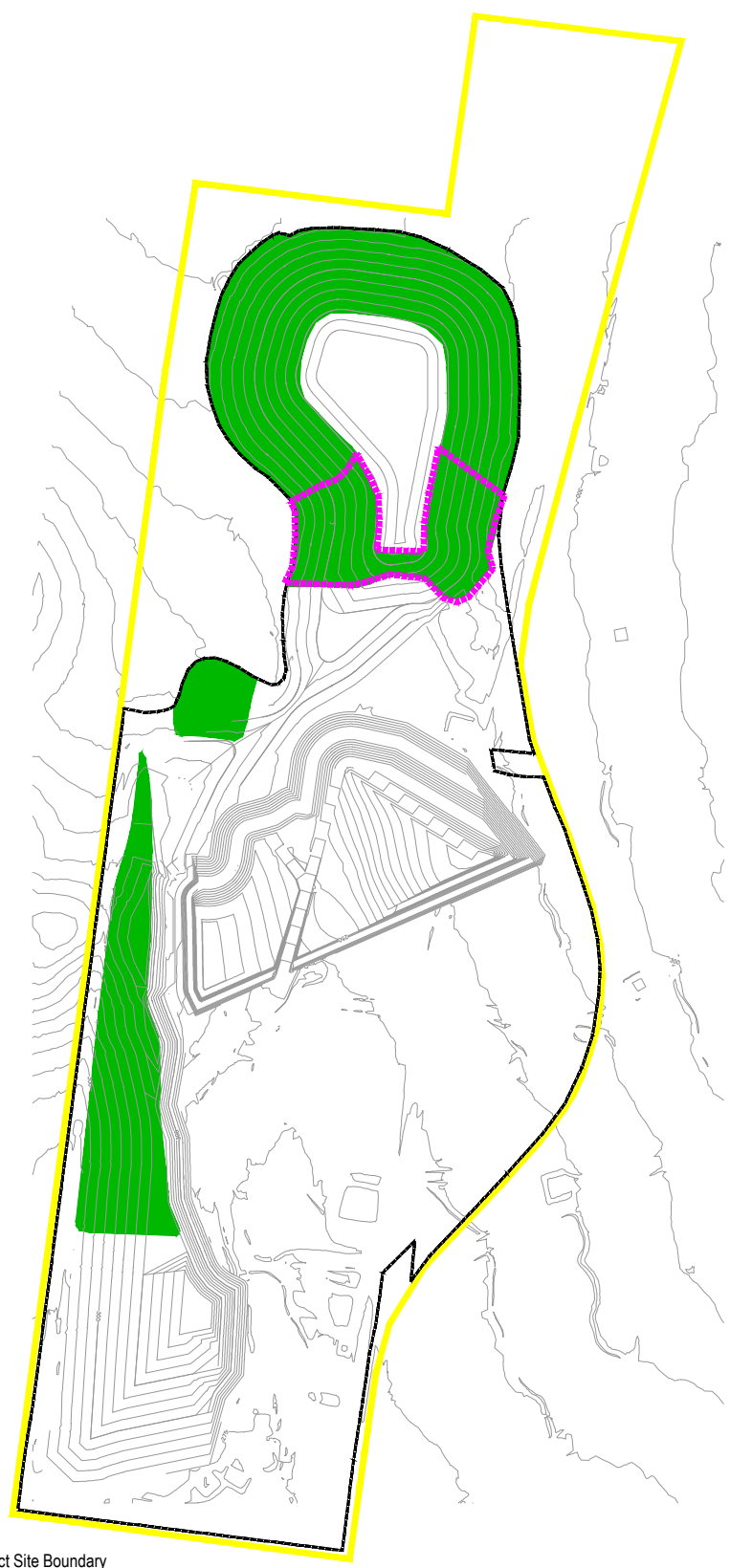
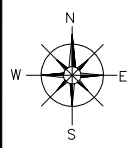
LEGEND

-  Project Site Boundary
-  Total Rehabilitated Area
-  Rehabilitated Area - This Annual Period
-  Anticipated Disturbance Area

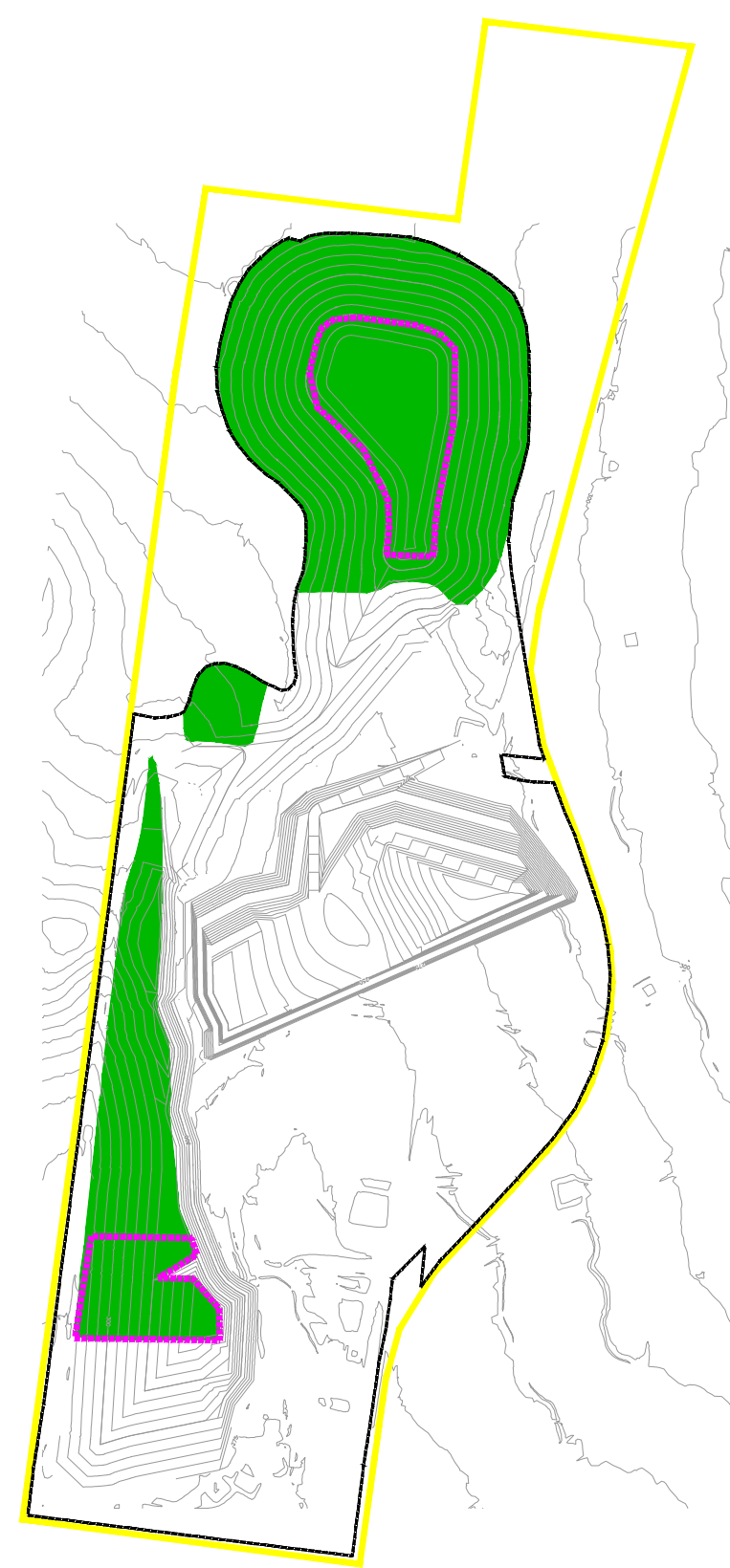


Base Plan Source: MMG Civil P/L

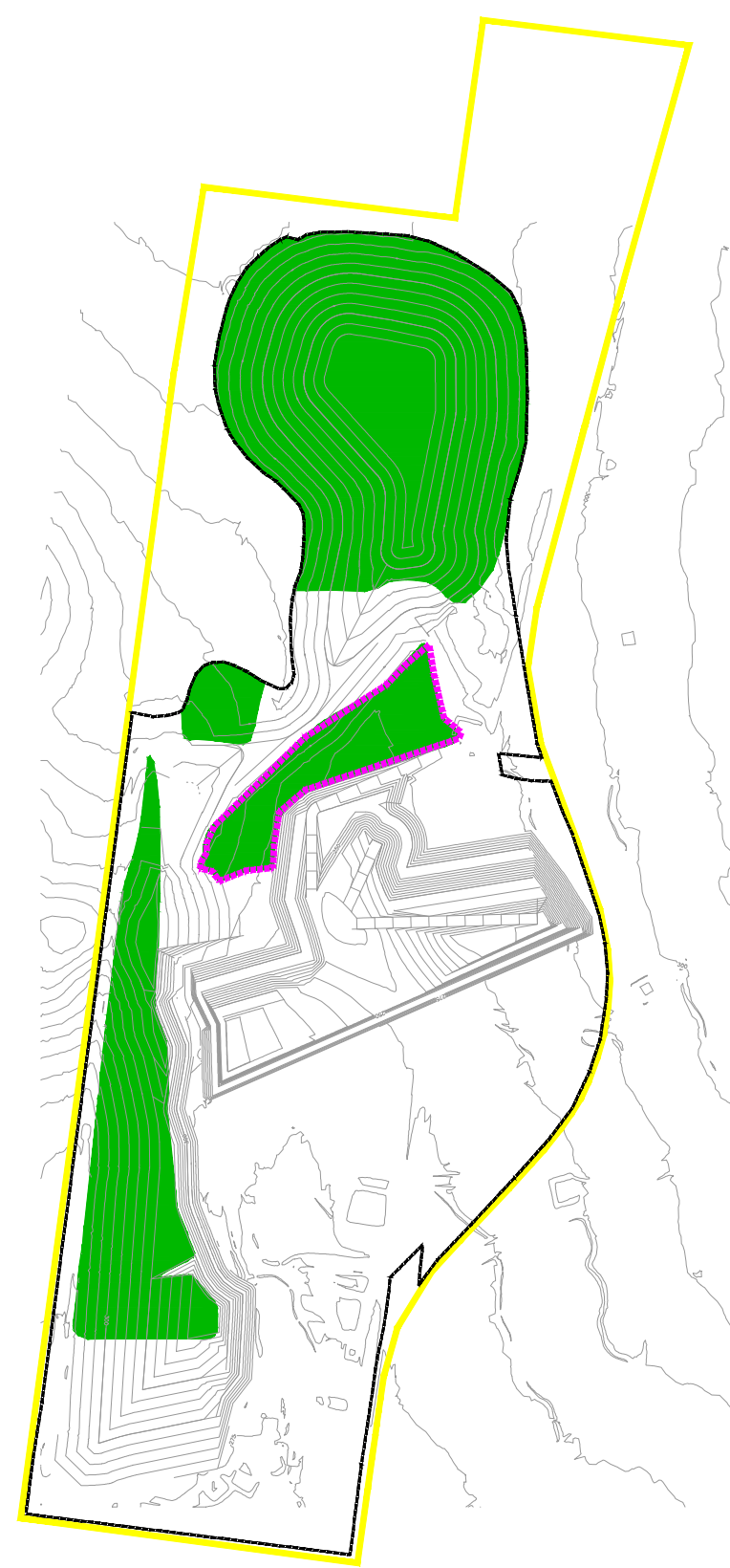
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Rehabilitated Areas - Year 5

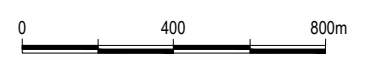


Rehabilitated Areas - Year 6



Rehabilitated Areas - Year 7

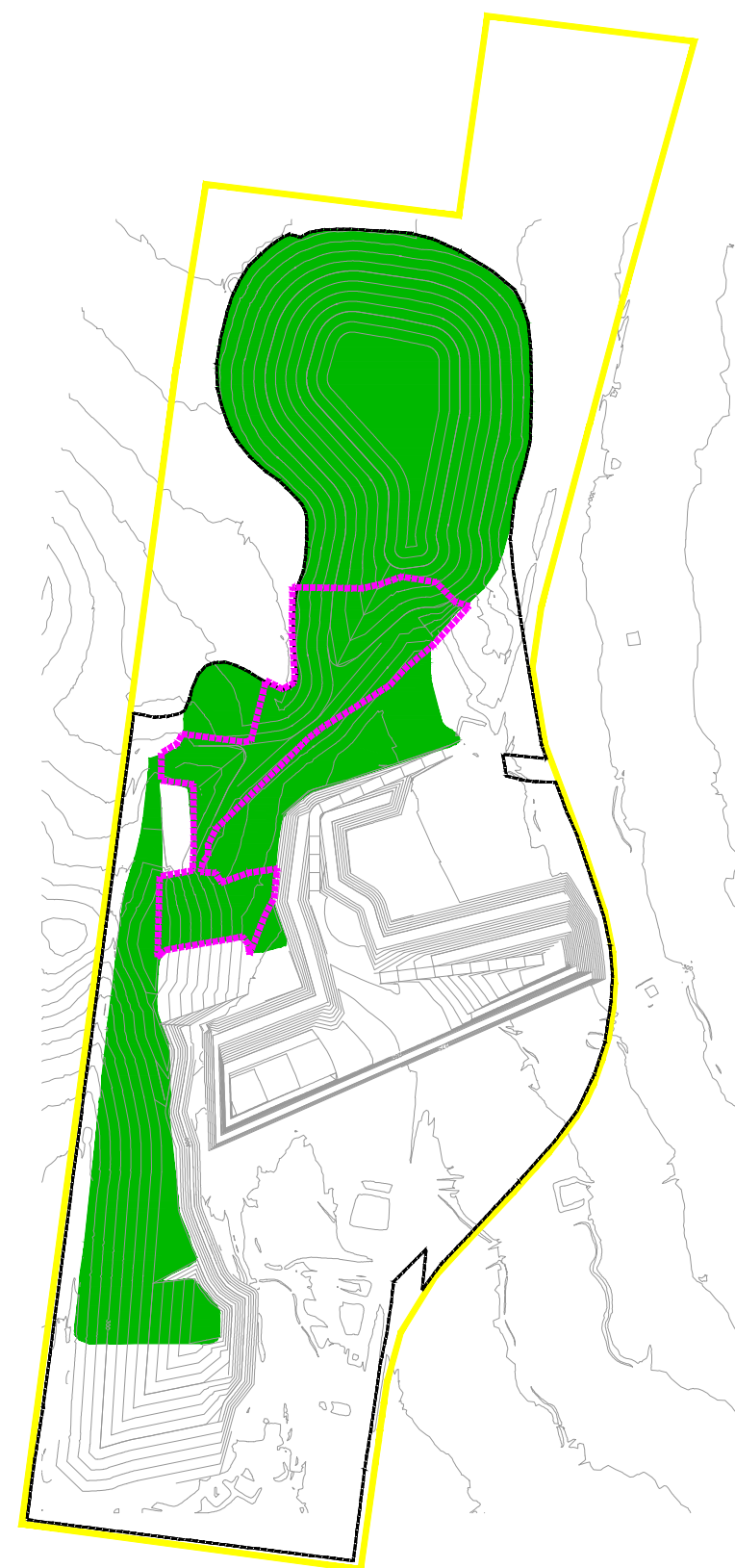
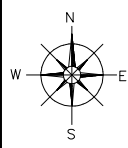
- LEGEND**
- Project Site Boundary
  - Total Rehabilitated Area
  - Rehabilitated Area - This Annual Period
  - Anticipated Disturbance Area



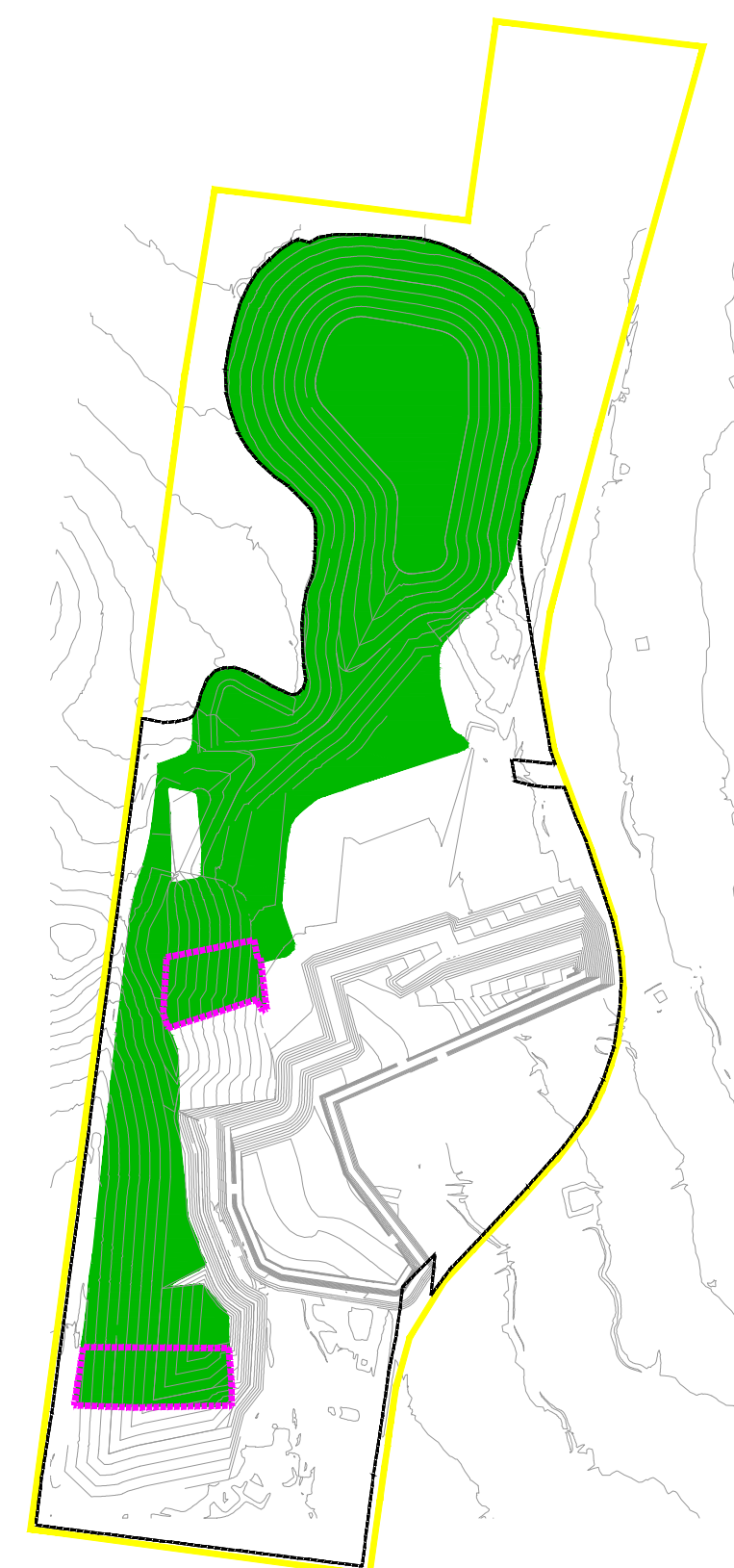
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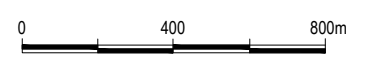


Rehabilitated Areas - Year 8



Rehabilitated Areas - Year 9

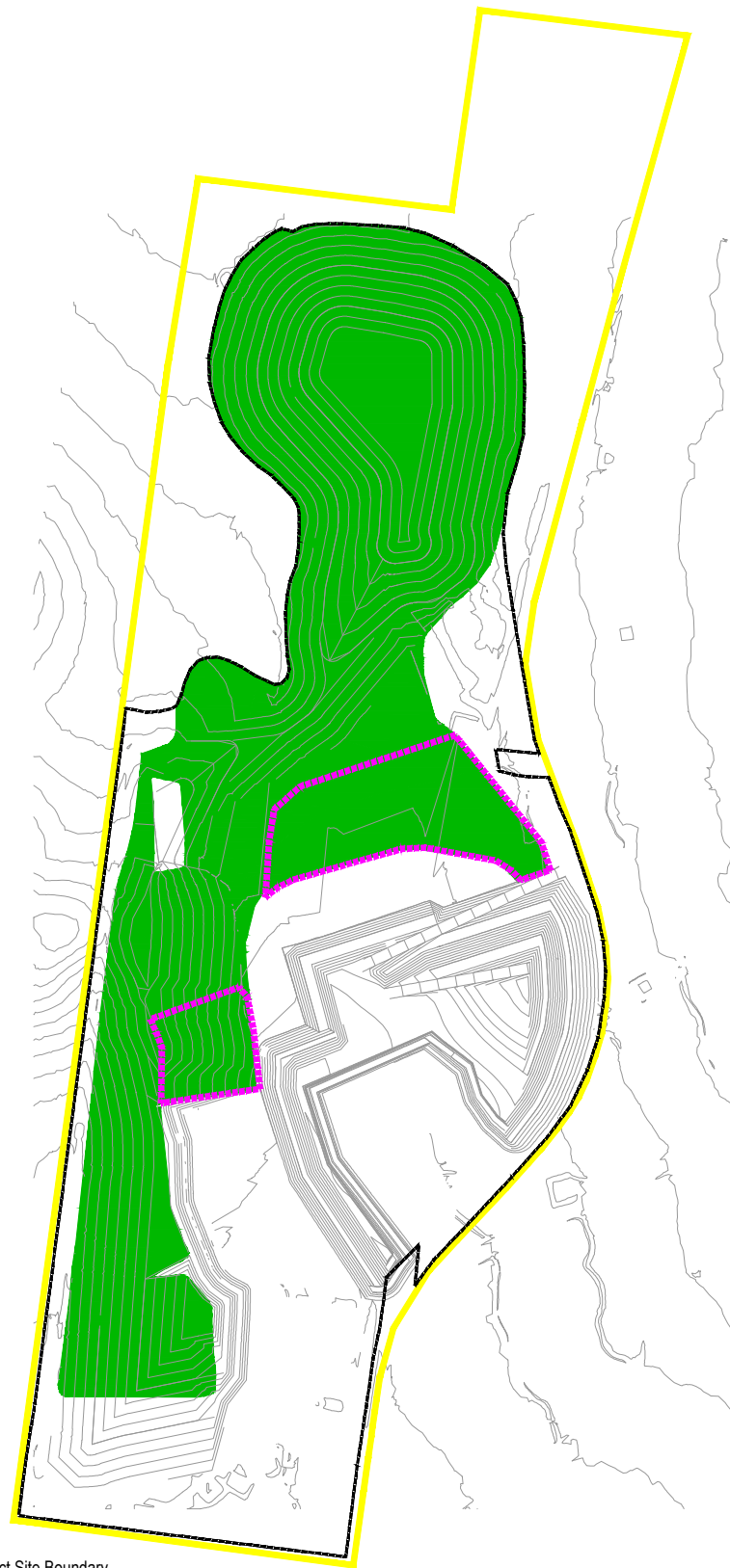
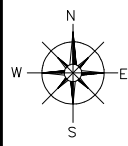
- LEGEND**
- Project Site Boundary
  - Total Rehabilitated Area
  - Rehabilitated Area - This Annual Period
  - Anticipated Disturbance Area



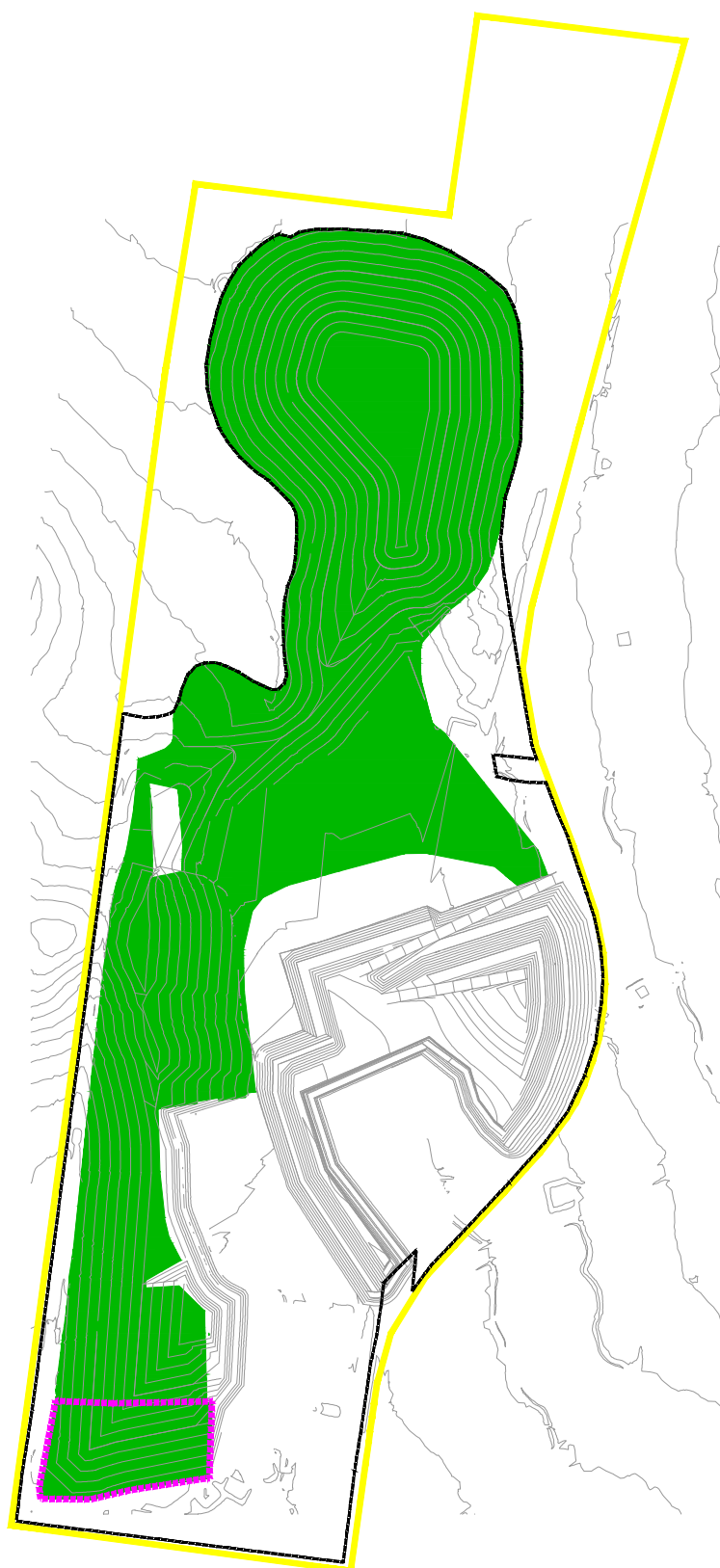
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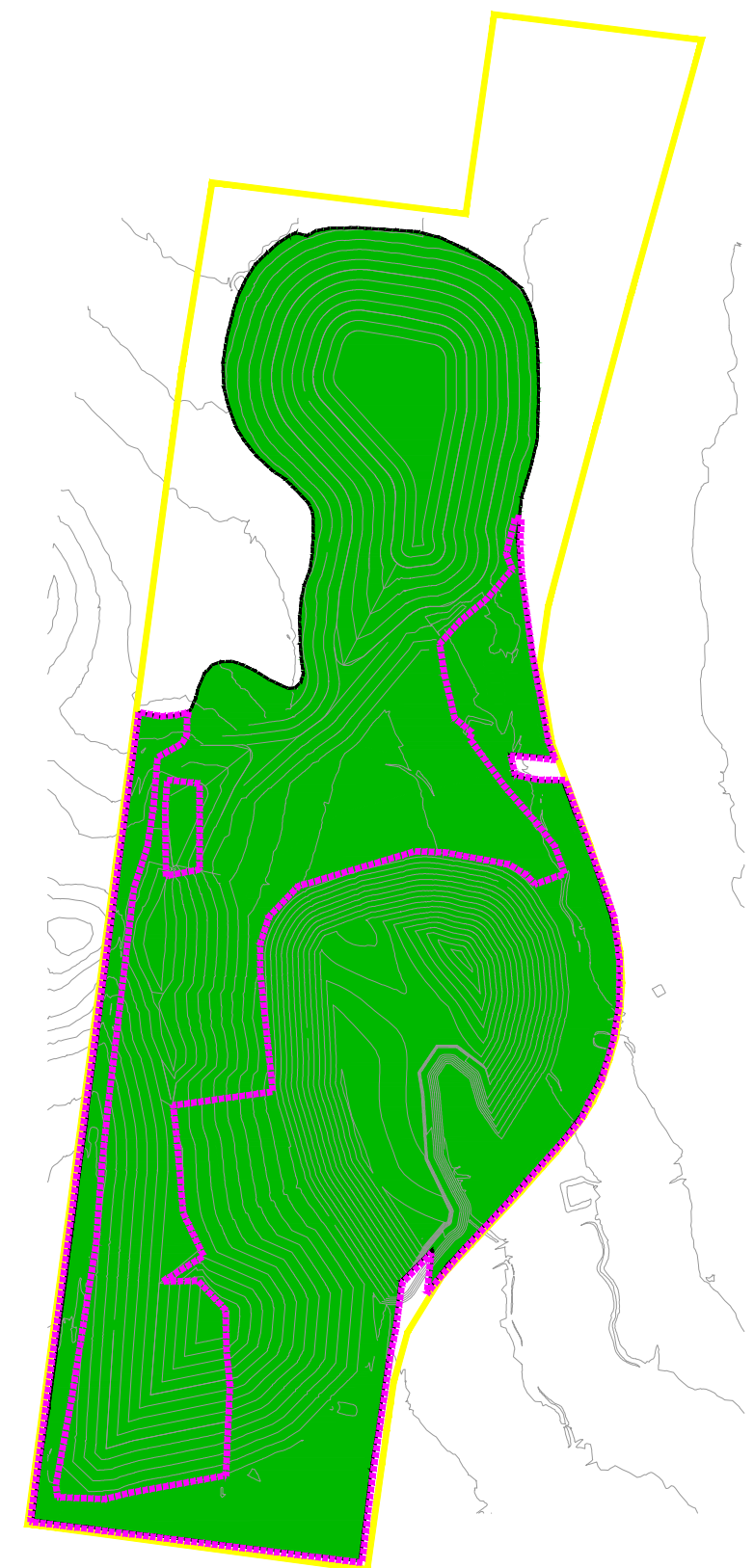




Rehabilitated Areas - Year 10







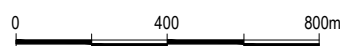
Rehabilitated Areas - Year 11



Rehabilitated Areas - End Of Mine Life

LEGEND

-  Project Site Boundary
-  Total Rehabilitated Area
-  Rehabilitated Area - This Annual Period
-  Anticipated Disturbance Area



Base Plan Source: MMG Civil P/L

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### Subsoil and Topsoil Replacement

Whitehaven's adopted general practice of including an intermediate layer of subsoil between the overburden material and the topdressing, which improves the water holding capacity of the rehabilitated landform and reinstates a more natural soil profile, will continue. As described in **Section 5.4.5**, Whitehaven may reduce or remove subsoil replacement in targeted areas of woodland rehabilitation as a means of investigating impacts of different soil regimes on woodland development.

Where resources allow, as outlined above in **Section 5.4**, topsoil and subsoil will each be spread to a nominal depth of between 100 to 150 mm, giving a combined depth of soil material on the rehabilitated landform of between 200 and 300 mm. The subsoil layer will be spread on an even but roughened surface that has been ripped along the line of the contour to break any compacted and/or smooth surfaces. Ripping will also assist the keying of subsoil into the overburden, which will, in turn, assist in the prevention of land slip and can help vegetation penetrate deep into the soil profile, encourage ingress of water and minimise erosion.

Tree trunks and branches less than 300 mm diameter and other smaller vegetative debris removed during clearing will be spread over those areas to be restored as rehabilitated bushland where practical.

### Drainage and Surface Water Structure Installation

Surface water management structures will be progressively installed on the rehabilitated landform. The heights (effective depths) and cross-sectional areas of the individual banks will be determined on the basis of individual sub-catchment areas, but will typically be less than 0.7 metres and 3 square metres (m<sup>2</sup>), respectively. Rock-lined drains will be used, where required, to convey water safely from the rehabilitated landform into the surface water management system that takes water from the site.

### Agricultural Land Pasture Sowing

The topdressed surfaces of those areas designated to be restored to rehabilitated pasture will be sown with a mixture of pasture species appropriate for the season. The seed mixture will include fast growing, short-lived species and perennial grasses and legumes. A proposed pasture mix for cool and warm seasons is presented in **Table 14**. Following establishment of these areas, it is anticipated rotational production of pasture and suitable crops will be undertaken at the discretion of the landowner.

**Table 14 – Recommended Pasture Species Seed Mix**

Pasture Species	Rate (kg/ha)	Fertiliser
<b>Warm Season Grasses</b>		
Bombatsi Panic	1 – 2	250kg/ha
Green Panic <sup>2</sup>	2 – 4	Di-Ammonium Phosphate (DAP)
Rhodes Grass <sup>2</sup>	1 – 2	
Purple Pigeon Grass	1 – 2	
<b>Annual Legumes</b>		
Subterranean Clover	4 - 5	
<b>Cool Season Legumes<sup>1</sup></b>		
Barrel (Sephi) medic	2 – 4	
Snail (sava) medic <sup>2</sup>	3 – 5	
Woolly Pod Vetch	4 – 6	
Serradella (Elgara)	1 – 2	
Lucerne	0.5	
<b>Cool Season Grasses</b>		
Phalaris (Sirolan or Holdfast)	1 - 2	
Wallaby Grass	0.3 - 1	

1 – inoculated and appropriate rhizobia; 2 – specific soil conservation application

### Native Vegetation Establishment

The topdressed surfaces of those areas designated to be restored as rehabilitated bushland will be initially stabilised with a non-persistent cover crop followed by planting of a selection of locally occurring trees. **Table 15** lists recommended species for the re-establishment of bushland within the Project Site.

**Table 15 – Recommended Tree and Shrub Species**

Common Name	Scientific Name	Common Name	Scientific Name
<b>Trees</b>		<b>Shrubs</b>	
		Western Golden Wattle	<i>Acacia decora</i>
Narrow-leaf ironbark	<i>Eucalyptus crebra</i>	Amulla	<i>Myoporum debile</i>
Pilliga Grey Box	<i>Eucalyptus pilligaensis</i>	Sandalwood	<i>Santalum lanceolatum</i>
White Box	<i>Eucalyptus albens</i>	Eastern Cottonbush	<i>Maireana microphylla</i>
Blakely's Red Gum	<i>Eucalyptus blakelyi</i>	Native Jasmine	<i>Jasminum lineare</i>
Yellow Box	<i>Eucalyptus melliodora</i>	Gargaloo	<i>Parsonsia eucalyptophylla</i>
Rosewood	<i>Alectryon oleifolius</i>	Yellow Berry Bush	<i>Maytenus cunninghamii</i>
Bull Oak	<i>Allocasuarina luehmannii</i>	Wild Lemon	<i>Canthium oleifolium</i>
Bimble Box	<i>Eucalyptus populnea</i>	Wild Orange	<i>Capparis mitchellii</i>
Brigalow <i>Acacia</i>	<i>Harpophylla</i>	Hopbush	<i>Dodonaea</i> spp.
Wilga	<i>Geijera parviflora</i>	Emubush	<i>Eremophila longifolia</i>
Belah	<i>Casuarina cristata</i>	Native Olive	<i>Notelaea macrocarpa</i>
Wild Orange	<i>Capparis mitchellii</i>	Butterbush	<i>Pittosporum angustifolium</i>
White Cypress Pine	<i>Callitris glaucophylla</i>	Cough Bush	<i>Cassinia laevis</i>

These species will encourage the re-establishment of the pre-mining vegetation communities and, in the medium to longer term, create habitat and corridors for native fauna. Tubestock will generally be propagated from locally-collected seed through Whitehaven's seed collection program and will be used in strategic landscape planting around the site for visual mitigation. Large areas may be planted by direct seeding methods if site conditions allow, and will require the purchase of bulk seed mixes. Where possible, these mixes will be complimented with the addition of seed collected in the immediate area.

All areas identified for bushland and pasture re-establishment will be fenced and have stock excluded until it can be demonstrated that the vegetation is stable and self-sustaining, and that grazing will not impact upon its establishment.

### 5.7.5 Rehabilitation Monitoring and Maintenance

A commitment to effective rehabilitation involves an on-going monitoring and maintenance program throughout and beyond the operation of the mine. Areas being rehabilitated will be regularly inspected and assessed against the long and short-term rehabilitation objectives. During regular inspections, aspects of rehabilitation to be monitored will include:

- Evidence of any erosion or sedimentation from areas with establishing vegetation cover;
- Success of initial grass cover establishment;
- Success of tree and shrub plantings;
- Adequacy of drainage controls;
- Presence/absence of weeds; and
- General stability of the rehabilitation site.

Where the rehabilitation success appears limited, maintenance activities will be initiated. These may include re-seeding and where necessary, re-topdressing and/or the application of specialised treatments such as composted mulch to areas with poor vegetation establishment. Tree guards will be placed around planted tube stock if grazing by native animals is found to be excessive.

If drainage controls are found to be inadequate for their intended purpose or compromised by grazing stock or wildlife, these will be repaired and/or temporary fences installed to exclude animals. Should areas of excessive erosion and sedimentation be identified, remedial works such as importation of additional fill, soil material and/or the redesigning of water management structures to address erosion will be undertaken.

As detailed in the *Rehabilitation and Decommissioning Strategy* (GSSE 2011) in **Appendix J**, GSSE recommends that monitoring be conducted periodically by independent, suitably skilled and qualified persons at locations that are representative of the range of conditions on the rehabilitating areas. Annual reviews should be conducted of monitoring data to assess trends and monitoring program effectiveness. The outcome of these reviews should be included in each AEMR.

No time limit has been placed on post-mining rehabilitation monitoring and maintenance. Maintenance will continue until such time as the objectives are met, although it is generally accepted that it will be at least five years beyond closure.

### **5.7.6 Preliminary Rehabilitation Success Criteria**

Preliminary rehabilitation success criteria for the mine site, as presented in the *Rehabilitation and Decommissioning Strategy* (GSSE 2011) in **Appendix J**, have been taken from the document titled *Strategic Framework for Mine Closure* (ANZMEC 2000, as cited in GSSE 2011) to ensure the most appropriate and efficient rehabilitation techniques are applied. Whitehaven will also seek advice, as required, from representatives of the I&I NSW, DoP, DECCW and specialist consultants regarding any additional actions that may need to be adopted during the operation of the mine.

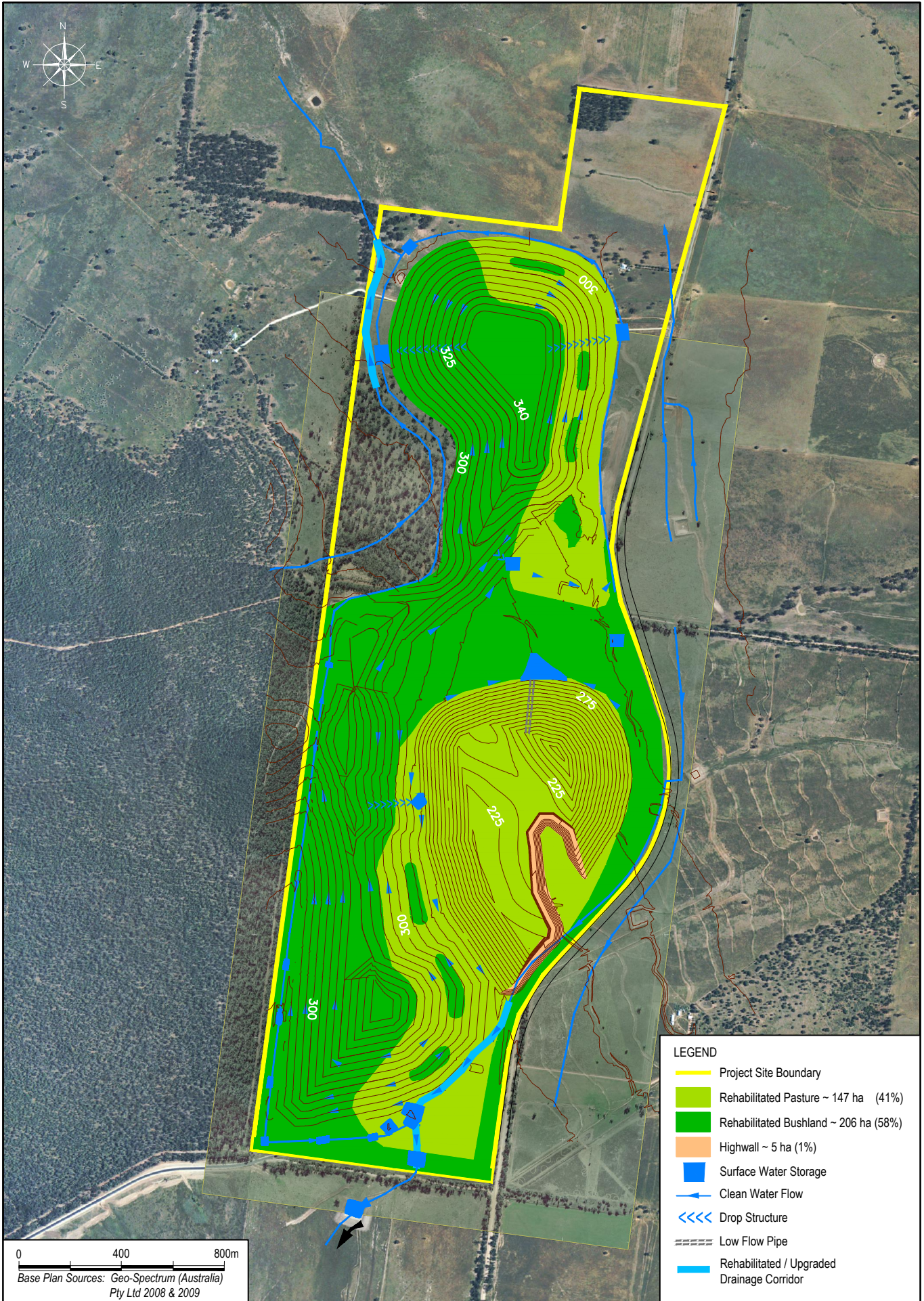
The success criteria comprise indicators for vegetation, fauna, soil, stability, land use and safety on a landform-type basis that reflects the nominated post-mine land use of a mosaic of rehabilitated bushland, rehabilitated grazing and open grasslands.

The success criteria are performance objectives or standards against which rehabilitation success in achieving a sustainable system for the proposed post-mine land use is demonstrated. Satisfaction and maintenance of the success criteria (as indicated by monitoring results) will demonstrate that the rehabilitated landscape is ready to be relinquished from the mine's financial assurance and handed back to stakeholders in a productive and sustainable condition.

### **5.7.7 Conceptual Post-Mining Landform**

Primarily based on the annual sequencing of coal extraction and progressive rehabilitation, the post-mining landform has been developed and refined in order to ensure that a low maintenance, stable and safe landform remains that blends in with the surrounding topography and can support a mixture of rehabilitated bushland with areas of grazing consistent with the pre-mining conditions. Specific attention was given to the re-shaping and blending of emplacement areas with surrounding landforms (including the adjacent Vickery State Forest), as well as ensuring that the size of the final void is minimised and the location and configuration (including appropriate battering of the low walls and highwall) of the final void minimises possible geotechnical and safety issues.

**Figure 21** presents the conceptual final post-mining landform. The major features of the proposed final landform include the following:



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Rocglen Coal Mine Extension Project  
 Post-Mining Landform and Land Use

**FIGURE 21**

- Coal extraction will leave an open pit void (final void) at mine closure covering an area of around 65 hectares in the eastern and southern extents of the open cut pit. It will have a maximum depth of around 65 metres below the natural surface, with elevations ranging between 220 and 285 metres AHD. The northern, western and part of the eastern slopes of the final void will be shaped to achieve between 10 and a maximum of 18 degree batter angles (1H:6V to 1H:3V) depending on the location of the slope within the extent of the void. The highwall on the south-eastern margin of the final void will be battered to approximately 45 degrees (1H:1V) through blasting.
- An elevated landform to the north, being the proposed expanded Northern Emplacement Area. This knoll will have a maximum design height of approximately 50 metres above the pre-mining landform, which is the approximate height of the adjacent ridge to the west of the Project Site at 340 metres AHD. Reshaping will ensure that the final batter slopes will not exceed 10 degrees (1H:6V).
- An elevated ridgeline extending southwards adjacent to the Vickery State Forest along the western boundary of the Project Site, being the approved Western Emplacement Area. The maximum design height of this ridgeline will, again, be approximately 50 metres above pre-mining landform, which is the approximate height of the adjacent ridge immediately to the west at 340 metres AHD. Reshaping will ensure that final slopes will generally be 10 degrees (1H:6V). In the northern section the eastern batters of this ridgeline will graduate to the gently sloping landform north of the final void, while in the middle section the ridgeline batters will blend with those of the final void. In the southern extent, the eastward and south facing batters of the ridgeline will blend into the undisturbed landform.
- The runoff from the Northern Emplacement Area and Western Emplacement Area will be managed by contour banks and rock drop structures conveying water off the relatively steep rehabilitated areas to the gentle surrounding slopes. Runoff from the Northern Emplacement Area will be directed to Dams A, B, C and E and discharged from the site into Driggle Draggie Creek. Runoff from the southern extent of the site, including the Western Emplacement Area, will flow southwards through Dam D to the east of the Western Emplacement Area and a series of small sediment dams to the west of the Western Emplacement Area before entering Dam SB 19.  
  
Overflows from Dam SB 19 will enter Dam SD 3 prior to leaving the site via an existing drainage line that eventually drains into the Namoi River approximately 10 kilometres from the Project Site. Rehabilitation of this drainage line, and others within the Project Site, will seek to reinstate the natural hydraulic functions and provide a revegetated riparian corridor in accordance with the *Blue Book* (LandCom, 2004 and DECC, 2008) and the *Guidelines for Controlled Activities – In-Stream Works* (DWE, 2008).
- An additional Dam F will be constructed to the north of the final void to assist with the prevention of surface water runoff entering into the void. Dam F will be sufficiently large (in the order of 15 megalitres) to capture large storm events (for example, 10 year Annual Recurrence Interval events) and allow this water to be used for stock watering purposes and evaporated to minimise discharges to the final void. A low flow pipe will be installed (below the primary spillway) to safely convey dam overflows to the base of the final void. Extreme rainfall events will result in flows over the spillway and into the final void.
- Other mine-related features forming part of the final landform within the Project Site will be the use of rock-lined drop structures, water storage dams and sediment basins used for surface water management and erosion and sediment control. The final landform would also incorporate contour/graded banks installed progressively as part of the rehabilitation program. The spacing and ultimate dimensions of these structures would be a function of the final slope and catchment area and, consequently, would be determined at the time of installation. On the steeper slopes, bank spacing should generally range between 50 and 80 metres.

Whitehaven undertook a review of the original preferred mine plan to improve the configuration of the final landform, particularly the configuration and location and configuration of the final void adjacent to the realigned Wean Road in terms of ensuring geotechnical stability and safety. On the basis of the revised mine plan, and as detailed in **Section 5.6.2**, GHA (2011) prepared a geotechnical report assessing the short and long term stability on the eastern highwall of the proposed open cut pit adjacent to the approved Wean Road realignment. A copy of this report is contained within **Appendix I**. The stability recommendations summarised in **Section 5.6.2** and detailed in GHA's (2011) report will be adopted as the pit progresses and the final landform is being developed.

While the final landform configuration shown on **Figure 21** provides a minimum 50 metre separation distance between the highwall to be retained as part of the final void and the realigned Wean Road, as recommended by GHA (2011), Whitehaven will undertake progressive stability reviews and monitoring of geological conditions once the pit moves within 250 metres of the realigned Wean Road to ensure geotechnical stability and safe conditions. If any unfavourable conditions are observed or detected, a detailed assessment will be undertaken by a suitably qualified geotechnical engineer before mining is allowed to continue towards Wean Road.

Limitations of land ownership and the relocation limits for Wean Road mean that realigning Wean Road further to the east away from the open cut pit limit and final void is not possible. Consideration was also given to additional backfilling to reduce the depth of the void and bring it above the modelled long-term groundwater recovery level. However this was determined unachievable and uneconomic given the volume and cost of backfill that would be required.

### **5.7.8 Final Void Stability**

#### **Low Walls**

The low wall is considered to comprise mixed, disturbed and fragmented material. Stability of the low wall should be achieved in the following manner:

- The low wall will be battered back from the angle of repose to ensure the long term geotechnical stability of the face, with the determination of geotechnical stability and recommendations as to the final slope undertaken by a qualified geotechnical engineer on the basis of an assessment of the overburden material, the likely degree of settlement, and the degree of weathering expected in the long term. However it is expected that the low wall sides of the final void will be battered back to a maximum of 18 degrees with a goal of 10 degrees being optimal;
- Surface water drainage on and over the low wall will be minimised through the construction of drainage control structures, the construction of Dam F, and the aim of diverting as much of the catchment as possible away from the final void and back into the surface water system; and
- Erosion of the low wall will be controlled by limiting the length of slope through the use of contour and graded drains, minimising the slope, and by the establishment of suitable vegetation.

All low wall areas will be revegetated in accordance with the requirements outlined in Section 2.5 of the *Rehabilitation and Decommissioning Strategy* (GSSE 2011).

#### **Highwall**

The highwall is considered to comprise undisturbed, solid material generally occurring above the economically lower-most limits of the mineable seam in the final void. Depending on the geology of the deposit, the high wall material may comprise a range of natural occurring soil or rock materials of varying strengths or states of weathering.

To ensure the safety of the final void, the surrounding final slopes will be left in a condition where the risk of slope failure is minimised. The highwall of the final void will be left at 45 degrees to ensure long term geotechnical stability. This will be assessed by a suitably qualified geotechnical engineer.

The following will be considered when assessing the geotechnical stability of the highwall:

- Long term final void water level;
- Height and inclination of slope and number and spacing of intermediate benches (as may be required to achieve the final slope);
- Shear strength of the highwall soils and rocks;
- Density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them; and
- The effects of the external factors, such as surface runoff.

GHA (2010) undertook an assessment of the short and long term stability of the eastern highwall adjacent to the approved Wean Road realignment. A copy of GHA's report is contained within **Appendix I** and summary discussion is contained within **Section 5.6.2**. The report outlines the issues involved in ensuring a safe and stable highwall design, analyses the stability of the highwall adjacent to the road and provides recommendations to ensure the permanent integrity of Wean Road. The report includes reference to site geology being a key element relevant to the final highwall stability.

GHA (2011) identifies that the open pit limits can be adjusted to ensure there is solid unmined ground to prevent instability collapsing the ground in a manner that could affect Wean Road as a result of the fault structures. Such adjustments will allow some flexibility if the fault structure changes location from that suspected at present. The stability recommendations to be adopted by Whitehaven are listed in **Section 5.6.2** and form part of the project commitments in **Section 8.0**.

Importantly, it will be some years before the pit approaches within 150 metres of the realigned Wean Road providing time to monitor and amend highwall design should any other stability issues arise. While the final landform configuration shown on **Figure 21** provides a minimum 50 metre separation distance between the highwall to be retained as part of the final void and the realigned Wean Road, as recommended by GHA (2011), Whitehaven will undertake progressive stability reviews and monitoring of geological conditions once the pit moves within 250 metres of the realigned Wean Road to ensure geotechnical stability and safe conditions. If any unfavourable conditions are observed or detected, a detailed assessment will be undertaken by a suitably qualified geotechnical engineer before mining is allowed to continue towards Wean Road.

The *Rehabilitation and Decommissioning Strategy* (GSSE 2011) in **Appendix J** should be referred to for further details regarding void slope stability, spontaneous combustion, control of surface water inflow and public safety considerations.

### 5.7.9 Conceptual Post-Mining Land Use

**Figure 21** presents the conceptual final post-mining land uses at the completion of the Project. Of the total anticipated disturbance area of approximately 358 hectares, it is proposed to restore approximately 206 hectares as rehabilitated bushland (58 percent), 147 hectares as rehabilitated pasture (41 percent), with the remaining 5 hectares comprising the retained highwall of the final void (1 percent). Furthermore, there will be retained areas of existing remnant vegetation within the Project Site.

The area of the Project Site that is within the "Roseberry" property would be predominately restored to rehabilitated pasture, with grazing able to recommence once a stable vegetative cover is established. The western area of the property will be restored as rehabilitated bushland to link in with the existing remnant bushland to the west (Vickery State Forest) and create a viable connection with the surrounding environment.

The area of the Project Site formally known as the “Belmont” property will be established predominantly with rehabilitated bushland, with the south-eastern area returned to rehabilitated pasture. A corridor from the western rehabilitated bushland will extend between the Northern Emplacement Area and the final void to connect with remnant vegetation to the east of the Project Site and create a wildlife corridor.

The western slopes of the Northern Emplacement Area within the “Glenroc” property will be restored to rehabilitated bushland, which will connect to and enhance the existing areas of remnant native vegetation that are to remain undisturbed. The remaining sections of the “Glenroc” property will be restored to rehabilitated pasture, allowing for the recommencement of some grazing activities.

As evident on **Figure 21**, along the eastern boundary of the Project Site adjacent to the realigned Wean Road, a strip of rehabilitated bushland will be established to screen the view of the final void and generally improve the visual amenity from Wean Road, as well as provide vegetation connectivity north-south on the eastern side of the void.

The large area proposed to be returned to rehabilitated bushland, which includes the western slopes of the Northern and Western Emplacement Areas, will blend in well with the retained remnant vegetation areas within the Project Site and within the adjacent Vickery State Forest and “Yarrowonga” property. Furthermore, strategically placed bushland tree lots to be established within rehabilitated pasture areas will break-up the landform and act as wildlife refuges and linkages.

#### **5.7.10 Preliminary Post-Mining Land Use Options for Final Void**

The following preliminary potential options have been considered for the final void in terms of post-mining land use(s):

##### **Backfilling with Overburden/Other Waste Material**

During the life of the mine, emplacement of overburden and backloaded coal rejects (as approved under PA 06\_0198) into the mined out areas will, to the extent practicable, be undertaken to minimise the overall size of the remaining void. Any future proposals to use the final void, or part thereof, as a long-term storage facility for overburden and/or coal rejects from other nearby mining operations will require consultation and approval from the I&I NSW and the DoP.

##### **Post Closure Water Storage Area**

Dam F will be constructed to the north of the final void to assist with the prevention of surface water runoff entering into the void. Dam F will be sufficiently large (in the order of 15 megalitres) to capture large storm events (for example, 10 year Annual Recurrence Interval events) and allow this water to be used for stock watering purposes and evaporated to minimise discharges to the final void. A low flow pipe will be installed (below the primary spillway) to safely convey dam overflows to the base of the final void. Extreme rainfall events will result in flows over the spillway and into the final void.

It is further anticipated that once mining is complete, recharge of groundwater into the pit will result in the eventual formation of surface water in the southern part of the void with locally deeper final surface levels. Douglas Partners (2010) expects that the inflow to the void will be offset by evaporation from the area of surface water due to the majority of the void being partially backfilled to an elevation above 250 metres AHD, therefore being generally dry in average years.

Douglas Partners (2010) states that the existing groundwater in the Maules Creek Formation is generally brackish with total dissolved solids in the range 1,000 to 5,130 milligrams per litre (mg/L). In general, the pore water in the backfilled mine spoil is expected to become less saline over time due to the percolation of rainfall through the spoil pile. The exception to this will be in the area of surface water in the non-backfilled portion of the pit. In this location, the salinity is expected to increase over time as the evaporation leads to a reduction in water volume and leaves the dissolved salt behind. The increase in concentration is expected to be generally isolated to the surface water in the locally deep area, with some minor mixing with the adjacent pore water in the mine spoil.

Consideration was given to raising the backfill levels such that surface water is never formed within the void, thereby reducing evaporation and associated increase in salinity over time. Calculations indicate that a final fill level of about 275 metres AHD is required to prevent surface water ever occurring. This level is above the pre-development groundwater level because the mine spoil will be relatively permeable and porous, and recharge rates into the mine spoil will be substantially higher than for the surrounding undisturbed ground. Such a high final ground level was determined to be unachievable and uneconomic given the volume and cost of backfill that would be required.

It is considered that, although the proposed final void form will, over time, lead to increasing salt concentrations in the localised area of surface water within the final void, this will be of minimal impact outside the final void for the following reasons:

- The final void will behave as a groundwater sink. Therefore any increases in salinity within the sink will not affect the surrounding groundwater quality as the flow will be towards the area of higher salinity and not away from it;
- The surface water level at equilibrium will be well below surrounding groundwater levels; and
- The surface water will be located within a small final void with relatively steep sloping sides. This small area will be unsuitable for alternative land uses which would be sensitive to the potential saline surface water

(Douglas Partners 2010).

Leaving the void as a stable landform with the possible additional use of a long-term water storage is, at this point in time, the preferred option. There may be additional appropriate land use options at mine closure, and in consultation with stakeholders at that time, any such options will need to be assessed as appropriate.

## 5.8 Revised Biodiversity Offset Strategy

The direct and indirect impacts to threatened species, populations and ecological communities and their habitats as a result of the Rocglen Extension Project are documented in the *Flora and Fauna Assessment* (RPS 2010a) contained within **Appendix K** and summarised in **Section 7.7**. In summary, these impacts comprise 95.44 hectares of vegetation consisting of 47.04 hectares of intact vegetation in moderate to good condition and 48.4 hectares of derived native grassland (DNG) in moderate condition.

To address and offset these impacts, Eco Logical Australia (ELA) was engaged to prepare a revised *Biodiversity Offset Strategy* that meets the offset requirements for an approval under the EP&A Act and the EPBC Act. While the following sections summarise the assessment, findings and recommendations of ELA (2010), the full *Biodiversity Offset Strategy* (ELA 2010) contained in **Appendix L** should be referred to.

### Field Assessment for Biodiversity Offset Strategy

RPS (2010a) and ELA (2010) identified five biometric vegetation communities within the Project Site plus cleared land. These vegetation communities and their correlation to the vegetation mapping undertaken for the original development approval (Geoff Cunningham Natural Resource Consultants 2007b) and the impacts of the Rocglen Extension Project are summarised in **Table 16**. Impacts to EPBC Act listed communities are highlighted in yellow.

ELA conducted a quantitative assessment of vegetation condition at the Project Site and adjoining properties ("Yarrowonga" and "Greenwood") utilising the BioBanking Assessment Methodology (DECC 2009) ('the BioBanking Methodology') from 20 to 22 October 2010. As recommended by DECCW, the BioBanking Methodology was used to 'inform' the 'improve or maintain' assessment and provide a 'quantum' of area required to offset the impacts of the Project.

**Table 16 – Biometric Vegetation Types**

Vegetation Community (Geoff Cunningham Natural Resource Consultants 2007b)	Biometric Vegetation Type	Biometric Condition	Ancillary Code
1 - Narrow-leaf Ironbark – Pilliga Grey Box Community	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Moderate to Good	
2 - Pilliga Grey Box – White Cypress Pine Community	Pilliga Box - Poplar Box- White Cypress Pine grassy open woodland on alluvial loams mainly of the temperate (hot summer) climate zone	Moderate to Good	
3 - Pilliga Grey Box – White Box – Yellow Box – White Cypress Pine Community	Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101)	Moderate to Good	
	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Moderate to Good	
6 - Brigalow Community	Brigalow - Belah woodland on alluvial often gilgaied clay soil mainly in the Brigalow Belt South Bioregion (Benson 35)	Moderate to Good	
8 - Cleared Lands – Used for Grazing and / or Cultivation	Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101)	Moderate to Good	Derived Native Grassland
	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Moderate to Good	Derived Native Grassland
	Cleared		

**Impacts of the Rocglen Coal Mine**

In accordance with discussions with Peter Christie of the DECCW, two separate BioBanking credit calculations were undertaken for the proposed *Biodiversity Offset Strategy*. The first was undertaken to determine the credit value of the existing approved (PA 06\_0198) biodiversity offset areas, which are now going to be impacted upon (i.e. a ‘BioBank’ site scenario), and the second was undertaken to determine the value of all remaining vegetation within the Project Site that is going to be impacted as part of the Rocglen Extension Project outside of previously approved development areas (i.e. a ‘Development’ site scenario).

This methodology was required to be implemented to account for the impacts to the existing approved biodiversity offset areas (see **Section 4.17**) and for the removal of vegetation within the Project Site as part of the Rocglen Extension Project.

While not all vegetation within the Project Site is likely to be cleared, the *Flora and Fauna Assessment* (RPS 2010a) and revised *Biodiversity Offset Strategy* (ELA 2010) have been prepared on the assumption that all remaining vegetation will be cleared with the exception of approximately 30 hectares in the north-eastern corner of the Project Site encompassing a small area of Poplar Box Grassy Woodland. This approach has been adopted, regardless of whether the clearing/disturbance occurs, in order to allow more flexibility, if required, to site associated infrastructure and undertake site management in peripheral areas (for example, vehicle access and manoeuvring, surface water management and stockpiles). This approach will also provide flexibility if future geological exploration and economic modelling determine recoverable coal reserves within these peripheral areas, which, if approval was granted for extraction, would enable Whitehaven to further maximise coal recovery using existing infrastructure at an approved operation and also maintain the on-going socio-economic benefits of the mine for a longer period of time.

All of the vegetation to be impacted as part of the Project, with the exception of the DNG areas, provides foraging habitat for the EPBC Act listed Regent Honeyeater and Swift Parrot, even though they have not been recorded on site. On this basis, the proposed *Biodiversity Offset Strategy* addresses the loss of up to 62.04 hectares of foraging habitat (47.04 hectares from the Rocglen Extension Project and the equivalent of 15 hectares associated with the loss of part of the original offset areas).

As the Rocglen Extension Project requires the removal of the existing Biodiversity Offset Areas, the areas of each vegetation type within the approved Biodiversity Offset Areas have been calculated and are listed in **Table 17**.

**Table 17 - Impacts to Existing Biodiversity Offset Areas**

Vegetation Type	Condition	Ancillary Code	Impact Area (ha)
Pilliga Box - Poplar Box- White Cypress Pine grassy open woodland on alluvial loams mainly of the temperate (hot summer) climate zone	Moderate to Good	Remnant Woodland	25.2
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Moderate to Good	Remnant Woodland	0.9
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Moderate to Good	Remnant Woodland	8.8
Cleared (assumed to be rehabilitated as part of Biodiversity Offset)	Cleared	N/A	8.9
Approved Development (assumed to be rehabilitated during mine closure)	Cleared	N/A	1.5
Approved habitat enhancement via replanting (northern area) Assumed to be rehabilitated with trees and shrubs as specified by Cunningham (2007) and Table 3	Cleared	N/A	2.6
<b>Total</b>			<b>47.9</b>

The cumulative losses of all impacts at the Rocglen Coal Mine are therefore the combination of the clearing approved under PA 06\_0198 and the clearing proposed as part of the Rocglen Extension Project, which, as listed in **Table 18**, totals 131.74 hectares.

**Table 18 - Cumulative Loss of Vegetation from Approved and Proposed Projects**

Vegetation Type	Condition	Impact Area (ha)	
		Approved Project	Proposed Project
Brigalow - Belah woodland on alluvial often gilgaied clay soil mainly in the Brigalow Belt South Bioregion (Benson 35)			0.14
Pilliga Box - Poplar Box- White Cypress Pine grassy open woodland on alluvial loams mainly of the temperate (hot summer) climate zone		23.4	27.9
Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101)		1.3	3.4
Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101)	DNG		37.5
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions			5.6
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	DNG		11.3
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion		11.6	9.7
<b>Total</b>		<b>36.3</b>	<b>95.44</b>

### Offset Requirements to 'Like for Like' and 'Maintain or Improve' Outcomes

ELA consulted with the DECCW's Peter Christie to clarify the methodology required for the assessment and to determine the 'like for like' requirements in relationship to the impacted vegetation types. ELA report that the DECCW advised that the methodology outlined in the *Biodiversity Offset Strategy* (**Appendix L**) would be considered appropriate to determine the cumulative impacts of the Rocglen Extension Project. As requested by the DECCW, any proposed offsets for the Project must be based on sound ecological principles, meet the 'like for like or better' requirement and provide information on the 'maintain and improve' conservation outcomes.

In this regard, both the DECCW (DECC 2008) and the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DEWR 2007) have published a list of principles that must be considered when developing offset strategies. These principles are included and discussed within the *Biodiversity Offset Strategy*.

### Proposed Biodiversity Offset Strategy

The *Biodiversity Offset Strategy* proposed for the Rocglen Extension Project, including replacement of original offset areas, is to retire the full 4,859 credit requirement as calculated in the *Strategy* (**Appendix L**) from the Whitehaven Regional BioBank Site (see **Figures 2 and 3**), which is in the final stages of registration by the DECCW as a BioBank Site under Part 7A of the TSC Act. It will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks via a BioBanking Agreement registered on the land title in-perpetuity.

The numbers and types of credits to be retired are summarised in **Table 19** and corresponds to the 'like for like or better' evaluation. This is equivalent to an area of around 525 hectares or an offset ratio of 4.75:1 for the 95.44 hectares of impact from the Rocglen Extension Project and replacement for the 47.9 hectares of the 111.3 hectares of the original offset area impacted by the Extension Project (this equates to approximately 15 hectares of the original 36.3 hectares of impacts resulting from PA 06-198). In summary, a total impact of 110.44 hectares for the Rocglen Extension Project and 131.74 hectares of cumulative impact for all approvals.

ELA (2010) reports that the proposed *Biodiversity Offset Strategy* meets the specific principles of offsets in NSW, particularly principles 6 and 10. Key components of the *Strategy* include:

- The vegetation at the Whitehaven Regional Biobank Site is of equal or greater conservation status to the Project Site;
- The offset area is almost five times the size of the cumulative area to be impacted at the Project Site;
- The Whitehaven Regional Biobank Site will have the highest level of conservation status outside of National Parks (via a registered BioBanking Agreement that is currently being assessed by DECCW);
- The Whitehaven Regional Biobank Site is to be actively managed via a BioBanking Management Plan with in-perpetuity management costs held in Trust; and
- The Whitehaven Regional Biobank Site enhances and provides strategic conservation outcomes to the west of the Kelvin CCA Zone 2 Aboriginal Area and provides protection to vegetation types not well represented in the existing reserve system (White Box Grassy Woodland). The Whitehaven Regional BioBank Site also enhances north-south connectivity on a regional scale and will eventually form part of an east-west link with Vickery State Forest once the Rocglen Coal Mine is rehabilitated.

**Table 19 – Proposed Biodiversity Offset Strategy**

Vegetation Type Impacted	Credits Required	'Like for Like' Equivalent Offset Area Vegetation Types	Credits Available at Whitehaven Regional BioBank Site (cumulative by type)	Credits to be Retired
Brigalow – Belah woodland on alluvial often gilgaied clay soil mainly in the Brigalow Belt South Bioregion (Benson 35)	6	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	1,402	6
Pilliga Box – Poplar Box-White Cypress Pine grassy open woodland on alluvial loams mainly in the temperate (hot summer) climate zone	1,793	Semi-evergreen vine thicket of basalt hills of the NSW north western slopes	1,820	720
		White Box – White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	2,822	1,073
Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101)	1,712	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	1,396	612
		Semi-evergreen vine thicket of basalt hills of the NSW north western slopes	1,100	1,100
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	784	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	784	784
White Cypress Pine – Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	564	White Cypress Pine – Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	2,415	564
<b>Total</b>	<b>4,859</b>			<b>4,859</b>

The offset package also meets the draft Commonwealth offset principles in that:

- The offset package is a direct package (Principle 4) that is targeted to the EPBC Act matters that are being impacted and determined to be a Controlled Action (Principle 1), are on a like for like basis (Principle 5):
  - 784 White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland biodiversity credits (equivalent to 75 hectares of the CEEC are being retired to offset impacts to 5.9 hectares of intact White Box along Wean Road and Jaeger Lane and 10.9 hectares of derived native grassland within the mine site boundary), an offset ratio of 4.46:1;
  - an additional 618 White Box credits, equivalent to 59.4 hectares is being protected to offset impacts to other non EPBC Act listed vegetation communities (a total area of 134.4 hectares of White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland will be protected which is of an equivalent condition to that being impacted); and
  - 525 hectares of habitat suitable foraging habitat for the Regent Honeyeater and Swift Parrot will also be protected to replace the loss of 47.04 hectares of suitable foraging habitat (intact woodland remnants) as a result of the mine extension and for the replacement for impacts to the original offset areas which provided offsets for approximately 15 hectares of the original impacts, a ratio of 8.5:1.

- The Whitehaven Regional Biobank Site will have the highest level of conservation status outside of National Parks (via a registered BioBanking Agreement on the land title that is currently being assessed by DECCW) (Principles 3 and 7);
- The Whitehaven Regional Biobank Site is to be actively managed via a BioBanking Management Plan with in-perpetuity management costs held in Trust (Principles 3 and 7);
- The offset area is less than 1 kilometre to the east of the Project Site and is therefore in the same general area as the development activity (Principle 6);
- The offset is enforceable and will be monitored and audited in accordance with the BioBank Agreement (Principle 8); and
- The Whitehaven Regional Biobank Site enhances and provides strategic conservation outcomes to the west of the Kelvin CCA Zone 2 Aboriginal Area and provides protection to vegetation types not well represented in the existing reserve system (White Box Grassy Woodland). The Whitehaven Regional BioBank Site also enhances north-south connectivity on a regional scale and will eventually form part of an east-west link with Vickery State Forest once the Rocglen Coal Mine is rehabilitated (Principle 2).

In summary, the proposed *Biodiversity Offset Strategy* compensates for the direct loss of 95.44 hectares of vegetation in various condition states (intact and DNG) and replacement offsets for impacts to 47.9 hectares of the 131.74 hectares of approved offsets on a 'like for like' basis with over 525 hectares of vegetation in the Whitehaven Regional Biobank Site. The *Biodiversity Offset Strategy* provides an offset (525 hectares) to impact (110.44 hectares comprising 95.44 hectares of impacts for mine extension and the equivalent of 15 hectares of original impacts which now needs a replacement offset) ratio of 4.75:1.

The improvements in conservation values at the Whitehaven Regional Biobank Site (through the cessation of current grazing and implementation of conservation management practices outlined in the BioBank Site Management Plan, including enhancement tree and shrub planting and weed control) will lead to an 'improve and maintain' conservation outcome.

The retirement of these credits, brings the total number of credits proposed to be retired from the Regional Biobank Site to 10,154 of the total 13,754 generated (ELA 2010) or 73.83%.

## 5.9 Other Minor Project Related Works

The Rocglen Extension Project also seeks approval to undertake the works outlined in the following sections.

### 5.9.1 Altered Surface Water Management

The Rocglen Extension Project will require the implementation of changes to the surface water management system within the Project Site in order to cater for the expanded operation. The altered system will ensure the effective management of all surface water on-site and minimise the risk for any off-site impacts on downstream water resources, as well as ensure the water demands of the Project can be met at various stages of the mine life.

The proposed management strategies for clean water, dirty water and mine water are outlined in **Section 7.5** and detailed in the *Surface Water Assessment* prepared by GSSE (2010c) in **Appendix M**.

### 5.9.2 Relocation of Mine Water Dam

Water generated within the open cut pit, primarily as a result of rainfall/runoff and possible groundwater seepage, would be managed within the open cut via in-pit sumps. This water would be directed to and contained within these in-pit sumps until it is necessary to pump the water to the Mine Water Dam.

The current location of the 11 ML Mine Water Dam (see **Figure 6**) is predicted to be mined through during Year 2 of the expanded operation. Before this date, a new Mine Water Dam will be constructed to the south-east of its current location between the eastern extent of the open cut pit and the realigned Wean Road. It will be constructed as a 'turkeys nest' dam with no catchment and will be kept at a level that does not overflow. In-pit sumps will continue to be used to collect runoff from within the pit and pump to the new Mine Water Dam as required.

### 5.9.3 Relocation of Jaeger Lane

As stated above in **Section 4.10**, a section of Jaeger Lane traversing through the Rocglen site from Wean Road has been relocated under the provisions of PA 06\_0198 to the north to provide continued access to "Yarrowonga". Application to formally close that section of Jaeger Lane within the Project Site has been made to the NSW Department of Lands and is pending approval.

The Rocglen Extension Project will require this section of Jaeger Lane to be relocated again in order to cater for the expanded Northern Emplacement Area. Upon receiving Project Approval, Whitehaven will undertake consultation with Gunnedah Shire Council in order to negotiate and agree upon a suitable alignment.

### 5.9.4 Removal of "Glenroc" Building Improvements

The "Glenroc" property owned by Whitehaven and located in the northern extent of the Project Site, encompasses an unoccupied residence and several outbuildings, including hay and stock sheds. The Rocglen Extension Project proposes the removal of the "Glenroc" outbuildings identified on **Figure 6** in order to cater for the expanded Northern Emplacement Area. It is also likely that the unoccupied "Glenroc" residence further to the north, while outside of the proposed disturbance areas, will also be removed.

### 5.9.5 Relocation of Meteorological Station

The "Glenroc" property, which is again owned by Whitehaven and located in the northern extent of the Project Site, encompasses a meteorological station established by Whitehaven in 2002 specifically for the Rocglen operation. While this meteorological station is located outside of the proposed disturbance areas, it will be relocated in order to ensure adequate separation distance from the expanded Northern Emplacement Area and optimal operation. Upon receiving Project Approval, Whitehaven will investigate and decide upon a suitable position within the Project Site for relocation of the meteorological station.

### 5.9.6 Relocation of High Volume Air Sampler

Adjacent to the meteorological station within the "Glenroc" property (see **Section 5.9.5**) is a high volume air sampler (HVAS) for measuring the concentration of particulate matter less than 10 micrometres (PM<sub>10</sub>). This HVAS will be relocated in order to cater for the expanded Northern Emplacement Area and ensure appropriate operation. This relocation will be undertaken in consultation with the DECCW and will be documented in a revised Air Quality Monitoring Program following receipt of Project Approval. An appropriate location will be selected taking into consideration local meteorological conditions, the proximity of surrounding residences and the locations of predicted dust emission sources from within the Project Site.

### 5.9.7 Realignment of Overhead Powerline

As identified on **Figure 6**, an overhead high voltage (HV) feeder powerline, owned by Country Energy, traverses through the northern extent of the Project Site adjacent to Wean Road. The Rocglen Extension Project will require the realignment of this powerline to ensure adequate separation distances from the expanded Northern Emplacement Area and Eastern Soil Stockpile Area.

As outlined above in **Section 2.3.5**, consultation has been undertaken with Country Energy in November 2009 in this regard. Country Energy confirmed, via email correspondence, that the preference for realignment is along the eastern edge of the Wean Road reserve. Upon receiving Project Approval, Whitehaven will undertake further consultation with Country Energy in order to discuss and ascertain the required path in terms of planning and commissioning the realignment.

## 6.0 STATUTORY PROVISIONS

The Rocglen Extension Project has been assessed in full consideration of the applicable statutory planning instruments. The following sub-sections contain a summary of the relevant major pieces of Commonwealth and State legislation and outline the application of these instruments to the Project.

### 6.1 Commonwealth Legislation

#### 6.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC), which was formally known as the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as matters of national environmental significance. An action that “*has, will have or is likely to have a significant impact on a matter of National Environmental Significance*” may not be undertaken without prior approval from the Commonwealth Minister, as provided under Part 9 of the EPBC Act.

The Significant Impact Guidelines provide overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the Act.

An assessment of the applicability of the EPBC Act to the Rocglen Extension Project was included in the *Flora and Fauna Assessment* (RPS 2010a), which is contained within **Appendix K**. RPS (2010a) undertook an on-line search of the EPBC Act Protected Matters Search database (3 January 2010) to generate a list of those matters of National Environmental Significance (NES) within 40 km of the Project Site. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed will have, or is likely to have, a significant impact upon a matter of NES, or on the environment of Commonwealth land.

Of the eight matters of NES prescribed under the EPBC Act, RPS (2010a) reported the following with regard to the Rocglen Extension Project:

##### **Commonwealth Land**

*The site is not land owned by the Commonwealth, and hence this portion of the Act is not applicable.*

##### **World Heritage Properties**

*The site is not a World Heritage Property. There are no World Heritage Properties listed as occurring in the Region. The Proposal would not have a significant impact upon any World Heritage Properties.*

##### **National Heritage Places**

*The site is not a National Heritage Place. There are no National Heritage Places listed as occurring in the Region. The Proposal would not have a significant impact upon any National Heritage Place.*

##### **Wetlands Protected by International Treaty (the RAMSAR Convention)**

*There are no wetlands protected by international treaty (the RAMSAR Convention) arising from the EPBC Act Protected Matters Report generated for an area within 40 km of the site.*

### **Nationally Listed Threatened Species and Ecological Communities**

*A total of 27 threatened species or ecological communities listed under the EPBC Act have been recorded or have suitable habitat within a 40 km radius of the subject site.... The potential for the Proposal to significantly impact on threatened species and ecological communities has been assessed in Section 6.0 (of RPS 2010a).*

*The Proposal will require the removal of approximately 5.9 hectares of the White Box, Yellow Box, Blakeley's Red Gum Grassy Woodland in the form of intact remnants along Wean Road and Jaegar Lane and 10.9 hectares of the community as derived native grasslands, and 0.14 hectares of the Brigalow (*Acacia harpophylla* dominant and co-dominant). ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of the above vegetation communities.*

*None of the 14 threatened fauna species listed on the EPBC Act were recorded during field surveys. Only two species were assessed as having a moderate likelihood of occurrence on the subject site (Large-eared Pied Bat and Greater Long-eared Bat). Given the relatively small area of potentially suitable woodland and forest habitat for the 14 threatened fauna species in comparison to the much larger provision of woodland and forest habitat in Vickery State Forest and surrounding rural properties, it is unlikely that the Proposal would significantly affect any of the 14 threatened fauna species. Additionally ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of potential habitat areas for threatened fauna species.*

### **Nationally Listed Migratory Species**

*A total of 10 migratory species listed under the EPBC Act have been recorded or have suitable habitat within a 40 km radius of the site. The Proposal is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.*

### **All Nuclear Actions**

*No type of nuclear activity is proposed for the site.*

### **The Environment of Commonwealth Marine Areas**

*No Commonwealth marine areas exist within or adjacent to the site.*

Following submission of a referral in late May 2010, the Rocglen Extension project was found to be considered a 'controlled action' under the EPBC Act. In summary, the then DEWHA advised the following:

*The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.*

*The project will be assessed through an accreditation of Part 3A of the New South Wales Environmental Planning and Assessment Act 1979.*

A copy of the letter and decision notice issued by the then DEWHA is contained within **Appendix N**.

## **6.2 NSW State Legislation**

### **6.2.1 Environmental Planning and Assessment Act 1979**

The EP&A Act is the principal piece of legislation overseeing the assessment and determination of development proposals in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development (ESD).

Coal mining is a class of development listed in Schedule 1 of the SEPP (Major Development) 2005 as requiring approval under Part 3A of the EP&A Act and determination by the Minister for Planning.

While the Rocglen Coal Mine operates under the provisions of an existing Part 3A Project Approval, consultation with the DoP has confirmed that the Rocglen Extension Project is outside the bounds of a Section 75W modification. On this basis, this EA has been prepared to accompany an application to the Minister for Planning seeking a new Project Approval under Part 3A of the EP&A Act. A copy of the project application form is contained within **Appendix A**.

In addition, the following key provisions of the EP&A Act are relevant to the Project under Part 3A.

### **Application of Environmental Planning Instruments**

Section 75R of the EP&A Act provides that environmental planning instruments, other than SEPPs, do not apply to projects approved under Part 3A of the Act, other than as outlined below.

### **Permissibility**

Under Section 75J(3), the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of Section 75R) apply to the project if approved. The EP&A Regulation may preclude approval for the carrying out of a class of project (other than a critical infrastructure project) that such an instrument would otherwise prohibit.

The Project is located wholly within the area to which the Gunnedah LEP 1998 applies and is zoned 1(a) Rural (Agricultural Protection). Coal mining is a permissible land use within this zone with development consent. As such, the Minister can approve the Rocglen Extension Project pursuant to Section 75J(3) and Clause 8O of the EP&A Regulation.

### **Approvals Legislation That Does Not Apply**

Under Section 75U of the EP&A Act, if the Project is granted approval under Part 3A, the following authorisations will not be required:

- A permit under Section 201, 205 or 219 of the *Fisheries Management Act 1994*;
- An approval under Part 4, or an excavation permit under Section 139, of the *Heritage Act 1977*;
- A permit under Section 87 or a consent under Section 90 of the *National Parks and Wildlife Act 1974*;
- An authorisation referred to in Section 12 of the *Native Vegetation Act 2003* (or under any Act to be repealed by that Act) to clear native vegetation or State protected land;
- A permit under Part 3A of the *Rivers and Foreshores Improvement Act 1948*;
- A bush fire safety authority under Section 100B of the *Rural Fires Act 1997*; and
- A water use approval under Section 89, a water management work approval under Section 90 or an activity approval under Section 91 of the *Water Management Act 2000*.

Nevertheless, the DoP will likely consider the relevant matters associated with these permits/authorisations/approvals during the assessment of the Project.

### **Approvals Legislation That Must Be Applied Consistently**

Under Section 75V of the EP&A Act, if the Project is granted approval under Part 3A, the following authorisations cannot be refused if it is necessary for carrying out the Project and is to be substantially consistent with the Project Approval:

- An approval under Section 15 of the *Mine Subsidence Compensation Act 1961*;
- A mining lease under the *Mining Act 1992*;

- An Environment Protection Licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in Section 43 of that Act); and
- A consent under Section 138 of the *Roads Act 1993*.

### 6.2.2 Other Key NSW State Legislation

Below is a summary of other key pieces of NSW Legislative Acts relevant to the Project.

#### **Protection of the Environment Operations Act 1997**

The Rocglen Extension Project may require a variation to the site's existing EPL (No. 12870). Under Section 75V of the EP&A Act, if the Project is granted approval under Part 3A, an EPL under the *Protection of the Environment Operations Act 1997* (POEO Act) cannot be refused if it is necessary for carrying out the Project and is to be substantially consistent with the Project Approval. Whitehaven will undertake the necessary consultations with the DECCW in this regard following Project Approval.

#### **Mining Act 1992**

Rocglen currently operates within the mining lease identified as ML 1620. The Rocglen Extension Project will extend mining-related activities outside the bounds of ML 1620 (see **Figure 6**). Under Section 75V of the EP&A Act, if the Project is granted approval under Part 3A, a mining lease application under the *Mining Act 1992* cannot be refused if it is necessary for carrying out the Project and is to be substantially consistent with the Project Approval. Whitehaven will undertake consultation with the I&I NSW in this regard and revise statutory mining documents, such as the *Mining Operations Plan* (MOP), as necessary.

#### **Coal Mine Health and Safety Act 2002**

Rocglen currently holds all necessary approvals under the *Coal Mine Health and Safety Act 2002*. Whitehaven will ensure that any further approvals required for the Rocglen Extension Project are obtained in consultation with the I&I NSW.

#### **Water Act 1912 and Water Management Act 2000**

The *Water Act 1912* and *Water Management Act 2000* (WM Act) contain provisions for the licensing of water capture and use. Points to note in relation to the Rocglen Extension Project are:

- There is currently an embargo in place for commercial licences within the area under Gazette number 35 (17 March 2006). As a result, if Whitehaven wishes to construct any new dams that require licensing, it will be necessary to transfer an existing water access licence to the new location.
- The dams within the Project Site currently collecting 'clean' water are within the harvestable right of the property, and no new 'clean' water dams are proposed.
- There are new 'dirty water' dams (pollution control dams) proposed for the purpose of erosion and sediment control, however these are exempt from the licensing requirements.
- Rocglen currently holds three bore licences for the purposes of mining and dewatering (see **Section 7.6.2**), and the Project does not require any amendment to these licences or additional licenses.

Note that under Section 75U of the EP&A Act, if the Project is granted approval under Part 3A, a water use approval under Section 89, a water management work approval under Section 90 or an activity approval under Section 91 of the WM Act are not required. Water access licences required under the WM Act do not fall under the Section 75U exemption, however, as outlined above, no additional water licences are proposed and there is currently an embargo for commercial licences within the area.

### **National Parks and Wildlife Act 1994**

The cultural heritage assessment undertaken by RPS (2010b) for the Rocglen Extension Project (see **Section 7.8** and **Appendix O**) has been prepared in accordance with the *National Parks and Wildlife Act 1994* (NP&W Act). This assessment identified three Aboriginal stone artefacts within proposed disturbance areas. Management of these sites will be undertaken in consultation with the Aboriginal community stakeholders and the DECCW under the provisions of the NP&W Act and the *Aboriginal and Cultural Heritage Management Plan* (Whitehaven 2008c). Under Section 75U of the EP&A Act, if the Project is granted approval under Part 3A, a permit under Section 87 or a consent under Section 90 of the NP&W Act are not required.

## **6.3 State Environmental Planning Policies**

In addition to the SEPP (Major Development) 2005, which has been discussed above in **Section 6.2.1**, the following SEPPs are relevant considerations for the Project.

### **6.3.1 SEPP No. 33 – Hazardous and Offensive Development**

*SEPP No. 33 - Hazardous and Offensive Development* links the permissibility of industrial development proposals to their individual safety and environmental performance. Certain activities may involve handling, storing or processing a range of materials which, in the absence of location, technical and/or operational controls, may create an off-site risk or offence to people, property or the environment. Such activities would be defined as ‘potentially hazardous industry’ or ‘potential offensive industry’.

In accordance with the Risk Screening undertaken by RWC (2007) for the original project proposal, there is no aspect of the currently approved Rocglen operation considered to be hazardous or offensive under SEPP No. 33. As the Rocglen Extension Project is essentially an expansion of the existing approved operation, it is not considered potentially hazardous or potentially offensive. On this basis, SEPP No. 33 is not applicable.

### **6.3.2 SEPP No. 44 – Koala Habitat Protection**

*SEPP No. 44 – Koala Habitat Protection* provides for the protection of koala habitat by ensuring that areas subject to development proposals are considered for their value as habitat or potential habitat for koalas. The flora and fauna assessment undertaken by RPS (2010a) for the Rocglen Extension Project (see **Section 7.7** and **Appendix K**) assessed the applicability of SEPP No. 44. In summary, RPS (2010a) determined the following:

- **Is the Land ‘Potential Koala Habitat’** - *Eucalyptus albens* and *Eucalyptus populnea*, which are feed tree species listed in Schedule 2 of SEPP No. 44, were recorded within the Project Site and within the adjacent “Yarrowonga” property and nearby “Greenwood” property. Some areas have either or both of these species present in numbers approaching 15%, therefore parts of the study areas do constitute Potential Koala habitat.
- **Is the Land ‘Core Koala Habitat’** - no koalas or evidence of koalas were observed within the Project Site or within “Yarrowonga” during field surveys. Due to the small size of the forest and woodland areas within the Project Site, and the open nature of most of the woodland areas, it is unlikely that any koalas present would be missed during two nights of spotlighting by two observers. It is considered that the Project Site is unlikely to provide suitable core breeding habitat for the koala and does not constitute Core Koala Habitat as defined under SEPP No. 44.

RPS (2010a) states that due to the relatively small area of forest and woodland vegetation within the Project Site in comparison to the area of suitable forest and woodland vegetation in the adjacent Vickery State Forest, it is unlikely that the koala would be significantly affected by the Project.

### 6.3.3 SEPP No. 55 – Remediation of Land

*SEPP No. 55 – Remediation of Land* provides for a state-wide planning approach to the remediation of contaminated land in order to reduce the risk to human health or any other aspect of the environment. Under the SEPP, a consent authority must not consent to the carrying out of development on land unless it has considered any potential contamination issues.

The Rocglen Extension Project is essentially an expansion of the existing approved operation. With continued implementation of the storage and handling procedures and management practices for hydrocarbons and explosives used on-site, the potential for contamination is considered low. Furthermore, the potential for acid generation from regolith material (topsoil and subsoil) and overburden within the Project Site is considered low.

The MOP amendment to be submitted to the I&I NSW for the Rocglen Extension Project and the detailed *Rehabilitation and Decommissioning Strategy* to be prepared within five years of planned mine closure will address land contamination commensurate with the requirements and guidelines of the NSW Government at that time.

### 6.3.4 SEPP (Mining, Petroleum Production and Extractive Industries) 2007

*SEPP (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of NSW. The SEPP provides that development for the purpose of mining may be carried out with development consent, and defines mining developments that are prohibited, exempt or complying development.

The provisions of the SEPP requiring specified matters to be taken into account have been drafted using the language of Part 4 of the EP&A Act and do not expressly apply to Part 3A. However, given that the matters to be considered under Part 3A remain largely at the discretion of the Director-General, the Mining SEPP has been considered for completeness.

Part 3, specifically Clauses 12 and 13, of the Mining SEPP requires that consideration be given to the compatibility of projects with other surrounding land uses. There is no land use within or surrounding the Project Site (see **Section 3.5**) that is considered to be incompatible or sensitive to the Rocglen Extension Project. This is supported by the fact that the Project is essentially an expansion of the existing approved Rocglen operation.

Part 3 of the Mining SEPP also requires the consideration of natural resource management and environmental management, efficiency of resource recovery, transportation and rehabilitation. The information presented in this EA addresses each of these matters and indicates that the Project will not have any significant impacts over or above the currently approved Rocglen operation. The comprehensive set of environmental management plans and monitoring programs currently implemented at Rocglen will be updated as required to effectively cater for the expanded operations.

## 6.4 Other Considerations

### 6.4.1 Water Sharing Plan

The Project Site lies within an area covered by the *Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2003*. However, this Plan only applies to those areas classified as 'water sources', with the drainage lines within and surrounding the Project Site not covered. On this basis, the provisions of the Water Sharing Plan do not apply to the Project Site.

## 6.4.2 Namoi Extractive Industries Policy

The *Namoi Extractive Industries Policy*, which was prepared by the Namoi CMA in November 2009, states that extractive industries compete for a wide range of resources including the natural resources of land, water, air and visual amenity. The Policy also acknowledges that exploration for and development of extractive industries within the Namoi Catchment has the potential to deliver substantial benefits to catchment communities.

Under the Policy, the CMA has a duty to advise and make recommendations to the Australian and NSW Governments to ensure that the catchment assets are sustained. To this end, the *Policy* states that the Namoi CMA:

- *Assumes a leadership role in advising on the impact of extractive industries in the Namoi Catchment, recognising that the NSW Government is the determining authority for mine approval and licensing.*

This EA includes a comprehensive and relevant assessment of the planning, development, operation, rehabilitation and environmental management and monitoring matters to a level of detail commensurate with the scale of the Rocglen Extension Project, industry standards and the legislative framework under which the Project is permitted. The EA has been prepared in accordance with the EP&A Act and associated Regulations, and should enable informed consideration of the implications of proceeding with the Project.

- *Acknowledges that exploration for minerals, gas and energy resources shall continue.*
- *Adopts the Precautionary Principle on extractive industries in the Namoi Catchment.*

Whitehaven has shown a commitment to the principles of Ecological Sustainable Development (ESD), including the Precautionary Principle, and understands that social, economic and environmental objectives are interdependent. Whitehaven also acknowledges that a well designed and effectively managed operation will avoid significant and/or costly environmental impact or degradation. The suite of environmental management plans and monitoring programs are designed to demonstrate environmental due diligence and to implement procedures that provide on-going management and monitoring of the Rocglen operation in-line with the objectives of ESD.

As outlined in **Section 9.3**, a detailed understanding of the issues and potential impacts associated with the Rocglen Extension Project has been obtained via appropriate consultation and assessment. Specialist assessments, including the use of engineering and scientific modelling, have been undertaken for the design of the mine expansion and for impacts relating to air quality (including greenhouse gas), noise and vibration, surface water, groundwater, flora and fauna, and Aboriginal heritage. Assessment has also been undertaken for other issues, including visual amenity, traffic and transport, waste management, bushfire hazard and socio-economic considerations. To this end, there has been careful evaluation undertaken in order to avoid, where possible, serious or irreversible damage to the environment.

This EA, combined with the consultation activities, has enabled Whitehaven to understand the potential implications of the Project, and therefore identify the required management strategies, mitigation measures and monitoring activities.

- *Opposes new approvals for extractive industries in the Namoi Catchment in the absence of a rigorous risk management assessment of cumulative impacts on the four key regional assets.*

As outlined in **Section 2.2**, the risk assessment undertaken was a broad brush pre-project assessment primarily aimed at identifying those issues that represent the greatest risk to the local environment and surrounding populace. While it may not be deemed as a rigorous risk assessment, where the individual risks were considered unacceptable, or where a knowledge gap was identified, specialist studies were commissioned and additional mitigation measures and/or management responses were nominated.

The potential impacts and cumulative impacts of the Project upon the four regional assets, being native plants and animals, surface and groundwater ecosystems, the landscape, and people and their communities, have been assessed and reported within this EA to a level of detail commensurate with the scale of the Project and level of risk.

- *Seeks to ensure that in-depth baseline natural resource management (NRM) databases are in place to ensure that adequate monitoring and evaluation of all extractive industry developments can take place.*

A comprehensive set of environmental management plans have been developed by Whitehaven (and engaged specialist consultants) and are implemented at Rocglen in accordance with PA 06\_0198 and EPL 12870. These plans are backed by an environmental monitoring network including meteorological, air quality, noise, blasting, surface water and groundwater. Similar management plans and monitoring activities are also implemented at Whitehaven's other mining operations in the Gunnedah Basin.

**Appendix H** contains the adopted schedule of monitoring activities from the *Environmental Monitoring Program* (Whitehaven Coal Mining 2009b) and a plan showing the locations of the monitoring sites.

- *Seeks to identify key catchment assets then seeks to identify the risks to those assets.*

As per discussion above in fourth dot point.

- *Seeks to have the Catchment Action Plan considered during the approval process.*

See below to **Section 6.4.3**.

- *Supports the ten International Council of Mining and Metals (ICMM) Principles.*

After reviewing the ten ICMM Principles, we believe that the contents of this EA and Whitehaven's commitment to the principles of ESD (see **Section 9.3**) demonstrate responsibility to the ICMM Principles.

- *Agrees to engage in constructive dialogue with the Australian/NSW Minerals Council on the risk management assessment together with the implementation and evaluation of the applicable ICMM principles.*

Noted. In addition to the discussion provided in relation to the above points, we confirm that Whitehaven is a member of the NSW Minerals Council.

- *Will seek the reimbursement of public NRM investment funds, from the developer, where these investments are impacted upon by mining or exploration, for reinvestment within the Namoi Catchment to maintain or improve the four key regional assets.*

Noted.

Overall, we believe that the relevant critical statements within the Namoi CMA's *Extractive Industries Policy*, as listed above, are adequately and appropriately addressed within the assessment and reporting contained within this EA.

### 6.4.3 Namoi Catchment Management Plan

The *Namoi Catchment Action Plan* (Namoi CAP), which was developed in consultation with the community and approved by the then Minister for Natural Resources in January 2007, is aimed at providing a strategic framework to guide natural resource management in the Namoi Catchment between 2007 and 2017. There are two documents (Parts A and B) which make up the Namoi CAP, with *Part B – The Natural Resource Management Plan* specifically developed to provide a clear strategic natural resource management focus and detail relevant Management Targets and Management Actions. Management Targets, which underpin broader Catchment Targets, address issues identified as having the most significant impact on the four catchment resources:

- The landscape;
- People and their communities;
- Native plants and animals; and
- Surface and groundwater ecosystems.

The relevant Management Targets from the Namoi CAP have been considered throughout this EA through the assessment of potential risks and impacts, and the identification of management plans, mitigation measures and monitoring activities to be implemented for the Rocglen Extension Project.

The assessment of the Project has been multi-disciplinary and involved consultation with various government agencies, surrounding landholders and community groups. Emphasis has been placed on anticipation and prevention of potential environmental and social impacts, with management strategies, mitigation measures and monitoring activities identified to keep potential impacts to a minimum.

The socio-economic output of the Rocglen Extension Project, particularly in terms of direct and indirect employment and flow-on benefits, is anticipated to make a significant contribution to Gunnedah and the surrounding region.

### 6.4.4 Other Environmental Guidelines

The DGRs and formal correspondences received from consulted government agencies (see **Appendix E**) identify various guideline documents recommended to be considered. These documents were reviewed and, where appropriate, considered by the Project Team in preparation of this EA and specialist assessments.

The Namoi CMA made particular reference to the following natural resource databases:

- *Land Management Units (LMU) in the Namoi Catchment* – this resource was utilised by GSSE in the investigation and preparation of the *Soil Survey and Land Resource Impact Assessment* (GSSEa 2010). These LMUs are considered broad-scale management zones and, on this basis, further field analysis and impact assessment was undertaken for the purposes of this EA.
- *Guide to Vegetation of the Namoi Catchment* – we understand that this resource was consulted by the specialist consultants (RPS) engaged to undertake the appropriate assessment and reporting of potential flora and fauna impacts associated with the Project. However, given that the database is considered a broad-scale guide, the site surveys, mapping and impact assessment undertaken by RPS (and ELA in preparation of the *Biodiversity Offset Strategy*) is considered far more site specific and accurate.

## 7.0 ENVIRONMENTAL ASSESSMENT

This section contains a description of the existing environment and a comprehensive and relevant assessment of the potential environmental issues/impacts relevant to the Rocglen Extension Project, including cumulative impacts.

In terms of potential cumulative impacts, it is worth reiterating that the Project does not involve any change to the coal production rate or mining intensity, methods of coal extraction, hours of operation, coal handling and processing techniques, site servicing or general waste management. The only change to the current mine fleet will be the addition of one 1250 excavator in the pit to enable cleaner and more efficient mining of coal (smaller machine). This, along with the facts that the nearest operational mine site is approximately 15 km from Rocglen and the configuration of the Project has been refined to maximise the use of existing infrastructure and minimise expansion of the original Project Site, indicates that the Rocglen Extension Project poses minimal risk for significant cumulative impacts over and above those approved originally under PA 06\_0198, particularly in relation to cumulative impacts associated with air quality, noise, blasting and vibration, traffic and visual amenity.

### 7.1 Land Resources

GSSE (2010a) assessed land resource issues associated with the Rocglen Extension Project as part of the *Soil Survey and Land Resource Assessment* contained in **Appendix G**. The findings of the soil survey, including recommended soil stripping and stockpiling methodology, are summarised in **Sections 3.12** and **5.4**. GSSE's assessment of land capability and agricultural suitability is summarised below.

#### 7.1.1 Land Capability Assessment

The land capability assessment for the Project Site was conducted by GSSE (2010a) in accordance with the former NSW Soil Conservation Service's (now part of NSW Government's Land and Property Management Authority) rural land capability classification system. This system classifies land on the basis of an increasing soil erosion hazard and decreasing versatility of use. It recognises three types of land uses, being land suitable for cultivation, land suitable for grazing and land not suitable for rural production.

The system allows for land to be allocated into eight possible classes, as described in **Table 20**, with land capability decreasing progressively from Class I to Class VIII.

**Table 20 – Rural Land Capability Classes**

Land Class	Land Capability	Land Definition
Class I	Regular Cultivation	No erosion control requirements
Class II	Regular Cultivation	Simple requirements such as crop rotation and minor strategic works
Class III	Regular Cultivation	Intensive soil conservation requirements such as contour banks and waterways
Class IV	Grazing, occasional cultivation	Simple practices such as stock control and fertiliser application
Class V	Grazing, occasional cultivation	Intensive soil conservation requirements such as contour ripping and banks
Class VI	Grazing only	Managed to ensure ground cover is maintained
Class VII	Unsuitable for rural production	Green timber maintained to control erosion
Class VIII	Unsuitable for rural production	Should not be cleared, logged or grazed

Source: Soil conservation Service of NSW, 1986 (as cited in GSSE 2010a)

These capability classifications identify limitations on the use of the land as a result of the interaction between the physical resources and a specific land use. The method of land capability assessment takes into account a range of factors including climate, soils, geology, geomorphology, soil erosion, topography and the effects of past land uses.

GSSE (2010a) assessed the land capability within the Project Site during the field survey and using the laboratory analysis results of collected soil samples. The *Soils and Land Capability Assessment* prepared by Geoff Cunningham Natural Resource Consultants (2007a) for the original project application approved under PA 06\_0198 was also used as a reference for pre-disturbance land capability.

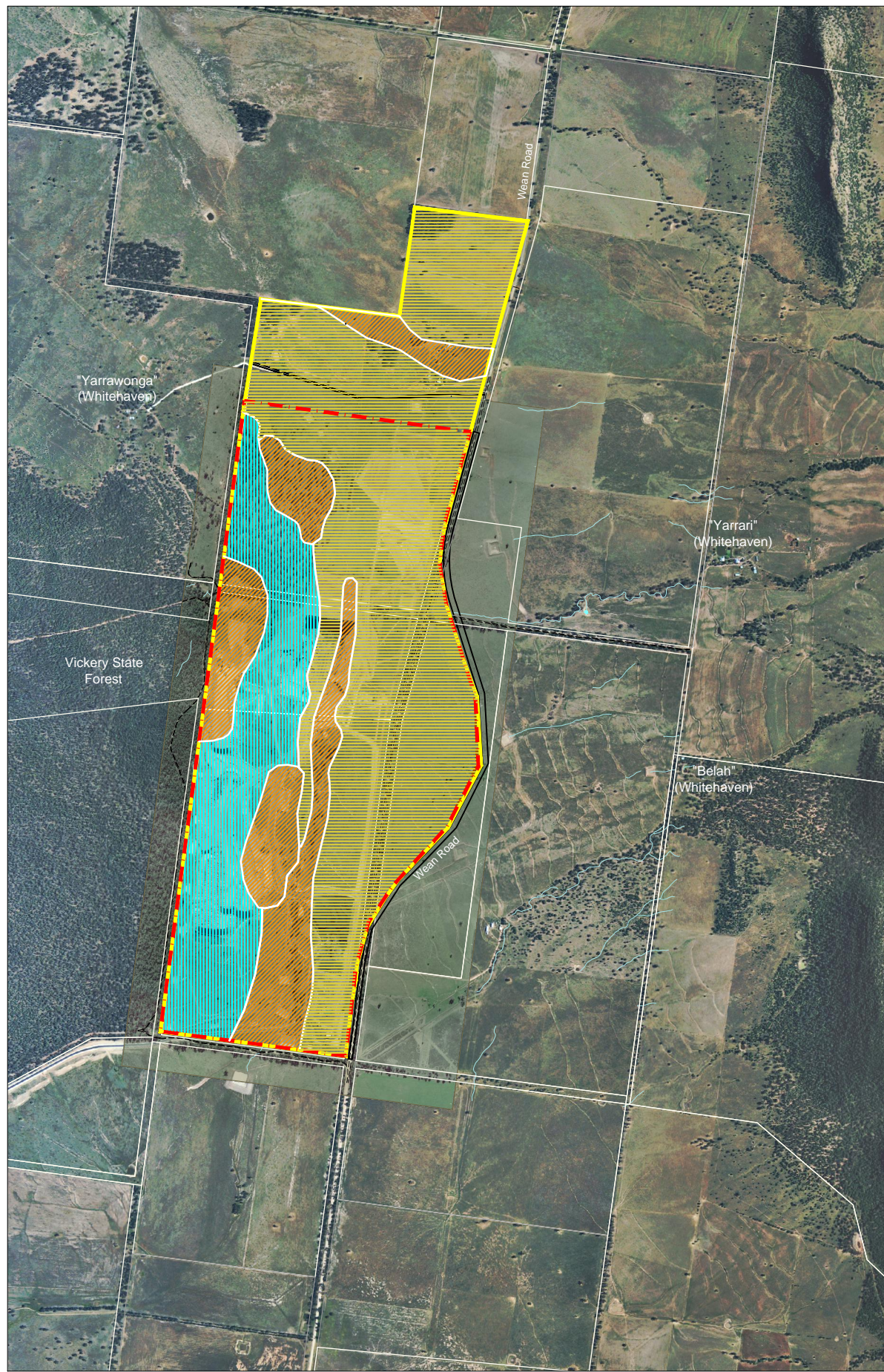
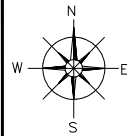
The pre-mining and post-mining rural land capability classes within the Project Site are illustrated on **Figure 22** and summarised in **Table 21**.

**Table 21 – Pre and Post-Mining Land Capability**

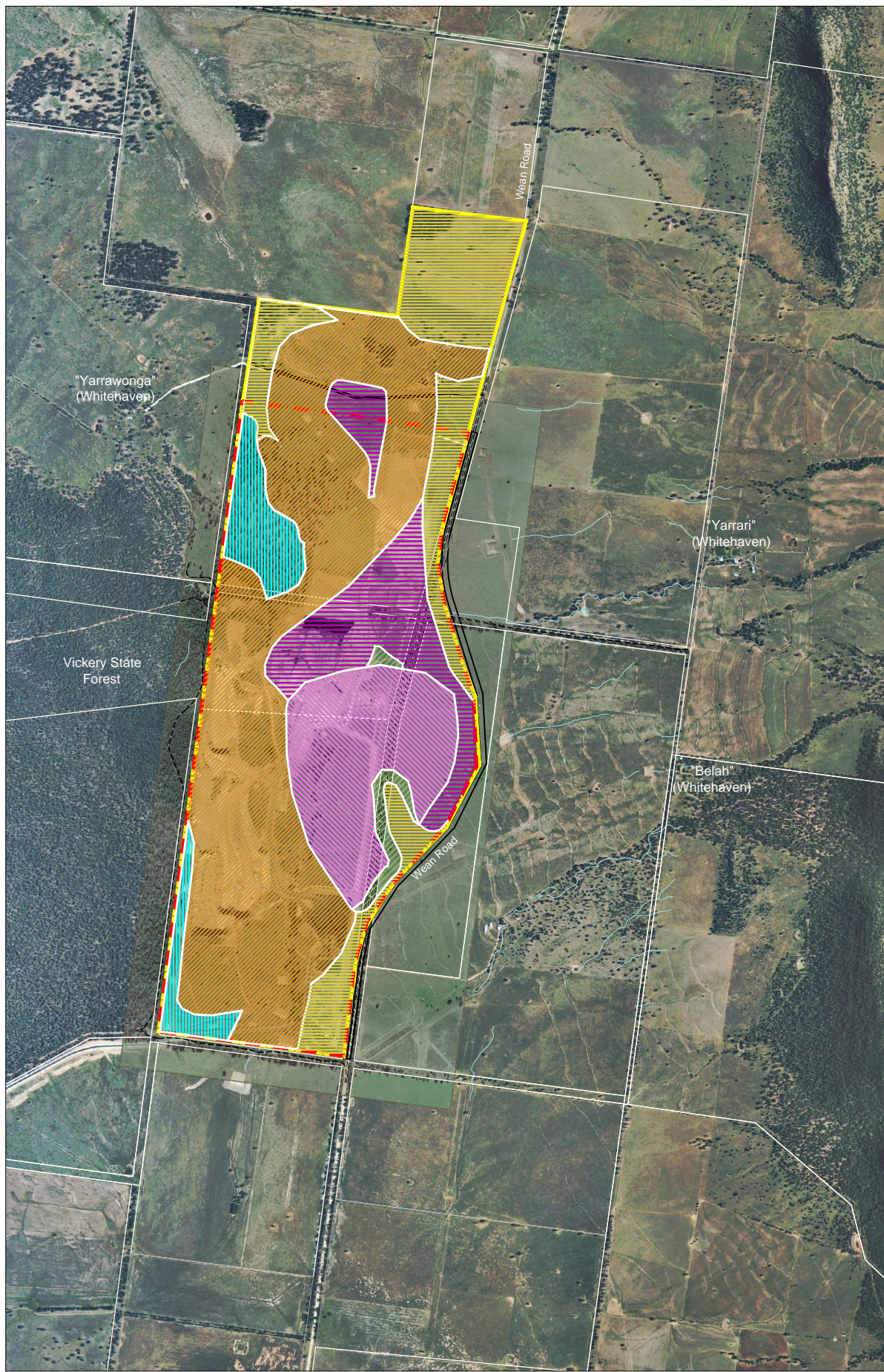
Land Class	Pre-Mining Area		Post-Mining Area	
	Hectares	Percent (%)	Hectares	Percent (%)
Class I	0	0	0	0
Class II	0	0	0	0
Class III	265	58	82	18
Class IV	0	0	57	12
Class V	102	22	29	6
Class VI	93	20	217	47
Class VII	0	0	68	15
Class VIII	0	0	7	2
<b>Totals</b>	<b>460</b>	<b>100</b>	<b>460</b>	<b>100</b>

Based on topographic, climatic and soils factors, GSSE (2010a) determined that the pre-mining land capability within the Project Site predominately comprised Class III land suitable for regular cultivation. Large areas have also been determined to be Class V land suitable for grazing with occasional cultivation and Class VI land suitable for grazing only.

Based on the soil resources available within the Project Site and proposed post-mining landform (see **Sections 5.4** and **5.7**, respectively), GSSE (2010a) predicts that the post-mining land capability within the Project Site will predominately comprise Classes III, IV, V, VI and VII. In accordance with **Table 20**, these land classes range from being suitable for regular cultivation to unsuitable for rural production. There is also a small area around the eastern margin of the final void (highwall) determined to be Class VIII land.



PRE-MINING



POST-MINING

- LEGEND
- Project Site Boundary
  - Mine Lease Boundary
  - Class III
  - Class IV
  - Class V
  - Class VI
  - Class VII
  - Class VIII

Base Plan Sources: Geo-Spectrum (Australia) Pty Ltd. 2008 & 2009

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Rocglen Coal Mine Extension Project  
Pre and Post-Mining Land Capability

FIGURE 22

### 7.1.2 Agricultural Suitability Assessment

The agricultural suitability assessment for the Project Site was conducted by GSSE (2010a) in accordance with the former NSW Agriculture and Fisheries' (now part of the I&I NSW) agricultural suitability classification system. The classification system is based upon the effects of climate, topography and soil characteristics, the cultural and physical requirements for various crops and pastures, and existing socio-economic factors including local infrastructure and geographic location. These factors combine to determine the productive potential of the land and its capacity to produce crops, pastures and livestock.

The system comprises the five classes listed in **Table 22**, which provide a ranking according to the land's productivity for a wide range of agricultural activities with the objective of determining the potential for crop growth within certain limits.

**Table 22 – Agricultural Suitability Classes**

Land Class	Agricultural Suitability	Land Definition
Class 1	Highly productive land suited to both row and field crops	Arable land suitable for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent
Class 2	Highly productive land suited to both row and field crops	Arable land suitable for regular cultivation for crops but not suited to continuous cultivation
Class 3	Moderately productive lands suited to improved pasture and to cropping within a pasture rotation	Grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with pasture
Class 4	Marginal lands not suitable for cultivation and with a low to very low productivity for grazing	Land suitable for grazing but not for cultivation. Agriculture is based on native or improved pastures established using minimum tillage
Class 5	Marginal lands not suitable for cultivation and with a low to very low productivity for grazing	Land unsuitable for agriculture or at best suited only to light grazing

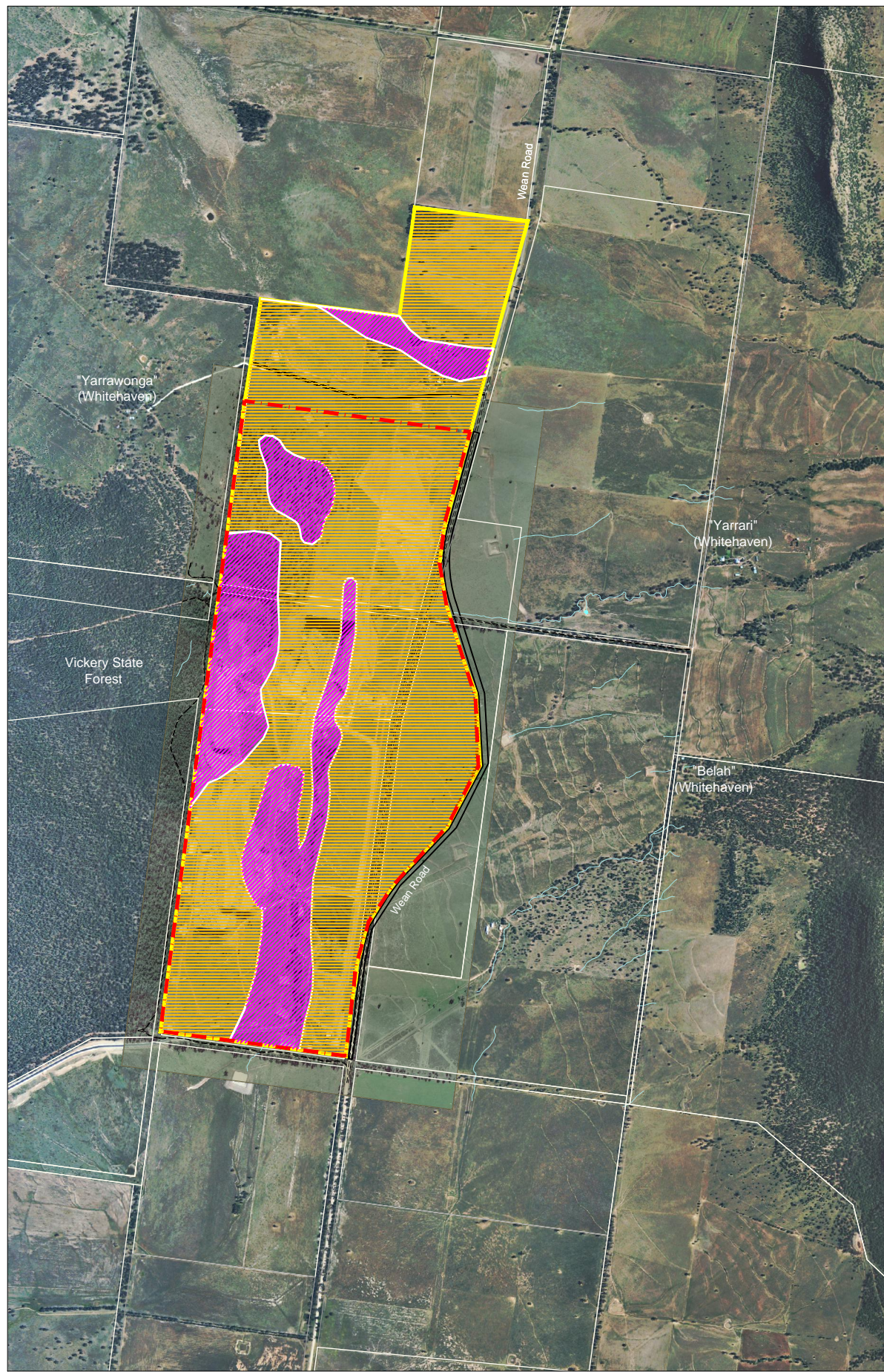
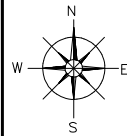
Source: NSW Agricultural and Fisheries, 1990 (as cited in GSSE 2010a)

Again, GSSE (2010a) assessed the agricultural suitability within the Project Site during the field survey and using the laboratory analysis results of collected soil samples. The *Soils and Land Capability Assessment* prepared by Geoff Cunningham Natural Resource Consultants (2007a) for the original project application approved under PA 06\_0198 was also used as a reference.

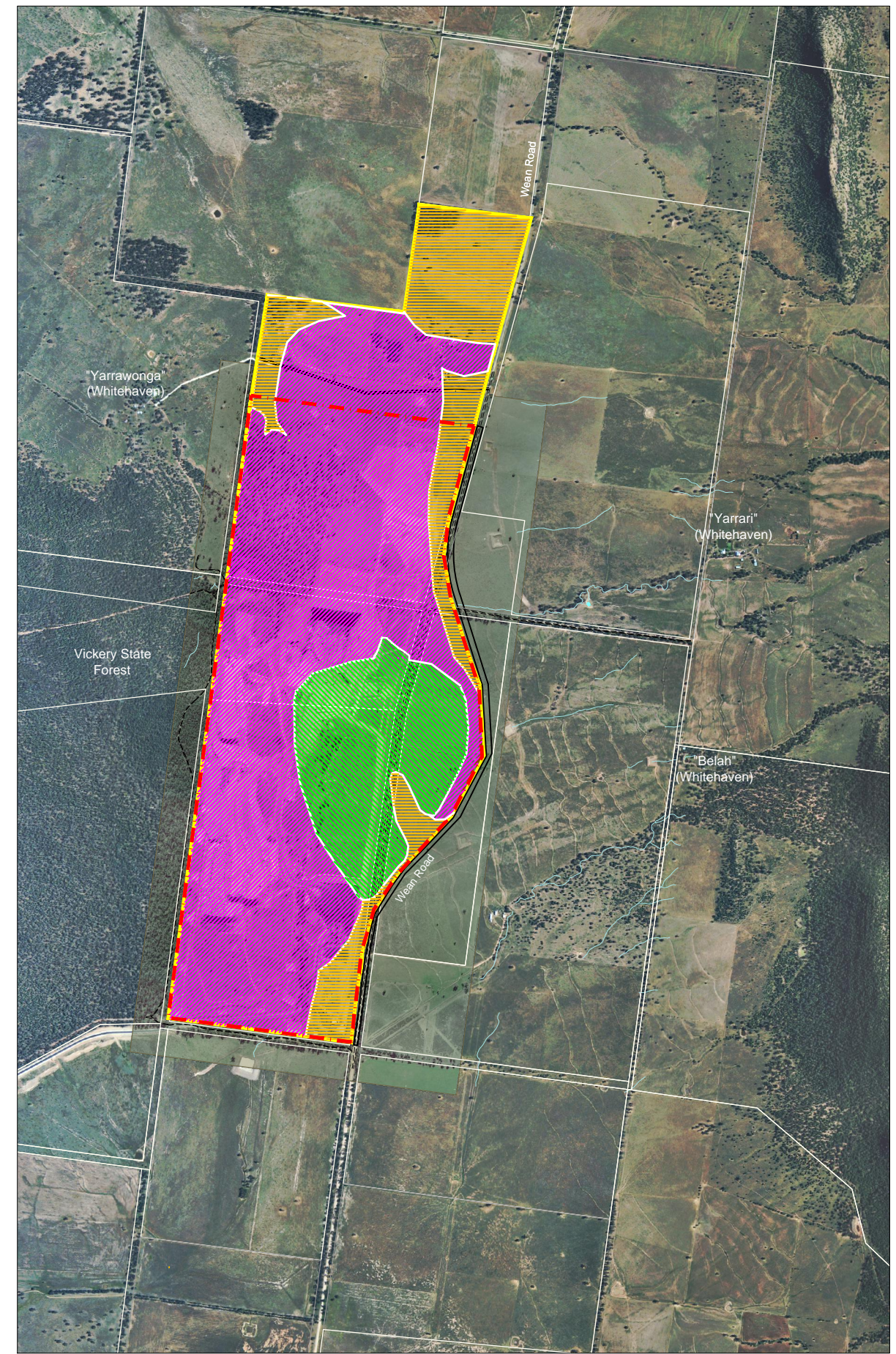
The pre-mining and post-mining agricultural suitability classes within the Project Site are illustrated on **Figure 23** and summarised in **Table 23**.

**Table 23 – Pre and Post-Mining Agricultural Suitability**

Land Class	Pre-Mining Area		Post-Mining Area	
	Hectares	Percent (%)	Hectares	Percent (%)
Class 1	0	0	0	0
Class 2	0	0	0	0
Class 3	348	76	82	18
Class 4	112	24	302	66
Class 5	0	0	76	16
<b>Totals</b>	<b>460</b>	<b>100</b>	<b>460</b>	<b>100</b>



**PRE-MINING**



**POST-MINING**

**LEGEND**

-  Project Site Boundary
-  Mine Lease Boundary
-  Class 3
-  Class 4
-  Class 5

0 400 800m

Base Plan Sources: Geo-Spectrum (Australia) Pty Ltd. 2008 & 2009

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GSSE (2010a) determined that the pre-mining agricultural suitability within the Project Site predominately comprised Class 3 land described as moderately productive and suited to grazing and pasture improvement. The remaining 112 hectares situated along minor drainage lines and hill slopes was determined as Class 4, which is marginal land not suitable for cultivation (minimum till pasture improvement may be possible for grazing enterprises).

Based on the soil resources available within the Project Site and proposed post-mining landform (see **Sections 5.4** and **5.7**, respectively), GSSE (2010a) predicts that the post-mining agricultural suitability will predominately comprise Class 4 land, including all the rehabilitated overburden emplacement areas. There are also smaller areas of Class 3 land, and the final void will be Class 5 land generally unsuitable for agriculture.

### 7.1.3 Management and Monitoring

In order to reduce the potential for degradation of lands within and adjoining the Project Site, the management strategies and mitigation measures detailed in **Section 5.4** for soil stripping and handling and **Section 5.7** for rehabilitation and mine closure will be undertaken.

Furthermore, as outlined in **Section 5.7.5**, on-going monitoring of the health and success of areas undergoing rehabilitation will be undertaken by Whitehaven, as well as periodic monitoring on rehabilitation areas by an independent and experienced professional.

## 7.2 Air Quality

PAEHolmes (2011) undertook an air quality assessment for the Rocglen Extension Project. The full assessment report is contained within **Appendix P**, with significant findings and recommendations summarised below.

### 7.2.1 Existing Environment

Coal mining operations generate fugitive dust emissions in the form of particulate matter described as total suspended particulate matter (TSP), particulate matter with equivalent aerodynamic diameters of 10 micrometres ( $\mu\text{m}$ ) or less ( $\text{PM}_{10}$ ) and particles with equivalent aerodynamic diameters of 2.5  $\mu\text{m}$  and less ( $\text{PM}_{2.5}$ ). In addition, combustion engines from vehicles release exhaust emissions including carbon monoxide (CO) and minor quantities of sulphur dioxide ( $\text{SO}_2$ ) and nitrogen dioxide ( $\text{NO}_2$ ).

The primary sources of particulate emissions during the operation of the Rocglen Coal Mine include:

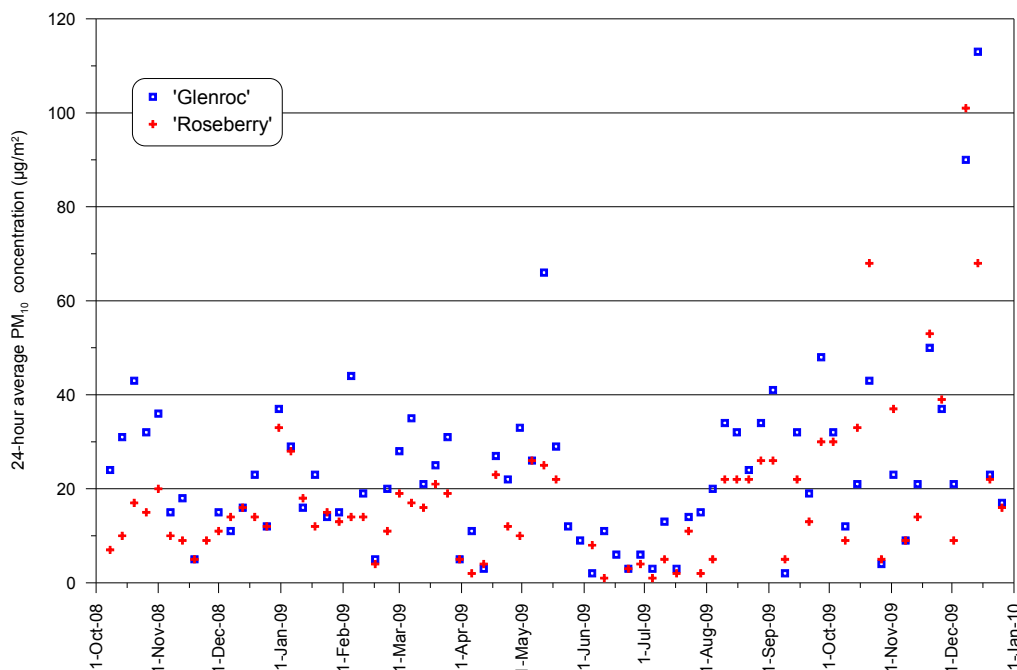
- Mining activities, including vegetation clearing, soil stripping, handling and stockpiling, overburden ripping, handling and placement, and drilling and blasting activities;
- Coal processing area activities;
- Wind erosion of areas within the open cut, overburden emplacements and soil stockpiles;
- General movement of heavy vehicles on unsealed roads within the Project Site; and
- Transportation of coal between the Project Site and the Whitehaven CHPP.

PAEHolmes (2011) states that emissions of CO,  $\text{SO}_2$  and  $\text{NO}_2$  on open cut mines are too small and too widely dispersed to give rise to significant off-site concentrations. For this reason these pollutants have not been considered within the air quality assessment.

Under Rocglen’s Air Quality Monitoring Program, Whitehaven operates a network of high volume air samplers (HVAS) and dust deposition gauges in the vicinity of the Project Site measuring 24-hour average concentrations of PM<sub>10</sub> on a six-day cycle and monthly averages of dust fallout levels. The locations of these monitoring sites are shown on **Figure 24**.

**Dust Concentration**

24-hour average concentrations of PM<sub>10</sub> on a six-day cycle have been measured at two HVAS monitoring sites within “Glenroc” (BA1) and “Roseberry” (BA2) between October 2008 and December 2009. Prior to being relocated to “Roseberry” in June 2009, the HVAS identified as BA2 was located within “Surrey”, approximately 2 km southeast of “Roseberry”. The results collected from these sites are shown on **Figure 25**, with a data point for each 24-hour average measured every sixth day.



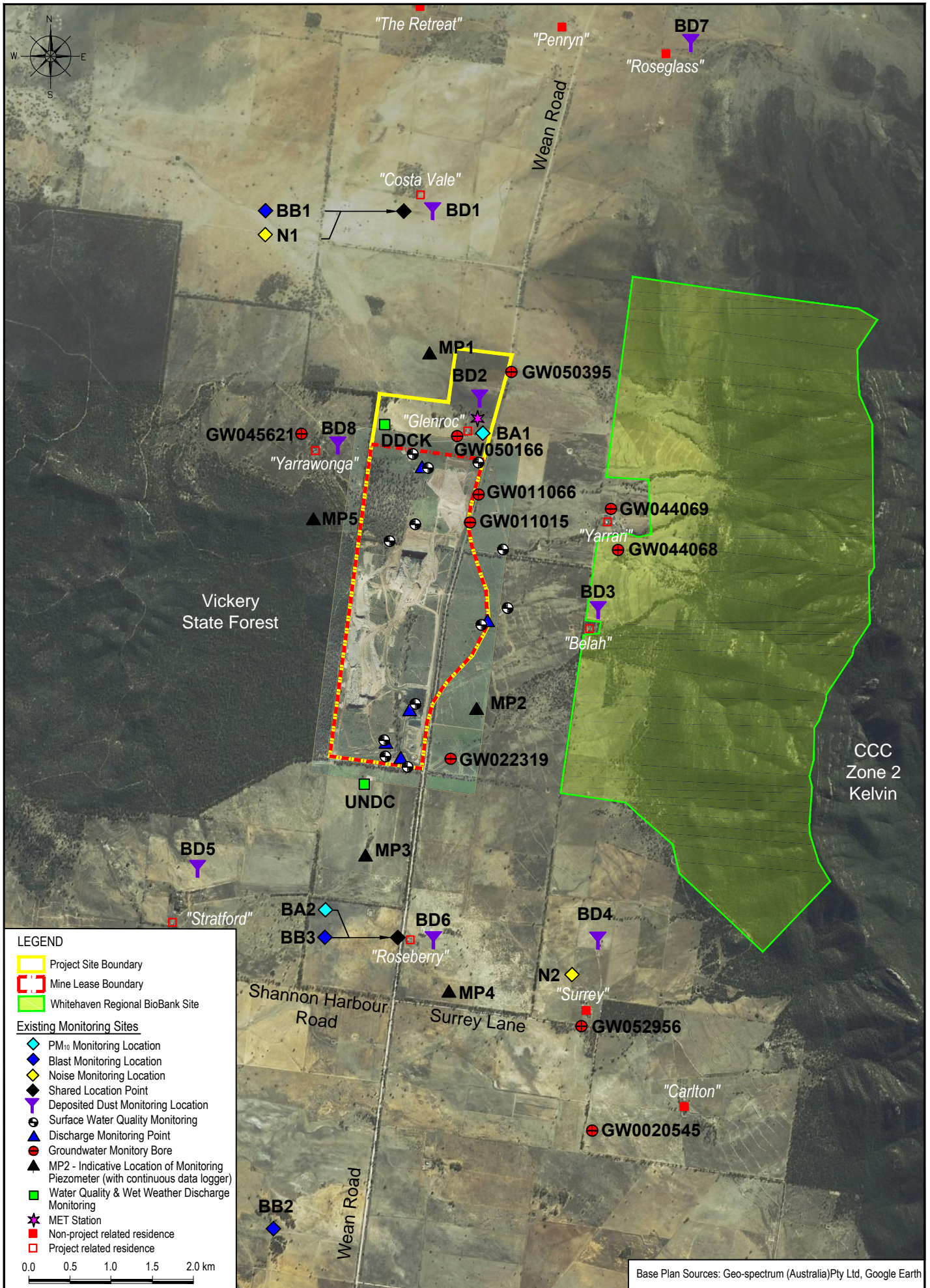
**Figure 25 – PM<sub>10</sub> Monitoring Data 2008 to 2009**

There are four occasions at “Roseberry” and three at “Glenroc” where the 24-hour average PM<sub>10</sub> level criterion of 50 µg/m<sup>3</sup> (see **Section 7.2.2**) is exceeded. Two of these occur on the same day at both locations (8 and 12 December 2009) and can most likely be attributed to reported high winds and dust storms at this time, as well as bush fires in the nearby Kelvin Range. There are three other occasions when measurements exceed 50 µg/m<sup>3</sup>, namely the 12 May 2009 at “Glenroc” and the 21 October and 20 November 2009 at “Roseberry”. These may be due to a combination of mining activity emissions or more localised effects such as farming activity or stock movements. It should also be noted that there were dust storms prevalent in the area in September and October 2009 which will have contributed to elevated levels.

PAEHolmes (2011) calculated the annual average for 2009 to be 24.3 µg/m<sup>3</sup> at “Glenroc” and 19.4 µg/m<sup>3</sup> at “Roseberry”. These values are both below the annual average air quality criterion of 30 µg/m<sup>3</sup> (see **Section 7.2.2**).

**Dust Deposition**

Dust deposition is monitored using gauges at eight locations in the vicinity of the Project Site (see **Figure 24**). The complete monthly data is presented in **Appendix P** and summarised in **Table 24**.



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Rocglen Coal Mine Extension Project  
Environmental Monitoring Sites

FIGURE 24

**Table 24 – Average Dust Deposition Levels**

Gauge	Average Dust Deposition Levels (g/m <sup>2</sup> /month)		
	2008	2009	Average
BD1	1.3	No data	1.3
BD2	1.0	1.6	1.3
BD3	1.1	1.2	1.1
BD4	1.2	1.0	1.1
BD5	0.7	1.3	1.0
BD6	1.0	1.2	1.1
BD7	1.2	1.4	1.3
BD8	1.1	1.3	1.2

It should be noted that measurements during a significant dust storm event in September 2009 have been removed from the annual averages calculated for 2009 as they are not representative of ambient levels likely to occur in the area.

It is difficult to determine if any trends are present given that only two complete years of data is available. Dust deposition levels in 2009 are slightly higher than 2008 at most gauges, which is expected given Rocglen mining operations commenced during that time.

When comparing the results for 2008 (before mining) and 2009 (during mining), it can be seen that the increase remains less than maximum criterion of 2 g/m<sup>2</sup>/month (see **Section 7.2.2**) and that there are no exceedances of the 4 g/m<sup>2</sup>/month cumulative criterion at any of the monitoring sites.

### 7.2.2 Assessment Criteria

**Tables 25** and **26** present the air quality criteria nominated by PAEHolmes (2011) to be used in the assessment of emissions from the Rocglen Extension Project. These criteria are generally considered to reflect current Australian community standards for the protection of health and for protection against nuisance effects.

**Table 25 – Air Quality Criteria for Particulate Matter**

Pollutant	Averaging Period	Criteria	Comments
Total Suspended Particulate Matter (TSP)	Annual mean	90 µg/m <sup>3</sup>	<ul style="list-style-type: none"> <li>NHMRC<sup>1</sup> criteria</li> </ul>
Particulate Matter PM <sub>10</sub>	24-hour maximum	50 µg/m <sup>3</sup>	<ul style="list-style-type: none"> <li>DECCW Criteria</li> <li>NEPM<sup>2</sup> reporting goal, allows five exceedances per year for bushfires and dust storms</li> <li>DoP acquisition criteria, allows five exceedances per year</li> </ul>
	Annual mean	30 µg/m <sup>3</sup>	<ul style="list-style-type: none"> <li>DECC criteria</li> <li>DoP acquisition criteria</li> </ul>

1 - National Health and Medical Research Council, 2 – National Environment Protection Measure

While the DECCW applies the maximum PM<sub>10</sub> levels to assess the potential for impacts from the Project, in more recent project approvals, the DoP has invoked requirements for acquisition, negotiated agreements and the like if the DECCW criterion for 24-hour maximum is exceeded on more than 5 days in any year (a 98.6 percentile level of compliance) or the annual average PM<sub>10</sub> DECCW criterion is exceeded.

In addition to potential health impacts, airborne dust also has the potential to cause nuisance effects by depositing on surfaces. **Table 26** shows the DECCW's maximum acceptable increase in dust deposition over the existing dust levels from an amenity perspective.

**Table 26 – Air Quality Criteria for Dust Deposition**

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Levels	Maximum Total Deposited Dust Levels
Deposited Dust	Annual	2g/m <sup>2</sup> /month	4 g/m <sup>2</sup> /month

### 7.2.3 Potential Impacts

#### Modelling Scenarios

Dispersion modelling was undertaken by PAEHolmes (2011) to predict off-site air quality impacts as a result of the Rocglen Extension Project. Total dust emissions due to proposed mining operations were estimated by analysing the activities taking place at the site during three mine plan scenarios. While annual production remains constant throughout the life of the mine, the amount of overburden waste generated varies significantly from year to year, as does the surface area of exposed pit and emplacement areas. As mining progresses from north to south it was also necessary to capture a scenario at each end of this spectrum. As outlined in **Section 5.3** and illustrated on **Figure 15**, the three modelling scenarios are:

- Year 1 of expanded operation - representing the period when the in-pit mining activities are closest to the northern residences;
- Year 5 of expanded operation - representing the year when the expanded Northern Emplacement Area will reach its peak exposed surface area, and there will still be haulage and placement at that location; and
- Year 10 of expanded operation - representing the year when activities are close to the southern residences and the overburden extraction rate is at its peak.

The operations were represented by a series of volume sources located according to the location of activities for the modelled scenarios. Estimates of emissions for each source were developed on an hourly time step taking into account the activities that would take place at that location. Thus, for each source, for each hour, an emission rate was determined which depended upon the level of activity and the wind speed.

#### Background Levels

In order to assess the cumulative impacts of the Project, PAEHolmes (2011) estimated background dust levels using the air quality monitoring data discussed in **Section 7.2.1**. As there is only limited information for 2008 (prior to mining at Rocglen), a conservative estimate has been made using an average of 2008 and 2009 monitoring data.

For non-modelled dust sources, the uniform constant background levels are estimated to be:

- 53 µg/m<sup>3</sup> for annual average TSP;
- 21 µg/m<sup>3</sup> for annual average PM<sub>10</sub>; and
- 1.2 g/m<sup>2</sup>/month for annual average dust deposition.

These are conservative estimates and are likely to be lower than this as they include current mining contributions.

### Annual Average Model Predictions

Tables 27, 28 and 29 present the air quality modelling predictions for Years 1, 5 and 10 of the Rocglen Extension Project, respectively. Visual representations of these results in the form of isopleth maps can be found in Appendix P, which include the relevant background value as stated in the above sub-section, where appropriate.

**Table 27 – Air Quality Modelling Predictions Year 1**

Property Identification		Annual PM <sub>10</sub> Rocglen (plus background) (µg/m <sup>3</sup> )	Annual TSP Rocglen (plus background) (µg/m <sup>3</sup> )	Dust Deposition (g/m <sup>2</sup> /month)	
Name	Ownership			Rocglen Only	Cumulative
<b>Criteria</b>		<b>30</b>	<b>90</b>	<b>2</b>	<b>4</b>
<b>Non-mining background</b>		<b>21</b>	<b>53</b>	<b>N/A</b>	<b>1.2</b>
1 “Roseglass”	Private	2 (23)	2 (55)	0.02	1.2
2 “Costa Vale”	Whitehaven	3 (24)	4 (57)	0.09	1.3
3 “Yarrowonga”	Whitehaven	8 (29)	10 (63)	0.67	1.9
5 “Yarrari”	Whitehaven	4 (25)	5 (58)	0.09	1.3
6 “Belah”	Whitehaven	7 (28)	7 (60)	0.16	1.4
7 “Stratford”	Whitehaven	1 (22)	2 (55)	0.04	1.2
8 “Roseberry”	Private <sup>1</sup>	2 (23)	2 (55)	0.05	1.3
9 “Surrey”	Private	3 (24)	3 (56)	0.05	1.3
10 “Carlton”	Private	2 (23)	2 (55)	0.04	1.2
11 “Wundurra Stud”	Private	1 (22)	1 (54)	0.02	1.2
12 “Brolga”	Private	1 (22)	1 (54)	0.01	1.2
13 “Braemar”	Private	1 (22)	1 (54)	0.01	1.2

1 - “Roseberry” is subject to a negotiated private agreement between the landholder and Whitehaven.

**Table 28 – Air Quality Modelling Predictions Year 5**

Property Identification		Annual PM <sub>10</sub> Rocglen (plus background) (µg/m <sup>3</sup> )	Annual TSP Rocglen (plus background) (µg/m <sup>3</sup> )	Dust Deposition (g/m <sup>2</sup> /month)	
Name	Ownership			Rocglen Only	Cumulative
<b>Criteria</b>		<b>30</b>	<b>90</b>	<b>2</b>	<b>4</b>
<b>Non-mining background</b>		<b>21</b>	<b>53</b>	<b>N/A</b>	<b>1.2</b>
1 “Roseglass”	Private	2(23)	2(55)	0.03	1.2
2 “Costa Vale”	Whitehaven	3(24)	3(56)	0.10	1.3
3 “Yarrowonga”	Whitehaven	7(28)	9(62)	0.89	1.9
5 “Yarrari”	Whitehaven	4(25)	4 (57)	0.10	1.9
6 “Belah”	Whitehaven	7(28)	7(60)	0.19	1.4
7 “Stratford”	Whitehaven	2(23)	2(55)	0.06	1.2
8 “Roseberry”	Private <sup>1</sup>	3(24)	3(56)	0.08	1.3
9 “Surrey”	Private	3(24)	3(56)	0.08	1.3
10 “Carlton”	Private	2(23)	2(55)	0.05	1.2
11 “Wundurra Stud”	Private	1(22)	1(54)	0.03	1.2
12 “Brolga”	Private	1(22)	1(54)	0.01	1.2
13 “Braemar”	Private	1(22)	1(54)	0.02	1.2

1 - “Roseberry” is subject to a negotiated private agreement between the landholder and Whitehaven.

**Table 29 – Air Quality Modelling Predictions Year 10**

Property Identification		Annual PM <sub>10</sub> Rocglen (plus background) (µg/m <sup>3</sup> )	Annual TSP Rocglen (plus background) (µg/m <sup>3</sup> )	Dust Deposition (g/m <sup>2</sup> /month)	
Name	Ownership			Rocglen Only	Cumulative
<b>Criteria</b>		<b>30</b>	<b>90</b>	<b>2</b>	<b>4</b>
<b>Non-mining background</b>		<b>21</b>	<b>53</b>	<b>N/A</b>	<b>1.2</b>
1 "Roseglass"	Private	2(23)	2(55)	0.03	1.2
2 "Costa Vale"	Whitehaven	3(24)	3(56)	0.07	1.3
3 "Yarrowonga"	Whitehaven	6(27)	7(60)	0.50	1.7
5 "Yarrari"	Whitehaven	5(26)	5(58)	0.11	1.3
6 "Belah"	Whitehaven	8(29)	9(62)	0.20	1.4
7 "Stratford"	Whitehaven	2(23)	2(55)	0.07	1.3
8 "Roseberry"	Private <sup>1</sup>	3(24)	4(57)	0.10	1.3
9 "Surrey"	Private	4(25)	4(57)	0.10	1.3
10 "Carlton"	Private	3(24)	3(56)	0.06	1.3
11 "Wundurra Stud"	Private	1(22)	2(55)	0.03	1.2
12 "Brolga"	Private	1(22)	1(54)	0.02	1.2
13 "Braemar"	Private	1(22)	1(54)	0.02	1.2

1 - "Roseberry" is subject to a negotiated private agreement between the landholder and Whitehaven.

In summary, the modelled predictions for the expanded operations indicate acceptable air quality impact at all privately-owned residences throughout the life of the mine. Specifically, **Tables 27, 28 and 29** show:

- **Predicted annual average PM<sub>10</sub> concentrations** – predicted annual PM<sub>10</sub> concentrations from the Rocglen operations in Years 1, 5 and 10, respectively, including the estimated background of 21 µg/m<sup>3</sup>, should not exceed the DECCW's 30 µg/m<sup>3</sup> criterion at any of the nearest residences;
- **Predicted annual average TSP concentrations** – predicted annual average TSP concentrations from the Rocglen operations in Years 1, 5 and 10, respectively, including the estimated background of 53 µg/m<sup>3</sup>, should not exceed the DECCW's 90 µg/m<sup>3</sup> criterion at any of the nearest residences;
- **Predicted annual average dust deposition for Rocglen only** – predicted annual average dust deposition rates for Rocglen operations alone in Years 1, 5 and 10, respectively, should not exceed the 2 g/m<sup>2</sup>/month criterion at any of the nearest residences; and
- **Predicted annual average cumulative dust deposition** – predicted annual average dust deposition rates for Rocglen operations in Years 1, 5 and 10, respectively, including the estimated background of 1.2 g/m<sup>2</sup>/month, should not exceed the 4 g/m<sup>2</sup>/month criterion at any of the nearest residences.

#### **Incremental 24-Hour Average PM<sub>10</sub> Concentrations**

**Table 30** lists the predicted maximum 24-hour average PM<sub>10</sub> concentrations at nearby residences. As highlighted in red, "Yarrowonga" and "Belah" are the only residences predicted to exceed the DECCW's criterion of 50 µg/m<sup>3</sup>.

**Table 30 – Maximum Predicted 24-Hour Average PM<sub>10</sub> Concentrations**

Property Identification		Maximum Predicted 24-Hour Average PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )		
Name	Ownership	Year 1	Year 5	Year 10
<b>Criteria</b>		<b>50</b>	<b>50</b>	<b>50</b>
1 "Roseglass"	Private	10	8	11
2 "Costa Vale"	Whitehaven	21	15	15
3 "Yarrowonga"	Whitehaven	<b>60</b>	30	33
5 "Yarrari"	Whitehaven	27	19	42
6 "Belah"	Whitehaven	34	29	<b>60</b>
7 "Stratford"	Whitehaven	16	16	22
8 "Roseberry"	Private <sup>1</sup>	23	26	29
9 "Surrey"	Private	19	20	29
10 "Carlton"	Private	12	12	17
11 "Wundurra Stud"	Private	10	11	14
12 "Brolga"	Private	7	9	14
13 "Braemar"	Private	7	7	9

1 - "Roseberry" is subject to a negotiated private agreement between the landholder and Whitehaven.

As stated in **Section 7.2.2**, in more recent project approvals, the DoP has required acquisition of properties if the 24-hour average PM<sub>10</sub> concentration is exceeded more than five times per year (i.e. the 98.6th percentile). Analysis conducted on the "Yarrowonga" and "Belah" properties determined that the 50 µg/m<sup>3</sup> criterion would be exceeded on 32 occasions and four occasions, respectively. However, both of these properties are already owned by Whitehaven and, as such, the acquisition criterion becomes irrelevant.

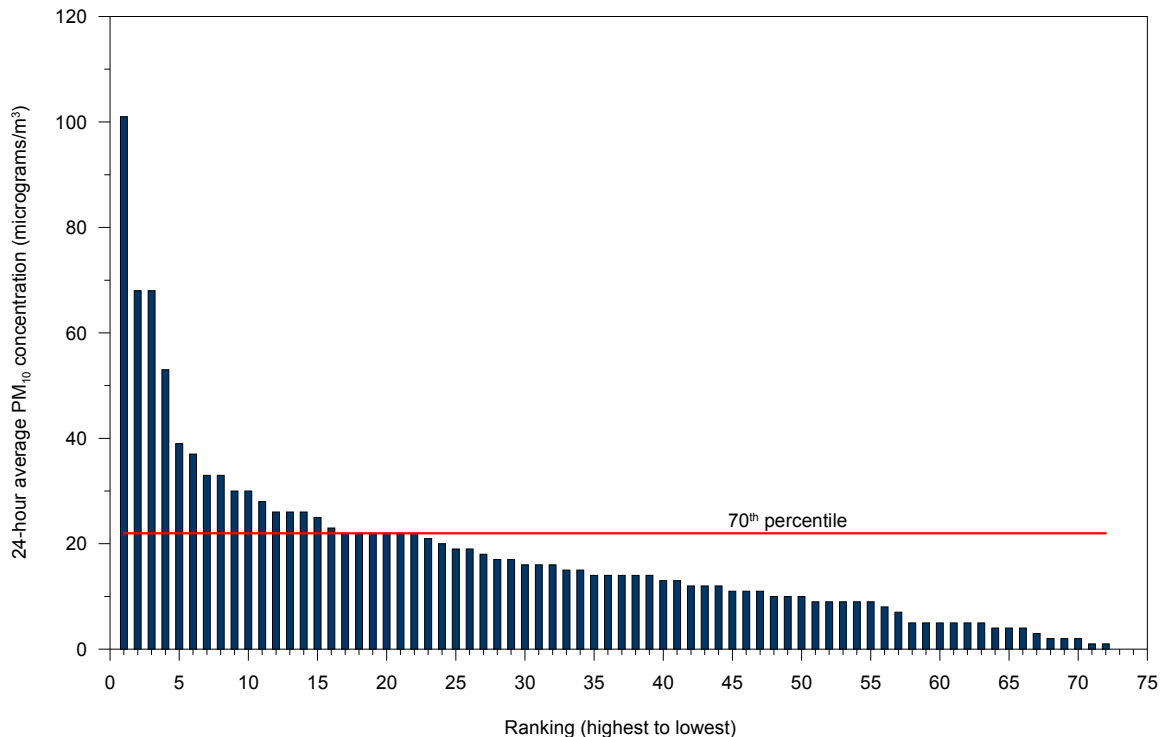
#### **Cumulative 24-Hour Average PM<sub>10</sub> Concentrations**

PAEHolmes (2011) notes that it is not possible to accurately predict the cumulative 24-hour PM<sub>10</sub> concentrations using dispersion modelling due to the variability in ambient levels and spatial and temporal variation in any day to day anthropogenic activity, including mining in the future. Experience shows that the worst-case 24-hour PM<sub>10</sub> concentrations are strongly influenced by other sources, such as bushfires and dust storms, which are essentially unpredictable and dominate worst-case PM<sub>10</sub> concentrations.

There are currently no continuous measurements of PM<sub>10</sub> available in the area that can be considered 'background'. As shown on **Figure 24**, there are currently two HVAS operating within the vicinity of the existing Rocglen operation at "Glenroc" to the north and "Roseberry" to the south. The variability in 24-hour average PM<sub>10</sub> concentrations can be clearly seen in **Figure 25**. The variation has a seasonal component, although clearly that is not the only factor.

The high values in December 2009 were likely to be the result of significant high winds and dust storms across NSW and bushfires in the Kelvin Range. Under these conditions, the proportional contribution of mining activities to the total PM<sub>10</sub> concentration will be minimal. It should also be noted that PM<sub>10</sub> concentrations in general in 2009 are likely to be higher than average due to the prolonged period of drought experienced over the previous six to seven years across NSW.

**Figure 25** also shows that the values at “Glenroc” are generally higher than those at “Roseberry”. This is not unusual given that the “Roseberry” site is more removed from current mining activity. In terms of making a crude estimate of a background 24-hour average PM<sub>10</sub> level, PAEHolmes (2011) considers it reasonable to use data from “Roseberry”. **Figure 26** shows a plot of these data, ranking the values from highest to lowest.



**Figure 26 – PM<sub>10</sub> Monitoring Data 2008 to 2009 at “Roseberry”**

The 70<sup>th</sup> percentile (22 µg/m<sup>3</sup>) provides a simplistic indication of PM<sub>10</sub> concentrations in the absence of anomalous data due to extreme events such as bushfires and dust storms. However it does still provide a conservatively high estimation of 24-hour average background PM<sub>10</sub> concentrations as contributions from the existing Rocglen operation are included. Using it as a background and adding it to modelling results also assumes that this level of 22 µg/m<sup>3</sup> will occur every day, which is clearly not the case as by definition it will be lower for 70 percent of the time.

As listed in **Table 31**, using the 70<sup>th</sup> percentile approach leads to predicted exceedances of the 50 µg/m<sup>3</sup> criterion at “Yarrowonga” “Yarrari”, “Belah”, “Roseberry” and “Surrey”. Of these residences, only “Roseberry” and “Surrey” are not currently owned by Whitehaven. Exceedances at these two properties are only predicted for operations in Year 10.

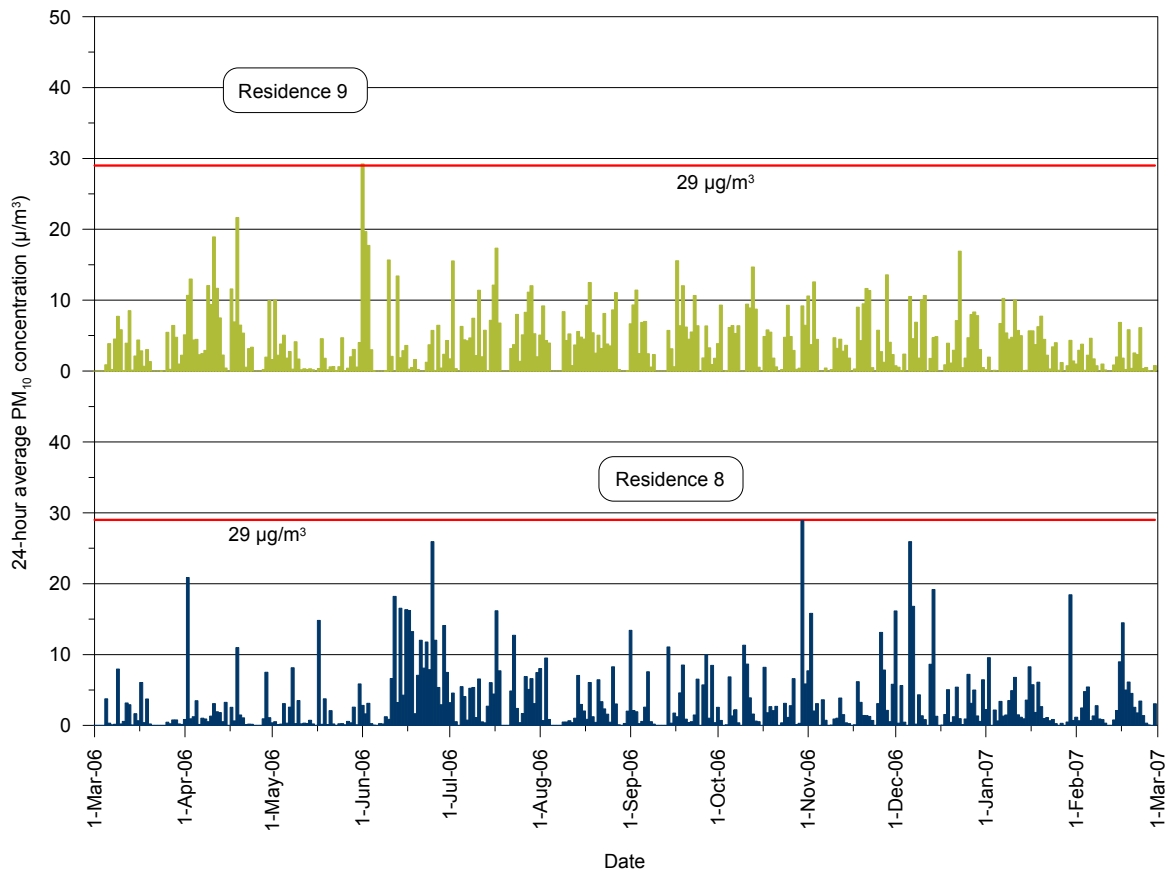
PAEHolmes (2011) carried further analysis for “Roseberry” and “Surrey” to determine how many times exceedance may occur, when added to a background of 22 µg/m<sup>3</sup>. For the 24-hour average PM<sub>10</sub> concentration to exceed 50 µg/m<sup>3</sup> at these residences, a predicted concentration must be 29 µg/m<sup>3</sup>.

The model was run to extract a predicted 24-hour average PM<sub>10</sub> concentration for each day of the year at “Roseberry” and “Surrey”, and these time series are shown on **Figure 27** (on following page). It can be seen that there is only one day of the year at each residence when 29 µg/m<sup>3</sup> is predicted to be exceeded, with the majority of values estimated to be less than 15 µg/m<sup>3</sup>. Using this conservative approach, the mine is predicted to comply with the DoP’s acquisition criterion at both “Roseberry” and “Surrey”.

**Table 31 – Maximum Predicted 24-Hour Average PM<sub>10</sub> Concentrations**

Property Identification		Maximum Predicted 24-Hour Average PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )		
Name	Ownership	Year 1	Year 5	Year 10
<b>Criteria</b>		<b>50</b>	<b>50</b>	<b>50</b>
<b>70<sup>th</sup> percentile background</b>		<b>22</b>	<b>22</b>	<b>22</b>
1 "Roseglass"	Private	32	30	33
2 "Costa Vale"	Whitehaven	43	37	37
3 "Yarrowonga"	Whitehaven	<b>82</b>	<b>52</b>	<b>55</b>
5 "Yarrari"	Whitehaven	49	41	<b>64</b>
6 "Belah"	Whitehaven	<b>56</b>	<b>51</b>	<b>82</b>
7 "Stratford"	Whitehaven	38	38	44
8 "Roseberry"	Private <sup>1</sup>	45	48	<b>51</b>
9 "Surrey"	Private	41	42	<b>51</b>
10 "Carlton"	Private	34	34	39
11 "Wundurra Stud"	Private	32	33	36
12 "Brolga"	Private	29	31	36
13 "Braemar"	Private	29	29	31

1 - "Roseberry" is subject to a negotiated private agreement between the landholder and Whitehaven.



**Figure 27 – Time Series of 24-Hour PM<sub>10</sub> Model Predictions at "Roseberry" and "Surrey"**

## 7.2.4 Management and Monitoring

While the dispersion modelling predicts acceptable air quality impacts at all privately-owned residences throughout the life of the mine, Whitehaven will continue to take reasonable and practicable measures to prevent or minimise the generation and dispersal of particulate matter. As listed below, a range of complementary air pollution management strategies, mitigation measures and monitoring activities are currently employed at Rocglen and these will continue to be implemented for the Rocglen Extension Project.

### Vegetation Clearing and Soil Stripping

- Cleared trees and branches will be retained for use in stabilising slopes identified for restoration of rehabilitated woodland. No burning of vegetation is permitted or occurs on-site.
- Where practicable, soil stripping will be undertaken when there is sufficient soil moisture to prevent lift-off dust and at times that avoid periods of high winds. Where this is not possible, dust suppression by water application will be undertaken to increase soil moisture.
- Land disturbance, including groundcover removal, will be limited in advance of mining activities consistent with operational requirements. Under normal circumstances, a maximum of 100 metres will be prepared in advance of mining.
- Groundcover will be removed with the topsoil, as opposed to prior to topsoil removal.
- Where long-term stockpiling of soil materials is planned (typically greater than 3 months) the stockpiles will be seeded and fertilised.

### Drilling and Blasting Activities

- Water injection will be used on the drilling rig.
- Coarse aggregates will be used for blasthole stemming at all times.
- Where practicable, blasting will be restricted during unfavourable weather conditions.
- When necessary, dust aprons will be lowered during on-site drilling.

### Overburden Ripping and Placement

- Where practicable, ripping of softer overburden material will be avoided during periods of high winds.

### Coal Mining

- When necessary, low moisture coal will be sprayed with water prior to excavation.

### Crushing and Screening

- Notwithstanding the generally moist nature of the ROM coal pad, when necessary, water will be applied to the coal at the feed hopper, crusher and at all conveyor transfer and discharge points.
- When necessary, some flexibility does exist to enable cessation of coal processing activities during periods of concurrent high winds and temperatures that have the potential to cause coal dust dispersal independent of water applications.

### Internal Transport

- As required, internal roads will be watered, with emphasis on those subject to frequent trafficking.
- The speed of all on-site vehicles and equipment will be restricted.
- All internal roads will be clearly defined to control their locations.
- As roads within the Project Site become obsolete, they will be promptly ripped and revegetated.

### External Transport

- All trucks hauling product coal and coal rejects between Rocglen and the Whitehaven CHPP will be required to be fitted with roll-over tarpaulins.
- All trucks transporting coal will be well maintained to ensure optimal operation, which will minimise the potential for noise emissions.

### Rehabilitation

- Rehabilitation of disturbed areas will be undertaken on a progressive basis to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, topdressed and vegetated to provide a stable landform.

### Consultation

- Routine consultations will be undertaken with surrounding residents and the CCC to ensure any concerns in relation to air quality are addressed.

### Monitoring

- The existing *Air Quality Monitoring Program* (Whitehaven 2009a) will be reviewed and, as necessary, revised to reflect the expanded mine operation and evaluate compliance with the applicable air quality assessment criteria.
- Whitehaven will install and operate a real-time PM<sub>10</sub> monitor. As recommended by PAEHolmes (2011), it is proposed to locate this monitor at the “Roseberry” residence, co-located within one of the existing HVAS. This would enable comparisons between both monitors and also provide real-time information for the majority of privately owned residences, which are to the south of the mine. Whitehaven has advised that the real-time monitor selected will be one that is fitted with a weather station to enable better contemporaneous analysis of PM<sub>10</sub> data collected from the site.
- The existing weather station and HVAS within the “Glenroc” property will be relocated to make way for the expanded Northern Emplacement Area and ensure appropriate operation. As recommended by PAEHolmes (2011), it is proposed to move these items to “Costa Vale”, which is along the axis of prevailing winds. Meteorological data collected at “Costa Vale”, in conjunction with that to be measured at “Roseberry”, will be very helpful in determining the likely sources of airborne dust on worst-case days and enable more effective management of mining activities.

## 7.3 Noise

Spectrum Acoustics (2010) undertook an assessment of operational noise levels and off-site road traffic noise levels associated with the Rocglen Extension Project. The full assessment report is contained within **Appendix Q**, with significant findings and recommendations summarised below.

### 7.3.1 Existing Environment

Unattended noise monitoring was undertaken on a quarterly basis at “Costa Vale” and “Surrey” (see **Figure 24**) between August 2008 and June 2009 to establish background noise levels for the mine. Unattended noise loggers record the total acoustic environment and it is not possible to identify various contributing sources. **Table 32** summarises the unattended noise monitoring results as reported in the 2008-2009 AEMR.

**Table 32 – Unattended Noise Monitoring Results 2008-2009**

Date	Location	Measure Noise Level dB(A)					
		Day L <sub>Aeq</sub>	Evening L <sub>Aeq</sub>	Night L <sub>Aeq</sub>	Day L <sub>A90</sub>	Evening L <sub>A90</sub>	Night L <sub>A90</sub>
Dec 2008	“Costa Vale”	43	44	46	31	30	32
Dec 2008	“Surrey”	44	41	40	31	31	27
Mar 2009	“Costa Vale”	55	47	44	32	29	25
Mar 2009	“Surrey”	48	47	44	28	31	27
Jun 2009	“Costa Vale”	46	36	46	30	28	36
Jun 2009	“Surrey”	47	40	46	29	32	27

Attended noise monitoring was undertaken on a monthly basis at “Costa Vale” and “Surrey” (see **Figure 24**) during construction (July, August and September 2008) and quarterly thereafter (December 2008, March 2009 and June 2009). **Table 33** summarises the attended operational noise monitoring results between December 2008 and June 2009, as reported in the 2008-2009 AEMR.

**Table 33 - Attended Noise Monitoring Results 2008-2009**

Date	Time	Location	Measured Mine Noise dB(A), L <sub>Aeq</sub>	Wind speed/ direction
16 Dec 2008	Day	“Surrey”	33	0-1m/s, W
16 Dec 2008	Day	“Costa Vale”	<25	1.0 m/s, W
16 Dec 2008	Evening	“Costa Vale”	<25	1-2 m/s, W
16 Dec 2008	Evening	“Surrey”	34	1-2 m/s, W
17 Dec 2008	Night	“Surrey”	30	Calm
17 Dec 2008	Night	“Costa Vale”	28	Calm
10 Mar 2009	Evening	“Costa Vale”	<25	>3 m/s, S
10 Mar 2009	Evening	“Surrey”	34	3 m/s, S
11 Mar 2009	Night	“Surrey”	<25	0.5 m/s, SE
11 Mar 2009	Night	“Costa Vale”	<25	0.5 m/s, SE
11 Mar 2009	Day	“Surrey”	<25	0-1m/s, SE
11 Mar 2009	Day	“Costa Vale”	30	1.0 m/s, SE
16 Jun 2009	Day	“Surrey”	<25	0.5 m/s, S
16 Jun 2009	Day	“Costa Vale”	29	0.5 m/s, S
16 Jun 2009	Evening	“Costa Vale”	32	1 - 2 m/s, S
16 Jun 2009	Evening	“Surrey”	25	1 - 2 m/s, S
16 Jun 2009	Night	“Surrey”	25	1 m/s, S
16 Jun 2009	Night	“Costa Vale”	33	2 m/s, S

As summarised in **Table 34**, quarterly attended noise monitoring results are now also available for 2010 at both “Costa Vale” and “Surrey”.

**Table 34 - Attended Noise Monitoring Results 2010**

Date	Time	Location	Measured Mine Noise dB(A),L <sub>Aeq</sub>	Wind speed/ direction
25 Mar 2010	Evening	"Surrey"	30	Calm
25 Mar 2010	Evening	"Costa Vale"	30	Calm
25 Mar 2010	Night	"Surrey"	31	<0.5 m/s, SW
25 Mar 2010	Night	"Costa Vale"	25	<0.5 m/s, SW
26 Mar 2010	Day	"Surrey"	24	Calm
26 Mar 2010	Day	"Costa Vale"	30	2 m/s, N
22 Jun 2010	Day	"Surrey"	28	1.5 m/s, SE
22 Jun 2010	Day	"Costa Vale"	30	1.5 m/s, SE
22 Jun 2010	Evening	"Surrey"	Inaudible	1.5 m/s, SE
22 Jun 2010	Evening	"Costa Vale"	Inaudible	1.5 m/s, SE
22 Jun 2010	Night	"Surrey"	Inaudible	1.0 m/s, SE
22 Jun 2010	Night	"Costa Vale"	28	1.0 m/s, SE
21/22 Sept 2010	Day	"Surrey" (22/9)	25	2.4 m/s, SSE
21 Sept 2010	Day	"Costa Vale" (21/9)	25	1.6 m/s, SSE
21 Sept 2010	Evening	"Surrey"	25	<0.5 m/s, N
21 Sept 2010	Evening	"Costa Vale"	34	<0.2 m/s, N
21 Sept 2010	Night	"Surrey"	<20	2 m/s, S
21 Sept 2010	Night	"Costa Vale"	<20	2 m/s, S
14 Dec 2010	Day	"Surrey"	<20	1.5 m/s, ESE
14 Dec 2010	Day	"Costa Vale"	30	1.5 m/s, ESE
14 Dec 2010	Evening	"Surrey"	Inaudible	3 m/s, E
14 Dec 2010	Evening	"Costa Vale"	Inaudible	3 m/s, E
14 Dec 2010	Night	"Surrey"	Inaudible	3 m/s, NE
14 Dec 2010	Night	"Costa Vale"	Inaudible	3.5 m/s, NE

The attended noise monitoring results summarised in **Tables 33** and **34** indicate that, under the operational and atmospheric conditions at the time, noise emissions from Rocglen did not exceed the criterion of 35 dB(A) (see **Section 7.3.2**) at any of the monitoring locations.

Additional attended noise monitoring was also undertaken on the 30 and 31 August 2010 at "Surrey" and the 21 September 2010 at "Penryn" following receipt of noise complaints. A summary of this additional noise monitoring is provided in **Table 35**.

**Table 35 – Additional Attended Noise Monitoring Results 2010**

Date	Time	Location	Measured Mine Noise dB(A),L <sub>Aeq</sub>	Wind speed/ direction
30 Aug 2010	Night	"Surrey"	32	0.5 m/s, NW
31 Aug 2010	Day	"Surrey"	40	Calm
21 Sept 2010	Day	"Penryn"	<25	1.6 m/s, SSE
21 Sept 2010	Evening	"Penryn"	32	>0.2 m/s, N
21 Sept 2010	Night	"Penryn"	<20	2.2 m/s, S

The results shown in **Table 35** indicate that, under the operational and atmospheric conditions at the time:

- Noise emissions from Rocglen exceeded the criterion of 35 dB(A) during the day (morning) monitoring at “Surrey”. The mine noise was attributed to engine revs (trucks and shovels), dozer tracks and general mine hum; and
- Noise emissions from Rocglen did not exceed the criterion of 35 dB(A) at “Penryn”.

Refer to **Section 7.3.5** for historical cumulative road traffic noise monitoring results at “Brooklyn”.

### 7.3.2 Assessment Criteria

Spectrum Acoustics (2010) based its assessment on the operational noise criteria and traffic noise criteria presented in the original Project Approval PA 06\_0198 and EPL, as listed in **Tables 36** and **37**, respectively.

**Table 36 – Operational Noise Impact Assessment Criteria**

Location	Day L <sub>Aeq</sub> (15 minute)	Evening L <sub>Aeq</sub> (15 minute)	Night	
			L <sub>Aeq</sub> (15 minute)	L <sub>A1</sub> (1 minute)
All privately owned residences	35	35	35	45

The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria at any residence on privately-owned land, or no more than 25 percent of any privately-owned land.

However, if the Proponent has a written negotiated noise agreement with any landowner and a copy of this agreement has been forwarded to the DoP and the DECCW, than the Proponent may exceed the noise limits in accordance with the negotiated noise agreement.

**Table 37 – Road Traffic Noise Impact Assessment Criteria**

Location	Day L <sub>Aeq</sub> (15 minute)	Evening L <sub>Aeq</sub> (15 minute)	Night	
			L <sub>Aeq</sub> (15 minute)	L <sub>A1</sub> (1 minute)
All privately owned residences	35	35	35	45

The Proponent shall ensure that the cumulative noise generated by road traffic associated with the Project, Canyon and Tarrawonga mines on public roads does not exceed the criteria.

### 7.3.3 Potential Operational Impacts

#### Modelling Scenarios

The assessment of operational noise was conducted using the Environmental Noise Model (ENM Version 3.06). The sound power levels of major operational noise sources used in the modelling have been measured on-site by Spectrum Acoustics at various times since commencement of the mine. These items were modelled at their known positions (stationary sources) or typical positions (mobile sources) and noise contours and point calculations were generated for the surrounding area and residences.

Noise modelling was conducted for four atmospheric conditions, these being daytime calm (neutral); inversion; prevailing wind (all times) from south; and prevailing wind (all times) from north north-west.

Noise models were generated for each of the following operational scenarios considered to be the worst case in terms of noise generation and potential impacts:

- Year 1 of expanded operation - all overburden going to the expanded Northern Emplacement Area at approximately 330 metres AHD, 24 hours. Topsoil placement on the northern face of Northern Emplacement Area and spreading by dozer, occurring daytime only.
- Year 5 of expanded operation - all overburden going to southern edge of the expanded Northern Emplacement Area at approximately 310 metres AHD, 24 hours. Topsoil placement on the top of both the Northern and Western Emplacement Areas and spreading by dozer, occurring daytime only.
- Year 10 of expanded operation - overburden being placed in the south-western extent of the pit where coal extraction has been completed and on the eastern face of Western Emplacement Area at approximately 320 metres AHD, 24 hours. Topsoil placement on the southern face of the Western Emplacement Area and spreading by dozer, occurring daytime only.

For each of these scenarios, ROM coal haulage, processing and product haulage has been included within the modelling as occurring over the full 24 hours. However there is no change proposed to off-site product haulage, which will remain between 7.00 am and 9.15 pm Monday to Friday and between 7.00 am and 5.15 pm on Saturdays.

### Model Predictions

Operational noise levels predicted using the ENM point calculation mode for privately-owned residences surrounding the Project Site are summarised in the below tables for the modelled operational and meteorological scenarios. Noise contours for the worst case scenarios are presented in **Appendix Q**.

**Table 38 – Predicted Operational Noise Levels – Year 1**

Receiver	Predicted Noise Level dB(A), $L_{eq}(15min)$						Criterion
	Neutral (day)	Wind (day)		Wind (eve/night)		Inversion (night)	
		S	NNW	S	NNW		
R1 "Retreat"	24	33	21	33	20	34	35
R2 "Penryn"	24	31	21	30	20	33	35
R3 "Roseglass"	24	30	21	28	20	32	35
R4 "Costa Vale"	32	40	30	39	26	41	35
R5 "Roseberry"	25	22	34	23	35	36	40 <sup>1</sup>
R6 "Surrey"	21	<20	30	20	0	32	35
R7 "Carlton"	<20	20	26	<20	25	29	35
R8 "Wundurra Stud"	<20	<20	27	<20	27	31	35

1 - Elevated noise limit in accordance with negotiated private agreement between landholder and Whitehaven.

Exceedance of the criterion have been predicted at "Costa Vale" during Year 1, with the primary contributing noise sources being trucks depositing overburden on the expanded Northern Emplacement Area and, to a less extent, topsoil spreading activities (daytime only). Noise mitigation to achieve compliance at "Costa Vale" would require all trucks to be retro-fitted with attenuator packages. Whitehaven has advised that while this may be technically feasible, it would be impractical given the large cost involved and the fact that "Costa Vale" is now owned by Whitehaven and, as such, is considered project-related.

**Table 39 – Predicted Operational Noise Levels – Year 5**

Receiver	Predicted Noise Level dB(A), $L_{eq}(15min)$						Criterion
	Neutral (day)	Wind (day)		Wind (eve/night)		Inversion (night)	
		S	NNW	S	NNW		
R1 "Retreat"	22	31	20	30	<20	32	35
R2 "Penryn"	22	30	20	29	<20	33	35
R3 "Roseglass"	21	29	20	27	<20	32	35
R4 "Costa Vale"	29	<b>37</b>	26	34	20	<b>36</b>	35
R5 "Roseberry"	28	25	36	23	34	36	40 <sup>1</sup>
R6 "Surrey"	25	23	33	20	31	34	35
R7 "Carlton"	22	<20	29	<20	27	30	35
R8 "Wundurra Stud"	21	<20	30	<20	27	31	35

1 - Elevated noise limit in accordance with negotiated private agreement between landholder and Whitehaven.

Minor criterion exceedances are again predicted at "Costa Vale" during Year 5 under adverse conditions.

**Table 40 – Predicted Operational Noise Levels – Year 10**

Receiver	Predicted Noise Level dB(A), $L_{eq}(15min)$						Criterion
	Neutral (day)	Wind (day)		Wind (eve/night)		Inversion (night)	
		S	NNW	S	NNW		
R1 "Retreat"	<20	27	<20	29	<20	30	35
R2 "Penryn"	<20	26	<20	29	<20	30	35
R3 "Roseglass"	<20	25	<20	27	<20	30	35
R4 "Costa Vale"	20	33	<20	34	<20	35	35
R5 "Roseberry"	30	27	38	26	38	39	40 <sup>1</sup>
R6 "Surrey"	28	25	34	25	34	35	35
R7 "Carlton"	24	20	30	20	30	31	35
R8 "Wundurra Stud"	24	20	31	<20	31	31	35

1 - Elevated noise limit in accordance with negotiated private agreement between landholder and Whitehaven.

No exceedances of the criterion are predicted at any receiver for the 10 year scenario.

### 7.3.4 Potential Sleep Disturbance Impacts

Spectrum Acoustics (2010) advises that to assess the impact on potential sleep disturbance during night time hours, the maximum noise levels at the nearest or potentially worst impacted receiver for each component of the project are compared to background levels in the area. If the maximum noise levels exceed the background level by more than 15 dB, further consideration of potential disturbance to sleep is required including the nature and level of ambient noise in the area.

The most impacted receiver in the Year 1 scenario (apart from “Costa Vale”, which is owned by Whitehaven and therefore project-related) is “Retreat” to the north of the site. Maximum noise levels estimated from individual sources at “Retreat” are more than 10 dB below the 45 dB(A) sleep disturbance ‘screening’ level and are also no greater than the total LAeq level from the entire mine. This is typical at large distances from a coal mine, where the overall ‘mine hum’ is reasonably constant and individual sources are not generally identifiable.

Spectrum Acoustics (2010) did not consider the full analysis of maximum noise levels, in terms of sleep disturbance, for the Year 5 and Year 10 scenarios necessary.

### 7.3.5 Potential Off-Site Road Traffic Impacts

The nearest receiver to the public road section of the coal haul route between Rocglen and the Whitehaven CHPP is “Brooklyn”, which is set-back from Blue Vale Road approximately 70 metres and is located several kilometres south of the intersection with Shannon Harbour Road. Coal trucks from the Whitehaven’s Canyon (now closed), Tarrawonga and Rocglen mines all pass this receiver.

**Table 41** summarises historical traffic noise measurements (all mine-related vehicles) conducted at “Brooklyn” by Spectrum Acoustics between March 2008 and December 2009.

**Table 41 – Historical Traffic Noise Measurements at “Brooklyn”**

Date	Trucks per Hour	Measured Noise Level dB(A) L <sub>eq</sub> (1hr)
March 2008	36	54
September 2008	16	51
December 2008	38	51
March 2009	48	52
June 2009	27	54
September 2009	42	57
December 2009	40	52
Average	35	53.5

The measured traffic noise levels in **Table 41** range from 3 to 9 dB below the 60 dB(A) criterion. The Project will not alter the total number of trucks passing “Brooklyn” and therefore off-site traffic noise levels are expected to remain compliant with the applicable criterion.

### 7.3.6 Management and Monitoring

While the modelling predicts acceptable noise impacts at all privately-owned residences throughout the life of the mine, Whitehaven will continue to take reasonable and practicable measures to prevent or minimise noise generation and propagation. As listed below, a range of complementary noise management strategies, mitigation measures and monitoring activities are currently employed at Rocglen and these will continue to be implemented for the Rocglen Extension Project.

#### Project Design

The external batter slopes of the expanded Northern Emplacement Area will be re-shaped and revegetated in Years 1 and 2 of the expanded operation to, amongst other things, minimise the projection of noise from overburden transportation and emplacement activities towards privately owned residences located to the north and north-east later in the mine life.

### General Operation

- Contractors, including all personnel and sub-contractors, will be advised of noise compliance limits prior to their work commencing. Contractors will be expected to take practical measures to limit noise generation during their activities where possible.
- Prior to being brought on-site, all earthmoving equipment will be tested to ensure sound power levels are consistent with the previous assessments undertaken by Spectrum Acoustics.
- Site personnel will be required to pay due attention to site weather conditions and modify or stand down from operational activities if directed by mine management.
- Where possible, equipment with lower sound power levels will be used in preference to more noisy equipment.
- All equipment used on-site will be regularly serviced to ensure the sound power levels remain at or below the levels used in the modelling undertaken by Spectrum Acoustics.
- Mid-high frequency broadband reverse beepers are fitted to on-site mobile mining equipment.
- The on-site road network will be maintained to limit vehicle body noise.

### External Transport

- All transport activities, including the haul route used between Rocglen and the Whitehaven CHPP and the hours of coal haulage, will continue to be undertaken strictly in accordance with that approved under PA 06\_0198.
- The haul route between Rocglen and the Whitehaven CHPP is fully sealed and will continue to be maintained under an existing contribution plan with Council.
- Drivers will continue to operate in accordance with an existing Transport Policy and Code of Conduct, which identify aspects such as travelling speeds, general behaviour, avoidance of exhaust brakes, load coverage, complaints and disciplinary procedures. The Policy and Code apply to all employee and contractor-owned vehicles.
- The trucks are speed limited to 93 km per hour to, amongst other things, minimise engine noise.
- All trucks transporting coal will be well maintained to ensure optimal operation, which will minimise the potential for noise emissions.

### Consultation

- Routine consultations will be undertaken with residents surrounding Rocglen and along the transport route, as well as with the CCC, to ensure any concerns relating to operational or traffic noise are addressed.

### Monitoring

- The existing *Noise Monitoring Program* (Whitehaven 2008d) will be reviewed and, as necessary, revised to reflect the expanded mine operation and evaluate compliance with the applicable noise assessment criteria. The current noise monitoring network consists of two monitoring locations, being one at “Costa Vale” and one at “Surrey” (see **Figure 24**). As recommended by Spectrum Acoustics (2010), “Retreat” or “Penryn” will be included as a noise monitoring location in the revised Program in place of “Costa Vale”, which is now owned by Whitehaven.
- Traffic noise monitoring will continue to be conducted at the “Brooklyn” and “Werona” residences on Blue Vale Road in accordance with the existing *Road Noise Management Plan* (Spectrum Acoustics 2008).

## 7.4 Blasting and Vibration

An assessment of ground vibration and airblast overpressure associated with blasting undertaken as part of the Rocglen Extension Project has been undertaken by Spectrum Acoustics within the *Noise and Vibration Impact Assessment* (2010). The full assessment report is contained within **Appendix Q**, with significant findings and recommendations summarised below.

### 7.4.1 Existing Environment

Potential blasting emissions include ground vibrations, air vibrations (noise and airblast), fly rock and dust.

The results of blast monitoring conducted at the nearest residences to the north (“Costa Vale”) and to the south (“Roseberry”) between August 2008 and July 2009 are reported in the 2008-2009 AEMR. Measured peak airblast overpressure ranges between 87.4 and 115.0 dB, and measured peak particle velocity (vibration) ranges between 0.1 and 1.48 mm/sec. On this basis, the results show no exceedances of either the blast overpressure or ground vibration criteria reported in the below section.

### 7.4.2 Assessment Criteria

Spectrum Acoustics (2010) based its assessment on the blast overpressure and ground vibration criteria presented in the original Project Approval PA 06\_0198 and the EPL.

**Table 42 – Airblast Overpressure Impact Assessment Criteria**

Airblast Overpressure Level dB(Lin Peak)	Allowable Exceedance
115	5% of the total number of blasts in a 12 month period
120	0%

**Table 43 – Ground Vibration Impact Assessment Criteria**

Peak Particle Velocity mm/s	Allowable Exceedance
5	5% of the total number of blasts in a 12 month period
10	0%

### 7.4.3 Potential Impact

Historical blast monitoring results show no exceedances of either the applicable ground vibration or blast overpressure criteria at the nearest residences surrounding the Project Site. On this basis, Spectrum Acoustics (2010) concludes that no significant blasting impacts are expected as a result of the Rocglen Extension Project.

Since coal production commenced at Rocglen in late 2008, there has only been one occasion when complaints have been received about blasting. On the 24 April 2009, four separate residents contacted Whitehaven to report a significant loud bang and vibration at their residences. Three out of the four residents advised that previous blasting had not resulted in any impact at their property.

Rocglen has two statutory blast monitoring locations, being the “Rosberry” point of interest (POI) and “Costa Vale” POI. On checking with Orica Mining Services (Orica), Whitehaven’s blasting contractor, it was discovered that they had failed to properly initiate the blast monitors and therefore did not capture any wave trace data for this particular blast. Orica was requested to provide formal assessment and advice, which included the following points:

- The blast monitors were placed at the statutory POIs and turned on, however the operator unintentionally failed to set the monitors to capture wave trace data;
- The prediction data shows that it is unlikely that blasting vibration and air-overpressure limits would have exceeded the statutory limits at the monitoring locations. However without supporting blasting wave trace data this is inconclusive;
- Lower frequency air-overpressure has the ability to travel further than higher frequencies. In the event that this was the case, the lower frequency ranges are outside the audible range of the human ear. Low frequency events have been known to cause windows to rattle, which can be mistaken for vibrations;
- In unfavourable meteorological conditions, it is common for airblast levels to increase by up to 20 dBL as a result of the combined effects of a temperature inversion and/or wind velocity (windshear). There was some cloud cover on the day the blast was fired, which could have played a part in the increased affects of blasting induced air-overpressure;
- Orica organised a Toolbox Talk for all shot-firers and blast crew aimed at training all relevant personnel in the proper use of the environmental blasting monitors, which will assist Whitehaven in adhering to the statutory conditions/limits; and
- Orica recommended that meteorological conditions be analysed prior to blasting to ascertain the likelihood of increased blasting environmental impacts on outer residences  
(Orica Mining Services 2009).

As a result of the complaints relating to the blast in April 2009 and Orica’s subsequent report, Whitehaven now ensures that meteorological conditions are analysed prior to blasting to avoid times when the potential for impact is heightened, and also endeavours to blast at around midday over the winter period to avoid temperature inversions.

All blasting at Rocglen is designed to satisfy relevant environmental and safety criteria with respect to airblast overpressure and ground vibration, initially using conservative predictive models and subsequently using site laws developed and refined on the basis of operational experience.

#### **7.4.4 Management and Monitoring**

Through the implementation of appropriate design and procedure safeguards, blast emissions can be limited to a level where:

- The safety of the public, mine employees and visitors is not threatened;
- Ground vibration occurs at acceptable levels and ensures the continued integrity of nearby dwellings, structures and facilities;
- Noise, ground and air vibrations have no impact on nearby livestock;
- Noise and air vibration levels at nearby residences are within acceptable limits and compatible with the safety and comfort of human beings; and
- The generation of dust is minimised and maintained at acceptable levels.

Whitehaven will continue to take reasonable and practicable measures to prevent or minimise ground vibration and blasting overpressure. As listed below, a range of complementary blast management strategies, mitigation measures and monitoring activities are currently employed at Rocglen and will continue to be implemented for the Rocglen Extension Project.

### **Blast Design**

- Blast design and implementation will continue to be undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.
- Blast design will continue to include the following features to ensure industry standards are met:
  - Ensuring that burden distances and stemming lengths are such that explosion gases are almost completely without energy by the time they emerge into the atmosphere; and
  - Ensuring that charges consistently detonate in carefully designed sequences.
- Whitehaven will analyse meteorological conditions prior to blasting to avoid times when the potential for impact is heightened, and also endeavours to blast at around midday over the winter period to avoid temperature inversions.

### **Air Vibrations (Noise and Airblasts)**

- Noise and airblast generation will be controlled to ensure that all, or the majority of, explosion energy is consumed in fragmenting and displacing the overburden by the time the gases vent (via broken burden rock and/or ejected stemming material) into the atmosphere via:
  - Ensuring blasthole spacing is implemented in accordance with blast design;
  - Careful selection and implementation of burden distance and stemming length;
  - Using appropriate materials (for example, 20 mm aggregates) for stemming;
  - Ensuring that charges detonate in the correct sequence and with inter-row delays that provide good progressive release of burden;
  - Limiting the maximum weight of explosive detonated in a given delay period (the maximum instantaneous charge (MIC)) to conservative and proven levels; and
  - Refining these controls on the basis of the blast monitoring program.

### **Ground Vibrations**

- Ensuring the minimum practicable weight of explosive detonates at an instant (minimising the MIC) by using the maximum number of delay periods in each blast.
- Ensuring that most of the energy liberated by the charge(s) on a given delay number is consumed in providing good fragmentation, adequate displacement and/or a loose, highly diggable muckpile.

### **Dust and Other Post-Blast Emissions**

- Ensuring stemming columns are not ejected for considerable distances into the atmosphere, with stemming column lengths designed to ensure ejection velocities are low.
- Using aggregates for blasthole stemming and nonel delay-type or electronic detonators to initiate charges. This will avoid the requirement for detonating cord downlines and, with the absence of detonating cord trunklines (surface lines), this will prevent the dust cloud that is formed when such trunklines detonate on a dry dusty surface.

### **Road Closures**

- The expanded limit of open cut mining encroaches within 500 metres of Wean Road, both in its current and proposed realigned position. The safety of traffic on Wean Road will be ensured via:
  - For all blasts within 500 metres of Wean Road, the road will be closed with blast notice boards updated at least 24 hours prior to each blast. Road closures typically occur for a period of up to 10 minutes;
  - Whitehaven will inspect the road following the blast and any rock fragments removed from the road surface prior to re-opening; and

- Whitehaven will monitor the distance flyrock travels (if any) beyond the designed blast envelope and identify if further safeguards are required.

### Consultation

- Whitehaven will undertake the following blast notification activities:
  - The proposed blasting schedule will be provided to all residents within a 3 km radius of the blast providing advance notice of the date and time of each proposed blast. A verbal confirmation on the day of the blast will also be undertaken.
  - Whitehaven will update the blast notice board near the mine entrance on Wean Road notifying passing motorists when the next blast is scheduled.
  - Whitehaven will update the Wean Road blast notice boards for blasting events that will result in the temporary closure of Wean Road.
- Routine consultations will be undertaken with residents surrounding Rocglen, as well as with the CCC, to ensure any concerns relating to blasting are addressed.

### Monitoring

- The existing *Blasting Monitoring Program* (Whitehaven 2008a) will be reviewed and, as necessary, revised to reflect the expanded mine operation and ensure blasting is completed in a manner that ensures continued compliance with the applicable air overpressure and ground vibration criteria. The current blast monitoring network consists of two monitoring locations, these being at “Costa Vale” and “Roseberry” (see **Figure 24**). As recommended by Spectrum Acoustics (2010), “Retreat”, as the nearest privately-owned residence to the north of the Project Site, will be included as a blast monitoring location now that “Costa Vale” is owned by Whitehaven.

## 7.5 Surface Water

GSSE (2010c) has undertaken a surface water assessment for the Rocglen Extension Project, requiring a site wide approach and the re-development of a suitable surface water management system for the expanded operation. The key aspects addressed include the identification of potential surface water impacts as a result of the Project, a description of the proposed management strategies and mitigation measures to be implemented, licensing requirements, recommendations for on-going surface water monitoring and a detailed site water balance, including a discussion on water sources, water security and predicted discharges from site.

GSSE (2010c) concludes that if the surface water management strategies and mitigation measures identified and discussed within the *Surface Water Assessment* are implemented and maintained, it is anticipated that there would be minimal impact on surface water downstream of the Project Site as a result of the Rocglen Extension Project.

A copy of the *Surface Water Assessment* is contained within **Appendix M**, with the key assessment findings and recommendations summarised below.

### 7.5.1 Existing Environment

#### Surface Hydrology

The surface hydrology within and immediately surrounding the Project Site is described in **Section 3.10**.

Within the existing approved mining area there are currently two major catchments that generally drain north or south. As runoff exits from the south of the Project Site, it reports to the Namoi River via an unnamed depression that flows generally in a southerly direction before turning west into the Namoi River approximately 10 km from the Project Site. To the north, runoff from the Project Site reports to Driggle Draggie Creek, which subsequently flows to the Namoi River via Barbers Lagoon drainage line approximately 14 km from the Project Site.

Overall, GSSE (2010c) considers that the local surface hydrology (with the exception of the State Forest areas) has been heavily disturbed by past agricultural activities and altered within areas of the Project Site as a result of the existing approved Rocglen mining operations.

**Existing Flow Regimes**

While all existing drainage lines that report to or lie within the Project Site are ephemeral in nature, they have very little flow primarily due to previous soil conservation works and current mining activities that have substantially diverted and dammed the drainage lines. Due to the extensive modification, the central drainage line now consists of a series of dams. For the majority of the time there is no off-site discharge from this drainage line, however, under high rainfall conditions, discharge events have occurred.

**Surface Water Features of Conservation Significance**

Based on existing documentation and the site visit conducted by GSSE in February 2010, there were no surface water features found within the Project Site to have conservation significance.

No drainage lines within the Project Site were found by GSSE (2010c) to contain significant riparian vegetation with the majority of the drainage lines having poorly defined bed and banks.

**7.5.2 Existing Licensed Discharge Points**

Runoff is discharged from the Rocglen site through two LDPs, which allow for wet weather discharges, held under the site’s current EPL. LDP 11 is located at the outlet of Storage Dam SD3 at the southern end of the site and LDP 12 is located on the northern boundary of the site. As listed in **Table 44**, both LDPs have pollutant concentration limits to ensure discharged water is of a suitable quality.

**Table 44 - Concentration Limits for LDP 11 and LDP 12**

Pollutant	Unit of Measure	100 <sup>th</sup> Percentile Concentration Limit
Oil and Grease	mg/L	10
pH	pH	6.5 – 8.5
Total Suspended Solids (TSS)	mg/L	50*

\* The TSS concentration limits may be exceeded for water discharge provided that:

- The discharge occurs solely as a result of rainfall measured at the premises that exceeds 38.4 mm over any consecutive 5 day period immediately prior to the discharge occurring; and
- All practical measures have been implemented to dewater all sediment dams within 5 days of rainfall such that they have sufficient capacity to store run off from a 38.4 mm, 5 day rainfall event.

While no concentration limits are specified, the EPL requires electrical conductivity (EC) and total organic carbon (TOC) to be monitored at the LDPs. The EPL also requires various pollutant concentrations at other sites within and surrounding the Project Site to be monitored, as well as yearly monitoring of numerous heavy metals in the Mine Water Dam. There are currently no volumetric limits on the LDPs.

**7.5.3 Existing Surface Water Quality**

**Baseline Water Quality Data (prior to mining)**

Due to the ephemeral nature of the drainage lines located in the surrounds of the Project Site, limited baseline data was collected prior to the approval of Rocglen in 2008. Some limited data collected in 2002, including six samples taken at different locations along the un-named central drainage line and one sample from Driggie Draggie Creek, is presented in **Appendix M**.

The one baseline sample taken from the un-named drainage line showed that there were high amounts of total phosphorous and EC levels slightly above those presented in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000, as cited in GSSE 2011) for slightly disturbed upland rivers in NSW. The samples taken along Driggle Draggie Creek showed a high nutrient load, with high phosphorous and nitrate readings. The water was also slightly alkaline with four of the six readings above the ANZECC (2000) pH guideline of 8.0.

Whilst the data is very limited, it does show slightly alkaline water quality in the region along with high nutrient levels. Unfortunately no analysis of total suspended solids (TSS) was reported.

### Wet Weather Discharge Data

The site's EPL outlines the surface water monitoring that must be undertaken at nominated sampling locations during or immediately following discharge events. Since commencing operation in 2008, there have been a total of ten discharges, occurring between the 29 December 2009 and 20 August 2010 when the site received well above average rainfalls. **Table 45** presents the recorded water quality for these discharges.

**Table 45 - Wet Weather Discharge Data**

Sample Location	Sample Date	pH	EC (µS/cm)	TSS (mg/L)	TOC	Grease & Oil (mg/L)	Preceding 5 Day Rainfall Totals (mm)
LDP 11 (SD3)	29-12-09	7.51	180	552	4	N/A	79.6
	04-01-10	7.74	325	1490	2	<5	25.2
	08-02-10	7.87	323	157	6	6	NR
	15-02-10	7.48	329	406	3	<5	51.2
	31-03-10	8.14	435	108	12	<5	46.6
	02-06-10	8.21	410	260	35	<5	27.0
	26-07-10*	8.34	458	17	5	<5	
	28-07-10	8.23	437	23	4	<5	23.2
	11-08-10	8.04	466	54	6	<5	26.0
	20-08-10	8.04	508	172	10	<5	15.4
LDP 12 (SB18)	15-01-10	7.51	356	1490	3	<5	21.6
	15-02-10	7.37	395	556	5	<5	51.2
	11-08-10	7.37	261	2320	5	<5	26.0
	28-08-10	7.37	422	2300	10	<5	15.4
Un-named drainage channel (below LDP11)	29-12-09	6.87	94	236	7	N/A	79.6
	04-01-10	7.37	467	34	17	6	25.2
	15-02-10	7.15	318	186	8	<5	51.2
	03-08-10	7.43	109	45	17	<5	
	11-08-10	7.72	333	116	12	<5	
	20-08-10	7.90	390	152	25	<5	
Driggle Draggie Ck (below LDP12)	15-01-10	6.86	338	157	6	6	21.6
	15-02-10	7.37	359	15	6	<5	51.2
	18-08-10	7.40	151	964	12	<5	
	20-08-10	7.96	344	912	20	<5	

NR – Site Meteorological Station broken during this period

SD – Storage Dam, SB – Sediment Basin, \* - controlled discharge

During several discharge events, the TSS concentration exceeded the 100% concentration limit of 50 mg/L at the LDPs. In letters dated 19 March 2010 and 27 September 2010 from Whitehaven to the DECCW detailing the above events, it was reported that due to earthworks associated with increasing the capacity of Sediment Basin SB19 there was significant amounts of disturbance immediately upstream of LDP 11. With the large volume of rainfall received immediately following construction, there was significant sediment flow into Storage Dam SD3 and insufficient time for settlement prior to additional rain causing discharge.

Since March, above average rainfall has exacerbated water management issues, with rainfall and runoff volumes exceeding the site's capacity for use of water prior to discharge. As a consequence of the above events, Whitehaven has taken action through the trialling of floc blocs and liquid flocculant in SD3 and SB18 to increase setting rates by chemical flocculation. The flocculation visibly reduced the sediment level of the dams, with surface water sampling during 2010 identifying significantly reduced TSS levels in SD3. Whilst effective, the use of floc blocs proved a relatively slow process and as a consequence, the site has commenced use of liquid flocculants to further enhance capacity for assisting the settling of sediment.

### Dry Weather / Operational Water Quality Monitoring Data

Additional monitoring has been undertaken to meet the requirements of the site's EPL and the *Site Water Management Plan* (RCA Australia in conjunction with Soil Conservation Service 2009). A summary of the results, including average values where applicable, is presented in **Table 46**.

**Table 46 – Dry Weather / Operational Water Quality Monitoring Results**

Sample Location	Sample Date	pH	EC ( $\mu\text{S/cm}$ )	TSS (mg/L)	TOC	Grease & Oil (mg/L)
<b>Open Cut Extraction Pit Water (contained on-site)</b>						
Mine Water Dam	24-06-09	9.30	1540	216	20	<10
	27-08-09	8.85	2260	60	3	<10
	16-12-09	9.15	4210	14	4	<10
	25-02-10	8.99	1390	106	5	<5
	12-05-10	8.90	2470	20	3	<5
	09-08-10	8.56	2330	8	2	<5
	08-11-10	9.12	2330	16	2	<5
	Mean	(8.90)	(2361)	(63)	(5)	(-)
<b>Dirty Water (controlled discharged through LDP 11 at the south of the site as required)</b>						
Un-named drainage channel (downstream of site below LDP 11)	23-09-08	7.70	150	510	NS	<2
	17-12-08	6.60	145	21	NS	<2
	Mean	(7.15)	(148)	(266)	(-)	(-)
SB8 (near offices)	17-12-08	7.80	295	1080	--	<2
	26-07-10	8.30	458	17	5	<5
	Mean	(8.10)	(376)	(548)	(5)	(-)
SB3	24-06-09	8.36	502	110	10	<10
	27-08-09	8.86	504	66	10	<10
	30-11-09	7.78	620	128	3	<10
	25-02-10	8.34	423	56	15	<5
	12-05-10	8.20	565	64	7	<5
	Mean	(8.31)	(523)	(85)	(9)	(-)
SD3* (at LDP 11)	24-06-09	8.56	354	1340	35	<10
	27-08-09	8.34	587	71	8	<10
	25-02-10	8.44	374	37	5	<5
	25-03-10	8.71	445	58		<5
	07-05-10	8.26	434	13		<5
	12-05-10	8.42	422	19	14	
	24-05-10	8.57	412	92	4	6
	09-08-10	7.62	458	239	12	<5
	12-10-10	8.31	575	11	5	
	02-11-10	8.25	478	33	6	<5
	08-11-10	8.42	472	107	7	<5
	25-11-10	7.40	522	52	9	
	Mean	(8.20)	(461)	(172)	(10)	(-)
SB7 (southern end)	16-12-09	9.38	600	18	8	<10
SB5 (southern end)	16-12-09	8.90	1440	50	7	<10
SB14 (southern end)	16-12-09	8.76	577	50	7	<10

\* Not discharging at the time

NS - Not sampled, SB – Sediment Basin, SD – Storage Dam

There has been an increase in the Mine Water Dam's EC, possibly as a result of the samples being taken over a dry period with evaporation rates exceeding inflow leading to a concentration of salts. In addition, between August and December 2009, the Mine Water Dam was a receiving location for water trucked to site from a Santos Gas trial well as a water re-use scheme approved through the DECCW, NOW and I&I NSW. The waters received from this scheme were generally higher in EC. The TSS in the Mine Water Dam reduced over this period due to the dry conditions increasing retention times.

The remaining EC readings within the dirty water system generally showed only a slight increase from the limited background data available. According to the *Namoi Catchment Action Plan* (Namoi CMA 2007), a number of major tributaries within the catchment have inherently high salinity levels. Whitehaven preferentially uses this water for dust suppression to ensure it is contained within the site and limits the potential release of saline water to surrounding watercourses.

The water testing also shows slightly higher alkaline water being held in the dirty water dams collecting runoff from the emplacement areas than in surrounding watercourses. This is due to the subsoils being more alkaline and producing higher alkaline runoff than the topsoils.

#### **7.5.4 Existing Surface Water Management**

Rocglen Coal Mine currently operates under a *Site Water Management Plan* prepared by RCA Australia in conjunction with the Soil Conservation Service in 2008 (revised in 2009) in accordance with PA 06\_0198. Current water management is partially segregated into clean and dirty water systems and is achieved through the use of purpose built controls. Clean water management comprises diversion of clean water away from disturbed areas through diversion banks and waterways, and includes retention in clean water storage dams. Dirty water management comprises capture and treatment of runoff water from disturbed areas across the site.

The majority of surface water drains to the south end of the site via catch banks where it is captured and treated within a series of interconnected sediment basins prior to reuse on the site or discharged through LDP 11. A small part of the site (primarily around the Northern Soil Stockpile area) drains to the north where it is directed to a sediment basin prior to discharge through LDP 12. Sediment basins located on the site, excluding the Mine Water Dam, have a combined total storage capacity of 36 ML. Captured water is re-used on-site for dust suppression, including around the crushing and screening operations.

In addition to the general description above, the current water management system includes:

- Sediment Basin (SB4) to specifically contain and treat flows from the ROM coal pad area;
- Sediment Basin (SB8) to specifically contain and treat flows from the facilities/amenities area;
- Mine Water Dam for water to be pumped to and from the open cut extraction pit;
- Bore Pump Dam for water to be pumped to and from a groundwater bore; and
- Various clean water storage dams (within Maximum Harvestable Right Dam Capacity (MHRDC)).

The existing water management system has adequately managed water for the mining operations with the exception of some instances of elevated TSS in surface water during discharge events (see above).

### 7.5.5 Site Water Balance

A detailed daily time step water balance was developed by GSSE (2010c) to examine the water requirements and available water storage against water availability of the Project Site. Site water balance calculations were undertaken for the scenarios referred to as Years 1, 5 and 10 of the expanded operation. The results based on dry, median and wet rainfall conditions are presented in detail in **Appendix M**.

With high quality site data and good model calibration, GSSE (2010c) is confident that the results of the model are an accurate reflection of the probable water balance to be experienced. It is considered that the site water balance for the three scenarios provides an appropriate representation of the range of conditions likely to be experienced across the site throughout the Project Life.

The overall results of the water balance indicate that the site has adequate water supply primarily through the rainfall runoff captured in sediment basins, which can be supplemented through the use of bore water when required. The model indicates that use of bore water is highly dependent on the water management practices adopted. Assuming controlled discharge is undertaken to draw down the Dirty Water Dams, the typical bore water usage will be 40 to 50 megalitres per year (ML/year) and will be within the licensed entitlement of 120 ML/year.

The model indicates that the number of overflow discharges is also highly dependent on the water management practices adopted. Assuming controlled discharge is undertaken, likely average annual overflow discharges of one day is expected, which will occur under extreme rainfall events (greater than the license threshold of 38.4 mm in 5 days). In practice the mine pit would provide substantial additional on-site storage (temporarily), which would reduce the potential for overflow discharge to occur.

Overall the calculations indicate that the site will be relatively well balanced. As a result of the water balance, various management strategies and mitigation measures have been developed and are outlined in the below sections.

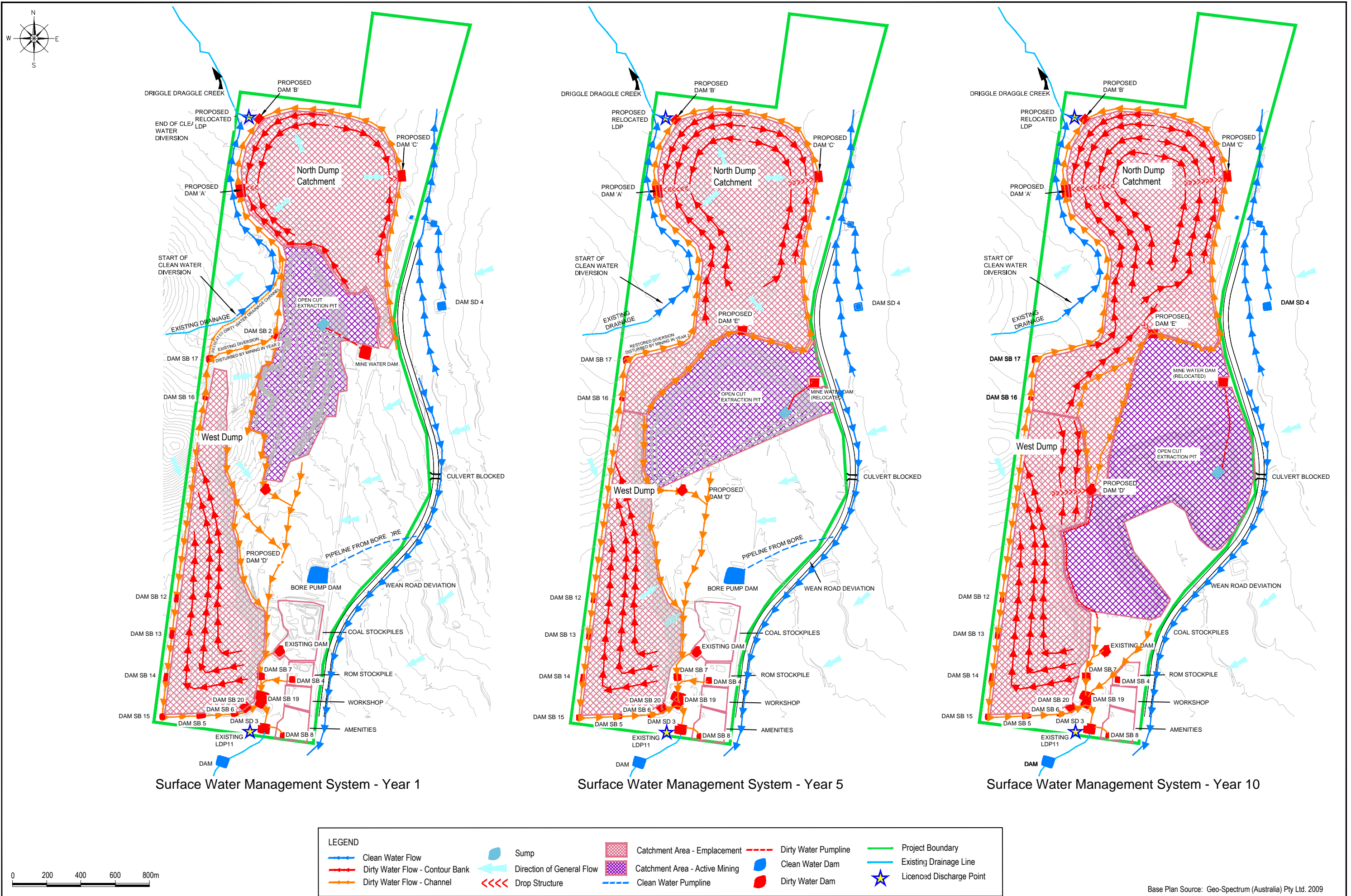
### 7.5.6 Proposed Water Management

#### Overview

The proposed water management systems for Years 1, 5 and 10 of the expanded operation are illustrated on **Figure 28**, with the post-mining landform shown on **Figure 21**. The *Surface Water Assessment* (GSSE 2010c) in **Appendix M** provides a detailed overview of the proposed water management system for these four key stages of the mine life.

The principle objective of surface water management at the mine site is to segregate clean and dirty water flows and to minimise surface flows across disturbed areas. The key water management strategies proposed to be adopted across the Project Site are summarised as follows:

1. Dirty water generated from disturbed areas to be captured and diverted using contour banks and drop structures in a manner that minimises the potential for concentrated overland flow and subsequent erosion. This water will be channelled through a series of sediment basins to reduce sediment loads prior to discharge.
2. Water generated within the open cut pit, primarily as a result of rainfall/runoff and some groundwater seepage, to be managed within the open cut via in-pit sumps. This water will be directed to and contained within these in-pit sumps until it is necessary to pump the water to the new Mine Water Dam, which will be constructed as a 'turkeys nest' to receive mine water only.
3. Clean water diversions will be constructed wherever possible upstream of disturbance areas to minimise the amount of dirty water to be contained and treated within the dirty water management system.



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4. Progressive rehabilitation of all re-shaped surfaces to assist in reducing the level of TSS (and possible high pH and salinity) in runoff from disturbed areas. This will also reduce the dependence on sediment controls and generally assist in improving water quality.
5. Water collected in the open cut extraction pit and/or dirty water dams will be used, as much as possible, for dust suppression purposes. This is the preferential use of water on-site to minimise the chance of pollution to downstream waterways.
6. Sediment control structures will be maintained to ensure the design capacities are preserved for optimum settling rates. This will be most critical for those 'end-of-line' sediment basins that discharge from the Project Site.
7. Implementation of an effective revegetation, maintenance and monitoring program.

The key changes proposed to be integrated into the existing surface water management system in order to effectively cater for the Rocglen Extension Project are:

- Additional water management controls to deal with water from the increased disturbance footprint in the northern area of the site;
- Additional water management controls to address TSS issues during wet weather discharge;
- Relocation of the Mine Water Dam; and
- More effective diversion of clean water from off-site catchments to the east.

Following Project Approval, a new *Site Water Management Plan* will be prepared to cater for the expanded mine operations in accordance with regulatory requirements and the *Blue Book (Volume 1 and Volume 2E)*.

To protect the quality of local surface water resources, Whitehaven will continue to employ the following mitigation measures for the Rocglen Extension Project:

- All hydrocarbon products will be securely stored;
- All of the mining fleet will be refuelled within designated areas of the Project Site;
- With the exception of some maintenance activities on mobile equipment, all maintenance works requiring the use of oils, greases and lubricants would be undertaken within designated areas of the Project Site;
- All water from wash-down areas and workshops would be directed to oil/water separators and containment systems;
- All storage tanks will be either self-bunded tanks or bunded with an impermeable surface and a capacity to contain a minimum of 110% of the largest storage tank capacity;
- Chemical flocculation to help increase the settling times of the sediment (TSS) in the water column will also be employed as required;
- As required, appropriate drainage structures and erosion and sediment controls will be installed and maintained; and
- Efforts will be undertaken to ensure that any water discharged from the Project Site via the LDPs meets the quality limits imposed by the DECCW on the site's EPL.

#### **Site Water Balance and Discharge**

The following will be considered and, where appropriate, adopted by Whitehaven to improve site water balance and minimise uncontrolled overflow discharges:

- The proposed dams will be built to at least the specified sizes, and made larger where practical to provide additional storage in order to further reduce the chance of uncontrolled overflow discharge. Increasing the total storage will provide opportunity to retain and treat water prior to controlled discharge;
- Water will be promptly transferred amongst sediment basins to ensure the maximum available on-site storage capacity of rainfall events is maintained; and
- That controlled discharge of treated (settled and/or flocculated) water will be undertaken to draw down the water storage within all the dirty water dams on-site, which will provide the capacity to contain the majority rainfall events and reduce uncontrolled overflow discharge.

Primarily it is the controlled discharge (of treated water) that will have the most significant impact on reducing the potential for discharge of sediment laden water. Whilst the overall discharge volumes will not change significantly, discharge in a controlled manner allows adequate settlement of sediment to be achieved prior to discharge.

### Drainage Lines

The Rocglen Extension Project will impact upon:

- Approximately 1 km of the head waters of Driggle Draggie Creek (first order) as a result of the expanded Northern Emplacement Area. The drainage line is currently heavily disturbed through past clearing practices associated with agricultural production combined with the construction of clean and dirty water storage dams along the drainage line;
- The upper section of the central unnamed drainage line (second order) where it exits the Vickery State Forest as a result of the expanded open cut pit. The drainage line is currently diverted north and into Driggle Draggie Creek via a temporary diversion and dams; and
- A disturbed section (approximately 125 metres) of the central drainage line within the expanded extent of the open cut pit. This section of drainage line to be removed is already heavily disturbed via the existing approved mining operations.

It is proposed that the upper section of the central drainage line be permanently diverted into Driggle Draggie Creek prior to disturbance. This will allow for the passage of clean water northwards around the open cut pit and the Northern Emplacement Area. The permanent diversion would join the existing alignment of Driggle Draggie Creek immediately downstream of the proposed disturbance areas and proposed Dam B, which is the proposed location for a new LDP (see **Section 7.5.7**). It will replace the existing approved temporary diversion and will also form the relocated alignment of the head waters of Driggle Draggie Creek that will be impacted upon by the Northern Emplacement Area.

It is also proposed that the majority of the central drainage line that lies outside the emplacement areas be reinstated as close as possible to its original path. All the affected drainage lines are in either the upper reaches of the catchment or have been previously heavily disturbed by agricultural practices and/or mining operations and are not considered to be of conservation significance. Despite this, it is proposed, where practical, that sections of drainage lines that are or will be impacted upon by the mining operation be rehabilitated post-mining. The rehabilitation program would seek to achieve a long-term enhancement of the ecological value of the drainage lines through the restoration of natural hydraulic conditions and appropriate revegetation of a riparian corridor.

The new *Site Water Management Plan* to be prepared following Project Approval will include further details on the drainage line rehabilitation works. Works within the restored drainage lines will generally be undertaken in accordance with Section 5.3.3 of the *Blue Book (Volume 1)* and the *Guidelines for Controlled Activities – In-Stream Works* (DWE 2008, as cited in GSSE 2010c) for watercourse rehabilitation and riparian zone rehabilitation. Key design elements of channel establishment works are listed in **Appendix M**.

### **Flow Regimes**

Clean water flowing onto the Project Site is proposed to be diverted around the disturbance areas into existing drainage lines. The clean water runoff from the eastern catchment will be diverted either north into Driggle Draggie Creek or south into the central unnamed drainage line. This will result in a large area of clean catchment being diverted around the site and into the natural drainage system rather than being held in the site water management system. The clean runoff from the west of the site originating in the Vickery Sate Forest will also be either diverted north or south into the same drainage lines.

As a result of the diversions, only runoff that lands within the proposed water management system of the Project Site will be contained for pollution control. This equates to an area of approximately 380 hectares at full development. This should help maintain ephemeral flows and sediment movement patterns in the watercourses downstream of the Project Site. It must also be noted that water of suitable quality contained within the water management system can be discharged when required through the LDPs under the provisions of the site's EPL.

### **Water Sources**

The majority of water required within the Project Site will be for dust suppression activities, including in the crushing and screening process. A nominal amount of potable water and water for ablutions is required on-site and will continue to be sourced from rainfall capture from the roofs of on-site buildings and trucked in from an external source.

Water sources for operational activities will be used in the following order of preference:

- Mine Water (via the Mine Water Dam);
- Dirty water from the sediment basins, preferentially sourced from the basins with higher EC readings;
- Licensed bores (via the Bore Pump Dam);
- Clean water within Maximum Harvestable Right Dam Capacity (MHRDC) (via storage dams); and
- Water occasionally trucked in from off-site as required.

### **TSS Mitigation Measures**

In addition to standard sediment control measures and progressive rehabilitation, it is recommended that mitigation measures be employed to improve the TSS levels within on-site water. Initially, sediment basins SD3 and proposed Dam B (all dirty water within the Project Site reports to one of these dams before exiting the site) will be drawn down and emptied at all times to allow for maximum runoff storage volume when the next rainfall event occurs and minimise the chances of a discharge off-site. It is Whitehaven's preference to promptly use any water that reports to either of these dams for dust suppression or pumped into other sediment basins around the site. However this will be influenced to a large degree by the volume of pit water stored in the Mine Water Dam, which will be utilised prior to utilising the water within SD3 and proposed Dam B.

Chemical flocculation to help increase the settling times of the sediment in the water column will also be employed as required. Tests using floc blocs have already indicated that TSS levels can be effectively reduced via chemical flocculation.

There are various other methods and techniques available to remove solids from sediment-laden water and the most appropriate will be determined for use on a case by case basis in conjunction with specialists and relevant government agencies.

## 7.5.7 Licensing Requirements

### Maximum Harvestable Right Dam Capacity

The MHRDC for the Project Site has been calculated by GSSE (2010c) to be approximately 32 ML. All existing clean water storage dams that will be used for water supply are within this volume, hence no licences are required for these existing dams.

### Dirty Water Dams

All the existing and proposed dirty water dams (sediment basins), as well as the Mine Water Dam, aimed at preventing the contamination of downstream waterways, are exempt from harvestable right calculations under the *NSW Farm Dams Policy 1999*.

The Bore Water Dam will be used as a 'turkeys nest' dam to contain water pumped from the licensed groundwater bores. It will not capture water from the natural catchment and is therefore also exempt from licensing under the *NSW Farm Dams Policy 1999*.

### Licensed Discharge Points

While LDP 11 will continue to be used at the southern end of the Project Site, LDP 12 will be superseded and require relocation due to the expanded Northern Emplacement Area. It is proposed that a new LDP to replace LDP 12 be positioned at the outlet of the proposed Dam 'B' located at the northern boundary of the Project Site to enable discharge into Driggle Draggles Creek. This will be undertaken in consultation with the DECCW.

## 7.5.8 Monitoring

The existing *Site Water Management Plan* (RCA Australia in conjunction with Soil Conservation Service 2009) comprises a *Surface Water Monitoring Program* that includes:

- Baseline data on surface water flows and quality in adjoining creeks and waterbodies that could be affected by the project;
- Surface water impact assessment criteria;
- A program to monitor the impact of the project on surface water flows and quality; and
- Procedures for reporting the results of this monitoring.

As outlined above, the Rocglen Extension Project will necessitate changes to the existing surface water management system. While many aspects of the current monitoring program will remain applicable to the expanded mine operation, it will be reviewed and updated to ensure changes to the surface water management system are accounted for. **Table 47** presents a summary of the intended surface water monitoring, as recommended by GSSE (2010c).

**Table 47 - Proposed Surface Water Monitoring**

Identification	Type of Monitoring Point	Pollutants	Frequency	Sampling Method
LDP 11	Wet Weather Discharge	Conductivity (µS/cm) Oil and Grease (mg/L) Total Organic Carbon (mg/L) Total Suspended Solids (mg/L) pH	Special Frequency 1 (all)	In situ
LDP 12	Wet Weather Discharge		Special Frequency 1 (all)	
Driggle Draggie Creek to the north of the Project Site	Baseline Data and Wet Weather Discharge (downstream of site)		Special Frequency 2 (all)	Grab sample
Un-named drainage channel to the south of the Project Site	Baseline Data and Wet Weather Discharge (downstream of site)		Special Frequency 2 (all)	Grab sample
Dam SD7 (eastern side of Project Site)	Baseline Data (upstream of site)		Special Frequency 2 (all)	In situ
Mine Water Dam	Water Quality	Aluminium Arsenic Bicarbonate Chloride Conductivity Iron Manganese Oil and Grease Sodium Total Organic Carbon Total Suspended Solids pH	Yearly Yearly Yearly Yearly Quarterly Yearly Yearly Quarterly Yearly Quarterly Quarterly Quarterly	Grab sample Grab sample Grab sample Grab sample In situ Grab sample Grab sample Grab sample Grab sample Grab sample Grab sample In situ

Special Frequency 1 – collection of samples as soon as practicable after each discharge commences and in any case not more than 12 hours after each discharge commences.

Special Frequency 2 – collection of samples quarterly (in the event of flow during the quarter) at a time when there is flow and as soon as practicable after each wet weather discharge from LDP 11 and LDP 12 commences and in any case not more than 12 hours after each discharge commences.

In addition to the monitoring required under the site's EPL, surface water monitoring is proposed for internal dams within the Project Site. This additional monitoring will allow the performance of the surface water management system to be assessed and enable implementation of additional controls if required. It will also allow for the monitoring of salt and alkalinity in dams collecting water from subsoils.

Whilst the continuation of water quality monitoring is recommended for the site, the establishment of volumetric flow monitoring at the Driggle Draggie Creek monitoring point and the southern drainage channel monitoring point is not warranted. These drainage lines are ephemeral and do not flow regularly enough to warrant the establishment and maintenance of flow gauging stations within those drainage lines.

The results of water quality analysis will be reported in the AEMR. In the event that an exceedance in surface water quality criteria is identified, the exceedance will be reported to the relevant agency in accordance with the requirements of the EPL.

## 7.6 Groundwater

Douglas Partners (2010) was commissioned to address hydrogeological (groundwater) issues associated with the Rocglen Extension Project. Douglas Partners (2010) confirmed and updated the conceptual hydrogeological model derived by RCA Australia for Rocglen in 2002 and 2007, and subsequently constructed and calibrated a revised numerical groundwater flow model in order to assess impact on the surrounding groundwater system and assess the quantum of groundwater seepage that may occur into the pit.

A copy of the *Hydrogeological Assessment* is contained within **Appendix R**, with the key assessment findings and recommendations summarised below.

### 7.6.1 Existing Environment

#### Aquifers

From drilling of coal exploration bores within the area, it is noted that groundwater is mainly limited to the coal seams (particularly the Belmont Coal Seam), which is considered to be the main aquifer zone within the Maules Creek Formation sequence. The Belmont Coal Seam is generally consistent in thickness and groundwater occurs in fracture cleat within the seam.

The other major aquifer of the region is the sand/gravel accumulations within alluvium associated with the Namoi River and associated tributaries. Alluvium abuts the Maules Creek Formation to the north and to the southwest of Rocglen Mine.

Previous testing by RCA Australia (2002 and 2007, as cited in Douglas Partners 2010) show that the coal seams are generally at least two orders of magnitude more permeable than the interburden strata.

#### Groundwater Levels and Flow Directions

RCA Australia (2007, as cited in Douglas Partners 2010) recorded groundwater levels in a number of bores throughout the region and calculated approximate reduced levels to a common datum. The reduced levels were then contoured to assess groundwater levels and flow directions.

Whitehaven has installed piezometers and has also monitored groundwater levels and quality in 13 private bores, which are known as WB-01 to WB-12, Yarrari Bore and Wundurra Bore. Bore WB-04 is not monitored due to casing around the bore preventing access. The locations of the monitoring bores are shown on **Figure 24**, and **Appendix R** contains summary detail and hydrographs.

The RCA Australia monitoring in 2007 included bores screened in the coal seams as they were within the mine footprint. The current monitoring bores generally do not intersect the coal seams as they are located outside the mining footprint (to avoid disturbance by mining) and, due to the geology, the coal seams are generally not present outside of the mine footprint.

Contoured groundwater levels (approximate) across the area prior to the commencement of mining, based on the current monitoring wells, suggests that the groundwater table is a subdued reflection of topography, and that groundwater flows from elevated areas east of the mine westward towards the Namoi River. The contoured groundwater levels are similar to those contoured by RCA Australia (2007). Of particular note is that the bores within the mine footprint, which were measured in 2007 were no longer available in 2008 as a consequence of mining commencing were not able to be used to calculate the contours. Reference to Table 6 of Douglas Partners' report (2010) indicates that for these bores the heads were generally in the range RL 252 to RL 258 in 2007. The contoured groundwater levels indicates interpolated groundwater contours in the range RL 255 to RL 260, which is similar to the heads measured in 2007.

### **Groundwater Recharge**

Hydrographs of groundwater levels presented in **Appendix R** show that recharge of the groundwater system in the vicinity of Rocglen is poor. No significant groundwater level rises in response to rainfall events are apparent in any of the hydrographs presented.

During the monitoring period, there have been a number of significant rainfall events which would be expected to result in groundwater recharge. In particular, the periods September to November 2008 and December 2009 and January 2010 recorded above average rainfall, yet groundwater level rises did not follow.

Poor recharge of the strata in the vicinity of Rocglen is probably a function of low permeability, in addition to the general exceedance of evaporation over rainfall.

### **Groundwater Quality**

RCA Australia (2007, as cited in Douglas Partners 2010) assessed baseline groundwater quality based on the laboratory analysis of 13 groundwater samples. Samples were analysed for alkalinity, aluminium, arsenic, chloride, EC, iron, magnesium, manganese, nitrates, nitrites, pH, potassium, sodium and sulphates. Based on this analysis, it was concluded that groundwater in the vicinity of Rocglen could be characterised as follows:

- pH ranging from 6.3 to 7.7 (essentially neutral);
- EC values indicate that the groundwater is brackish; and
- The groundwater is generally of a sodium-bicarbonate/chloride type.

The range of chemical parameters analysed for by RCA Australia (2007, as cited in Douglas Partners 2010) is somewhat limited, and Douglas Partners (2010) state that the 2007 characterisation cannot be relied upon without additional testing.

Since mining began, Whitehaven has periodically collected groundwater samples from a number of monitoring bores and had them laboratory analysed for an extensive range of chemical parameters. A total of 35 groundwater samples from 13 monitoring bores have been analysed since October 2008. The results have been analysed to calculate Percentage Reacting Values (PRVs) of major ions and assess water type. Key findings include:

- Sodium is the dominant cation with an average PRV of about 60%;
- Calcium and magnesium are also prominent cations in groundwaters from a number of monitoring bores with PRVs in excess of 25%; and
- Chloride and bi-carbonate are the dominant anions with average PRVs of 52% and 43%, respectively.

While the waters can generally be described as either sodium chloride or sodium bi-carbonate in type, the prominence of calcium and magnesium indicates a wide range of chemical types.

A significant range in water quality is characteristic of groundwater systems with low permeability, minimal flow and structural complexity.

**Appendix R** contains a comparison of average concentrations of all chemical parameters tested for from each of the monitoring bores with ANZECC (2000) guideline values for potable water quality and for livestock watering guideline values. Many of the groundwaters sampled exceed guideline values for potable water quality in terms of pH, salinity (EC and TDS), sodium, chloride, sulphate, ammonia, arsenic, iron, lead, manganese and nickel. In terms of stock watering guidelines, no guideline values are exceeded for the parameters analysed, with the exception of groundwater from Bore WB-5 which has an average salinity (TDS) value in excess of 5,000 mg/L.

### Groundwater Utilisation

Groundwater resources are used by landholders throughout the area for domestic use, stock watering and irrigation, with the major use being stock watering. Individual bore yields are generally low (less than 1 L/s).

Douglas Partners (2010) undertook a search of the NSW Government's Groundwater Database to identify groundwater users in the vicinity of Rocglen, with a total of 32 bores identified. Results of the database search show that bores in the region are on average 60 metres deep. Very few bores are greater than 100 metres depth or shallower than 30 metres. Bore yields average 0.5 L/s, ranging from 0.1 L/s to 1.3 L/s. The depth to the groundwater table is generally about 25 metres for most bores.

### Groundwater-Dependent Ecosystems

RWC (2007) reported no groundwater dependent ecosystems have been identified on or immediately surrounding the Project Site. As groundwater dependent ecosystems are typically associated with groundwater discharge zones, which are not present on or surrounding the Project Site, it is unlikely that the Project would impact on any (yet to be identified) groundwater dependent ecosystems.

RWC (2007) stated that the former NSW Department of Water and Energy (now part of the DECCW) advised that tree roots have been recorded within bores of the region to a depth of 30 metres, suggesting some degree of groundwater dependence. Geoff Cunningham Natural Resource Consultants (2007b) (as cited in RWC 2007) advised, however, that the vegetation communities found in and adjacent to the Project Site, most notably within the Vickery State Forest are highly unlikely to set roots at these depths and as such would not be dependent on groundwater. Douglas Partners (2010) reports that the depth to the groundwater table is generally about 25 metres for most bores.

## 7.6.2 Existing Groundwater Licences

Rocglen currently has three groundwater extraction licences, the details of which are summarised in **Table 48**.

**Table 48 - Groundwater Extraction Licences**

Licence Number	Date of Issue	Valid Until	Allocation (ML/year)	Conditions
Aquifer Interference (90BL254684)	May 2009	May 2014	700	Metering and annual reporting, development of model, monitoring of groundwater levels and quality.
Linked Groundwater Licence (90BL254758)	Jan 2010	Jan 2015	120 (total combined as linked licence)	Metering and annual reporting, development of model, monitoring of groundwater levels and quality.
Linked Groundwater Licence (90BL255249)	Jan 2010	Jan 2015		Metering and annual reporting, monitoring of groundwater levels and quality (requirements outlined in detail below).

Environmental monitoring for 90BL255249 licence includes the following conditions:

- Desired outcome - monitor and record environmental impacts on the local environment;
- Monitor the surface water level (SWL) and saturated thickness and water quality of the following registered bores:
  - GW050395, GW050166, and GW011066 on the Glenroc Property;
  - GW045621 on the Yarrowonga Property;
  - GW044068 and GW044069 on the Yarrari Property;
  - GW022319 on the Roseberry Property; and
  - GW013369 on the Brolga Property.

Timing – SWL and saturated thickness quarterly, water quality annually (subject to review).

- Construct and monitor the SWL of the three piezometers on proponent owned land between the open cut and the nearest non-project related groundwater bores. Timing - continuously (data logger) with downloads monthly;
- Monitor water quality of the in-pit sump. Timing - 6 monthly; and
- Prepare and implement a groundwater monitoring program, in consultation with DECC (now DECCW), DWE (now NOW) and DoP. Timing - before commencement of mining.

The bores required to be monitored as part of the program are listed in **Table 49**.

**Table 49 - Bores to be Monitored as Condition for Licence 90BL255249**

Bore ID	Whitehaven Number	Property	Depth	Aquifer
GW050395	WB02	"Glenroc"	36.6	Unknown
GW050166	WB03	"Glenroc"	18.3	Well - unknown
GW011066	WB05	"Glenroc"	47.9	Maules Creek Formation
GW045621	WB04	"Yarrowonga"	10.0	Unknown
GW044068	WB06	"Yarrari"	43.6	Maules Creek Formation
GW044069 <sup>1</sup>	Not Monitored <sup>3</sup>	"Yarrari"	47.9	Maules Creek Formation
GW022319	WB07	"Roseberry"	52.4	Maules Creek Formation
GW013369 <sup>2</sup>	Not Monitored <sup>3</sup>	"Brolga"	22.3	Unknown

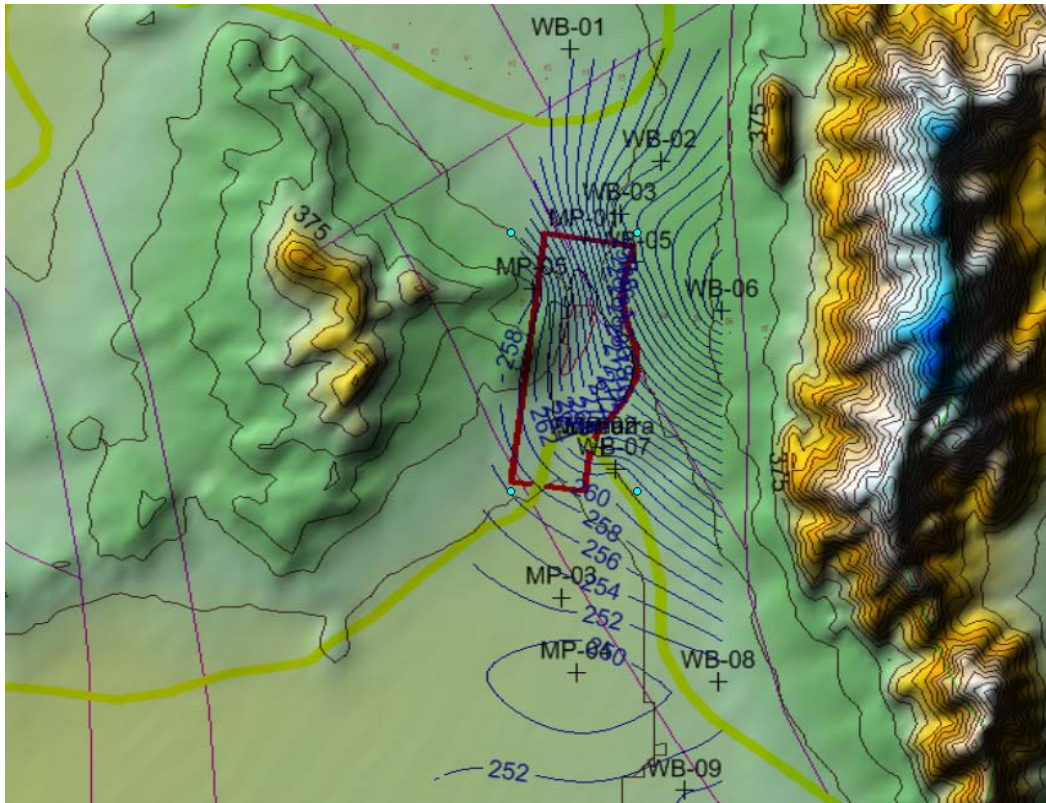
1 - closest monitored bore is WB06, ~0.48 km distant

2 - closest monitored bore is WB12, ~1.25 km distant

3 – bores are not serviceable and are not required to be monitored as part of Rocglen's *Site Water Management Plan*

### 7.6.3 Conceptual Modelling

The conceptual model for the groundwater flow at the site as presented by Douglas Partners (2010) is shown in **Figure 29**.



Source: Douglas Partners (2010)

**Figure 29 – Site Terrain and Groundwater Head Contours (m AHD) in July 2008**

This conceptual model is described by Douglas Partners (2010) as follows:

- Rainfall recharge occurs across the model domain;
- Flow from recharge on the eastern valley sides flows in a generally westerly direction towards the site. Flow at the southern end of this range is diverted in a south-westerly direction discharging towards the southern alluvium. Flow from the northern end of the range is diverted in a north-westerly direction towards the northern alluvium;
- A similar flow regime is expected to occur on the western side of the valley, with flow in a generally easterly direction. There is little groundwater data on the western side of the valley to fully characterise this, however the groundwater divide is likely to be offset to the western side of the valley due to the reduced relief on this side;
- The head in the northern alluvium is expected to be about 20 metres higher than the southern alluvium and there will also be some recharge to the site from the northern alluvium and discharge of flow from the site to the southern alluvium. It is noted that although WB01 is not screened directly in the alluvium, it is screened below the alluvium in the shale. Only a slight variation in head would be expected due to some limited vertical flow, and therefore WB01 is expected to give a reasonable representation of the head in the alluvium. The hydraulic gradient in the alluvium is generally expected to be low due to its relatively high permeability with respect to the coal measures rocks. In the southern alluvium there are indications of localised drawdowns (near MP-004) which are probably related to groundwater extraction.

It is noted that groundwater monitoring was prevented at times in WB07 because of the presence of a pump in the well and during the site visit high volume extraction was noted from several bores to the south of the site;

- Within the mine site the Glenroc and Belmont coal seams are the primary water bearing zones, with estimated permeability of at least two orders of magnitude higher than the surrounding strata. The seams are only present between the Belmont and Roseberry Fault, and also subcrop in several locations around the proposed extent of mining. The full extent of the seams within the areas between the faults has not been established, in particular to the south of the site, however is likely to be less than the full extent between the faults;
- Recharge into the coal seams is expected to occur from the northern alluvium and eastern and western valley sides and is expected to be impeded by the presence of faulting as discussed further below. Some very limited direct rainfall recharge on the site may also recharge the coal seams.
- Preferential flow is expected to occur within the coal seams below the site towards the south which eventually discharges into the alluvium through limited hydraulic connection. The coal will in essence act as a drainage blanket.
- The Belmont and Glenroc Coal seams are truncated by faulting and do not continue significantly to the east, west or north of the immediate mine site. The role that the faults are expected to play in the interaction between the coal seams and the surrounding strata are discussed as follows:
  - The Belmont fault immediately to the east of the site has no direct connection to the southern alluvium, however it does connect with the Mooki Thrust, further to the east, which does intersect with the southern alluvium several kilometres south of the site. The region where the faults are present to the east of the site is characterised by relatively high groundwater heads compared with heads within the coal seams at the site. This indicates that flow occurs from the strata to the east into the coal seams towards the west, however the connection seems limited, as evidenced by the elevated head to the east of the fault, suggesting the fault is having a damming effect rather than a draining effect. There is also no indication of a significant connection between the eastern faults and the southern alluvium. If a significant connection was present the faults would be expected to act as drains, leading to drawdown of head in adjacent strata and possible flow from the west towards the eastern fault; however this is not evident.
  - The fault immediately east of the site also connects with a lineament to the north of the site which does intersect with the northern alluvium. However, the groundwater contours indicate there is no significant hydraulic connection between the alluvium and the coal seam. There is a minor hydraulic connection between the northern alluvium and the coal seams, however it doesn't necessarily occur through the faulting. If a significant hydraulic connection was present, the heads in the coal seams below the site would be closer to the head in the northern alluvium. However, the head in the coal seams below the site are closer to those in the southern alluvium, suggesting more connectivity to the southern alluvium than to the northern alluvium.
  - The fault to the west of the site continues directly below the alluvium to the south. There are limited monitoring data to the west of the site and it is possible that the hydraulic connection between coal seams below the site could be at least partly due to preferential flow throughout the fault, however it would also be due to vertical flow between the strata separating the alluvium and the coal seams.

Based on the conceptual model, the impacts of mine drainage would be expected to be subdued due to the presence of faulting to the east, west and north of the site, effectively limiting any hydraulic connection between the coal seams within the site and the surrounding strata. There is likely to be some hydraulic connection between the coal seams and the southern alluvium. The degree of connection has been further assessed by numerical modelling, as presented in the following sections.

#### 7.6.4 Monitored Impact to Date

Using numerical modelling techniques, RCA Australia (2007, as cited in Douglas Partners 2010) in their original assessment predicted that over a seven year period of mining, inflows to the open pit would be as follows:

- During mine years 1 to 3 - average inflow of 1,643 m<sup>3</sup>/day (~19 L/s);
- During mine years 4 and 5 - average inflow of 2,235 m<sup>3</sup>/day (~26 L/s); and
- During mine years 6 and 7 - average inflow of 1,813 m<sup>3</sup>/day (~20 L/s).

RCA Australia (2007, as cited in Douglas Partners 2010) further considered that these inflows would be balanced by evaporation in excess of rainfall, and that as a result, net seepage into the pit would be limited and not noticeable.

While evaporation does exceed rainfall markedly on an annual basis, there are periods during the year, notably the months of June and July, where rainfall almost balances evaporation. During such times, a baseline inflow of the order of 20 to 25 L/s would be apparent. During the period of mining from mid 2008 to present, there have been a few such occasions where an inflow of the order of 20 L/s should have presented.

Whitehaven reported that there have generally been no noticeable inflows from the inception of mining to date, with the exception of the eastern extent where the seams dip and are locally deeper. Therefore, based on site observations it seems that the predicted inflows were slightly overestimated, although such flows have probably occurred for the locally deeper parts of the excavation.

Apart from the groundwater levels recorded for monitoring bore WB-05, which is likely to be anomalous and affected by nearby pumping, it is apparent that the mine has had very little impact on surrounding groundwater levels over the period mid 2008 to present.

Based on the monitored groundwater levels to date, it is considered that the RCA Australia (2007, as cited in Douglas Partners 2010) model over-predicts the mine induced impact on the groundwater system. This is likely to be because the model assumed that the coal seam was continuous beyond the site, and did not take account of the faulting, which is present.

In comparison with the extent of the approved Rocglen Coal Mine, the proposed expansion comprises a reasonably uniform increase around the existing perimeter and therefore is not expected to have a significantly different impact on groundwater flow directions.

#### 7.6.5 Numerical Modelling

In order to clarify the conceptual model outlined above in **Section 7.6.3**, a 3D numerical model was developed by Douglas Partners (2010) using the software Visual MODFLOW. The primary aim of the modelling was to assess potential impacts of the mine drainage on the aquifers, in particular the magnitude of interference to flow to the southern alluvium. The model domain was limited to the extent of groundwater monitoring data, as per the conceptual model.

##### Steady State Modelling

Steady state modelling was undertaken to replicate the groundwater heads measured in July/August 2008, prior to commencement of mining. Given it is possible to have differing sets of permeability/recharge data provide the same modelled outcomes, the model was run for a range of plausible parameters.

Two cases were modelled as follows:

- Case 1 - based on a best estimate of the permeability of the coal seams ( $1.0 \times 10^{-5}$  m/s / 0.86 m/day), from the well test data. The permeability of the overburden strata and recharge were then adjusted to match the observed head distribution; and
- Case 2 - permeability of the coal was set to a maximum credible value ( $4.6 \times 10^{-5}$  m/s / 4 m/day) and the permeability of the overburden and recharge were adjusted to fit the data.

A permeability of  $5.0 \times 10^{-5}$  m/s (4.3 m/day) was adopted as being typical of alluvial strata and to replicate the relatively low hydraulic gradients in the alluvium. The thickness of alluvium was based on bore logs from registered wells and typically ranged up to approximately 70 metres in the model domain. The extent of alluvium was based on the Namoi Alluvium mapping, however was extended slightly to the east as part of the calibration process.

For the above cases it was assumed that there was limited hydraulic conductivity across the faults, as per the conceptual model. In order to assess the possibility that the faults were in fact conduits for flow, a number of additional cases were modelled to assess the plausibility of the faults being conduits for flow:

- Case 1A – all faults high permeability;
- Case 1B – western and northern faults high permeability; and
- Case 1C – only western fault high permeability.

The faults were modelled with a hydraulic conductivity of  $1.0 \times 10^{-4}$  m/s.

For Case 1A, the presence of the faults resulted in heads to the east of the site being too low. If the recharge was then adjusted to increase the heads to the east, the heads in the coal seams below the site were too high. In essence, the high hydraulic gradient to the east of the mine could not be replicated.

For Case 1B the heads to the east of the site could be more closely replicated, however the heads in the coal seam were too high, and increasing the permeability of the fault lines actually made the heads higher rather than lower. This is because the strong hydraulic connection to the northern alluvium resulted in the heads in the coal seam being more an average of the heads in the north and south alluvium, which is not the case.

For Case 1C, it was possible to gain a calibration close to, though not quite as good a fit as Case 1. Case 1C did not require any restriction in flow between the coal seams and eastern strata as it was offset by the additional connection to the southern alluvium. Therefore Case 1C with a permeable fault to the west, connecting to the southern alluvium is considered a plausible alternative to Cases 1 and 2. The presence of permeable faults connecting to the alluvium to the east and/or north are considered implausible, based on an analysis of the data available

### **Transient Modelling**

The results of groundwater monitoring during the first year of operation of the pit indicated minimal impact on water levels and generally no observable or only slight inflows to the pit. The level of excavation during this period ranged down to about RL 200, however more generally in the range RL 220 to RL 240, and an average drainage RL of approximately RL 230 was modelled.

The model was run in transient mode, simulating a 12 month period, to allow calibration to the observed changes in head. Daily time steps were used.

The four cases were modelled as follows:

- Case 1 - upper bound permeability;
- Case 1C - upper bound permeability with permeable western fault;
- Case 2 - lower bound permeability; and
- Case 2C - lower bound permeability with permeable western fault.

The calibrated model flows into the pit are presented in **Table 50**. The model assumes an instant drawdown occurs, however, in reality the mining occurs over a period and the drawdown is more gradual. As the model simulates instant drainage, the initial flow rates are over-estimated. Therefore the first 50 days of calculations has been ignored for the purpose of the flow assessment.

**Table 50 – Calibrated Flow in Pit During First Year of Operation**

Flow into Pit	Case 1	Case 1C	Case 2	Case 2C
Initial (50 days)	2850 m <sup>3</sup> /day 33 L/s	2534 m <sup>3</sup> /day 29 L/s	1656 m <sup>3</sup> /day 19 L/s	1097 m <sup>3</sup> /day 13 L/s
Final (360 days)	1664 m <sup>3</sup> /day 19 L/s	1641 m <sup>3</sup> /day 19 L/s	607 m <sup>3</sup> /day 7 L/s	509 m <sup>3</sup> /day 6 L/s

Observations from the mine were that there was generally no seepage observed in the pit during this time, with some localised seepage on the eastern side where the excavation was deeper and in this instance the flow may have been in the order of about 20 L/s.

The model simulates an average drainage level, however due to the steep dip of the seams, the drainage level will vary and in cases where the mining is locally deeper, such as along the eastern side, the flow rates will be above the average and visa-versa. Therefore the Case 2/2C calculated flow rates are considered more consistent with site observations. Flows in the range 19 to 32 L/s, as calculated for Case 1 would be expected to have resulted in clearly evident flows much of the time.

Subsequent records from the mine indicate that 23 ML has been pumped from the pit for the period August 2009 to July 2010, which is equivalent to 63 m<sup>3</sup>/day (0.7 L/s). Much of this is likely to have been from rainfall, which further supports that Case 2 conditions are more likely.

**Predictive Modelling**

The calibrated numerical models were used to simulate flow rates and drawdown in order to assess likely impacts of the Rocglen mine to the end of mine life. The mining sequence was split into two periods as follows:

1. Northern Mining Phase – to simulate mining in the northern parts of the pits anticipated to be from 2008 to Year 5 of the expanded operation, which is expected to be around 2015; and
2. Southern Mining Phase – to simulate mining in the southern parts of the pits anticipated to be from Year 5 to Year 10/11 of the expanded operation, which is expected to be around 2015 to 2020.

The pit was modelled as a material with a high permeability of 1.0 x 10<sup>-4</sup> m/s (8.6 m/day), commensurate with mine spoil.

The predicted drawdown at each of the groundwater monitoring wells, from the start of mining, is presented in **Table 51**.

**Table 51 - Predicted Drawdown at Groundwater Monitoring Points**

Monitoring Well	Case 1 (Case 1C) (metres)		Case 2 (Case 2C) (metres)	
	End of Northern Mining Phase	End of Southern Mining Phase	End of Northern Mining Phase	End of Southern Mining Phase
MP01	2.2 (1.9)	3.0 (5.2)	0.5 (0.5)	0.6 (3.7)
MP02	7.4 (6.5)	27.8 (30.0)	4.0 (3.2)	24.3 (32.1)
MP03	0.5 (1.8)	0.65 (2.4)	0.1 (0.6)	0.2 (1.4)
MP04	0.2 (0.1)	0.3 (1.9)	0.1 (0.2)	0.1 (1.0)
MP05	13.4 (8.7)	21.2 (24.7)	6.2 (2.7)	22.9 (9.9)
WB01	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
WB02	0.7 (0.6)	1.0 (0.7)	0.5 (0.4)	0.8 (0.3)
WB03	0.9 (0.6)	1.1 (1.9)	0.3 (0.1)	0.5 (0.3)
WB05	2.5 (2.8)	3.2 (5.4)	0.5 (0.5)	0.7 (1.6)
WB06	0.6 (0.6)	0.7 (1.7)	0.1 (0.1)	0.2 (0.1)
WB07	2.9 (3.3)	12.9 (20.9)	3.3 (1.3)	13.2 (14.0)
WB08	0.7 (0.4)	0.9 (2.1)	0.1 (0.1)	0.1 (0.3)
WB09	0.3 (0.4)	0.4 (2.3)	0.1 (0.1)	0.1 (0.2)
WB10	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
WB12	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)

**Table 51** indicates high drawdowns in close proximity to the mine site, up to approximately 30 metres near MP02 and MP05, with relatively low impacts to the east of the faulting. The predicted impacts on the alluvium are also low, however are slightly higher in the alluvium immediately south of the pit in the case that a permeable fault was present to the west of the site. The extent of the impacts on groundwater head are expected to be less than previously predicted by RCA Australia (2007, as cited in Douglas Partners 2010) for areas outside of the area of faulting.

**Table 52** presents the predicted flow rates into the pit for current mine operation, end of the Northern Mining Phase (anticipated to be around Year 5 of the expanded operation or 2015) and end of Southern Mining Phase (anticipated to be around Year 10/11 of the expanded operation or 2020). The table also includes the estimated interference that the mine drainage will have on base flows into the alluvium.

**Table 52 - Modelled Pit Inflows**

Time	Case 1 – Flow Components (m <sup>3</sup> /day) (Case 1C – Permeable Faulting)			Case 2 – Flow Components (m <sup>3</sup> /day) (Case 2C – Permeable Faulting)		
	Into Pit	Storage Loss from Alluvium	Reduction of Flow in Alluvium**	Into Pit	Storage Loss from Alluvium	Reduction of Flow in Alluvium**
Initial (50 days)*	2850 (2534)	189 (611)	1	1656 (1097)	66 (136)	<1
2009	1664 (1641)	419 (833)	4	607 (509)	70 (254)	<1
End of Northern Mining Phase	1105 (1326)	518 (809)	52 (30)	491 (516)	106 (243)	6 (2)
End of Southern Mining Phase	2614 (3381)	1206 (1932)	191 (187)	1057 (1504)	270 (751)	37 (25)

\* assumes instant excavation and over-estimates initial flow rates

\*\* measured at constant head boundaries

Flow rates are generally expected to decrease as mining continues in the northern end of the pit, however are expected to increase as the mining progresses to the south due to the increased area of the pit and because the flow is less restricted by the faulting to the north. The variations in flow between the various years will be less distinct than those predicted as the modelling assumed three distinct stages of mining, however in reality the sequencing will be gradual.

As the floor of the Belmont Seam ranges in elevation the flow rates into the pit will vary according to the depth of the seam. For areas where the seam floor is about RL 210, mostly on the central parts of the proposed mining extent, the flows can be expected to be less than the average predicted values and will probably generally not be visible in the pit due to evaporative effects. For deeper parts of the excavation the flow rates can be expected to be higher and free flow into the pit can be expected.

The predicted impact on flows to the alluvium is minor as most of the flow comes from storage, however as the life of the mine increases the influence of storage reduces and the impact of flows to the alluvium increases slightly. Impacts on storage in the alluvium occur in close proximity to the mine and the percentage contribution to the inflow to the mine from storage depends on the presence of permeable faulting to the west of the site. For possible permeable faulting to the west of the site or for the higher ranges of permeability with no faulting, the component of flow from alluvial storage is initially low and then ranges up to about 50 percent. For the more likely Case 2, with lower permeability and limited permeability faulting to the west of the site, the component ranges up to about 25 percent. The impact on flows/storage in the alluvium is primarily to the southern alluvium (at least 90 percent) as the northern alluvium is up gradient and essentially hydraulically separated.

The range of possible inflows to the pit, based on the credible range of parameters, ranges from 1,057 to 3,381 m<sup>3</sup>/day. Overall, the predictions for Case 1 are similar to the predictions of the previous modelling by RCA Australia (2007), however based on site observations to date it is considered that the Case 2 flows are more likely to occur. Therefore it is unlikely that the annual flow rates into the pit will exceed the existing groundwater interference licence of 700 ML/year (1,918 m<sup>3</sup>/day). It is noted however that there is some uncertainty in the site conditions, in particular to the south west of the site, and flows greater than 700 ML/year may be possible if adverse conditions occur. Therefore a robust on-going monitoring program and updating of the predictive model are recommended as mining continues.

### 7.6.6 Mine Closure

It is understood that the majority of the pit will be backfilled to an elevation above 250 metres AHD, with the exception of an area of about 38 hectares in the southern side of the pit where the surface levels will be in the range RL 220 to RL 250. It is expected that once mining is complete, recharge of groundwater and rainfall infiltration into the pit will result in the formation of a water table within the backfill. It is likely that this will eventually lead to the formation of surface water in the southern part of the pit with the locally deeper final surface level.

The inflow to the pit will be offset by evaporation from the area of surface water and therefore it is unlikely that the groundwater levels within the pit will ever fully recover to pre-development levels. It is estimated that the final equilibrium water levels will range between RL 220 and RL 245, however this may take 20 to 50 years to occur and would also be subject to variations according to climatic conditions.

The existing groundwater in the Maules Creek Formation is generally brackish with total dissolved solids in the range 1000 to 5130 mg/L. In general, the pore water in the backfilled mine spoil is expected to become less saline over time due to the percolation of rainfall through the spoil pile. The exception to this will be in the area of surface water in the non-backfilled portion of the pit. In this location, the salinity is expected to increase over time as the evaporation leads to a reduction in water volume and leaves the dissolved salt behind. The increase in concentration is expected to be generally isolated to the surface water in the locally deep area, with some minor mixing with the adjacent pore water in the mine spoil.

Consideration was given to raising the backfill levels such that surface water is never formed within the pit, thereby reducing evaporation and the associated increase in salinity over time. Calculations indicate that a final fill level of about RL 275 metres AHD is required to prevent surface water ever occurring. This level is above the pre-development groundwater level because the mine spoil will be relatively permeable and porous, and recharge rates into the mine spoil will be substantially higher than for the surrounding undisturbed ground. Such a high final ground level, well above pre-development groundwater levels, is understood to be impractical from a mine spoil management perspective.

It is considered that, although the proposed final void form will, over time, lead to increasing salt concentrations in the localised area of surface water within the final void, this will be of minimal impact outside the final void for the following reasons:

- The final void will behave as a groundwater sink. Therefore any increases in salinity within the sink will not affect the surrounding groundwater quality as the flow will be towards the area of higher salinity and not away from it;
- The surface water level at equilibrium will be below surrounding groundwater levels; and
- The surface water will be located within a small final void with relatively steep sloping sides. This small area will be unsuitable for alternative land uses which would be sensitive to the potential saline surface water

### 7.6.7 Management and Monitoring

The existing groundwater management strategies, mitigation measures and monitoring activities employed at Rocglen will continue to be implemented for the Rocglen Extension Project. In summary:

- All hydrocarbon products will be securely stored.
- All of the mining fleet will be refuelled within designated areas of the Project Site
- All water from wash-down areas and workshops would be directed to oil/water separators and containment systems.

- With the exception of some maintenance activities on mobile equipment, all maintenance works requiring the use of oils, greases and lubricants would be undertaken within designated areas of the Project Site.
- All storage tanks will be either self-bunded tanks or bunded with an impermeable surface and a capacity to contain a minimum of 110% of the largest storage tank capacity.

A revised groundwater monitoring program will be implemented to verify the predicted impacts on groundwater availability and develop, if required, mitigation measures to ensure that any reduction in available groundwater is replaced by a comparable water source or otherwise compensated. Replacement and/or compensatory measures would be developed in consultation with the relevant government agencies and effected landholder.

Groundwater monitoring undertaken since 2008 has been based on available existing bores in proximity to the mine site and several established bores for monitoring purposes. As recommended by Douglas Partners (2010), the following actions will be implemented to improve monitoring outcomes:

- The aquifer interval monitored by each of the bores is not known with certainty. Bores will be cleaned out (air-lift developed) and depth checked with a weighted tape. Bores will then be geophysically wireline logged (SP/SPR and Gamma) to confirm slotted intervals and the nature of the strata over slotted intervals;
- All monitoring bores will be surveyed for location and level (both ground level and the level of the Reference Point (RP) from which groundwater levels are measured);
- Monitoring of groundwater levels will initially be undertaken on a monthly basis for the first year of the expansion, after which the interval could potentially be relaxed subject to review of the results. In the longer term a monitoring interval of three months is anticipated. The current frequency of groundwater sampling and laboratory analysis of water samples will remain. Water samples will be analysed for all major ions, including carbonate; and
- Pressure transducers/dataloggers will be installed in monitoring bores MP-01 to MP-05 for the continual recording of groundwater levels. These instruments will be downloaded every 2 months. In the case of MP-04 and MP-05, these wells only just intersected the water table when installed and have been observed to run dry. On this basis, these bores will be deepened to at least 10 metres below the water table.

In order to address the concerns of the NOW in regard to the potential for impact on alluvial aquifers of the Namoi River and associated tributaries, and as recommended by Douglas Partners (2010), the following program of investigations will be undertaken:

- Bores MP-04 and WB-01 are nominally located within the alluvium south and north of the mine, respectively. Once this is confirmed through the activity recommended above, a second bore will be drilled adjacent to each of them, to a depth at which the base of the alluvium is intersected. This adjacent bore will be completed as a monitoring bore in the Maules Creek Formation and have a pressure transducer/datalogger installed for continuous water level monitoring. Such actions will need to be agreed to by the relevant landowners; and
- There is some uncertainty regarding the nature of the interface between the southern alluvium and the weathered conglomerate profile of the Maules Creek Formation at the southern end of the proposed pit. On this basis, a pair of piezometers will be installed immediately to the south of the proposed pit, one in the Belmont Seam and one in the alluvium/weathered conglomerate. Also, hydraulic testing will be undertaken on the bore in the alluvium/weathered conglomerate to allow refinement of the groundwater model in this regard.

Regular monitoring of both MP-04 and WB-01, the new piezometers immediately to the south of the pit, and their adjacent bores will assist in assessing the degree of hydraulic connection between the Maules Creek Formation and the alluvial aquifer.

## 7.7 Flora and Fauna

RPS (2010a) was engaged to undertake a flora and fauna assessment of the Rocglen Extension Project. The purpose of the assessment is to:

- Ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist on the site; and
- Provide information to enable compliance with applicable assessment requirements contained within the *Threatened Species Conservation Act 1995* (TSC Act), EP&A Act, the EPBC Act, and any other relevant state, regional and local environmental planning instruments.

In addition to a review of existing literature and available vegetation mapping, RPS employed a variety of field survey techniques while on site between the 8 and 12 February 2010 to record a representative sample of flora and fauna species across the site. The methodology was designed on previous ecological works undertaken on site, and to satisfy the *Threatened Species Survey and Assessment Guidelines* (DEC 2004, as cited in RPS 2010a). The surveys included a site inspection, flora surveys and various fauna survey methods including trapping, spotlighting and habitat assessments. Targeted searches for threatened flora and fauna species were also undertaken.

The key findings and recommendations of the *Flora and Fauna Assessment* (RPS 2010a) are summarised below. The full report within **Appendix K** should be referred to for full detail.

### 7.7.1 Existing Flora

The previous flora survey undertaken by Geoff Cunningham Natural Resource Consultants (2007b) described and mapped five vegetation communities within the Rocglen study area. These being:

- Narrow-leaf Ironbark – Pilliga Grey Box Community;
- Pilliga Grey Box – White Cypress Pine Community;
- Pilliga Grey Box – White Box - Yellow Box – White Cypress Pine Community;
- Brigalow Community;
- Cleared Lands – used for grazing and / or cultivation.

Ground truthing of the vegetation within the Project Site, and within the adjacent “Yarrowonga” and nearby “Greenwood” properties, identified the following five vegetation communities:

1. Narrow-leaved Ironbark (*E. crebra*), White Cypress (*Callitris glaucophylla*) Open Forest;
2. Narrow-leaved Grey Box (*E. pilligaensis*), White Cypress (*Callitris glaucophylla*), Narrow-leaved Ironbark (*E. crebra*) Forest;
3. Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*) Inland Grey Box (*E. microcarpa*), Grassy Woodland (Endangered Ecological Community);
4. Brigalow (Endangered Ecological Community); and
5. Cleared land with scattered trees.

Following discussions with the DECCW during the development of the revised *Biodiversity Offset Strategy* (ELA 2010), the DECCW requested that vegetation communities 3 and 5 (above) be further investigated. Such investigations were undertaken during the development of the revised *Biodiversity Offset Strategy* by ELA (2010), with the two communities defined as follows:

3. Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*) Inland Grey Box (*E. microcarpa*), Grassy Woodland -
  - i Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101); and
  - ii White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions.
  
5. Cleared land with scattered trees -
  - i Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101) – Derived native grassland; and
  - ii White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions – Derived native grassland.

**Figures 30 and 31** illustrate the extent of these vegetation communities.

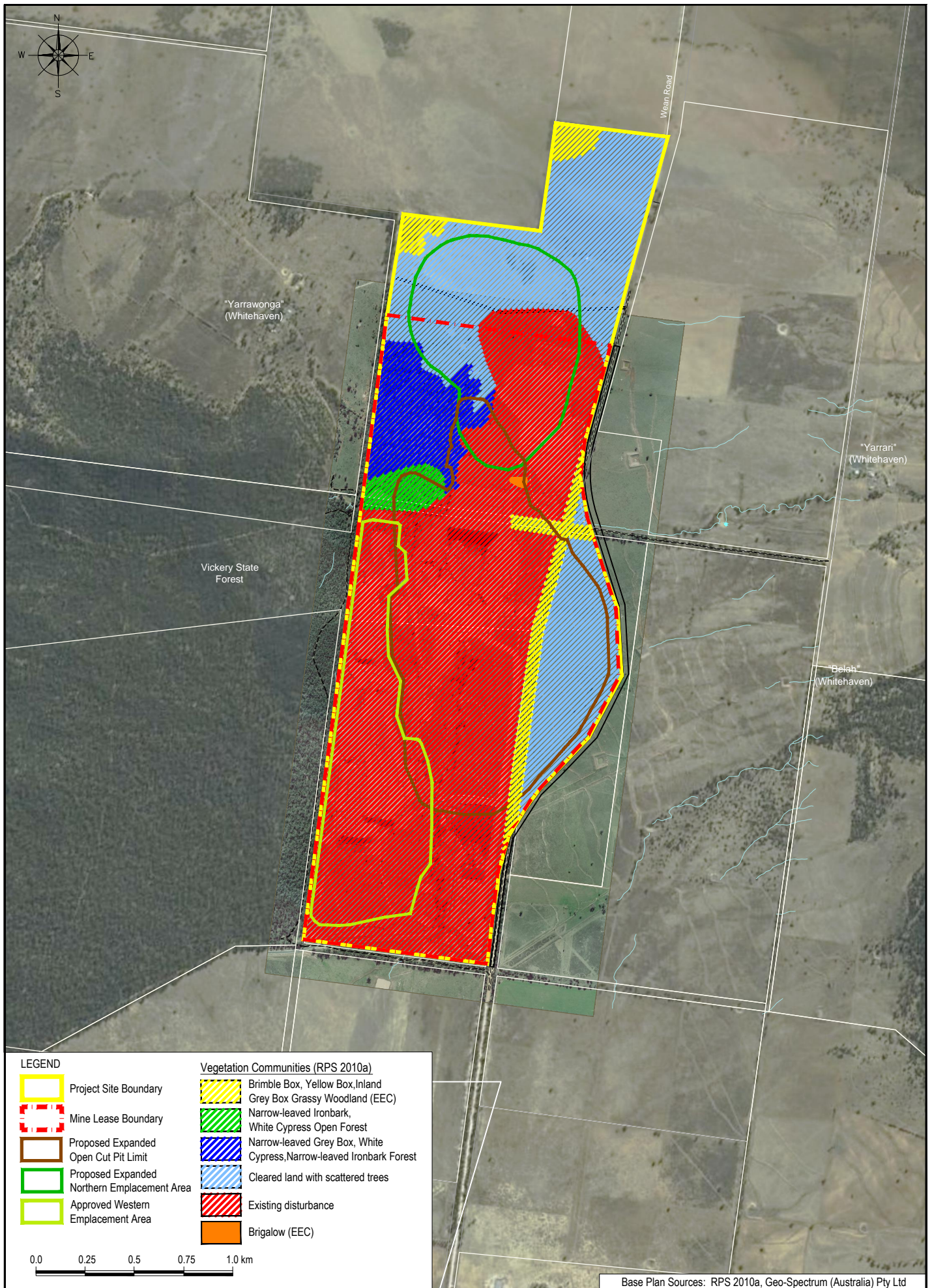
The Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*) Inland Grey Box (*E. microcarpa*), Grassy Woodland, as described and mapped by RPS (2010a) corresponds to the Endangered Ecological Community (EEC) known as White Box Yellow Box Blakely's Red Gum Woodland, which is listed within the TSC Act. This community also corresponds to the federally listed threatened community known as "White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland", which is listed as critically endangered within the EPBC Act.

The highly disturbed small patch of Brigalow, as described and mapped by RPS (2010a), corresponds to the EEC listed within the TSC Act known as Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions. This community also corresponds to the federally listed EEC (EPBC Act) known as "Brigalow (*Acacia harpophylla* dominant and co-dominant)". The Brigalow EEC is comprised of a stand of 38 old age Brigalow trees in a 0.14 hectare area. No other tree species were recorded and only a single species (Slender Bamboo Grass, *Austrostipa verticillata*) was recorded in the understorey. Given the depauperate state of the Brigalow patch, it is not considered as a viable ecological community into the future.

Suitable habitat for two cryptic threatened flora species, Finger Panic Grass (*Digitaria porrecta*) and Tricolour Diuris (*Diuris sheaffiana*), may occur in the local area. RPS (2010a) undertook the field surveys during the January to February flowering period for Finger Panic Grass (when it is most likely to be detected). Surveys for Tricolour Diuris during the flowering period of September to November were not possible, however the proposed removal of a relatively small area of 'moderate' potential habitat relative to the availability of nearby similar habitat areas would be unlikely to significantly impact the species.

All other species of threatened flora known or likely to occur in the local area are non-cryptic or were surveyed within their recommended survey period.

No threatened flora species were observed during previous flora surveys by Geoff Cunningham Natural Resource Consultants (2007b) or by the recent flora surveys by RPS (2010a).

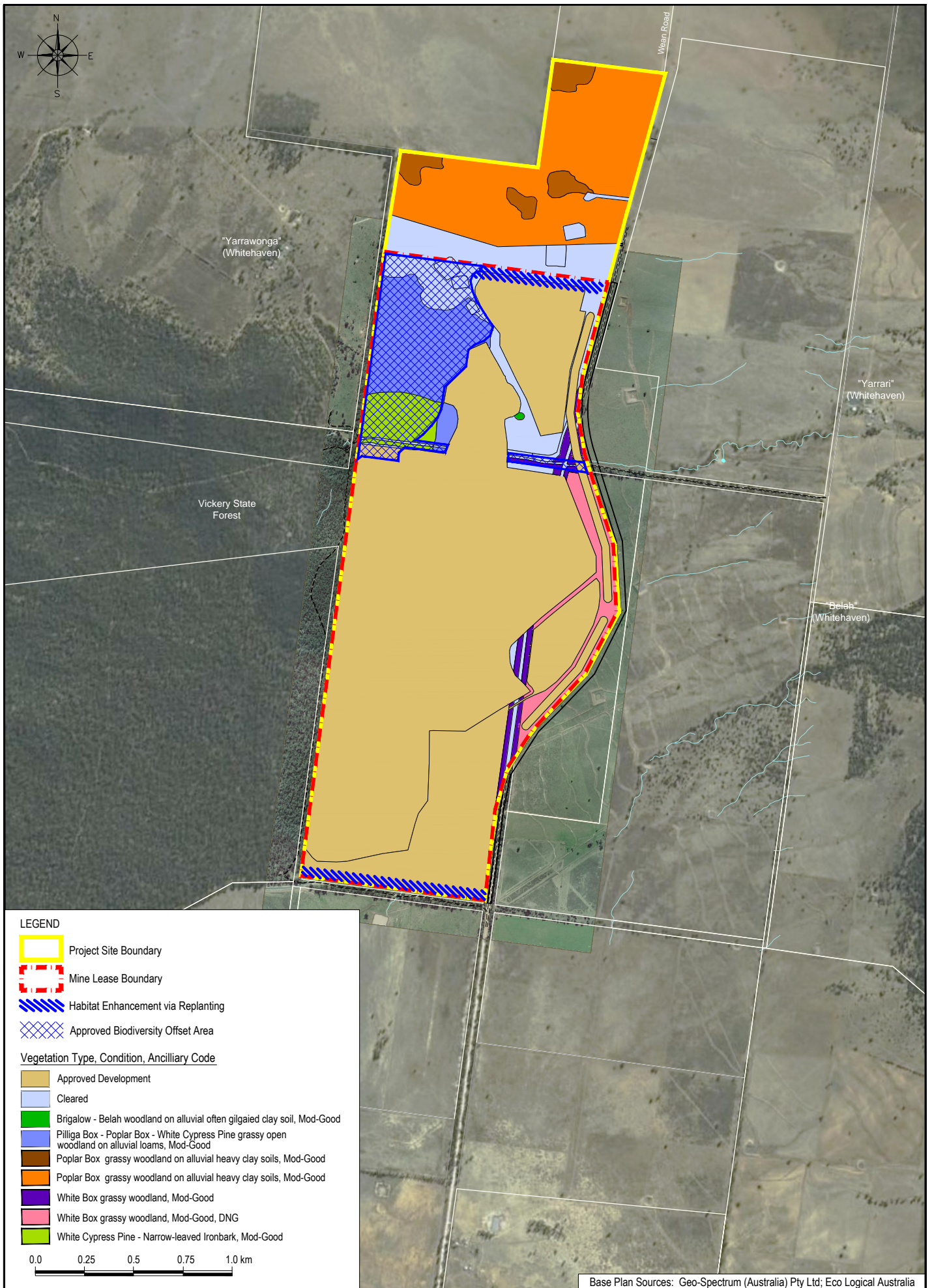


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Base Plan Sources: RPS 2010a, Geo-Spectrum (Australia) Pty Ltd

Rocglen Coal Mine Extension Project  
Vegetation Mapping (RPS 2010a)

**FIGURE 30**



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Rocglen Coal Mine Extension Project  
Biometric Vegetation Mapping (ELA 2010)

**FIGURE 31**

### 7.7.2 Existing Fauna

The previous fauna survey within the Rocglen study area undertaken by Countrywide Ecological Service (2007) found or detected the following threatened species on-site:

- Grey Falcon (*Falco hypoleucos*);
- Gilbert’s Whistler (*Pachycephala inornata*);
- Grey-crowned Babbler (*Pomatostomus temporalis*);
- Turquoise Parrot (*Neophema pulchella*);
- Hooded Robin (*Melanodryas cucullata*);
- Beccaris Mastiff-bat (*Mormopterus beccarii*); and
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).

The assessment for these species found that there was no significant impact likely to occur as a result of the proposed mine (Countrywide Ecological Services 2007).

A total of 100 fauna species were recorded by RPS (2010a) during field surveys in February 2010, comprising nine frogs, nine reptiles, 64 birds and 18 mammals. While no species listed on the EPBC Act were recorded, as listed in **Table 53**, five threatened fauna species listed on the TSC Act were recorded.

**Table 53 – Identified Threatened Fauna Species**

Scientific Name	Common Name	Property Recorded Within
<b>Vulnerable Species – TSC Act</b>		
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	Project Site
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	Project Site
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Neighbouring Land
<i>Stagonopleura guttata</i>	Diamond Firetail	Neighbouring Land
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Project Site

Potential habitat exists for a further 13 threatened fauna species listed on the TSC Act. Of the 14 threatened species and 10 migratory species listed on the EPBC Act protected matter database search results, none were identified in the Project Site. However potential habitat exists for two of the threatened species and seven of the migratory species.

### 7.7.3 Potential Flora Impacts

No threatened flora species were observed within the Project Site, and it is therefore considered that the Rocglen Extension Project will not have any significant effect on locally occurring threatened flora species.

#### **White Box Yellow Box Blakely’s Red Gum Woodland EEC**

It is expected that the Project will result in the removal of 5.9 hectares of the White Box Yellow Box Blakely’s Red Gum Woodland EEC along Wean Road (note that a large portion of Wean Road occurs within areas covered by the original mine approval) and Jaeger Lane, and 10.9 hectares of derived native grassland of the EEC from the within the Project Site.

Habitat critical to the survival of this EEC has not been gazetted within the TSC Act or EPBC Act. Therefore the Project is not likely to impact any habitat critical to this community.

The importance of the patch of White Box Yellow Box Blakely's Red Gum Woodland EEC to be removed is considered to be 'medium' due to a number of factors:

- Disturbances such as invasion by some common exotic pasture species;
- Trampling and grazing by livestock;
- Suppression of the shrub layer via grazing and other land management practices;
- Suppression of tree recruitment, also by grazing and other land management practices; and
- The area of EEC proposed for removal comprises the eastern most portion of a larger contiguous patch of woodland vegetation extending into Vickery State Forest.

The Project is not expected to extensively modify abiotic factors such as ground or surface water levels such that it affects other areas of White Box Yellow Box Blakely's Red Gum Woodland EEC.

The revised *Biodiversity Offset Strategy* (ELA 2010) contained within **Appendix L** and outlined in **Section 5.8** provides a 'maintain or improve' outcome for the removal of this vegetation community.

#### **Brigalow EEC**

A small stand (approximately 0.14 hectares) of Brigalow trees (*Acacia harpophylla*) is present within the proposed mine expansion area. The presence of this EEC is not definitive, due to its modified condition, but is indicative of the EEC "Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions EEC" listed under the TSC Act.

Two factors need to be considered where a highly cleared landscape is concerned, if that area is less than or equal to 4 hectares (DECC 2009, as cited in RPS 2010a). These are the contribution of the stand to regional biodiversity values and the viability of the stand. If both of the above factors are considered to be 'low', then the DG may consider that 'Red Flag' areas may not be impacted by a development if the overall impact can be regarded as improving or maintaining biodiversity values.

#### **Contribution to Regional Biodiversity**

While no other stands of this EEC exist at the development site, the actual extent of this community in the Gunnedah region is not known, although Benson et al. (2006, as cited in RPS 2010a) describes this EEC as occupying up to 18,000 hectares in the bioregion (which includes the Liverpool and Moree Plains). The removal of 0.14 hectares of this community is an extremely small reduction in the overall extent in the region/bioregion. In this case, its contribution to regional biodiversity values is likely to be low.

While the Brigalow stand groundcover is disturbed by exotic species invasion, and the native mid and groundcover species normally associated with this community are almost completely absent the over-storey is relatively intact, and so according to the criteria of the bio-banking assessment tool (DECC 2009, as cited in RPS 2010a) the vegetation must be considered to be in 'moderate to good' condition.

Analysis of local vegetation mapping failed to identify any areas of similar vegetation in the local area. Due to the small size and significant isolation of the Brigalow stand it is considered regionally unviable and thus regionally insignificant.

### **Stand Viability**

Given the past use of the area by cattle (causing ground compaction), the in-situ seedbank for this species is unlikely to be viable. Grazing has also ensured that regeneration of this community has not occurred. The absence of any signs of regrowth during a recent site inspection would confirm the above. The old age of the trees would also suggest that the end of their natural lifespan is close. In addition the native shrub and ground layer species associated with this EEC are completely absent within the subject site patch, in other words the community is represented wholly by the occurrence of only one species (*Acacia harpophylla*).

Given the location of the Project Site it is considered that this patch of Brigalow EEC is not at the limit of the known distribution for Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions. This EEC is known to occur within scattered locations over a wide range. The removal of this very small and floristically depauperate patch is not likely to have an adverse effect on the extent of the ecological community given that the stand is not considered to be ecologically viable.

Given the very poor biodiversity of the Brigalow patch and notwithstanding the possible rehabilitation of this community within offset areas, it is considered that the Project is not likely to further substantially and adversely modify the composition of the ecological community as it is already depauperate with regard to species composition. The Brigalow patch is already fragmented or isolated from other areas of similar vegetation and is unlikely to provide an adequate stepping-stone patch for any flora or fauna species specialising in this vegetation type.

The Critical Habitat Registers within the TSC Act and the EPBC Act do not list any critical habitat pertaining to the Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions EEC. Therefore, the Project is not likely to have any direct or indirect adverse effect on critical habitat for this EEC.

In summary, it is considered that the existing stand of Brigalow is not viable due to its small size, lack of recruitment, depauperate condition, isolation and lack of an adequately sized gene pool for continued survival.

There are currently no draft or final recovery plans for the Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions. The proposed removal of the small (0.14 hectare) patch of Brigalow would not be consistent with the general aims to protect, conserve and manage Brigalow within the state of NSW. However, the revised *Biodiversity Offset Strategy* (ELA 2010) contained within **Appendix L** and outlined in **Section 5.8** provides a 'maintain or improve' outcome for the removal of this vegetation community.

### **7.7.4 Potential Fauna Impacts**

While the removal of forest and woodland vegetation from the Project Site would displace a group of Grey-crowned Babblers and reduce the foraging area for one or more groups (pairs and trios) of Speckled Warblers, suitable areas of similar habitat occur within the adjacent "Yarrowonga" property. Both the Grey-crowned Babblers and Speckled Warblers were also recorded on "Yarrowonga".

The Varied Sittella and Diamond Firetail were recorded on "Yarrowonga" and likely also utilise the Project Site forest and woodland vegetation. Both species would be unlikely to be significantly affected by the Project due to the large amount of similar vegetation occurring on "Yarrowonga" and in Vickery State Forest.

The Yellow-bellied Sheath-tail-bat was identified on the Project Site from Anabat analysis. Due to a mechanical/programming failure no Anabat data was collected from "Yarrowonga" however, it is likely that the Yellow-bellied Sheath-tail-bat also occurs on "Yarrowonga" and across the Vickery State Forest. Due to the large areas of suitable habitat on "Yarrowonga" and in Vickery State Forest the Yellow-bellied Sheath-tail-bat would be unlikely to be affected by the Project.

The Project would be unlikely to significantly affect any threatened, migratory or protected fauna species occurring within the subject site.

### 7.7.5 Key Threshold Assessment

As required by the *Draft Guidelines for Threatened Species Assessment for Part 3A Applications* (DEC/DPI 2005, as cited in RPS 2010a), RPS (2010a) has provided the following assessment of Key Thresholds for the Project.

**1. Whether or not the Proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.**

It is considered that the information presented within the *Flora and Fauna Assessment* (RPS 2010a), combined with the revised *Biodiversity Offset Strategy* (ELA 2010), is likely to result in a maintained, if not an improved, long term outcome for biodiversity within the region.

**2. Whether or not the Proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.**

The threatened species, populations and ecological communities within the Project Site are, or are likely, well represented in the surrounding habitat areas of Vickery State Forest and Kelvin Aboriginal Area. The removal of the relatively small area of habitat for the Project is considered unlikely to reduce the long-term viability of any species, population or EEC.

**3. Whether or not the Proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.**

The threatened species, populations and ecological communities within the Project Site are, or are likely, well represented in the surrounding habitat areas of Vickery State Forest and Kelvin Aboriginal Area as well as the wider region. The removal of the relatively small area of habitat for the Project is considered unlikely to accelerate the extinction or place at risk of extinction any species, population or ecological community.

**4. Whether or not the Proposal will adversely affect critical habitat.**

There is no declared "Critical Habitat" within the Rocglen Coal Mine locality, and as such the Project will not adversely affect any such habitat.

### 7.7.6 Other Legislative Considerations

Considerations under the EPBC Act and SEPP No. 44 – Koala Habitat Protection have been made and are outlined in **Section 6.1.1** and **6.3.2**, respectively, and summarised below:

#### EPBC Act

An assessment of the applicability of the EPBC Act to the Rocglen Extension Project was included in the *Flora and Fauna Assessment* (RPS 2010a). RPS (2010a) undertook an on-line search of the EPBC Act Protected Matters Search database (3 January 2010) to generate a list of those matters of NES within 40 km of the Project Site. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed will have, or is likely to have, a significant impact upon a matter of NES, or on the environment of Commonwealth land.

A summary of RPS's (2010a) assessment of the eight matters of NES prescribed under the EPBC Act is provided in **Section 6.1.1**. Of particular importance is:

### **Nationally Listed Threatened Species and Ecological Communities**

*A total of 27 threatened species or ecological communities listed under the EPBC Act have been recorded or have suitable habitat within a 40 km radius of the subject site.... The potential for the Proposal to significantly impact on threatened species and ecological communities has been assessed in Section 6.0 (of RPS 2010a).*

*The Proposal will require the removal of approximately 5.9 hectares of the White Box, Yellow Box, Blakeley's Red Gum Grassy Woodland in the form of intact remnants along Wean Road and Jaegar Lane and 10.9 hectares of the community as derived native grasslands, and 0.14 hectares of the Brigalow (*Acacia harpophylla* dominant and co-dominant). ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of the above vegetation communities.*

*None of the 14 threatened fauna species listed on the EPBC Act were recorded during field surveys. Only two species were assessed as having a moderate likelihood of occurrence on the subject site (Large-eared Pied Bat and Greater Long-eared Bat). Given the relatively small area of potentially suitable woodland and forest habitat for the 14 threatened fauna species in comparison to the much larger provision of woodland and forest habitat in Vickery State Forest and surrounding rural properties, it is unlikely that the Proposal would significantly affect any of the 14 threatened fauna species. Additionally ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of potential habitat areas for threatened fauna species.*

### **Nationally Listed Migratory Species**

*A total of 10 migratory species listed under the EPBC Act have been recorded or have suitable habitat within a 40 km radius of the site. The Proposal is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.*

Following submission of a referral in late May 2010, the Rocglen Extension project was found to be considered a 'controlled action' under the EPBC Act. In summary, the then DEWHA advised the following:

*The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.*

*The project will be assessed through an accreditation of Part 3A of the New South Wales Environmental Planning and Assessment Act 1979.*

A copy of the letter and decision notice issued by the then DEWHA is contained within **Appendix N**.

### **SEPP No. 44 – Koala Habitat Protection**

As outlined in **Section 6.3.2**, an assessment of the applicability of the SEPP No. 44 – Koala Habitat Protection to the Rocglen Extension Project was included in the *Flora and Fauna Assessment* (RPS 2010a). In summary, RPS (2010a) determined that due to the relatively small area of forest and woodland vegetation within the Project Site in comparison to the area of also suitable forest and woodland vegetation in the adjacent Vickery State Forest, it is unlikely that the koala would be significantly affected by the Project.

## **7.7.7 Management and Monitoring**

All efforts will be made by Whitehaven to avoid disturbance of the vegetation communities within the Project Site and to maintain and enhance as much of the existing remnant vegetation on-site as possible.

Whitehaven already employs a range of complementary flora and fauna management strategies and mitigation measures and these will continue to be implemented for the Rocglen Extension Project.

As specifically recommended by RPS (2010a), the following mitigation measures will be implemented, in addition to the revised *Biodiversity Offset Strategy* (see **Sections 5.8** and **7.7.8**) and *Rehabilitation and Decommissioning Strategy* (see **Section 5.7**), to minimise the potential impacts of the Project on flora and fauna:

- A high level of hygiene will be adopted in respect to vehicle and machinery to help prevent soil-borne disease transmission and weed seed dispersal;
- Strict erosion and sediment control measures will be installed, monitored and maintained to prevent the erosion and sedimentation impact on adjacent areas;
- Dust control measures will be implemented to protect adjacent retained vegetation communities;
- The minimal practicable amount of clearing will be undertaken as a general objective, particularly within those areas that currently contain identified threatened species or ecological communities;
- Where possible disturbance areas will be fenced to protect adjoining vegetation prior to disturbance activities in order to reduce potential damage from uncontrolled or accidental access;
- Stockpiling of materials will occur within already disturbed areas;
- Weed management, monitoring and control practices will be implemented to minimise the spread of exotic species into natural areas within the site;
- A tree felling protocol will be developed to minimise harm to fauna species during clearing activities. The tree felling protocol will be developed by a suitably qualified and licensed ecologist with previous experience supervising the felling of trees. It is anticipated that the protocol will comprise the following key steps:
  - Establishment of the best time of the year for felling;
  - Pre-felling mapping of habitat trees;
  - Inspections of trees on the day of felling;
  - Procedures for the safe removal of fauna species from trees prior to and post felling;
  - A relocation/release protocol;
  - Leaving the tree overnight where it fell; and
  - A protocol for the salvaging of tree hollows for rehabilitation works where necessary.

Where possible, tree felling will be supervised by the ecologist that developed the tree felling protocol or by another suitably qualified and licensed ecologist;

- Where trees are to be removed an assessment of the surrounding level of tree hollow provision will be undertaken by a suitably qualified ecologist in order to determine the need for local supplementing of tree hollows (using salvaged tree hollows or nest boxes);
- Mature and hollow-bearing trees will be retained wherever feasible within the site;
- Vegetation to be removed will be clearly marked in the field using temporary fencing (flagging tape or similar) so that the boundaries are clearly established and to minimise the potential for equipment to accidentally enter areas to be retained;
- Where possible, the timing of clearing activities will be undertaken at such times to avoid removal of hollow-bearing trees during breeding season of threatened species; and
- Regular monitoring of the vegetation within the Project Site and offset areas will be undertaken in order to enable effective management with regards to rehabilitation (planting), regeneration, watering, fencing and weed control.

Many of the above mitigation measures are part of Whitehaven's pre-clearance procedures adopted at Rocglen.

### 7.7.8 Revised Biodiversity Offset Strategy

The direct and indirect impacts to threatened species, populations and ecological communities and their habitats as a result of the Rocglen Extension Project are documented in the *Flora and Fauna Assessment* (RPS 2010a), as outlined in the above sections.

To address and offset these impacts, and as outlined in **Section 5.8**, ELA was engaged to prepare a revised *Biodiversity Offset Strategy* that meets the offset requirements for an approval under the EP&A Act and the EPBC Act. ELA conducted a quantitative assessment of vegetation condition at the Project Site and adjoining properties ("Yarrowonga" and "Greenwood") utilising the BioBanking Assessment Methodology (DECC 2009) ('the BioBanking Methodology') from 20 to 22 October 2010. As recommended by DECCW, the BioBanking Methodology was used to 'inform' the 'improve or maintain' assessment and provide an indicative 'quantum' of area required to offset the impacts of the Project.

While not all vegetation within the Project Site is likely to be cleared, the *Flora and Fauna Assessment* (RPS 2010a) and revised *Biodiversity Offset Strategy* (ELA 2010) have been prepared on the assumption that all remaining vegetation will be cleared with the exception of approximately 30 hectares in the north-eastern corner of the Project Site encompassing a small area of Poplar Box Grassy Woodland. This approach has been adopted, regardless of whether the clearing/disturbance occurs, in order to allow more flexibility, if required, to site associated infrastructure and undertake site management in peripheral areas (for example, vehicle access and manoeuvring, surface water management and stockpiles). This approach will also provide flexibility if future geological exploration and economic modelling determine recoverable coal reserves within these peripheral areas, which, if approval was granted for extraction, would enable Whitehaven to further maximise coal recovery using existing infrastructure at an approved operation and also maintain the on-going socio-economic benefits of the mine for a longer period of time.

The *Biodiversity Offset Strategy* proposed for the Rocglen Extension Project, including replacement of original offset areas, is to retire the full 4,859 credit requirement as calculated by ELA (2010) from the Whitehaven Regional BioBank Site, which is in the final stages of registration by the DECCW as a BioBank Site under Part 7A of the TSC Act. It will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks via a BioBanking Agreement registered on the land title in-perpetuity.

In summary, the proposed *Biodiversity Offset Strategy* compensates for the direct loss of 95.44 hectares of vegetation in various condition states (intact and DNG) and replacement offsets for impacts to 47.9 hectares of the 131.74 hectares of approved offsets on a 'like for like' basis with over 525 hectares of vegetation in the Whitehaven Regional Biobank Site. The *Biodiversity Offset Strategy* provides an offset (525 hectares) to impact (110.44 hectares comprising 95.44 hectares of impacts for mine extension and the equivalent of 15 hectares of original impacts which now needs a replacement offset) ratio of 4.75:1.

The improvements in conservation values at the Whitehaven Regional Biobank Site (through the cessation of current grazing and implementation of conservation management practices, including enhancement tree and shrub planting and weed control) will lead to an 'improve and maintain' conservation outcome.

The retirement of the 4,859 credits brings the total number of credits proposed to be retired within the Regional BioBank Site to 10,154 out of the total 13,754 generated (ELA 2010) or 73.83%.

For further details, refer to the *Biodiversity Offset Strategy* contained within **Appendix L** and the detailed summary contained within **Section 5.8**.

## 7.8 Aboriginal Heritage

An assessment of Aboriginal cultural heritage issues associated with the Rocglen Extension Project has been undertaken by RPS (2010b). A copy of the *Cultural Heritage Survey and Assessment* is contained within **Appendix O**, with significant findings and recommendations summarised below.

The report has incorporated an environmental and archaeological regional context assessment, detailed literature review of previous archaeological and historical studies relevant to the Project Site, a search of the DECCW Aboriginal Heritage Information Management System (AHIMS) database, mapping and a field survey. RPS (2010b) states that the assessment report has been written in accordance with the NP&W Act and meets all of the requirements of the NPWS (1997 survey and assessment writing guidelines).

Whitehaven prepared an *Aboriginal and Cultural Heritage Management Plan* (ACHMP) in 2008 in accordance with PA 06\_0198. This ACHMP covers the entire mining lease and the majority of the Project Site. Since that time, the sites identified as B1, B2 and B3 have been salvaged under PA 06\_0198.

### 7.8.1 Aboriginal Community Consultation

RPS (2010b) followed the schedule for Aboriginal community consultation and archaeological survey methodology outlined in the ACHMP (Whitehaven 2008c). As outlined in **Section 2.3.4**, consultation with Aboriginal stakeholders was in accordance with the DECCW's 2004 *Interim Community Consultation Requirements* (ICCRs).

As listed in **Section 2.3.4**, there were 12 Aboriginal stakeholder groups that registered an interest in consultation for the Project following the advertisement and notification process commenced in January 2010 under Stage 1 of the ICCRs. Letters in accordance with Stage 2 of the ICCRs were sent to the registered stakeholders advising of the survey and detailing the proposed survey methodology. The Red Chief Local Aboriginal Land Council (RCLALC), Bigundi Biame Gunnedarr Traditional People (BBGTP), Gunida Gunya Aboriginal Corporation (GGAC) and Min Min Aboriginal Corporation (MMAC) participated in the field survey that was undertaken on the 2 March 2010.

RPS provided a copy of the draft *Cultural Heritage Survey and Assessment* to the RCLALC, BBGTP, GGAC and MMAC for review and comment, in accordance with Stage 3 of the ICCRs, on the 6 May 2010. Three written responses were received by the 4 June 2010, with the fourth response received by the 10 June 2010. The Consultation Log and received Aboriginal community responses are contained within the *Cultural Heritage Survey and Assessment* (RPS 2010b) in **Appendix O**.

### 7.8.2 Existing Environment

Regionally, the Project Site is incorporated in the Barwon Basin region, which is formed by the Bogan, Macquarie and Castlereagh Rivers flowing north and the southwest Namoi and Barwon Rivers. Aboriginal occupation along these river systems and its tributaries was geared towards the river channels and lakes and their aquatic resources.

The archaeological reports reviewed by RPS (2010b) and the AHIMS search (see below) found that the most commonly occurring site type associated with the Rocglen Coal Mine region is artefact scatters. Scarred trees were the second most commonly occurring site type, with some scar tree sites also incorporating artefact scatters. The implication for the Project Site is that there is a high probability that artefact scatters will occur given the proximity of local creek lines and tributaries. Scar trees have also been identified in the region close to permanent water supplies.

### **Aboriginal Heritage Information Management System**

A search of the DECCW's AHIMS was conducted over a 10 km radius encompassing the Project Site and immediate surrounds. The AHIMS results support the suitability of the regional area for the occurrence of artefact scatters, with a total of 12 sites recorded on the AHIMS database. Also recorded in the area were a number of scarred tree sites (n=9) and scarred trees sites incorporating artefact scatters (n=4). A grinding groove site was also identified which incorporated an artefact scatter (n=1).

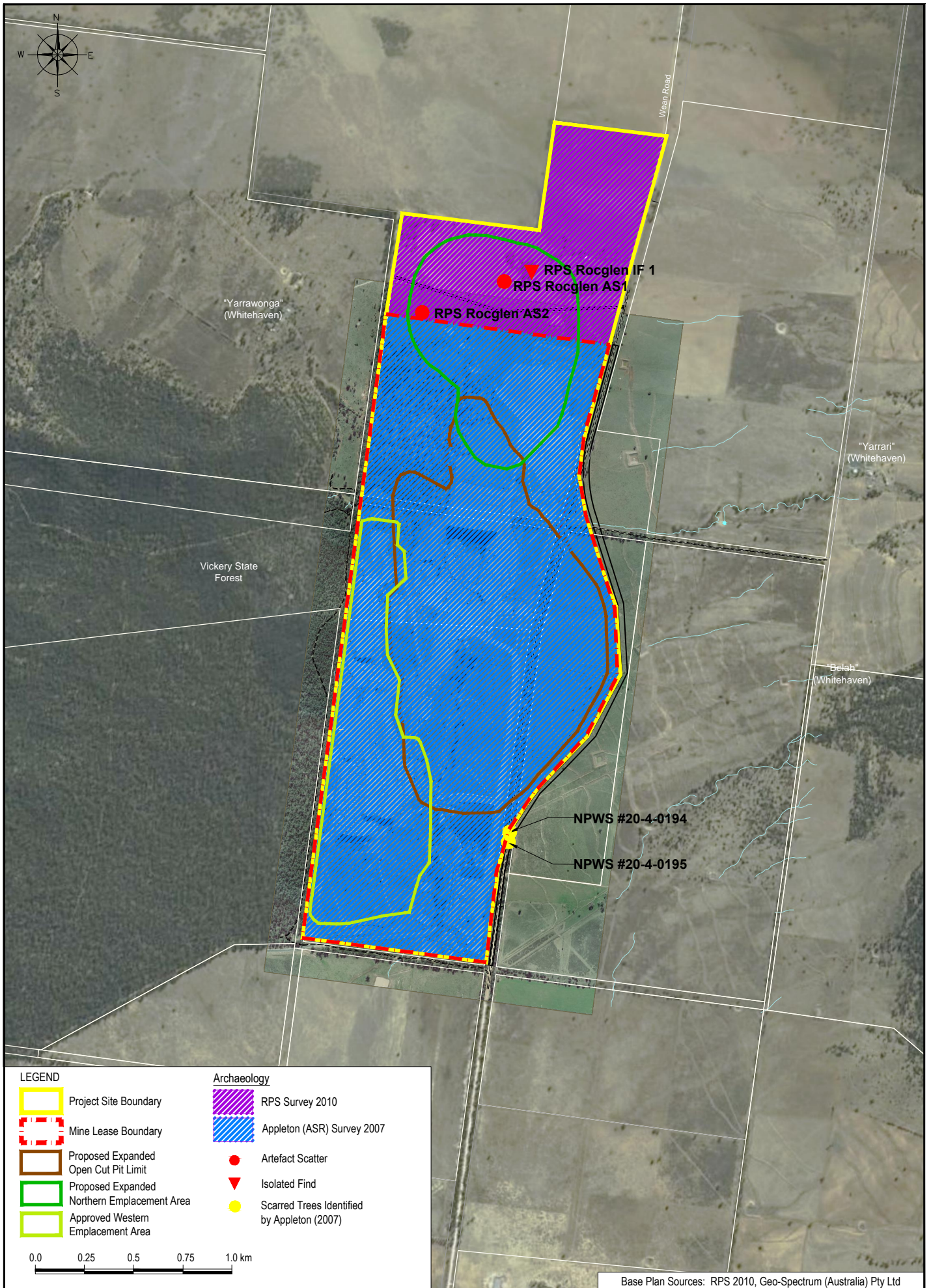
The results of the AHIMS search show that it is unlikely that shelter sites will occur in the Project Site due to the localised low lying landscape and the lack of rock outcrops where such sites may have been possible. In contrast, the State forests to the east and west have the potential for shelters because of the mountainous topography and potential availability of suitable outcropping rock. Midden sites have potential in the area as long as there is fresh water shell fish accessible in local rivers and creek systems. Exposed sandstone along these river and creek systems and other tributary drainage lines are potential areas for grinding groove sites in the locality. Scar trees in the area that may have been utilised for making canoes are likely to be in close proximity to water, whereas trees that were used for making shields or coolamons may have been some distance from water on a variety of landforms (DEC 2005, as cited in RPS 2010b).

### **Field Survey**

In August 2007 Whitehaven engaged Archaeological Surveys and Reports (ASR) to conduct an assessment of the potential impact of the original Rocglen Coal Mine development proposal on Aboriginal heritage. The extensive archaeological field survey undertaken with members of the Red Chief Local Aboriginal Land Council covered predominantly common ground to the recent survey by RPS (2010b) except for some of the area proposed to be disturbed by the expanded Northern Emplacement Area. Archaeological surveys are considered as being current for up to five years by the DECCW. As such, the RPS methodology for archaeological ground survey focussed on those areas not already covered by ASR two and a half years earlier.

RPS (2010b) undertook an archaeological survey of the area shown on **Figure 32** on the 2 March 2010. Survey team members included site officers of RCLALC, BBGTP, GGAC and MMAC, together with RPS Archaeologists. The strategy for field survey was to comprehensively cover all ground surface areas by means of a pedestrian survey and vehicular survey. The field survey equally targeted areas offering good ground surface visibility as well as more vegetated locations. Exposure included unformed livestock and vehicle tracks, areas absent of grass cover under trees, along fence lines and dam walls.

In summary, and as identified on **Figure 32**, three stone artefacts sites were located during the survey, comprising one isolated find and two artefact scatters.



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Rocglen Coal Mine Extension Project  
Archaeological Survey and Aboriginal Sites

**FIGURE 32**

The isolated find identified as **RPS Rocglen IF1** was located in the western section of Survey Unit 3 within a large cluster of eucalypt trees. The artefact is a chalcedony flake with a banded quartz vein.



**Plate 1 - RPS Rocglen IF1 identified in Survey Unit 3**

The artefact scatter identified as **RPS Rocglen AS1** was located in Survey Unit 4 on the western side of the north to south fence line in an area of exposed B Horizon soils. AS1 contained flake pieces comprising mudstone, chert and grey silcrete.



**Plate 2 - RPS Rocglen AS1 identified in Survey Unit 4**

The artefact scatter **RPS Rocglen AS2** was located in the western extent of Survey Unit 5 in exposed soils adjacent to an inundated area. The scatter contained flaked pieces of greenstone and chert.



**Plate 3 -RPS Rocglen AS2 identified in Survey Unit 5**

Results of the field survey showed that there are no permanently flowing rivers or creeks in the Project Site. An ephemeral first order stream of Driggle Draggie Creek flows from the north west out of the Project Site. The three Aboriginal sites recorded on the field survey may have been associated with the fresh water reserves of this first order stream, but the consequence of seasonal weather conditions and agricultural activity in the area may result in the context of the sites being altered.

Further to the above finding, two scarred trees identified on the AHIMS as NPWS #20-4-0195 and NPWS #20-4-0194, recorded by Appleton (2007), are located on the eastern side of Wean Road reserve. The location of these scarred trees is shown on **Figure 32**.



**Plate 4 – Scarred Tree - AHIMS NPWS #20-4-0195**



**Plate 5 – Scarred Tree - AHIMS NPWS #20-4-0194**

### 7.8.3 Significance Assessment

The archaeological significance given to a site or area in the absence of identified sites is based on several criteria detailed below. This criterion has been used to ascertain the archaeological significance of the isolated find and two artefact scatters as identified for the Rocglen Extension Project.

**Rarity:** The isolated finds and two artefact scatters were located on a level plain landform associated with a first order stream of Driggle Draggie Creek which drains the north western section of the Project Site. All three sites would be considered to be of low rarity.

**Representativeness:** Artefact scatters are representative of the most common site found across the local and regional area. Isolated finds are very few in the local and regional area. In this instance, the artefact scatter sites (RPS Rocglen AS1 and RPS Rocglen AS2) have the potential to be classified as low to moderate for representativeness of the site type and raw material identified present.

**Integrity:** The area surrounding RPS Rocglen IF1 has been subject to disturbances by grazing cattle and possibly water. Cattle movement in the paddock may have contributed to alteration in the site's location. RPS Rocglen AS1 and RPS Rocglen AS2 have been subject to water flow after heavy rain when the tributary would have been present and abundant. All three sites are considered to have low to moderate integrity.

**Connectedness:** The area and location of the new recorded sites on the survey are considered to have moderate significance for connectedness.

**Complexity:** The complexity of the artefact scatter sites can only be determined by the surface material. As there is no evidence of subsurface material in either of the artefact scatter locations, it is considered that the complexity of the artefact scatter sites be assigned as low. The isolated find (RPS Rocglen IF1) was identified in a heavily vegetated area amongst grass, leaf and bark litter. Evidence of subsurface material was not determined and no other surface artefacts were identified in the close locality. It is considered that the complexity of the isolated find site be assigned as low.

**Contribute to Knowledge:** The artefact scatters (RPS Rocglen AS1 and RPS Rocglen AS2) and isolated find (RPS Rocglen IF1) are all located in areas of moderate to high disturbance. The two artefact scatter sites have the highest degree of disturbance as they are located in eroded soil context in areas that are at risk of inundation in heavy rain periods. The isolated find would be classified as moderate disturbance as it is not at risk of inundation and is situated at the base of a cluster of trees. As these sites are located in a disturbed context, they have low potential to contribute to the archaeological record.

### 7.8.4 Management

The comments received on the *Cultural Heritage Survey and Assessment* (RPS 2010b) from MMAC, GGAC and BBTP do not raise any significant issues. BBTP did recommend that the three sites found undergo archaeological excavation. RPS (2010b) does not recommend for excavation to be carried out at Aboriginal archaeological sites RPS Rocglen AS1 and RPS Rocglen AS2 due to the highly disturbed context and no evidence of in-situ archaeological items. However, in the case of RPS Rocglen IF1, the DECCW may consider subsurface investigation to be limited in this area.

All efforts will be made by Whitehaven to minimise disturbance within the Project Site. Rocglen already operates under an ACHMP (Whitehaven 2008c) and a range of management strategies and mitigation measures are employed. These will continue to be implemented for the Rocglen Extension Project.

The management requirements that stem from RPS's (2010b) archaeological assessment are based on the legislation designed to address the impact of development upon sites of cultural significance. As recommended by RPS (2010b), Whitehaven will implement the following management actions:

**Recommendation 1 – Aboriginal Community Consultation**

Liaison established with the registered Aboriginal stakeholders and other interested parties during the assessment will be maintained until all issues in relation to the management of Aboriginal cultural heritage have been resolved.

**Recommendation 2 – Aboriginal Archaeological Management**

Subject to the works associated with the expanded Northern Emplacement Area, if impact to RPS Rocglen IF1, RPS Rocglen AS1 and RPS Rocglen AS2 is unavoidable, a surface salvage will be undertaken in accordance with Section 3 of the ACHMP (Whitehaven 2008c). Artefacts salvaged will be transferred to relevant Aboriginal groups under a Care and Control Permit under Section 85A of the NP&W Act.

**Recommendation 3 – Aboriginal Archaeological Management of Wean Road Scar Trees**

Protective measures designed to prevent damage to the scarred trees (NPWS #20-4-0194 and NPWS #20-4-0195) will be enacted upon as per recommendations in Appleton (2007) and the ACHMP (Whitehaven 2008c). Whitehaven has restricted the proposed mine extension in this area and has committed to ensuring that no disturbance to the scarred trees or immediate surrounds will occur as a result of the Project. In short, the trees are not to be disturbed in any way and appropriate fencing and signage will be undertaken in consultation with the Aboriginal Community and the DECCW.

**Recommendation 4 – Drainage line in far north of Project Site**

In areas where surface excavation might occur in the future within 25 metres of the east-west oriented drainage line, Whitehaven will follow protocols in Section 4.1(iii) of the ACHMP (Whitehaven 2008c).

**Recommendation 5 - General**

In general during the course of the Project, if it is suspected Aboriginal cultural heritage material has been encountered, work will cease immediately in that locale. The DECCW, along with the RCLALC, BBGTP, GGAC and MMAC, will be notified. Works will only recommence when an appropriate and approved management strategy has been agreed to by all of the relevant stakeholders.

**Recommendation 6 - General**

In the event that skeletal remains are uncovered during operations, work will stop in the vicinity immediately and the NSW Coroner's Office and NSW Police contacted. If skeletal remains are deemed to be of Aboriginal origin, a representative of the local Aboriginal Community and the DECCW will be consulted.

## **7.9 European Heritage**

An assessment of European heritage issues associated with the Rocglen Extension Project has been undertaken by RPS (2010b) as part of the *Cultural Heritage Survey and Assessment*. The full assessment report is contained within **Appendix O**, with significant findings and recommendations summarised below.

### **7.9.1 Existing Environment**

The area has a history of pastoral use based on sheep and cattle grazing. There is potential for cultural remains from early or significant dwellings and farming structures such as sheds, fences and stockyards.

The unoccupied residence of the “Glenroc” property is in the northern sector of the Project Site. The residence, associated outbuildings, fences and structures were inspected by RPS (2010b) to determine if they were of heritage significance.



**Plate 6 – Unoccupied “Glenroc” Residence (view from south)**



**Plate 7 – “Glenroc” Outbuildings**

There are no known potential historic or archaeological elements in proximity of the Project Site. RPS (2010b) reports:

- There are no items on the State Heritage Register, which lists those places of State Significance recorded by the NSW Heritage Branch under the *Heritage Act 1977*;
- No items on the State Heritage Inventory, which contains items considered by local Councils to be of heritage value at the local level; and
- No items listed in the State Heritage database maintained by the NSW Heritage Branch, which lists all items that have been identified as of heritage value on LEPs throughout NSW.

### **7.9.2 Significance Assessment**

As outlined in **Section 5.9.4**, the Rocglen Extension Project proposes the removal of the “Glenroc” outbuildings within the northern extent of the Project Site in order to cater for the expanded Northern Emplacement Area. It is also likely that the unoccupied “Glenroc” residence further to the north, while outside of the proposed disturbance areas, will also be removed.

RPS (2010b) considers that the “Glenroc” residence was most likely constructed in the early to mid twentieth century together with associated outbuildings and fences. There was no evidence of an earlier house or buildings.

RPS (2010b) concludes that the “Glenroc” residence and associated outbuildings are not considered to have any historic significance. No other items of heritage significance were observed by RPS (2010b).

### 7.9.3 Management

While no European cultural heritage sites were located during the survey of the Project Site, as recommended by RPS (2010b), if significant European cultural heritage material is uncovered during site works, work will cease in that area immediately. An archaeologist will be contacted to assess the significance of the remains and works will only recommence when an appropriate and approved management strategy is instigated.

## 7.10 Visual Amenity

GSSE has undertaken a visual amenity assessment considering the post-mining outlooks from five residences (both privately owned and project-related) in close proximity to the mine. The purpose is to assess the visual amenity of the local setting, particularly that of privately owned residences, with the addition of the key elements associated with the Rocglen Extension Project and residual impacts following implementation of mitigation measures and site rehabilitation.

The following figures have been prepared to aid this visual assessment:

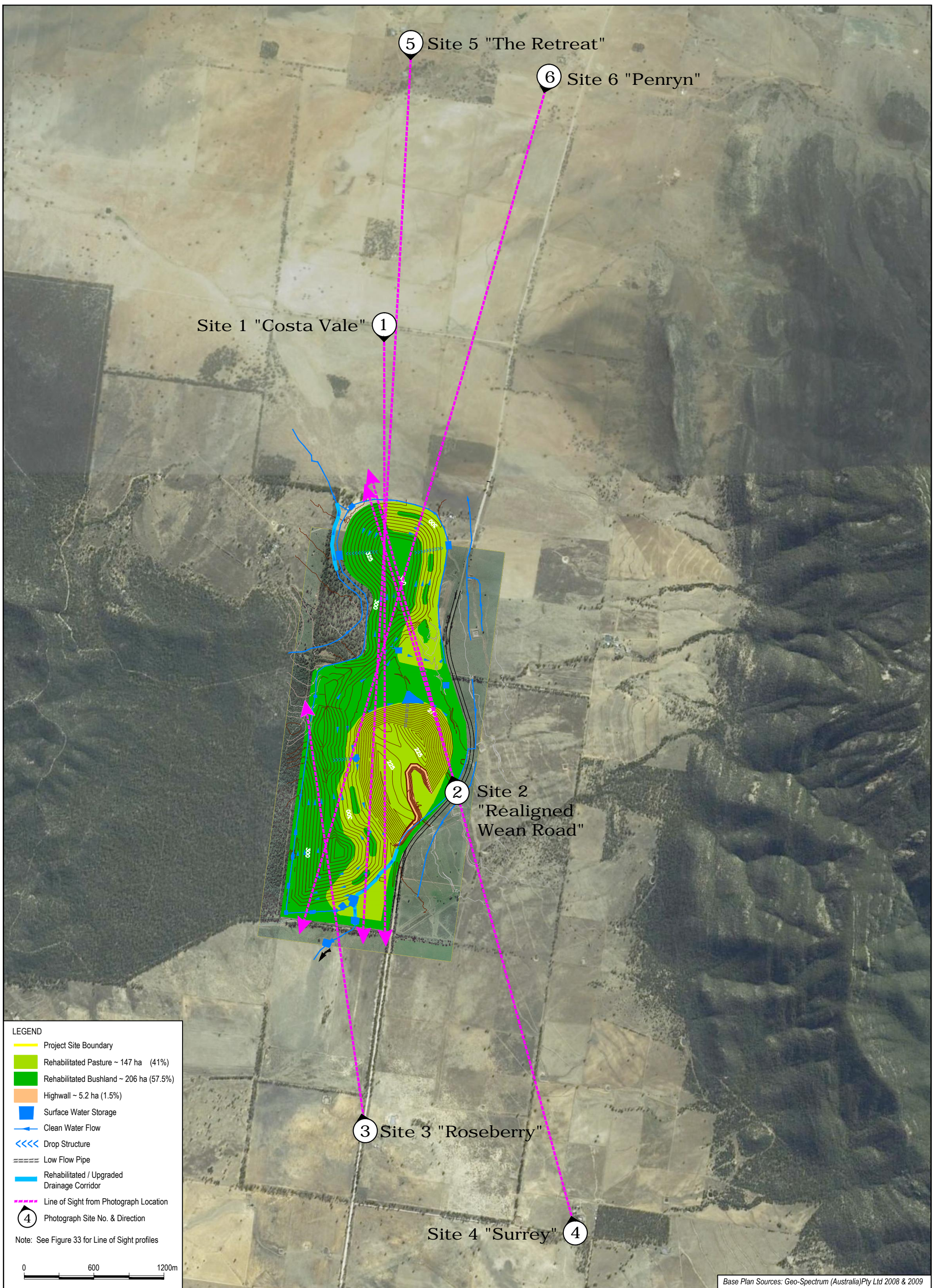
**Figures 33 and 34** – plans showing conceptual post-mining visual profiles from surrounding residences and the realigned Wean Road; and

**Figures 35 and 36** – plans showing conceptual photographic viewpoints from surrounding residences, comparing February 2010 outlooks to post-mining outlooks. The finished landform surfaces shown on **Figure 36** in a beige/tan (for identification purposes) will be rehabilitated and revegetated with woodland or pasture.

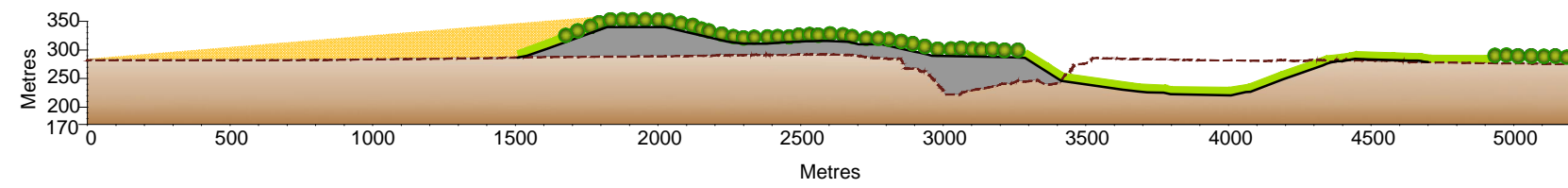
### 7.10.1 Existing Environment

The Project Site lies on the floor of a small north-south tending valley between the isolated elevated areas of Vickery State Forest to the west and the CCA Zone 2 Kelvin to the east. The elevated and vegetated slopes of the adjacent Vickery State Forest offer a level of natural screening to the west of the Project Site. The remaining areas around the site are dominated by cleared agricultural land with scattered trees. There are a number of public and private roads within the surrounding area that maintain narrow corridors of remnant vegetation.

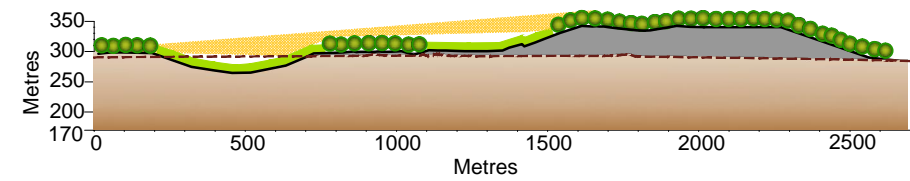
The Project Site is located in an area that is removed from any urban areas and has a relatively low density of surrounding residences. In accordance with **Table 3** in **Section 3.6**, “Retreat” and “Penryn” appear to be the closest privately owned residences to the north at approximately 4 km from the expanded Northern Emplacement Area, and “Surrey” appears to be the closest residence to the south at approximately 3.2 km from the approved Western Emplacement Area.



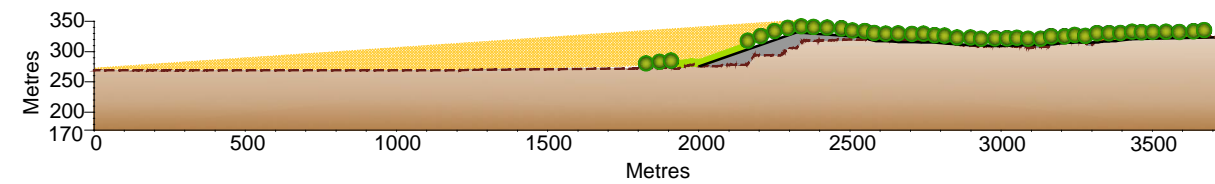
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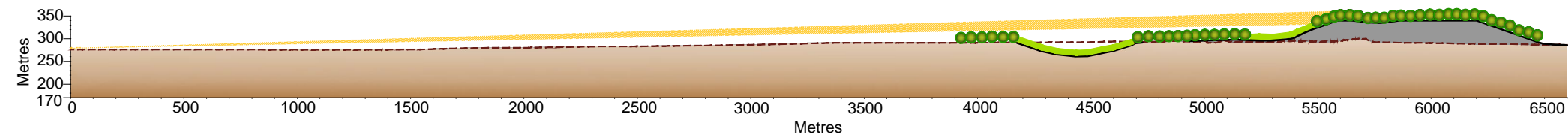
**LINE OF SIGHT (LoS) from Site 1 - Costa Vale**



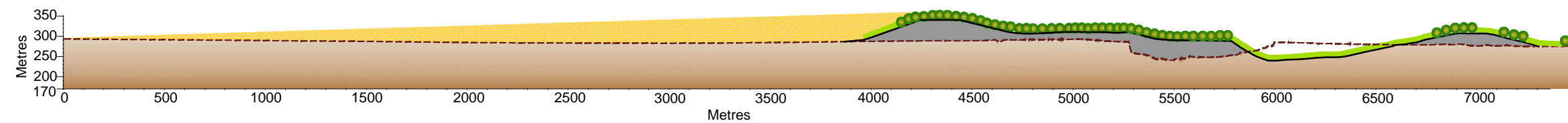
**LINE OF SIGHT (LoS) from Site 2 - Realigned Wean Road**



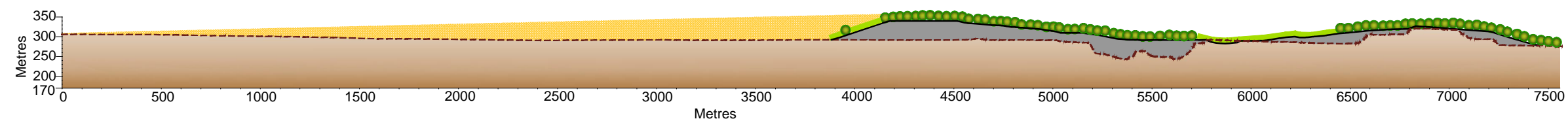
**LINE OF SIGHT (LoS) from Site 3 - Roseberry**



**LINE OF SIGHT (LoS) from Site 4 - Surrey**



**LINE OF SIGHT (LoS) from Site 5 - The Retreat**



**LINE OF SIGHT (LoS) from Site 6 - Penryn**

**LEGEND**

- Line of Site (from photograph location)
- Finished design landform
- Current surface level
- Finished surface level
- Final Landform Rehabilitation - Bushland
- Final Landform Rehabilitation - Pasture

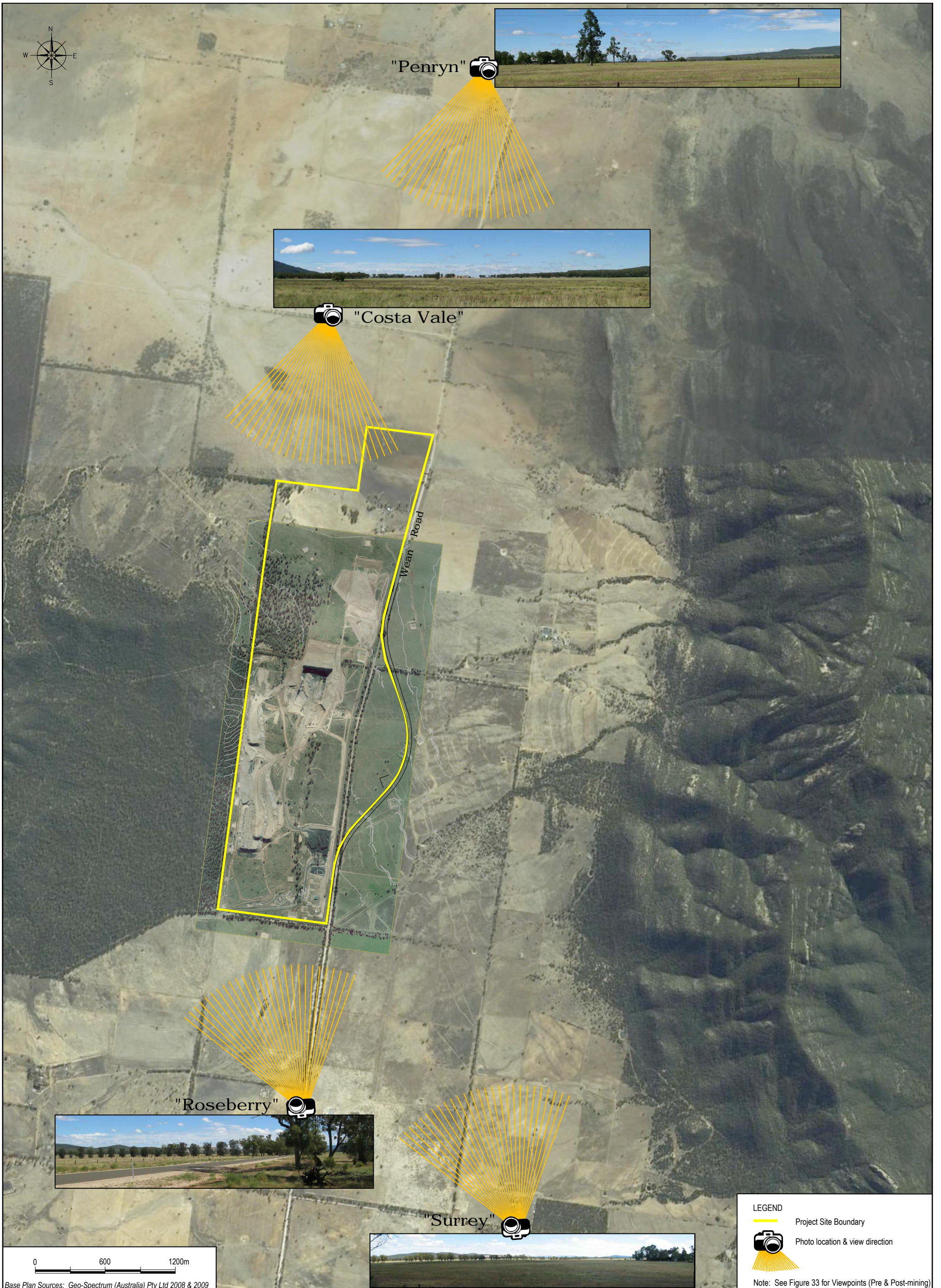
**NOTES:**

Vertical Exaggeration = 2

For viewpoint locations refer to:  
"Figure 2 Visual Assessment Photograph Sites"

Horizontal Scale: 1 : 25 000

Vertical Scale: 1 : 12 500

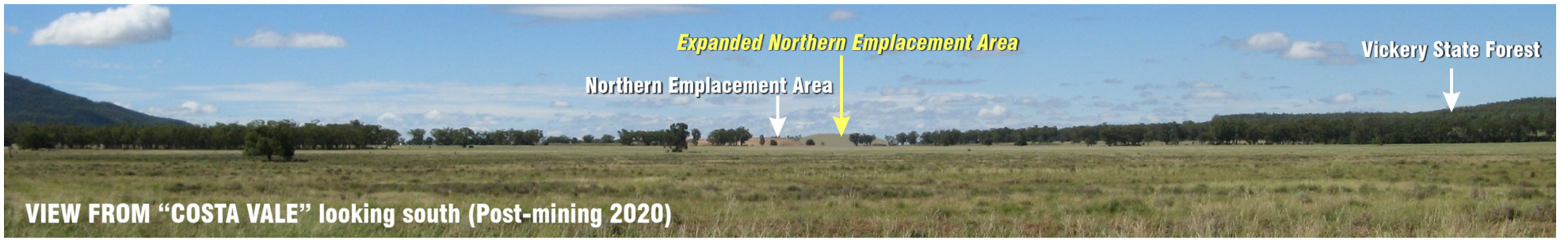


Rocglen Coal Mine Extension Project  
 Visual Assessment Photographic Viewpoints

FIGURE 35



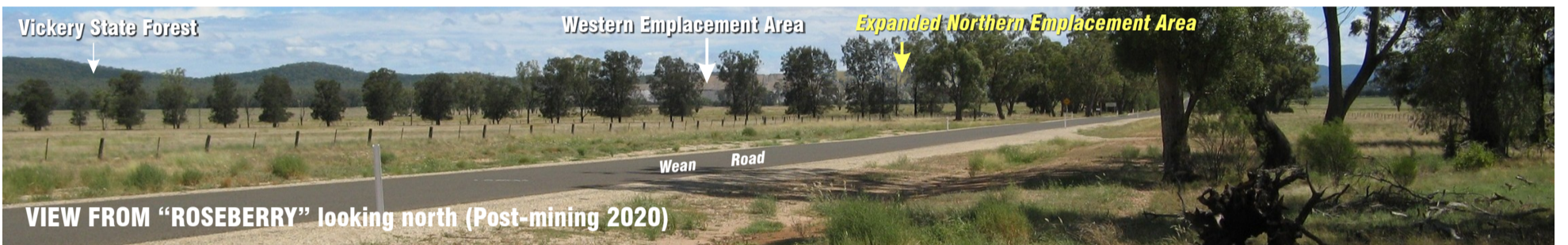
VIEW FROM "COSTA VALE" looking south (February 2010)



VIEW FROM "COSTA VALE" looking south (Post-mining 2020)



VIEW FROM "ROSEBERRY" looking north (February 2010)



VIEW FROM "ROSEBERRY" looking north (Post-mining 2020)



VIEW FROM "PENRYN" looking south (February 2010)



VIEW FROM "PENRYN" looking south (Post-mining 2020)



VIEW FROM "SURREY" looking north (February 2010)



VIEW FROM "SURREY" looking north (Post-mining 2020)

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NOTE:  
1. The views here represent an artistic impression of the final landform and are for conceptual purposes only.  
2. Finished landform surfaces, which are currently shown in beige / tan for identification purposes, will be rehabilitated and revegetated with pasture and bushland.

### 7.10.2 Potential Impact

The impact of the Rocglen Extension Project on the visual amenity of the local area is considered to be low and acceptable. While the existing topography and remnant vegetation generally contained within road reserves around the Project Site offer natural screening, distant views of the expanded Northern Emplacement Area will be seen from surrounding residences. There is no additional coal handling or significant infrastructure improvements proposed.

The following sub-sections provide an overview of the anticipated visual implications of the Project upon the three closest privately owned residences.

#### **“Roseberry”**

While “Roseberry” is a privately owned residence, it is subject to a negotiated agreement between the landholder and Whitehaven. The residence is situated at approximately 270 metres AHD, which is slightly lower than the elevation range of the natural surface levels of the Project Site, and at approximately 1,900 metres from the Western Emplacement Area, 2,000 metres from the coal handling and processing area, and 2,400 metres from the expanded limit of open cut mining.

The current view looking north towards Rocglen from “Roseberry” is obscured by existing tree corridors along roadways, with the Western Emplacement Area partially visible between the existing trees.

The post-mining view of the mine is anticipated to remain essentially the same with the inclusion of obscured views of the expanded Northern Emplacement Area between the existing trees.

#### **“Penryn”**

The privately owned “Penryn” residence is located at approximately 315 metres AHD, which is higher than the Project Site. It is located at approximately 4,000 metres from the proposed expanded Northern Emplacement Area, 6,800 metres from the coal handling and processing area, and 4,700 metres from the expanded limit of open cut mining.

The current view looking south from “Penryn” towards Rocglen is dominated by the Vickery State Forest and a line of trees extending from the Vickery State Forest to the east. The Rocglen mine is almost entirely obscured by trees, with only a small portion of the Western Emplacement Area visible above the tree line.

The post-mining view of the mine is anticipated to be dominated by the line of trees extending from the west within the Vickery State Forest with distant views of the expanded Northern Emplacement Area extending slightly above the trees. All other features within the site including the Western Emplacement Area and coal handling and processing area will be obscured by trees, as is currently the case.

#### **“Surrey”**

The privately owned “Surrey” residence is situated at approximately 280 metres AHD, which is within the elevation range of the natural surface levels of the Project Site. It is located at approximately 3,400 metres from the Western Emplacement Area, 3,200 metres from the coal handling and processing area, and 3,500 metres from the expanded limit of open cut mining.

The current view looking north-west towards Rocglen is obscured by trees contained within a road reserve. The vegetated areas of the Victory State Forest dominate the background left portion of the view with only small sections of the Western Emplacement Area visible through the trees.

The post-mining view of the mine is anticipated to include distant views of the expanded Northern Emplacement Area extending slightly above the tree line. The remaining features within the site, including the Western Emplacement Area, will be obscured by trees, as is currently the case.

### 7.10.3 Management

Early re-shaping and revegetation of the external batter slopes of the emplacement area will be undertaken in Years 1 and 2 of the expanded operation to, amongst other things, minimise visual impacts. While the expanded Northern Emplacement will extend above the tree line, the post-mining landform is expected to be consistent with the ridgeline contained within the Victory State Forest and, as such, when fully revegetated, it will not present a significant impact on the visual amenity of the area.

Whitehaven employs various complementary management strategies and mitigation measures to minimise both short-term and long-term visual impacts and these will continue to be implemented for the Rocglen Extension Project. Such initiatives include:

- Whitehaven will continue to adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, topdressed and vegetated. The progressive formation of the post-mining landform and the establishment of a vegetative cover will reduce the amount of disturbed land at any one time and also reduce the visibility of mine-related activities from surrounding properties and roads. Early reshaping and revegetation of the external batter slopes of the emplacement areas is particularly important and has been targeted as a priority. Refer to **Section 5.7**.
- The post-mining landform of the expanded Northern Emplacement Area has been aimed at creating a natural looking knoll that is linked to the adjacent ridge within the Vickery State Forest by a gently sloping saddle. The final design height of this emplacement area has also been planned to be consistent with the height of the adjacent ridge at 340 metres AHD.
- In addition to retaining areas of existing remnant vegetation, it is proposed to restore approximately 206 hectares (58 percent) of the disturbed area within the Project Site as rehabilitated bushland. This large area, which includes the western slopes of the Northern and Western Emplacement Areas, will blend in well with the retained remnant vegetation areas within the Project Site and within the adjacent Vickery State Forest and “Yarrowonga” property.
- Strategically placed bushland tree lots have been integrated into the post-mining landform to break-up the landform and provide visual texture. This will be complimented by the establishment of pasture grass areas that will provide short-term visual impact mitigation prior to the trees becoming established.
- An earthen bund of appropriate height will be established between the realigned Wean Road and the active pit area. This bund will be vegetated immediately following construction. The bund will provide an effective visual screen of the site from Wean Road. In addition to the bund, a strip of bushland will be established to screen the view of the final void and generally improve the visual amenity from Wean Road (see **Figure 21**).
- The requirements of the Australian Standard *AS 4282 1997 – Control of Obtrusive Effects of Outdoor Lighting* will be taken into consideration when placing and directing lights required when working outside of daylight hours. In particular, lighting plant will be positioned and directed away from surrounding residences and aimed downwards to avoid light spill onto adjoining lands and public roads.

## 7.11 Greenhouse Gas Emissions

An assessment of greenhouse gas emissions associated with the Rocglen Extension Project has been undertaken by PAEHolmes within the *Air Quality Assessment* (2011). The full assessment report is contained within **Appendix P**, with significant findings and recommendations summarised below.

### 7.11.1 Emission Calculation

Emissions of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) will be the most significant greenhouse gases for the Rocglen Extension Project. These gases are formed and released during the combustion of fuels used on-site and from fugitive emissions occurring during the mining process due to the fracturing of coal seams.

Different gases have different greenhouse warming effects (global warming potentials) and emission factors take into account the global warming potentials of the gases created during combustion. The estimated emissions are referred to in terms of CO<sub>2</sub>-equivalent (CO<sub>2</sub>-e) emissions by applying the relevant global warming potential.

The greenhouse gas assessment has been conducted using the *National Greenhouse Accounts (NGA) Factors* published by the Department of Climate Change (as cited in PAEHolmes 2011). This system defines three emission categories:

- **Scope 1** emissions cover direct emissions from sources within the project boundary such as fuel combustion and fugitive methane;
- **Scope 2** emissions cover indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation; and
- **Scope 3** emissions includes all other indirect emissions that are a consequence of the organisations activities but are not from sources owned or controlled by the organisations, for example, production of diesel fuel, off-site transport of the product.

Project-related greenhouse gas sources included in the assessment are as follows:

- Fuel consumption (diesel) during mining operations - Scope 1;
- Release of fugitive methane during mining – Scope 1;
- Indirect emissions associated with the production and transport of fuels – Scope 3;
- Emissions from coal transportation – Scope 3; and
- Emissions from the burning of the product coal – Scope 3.

**Table 54** provides a summary of the total greenhouse gas emissions associated with the Rocglen Extension Project.

**Table 54 – Summary of Greenhouse Gas Emissions**

Emission Source	Average Tonnes CO <sub>2</sub> -e/annum		
	Scope 1	Scope 3	Total
Diesel	17,810	1,358	19,168
Explosives	480		480
Fugitive Methane	67,500		67,500
Coal Transportation		13,067	13,067
Coal Burning		2,506,991	2,506,991
<b>Total – Annual</b>	<b>85,789</b>	<b>2,521,415</b>	<b>2,607,205</b>
<b>Total – Life of Mine</b>	<b>875,703</b>	<b>25,215,512</b>	<b>26,091,215</b>

PAEHolmes (2011) undertook a comparison with the baseline 1990 Australian emissions, which are reported under the Kyoto Protocol as 547.7 Mt CO<sub>2</sub>-e (DCC 2008, as cited in PAEHolmes 2011). The baseline is used to assign the Australian target under the Kyoto Protocol, which is 108% of the 1990 level. Comparing the average annual Scope 1 emissions from Rocglen, against the 1990 baseline, results in a 0.02% increase from 1990 levels.

The annual greenhouse emissions for NSW in 2007 were 151.6 Mt (DCC 2009, as cited in PAEHolmes 2011). Average annual Scope 1 emissions from Rocglen represent an approximate increase of 0.06%.

PAEHolmes (2011) concludes that there are not likely to be any measurable environmental effects due to the emissions of greenhouse gases from the Rocglen Extension Project.

### 7.11.2 Management

A *Greenhouse and Energy Efficiency Plan* was prepared by Denis Cooke & Associates in June 2009 in accordance with PA 06\_0198. This Plan is designed to promote continuous change and sustainable improvement in energy management and efficiency. It contains energy management and greenhouse principles, estimated energy baseline data and energy savings opportunities.

The *Greenhouse and Energy Efficiency Plan* (Denis Cooke & Associates 2009) will continue to be implemented at Rocglen. The energy savings measures listed in the report provide a “snapshot” of the activities that have and/or currently being investigated. As with all cost reduction activities, this process is continuous and is now embedded within Whitehaven’s operating principles and procedures. New opportunities will be identified as technology changes and as older measures are revisited under circumstances where cost-benefit ratios change.

## 7.12 Traffic and Transport

All coal mined at Rocglen will continue to be transported approximately 30 km by road to the Whitehaven CHPP, as currently approved under PA 06\_0198, for selective washing, stockpiling and dispatch by rail to the Port of Newcastle or by road to domestic customers.

In summary, crushed and screened coal will continue to be transported via a purpose built section of road between Rocglen and Hoad Lane, and from Hoad Lane via an established coal haulage route to the CHPP (see **Figure 2**).

The section of the road approved and constructed under PA 06\_0198 traverses the “Brentry” property, along the southern edge of Vickery State Forest with a further section of private road constructed across the “Stratford” property to link with Shannon Harbour Road. The transport route then incorporates a length of upgraded Shannon Harbour Road before intersecting with Hoad Lane. The transport route then joins a previously established coal haulage route along Hoad Lane, Blue Vale Road and the Kamilaroi Highway before entering the Whitehaven CHPP. The haul route between Rocglen and the Whitehaven CHPP is fully sealed and well maintained under a contribution plan with Council.

Once reaching the Whitehaven CHPP, the coal is stockpiled for washing or placed directly on the bypass stockpile and then either loaded into trains at the Whitehaven Rail Loading Facility for dispatch to the Port of Newcastle or loaded into trucks for road dispatch to domestic customers. These activities are covered by a separate development consent granted by Council, under the Minister’s delegation, in October 2002.

A proportion of the coarse and fine reject material from the Whitehaven CHPP is approved under PA 06\_0198 to be backloaded to Rocglen for placement in the mined-out areas of the open cut. This is proposed to continue under the Rocglen Extension Project.

The bulk of the truck fleet consists of 40 tonne capacity B-double trucks and the occasional semi-trailer. An average of 120 loads (4,800 tonnes) of coal is dispatched daily at the maximum production rate of 1.5 Mtpa. This equates to between 17 and 24 movements per hour over a typical operational day, with dispatch of coal permitted under PA 06\_0198 between 7.00 am and 9.15 pm Monday to Friday and between 7.00 am and 5.15 pm on Saturdays.

**Table 55** presents the average daily vehicle traffic generated by the Rocglen operation approved under PA 06\_0198.

**Table 55 – Operational Traffic Movements**

Transport Activity	Vehicle Type	Average Daily Vehicle Movements <sup>1,2</sup>	
		Heavy Vehicles	Light Vehicles
Coal to CHPP / Reject backloading	B-double, with occasional semi-trailer	240	-
Equipment Supplies	Semi-trailer / rigid truck	8	-
Workforce	Various light	-	42 (48 <sup>3</sup> )
Miscellaneous	Various light	-	8
<b>TOTAL</b>		<b>248</b>	<b>50 (56<sup>3</sup>)</b>

1 - assumes 312 days per year of operation.

2 - one round trip equals 2 movements.

3 - bracketed numbers correspond to periods of concurrent open cut and auger mining activities.

Given that the Rocglen Extension Project does not involve any change to the coal production rate, transport fleet or hours of coal haulage, the figures presented in **Table 55** will remain the same. On this basis, and on the basis of the fact the haulage route used between Rocglen and the Whitehaven CHPP will remain as approved under PA 06\_0198, the Rocglen Extension Project does not pose any additional annual impacts upon the local road network or traffic volumes, nor does it pose any additional conflict with non-mine related traffic using the haul route.

The Project will result in an extension to the life of the Rocglen operation, which will necessitate on-going coal transport for a number of years beyond what was originally approved under PA 06\_0198. The use of the road network for this extended period will be covered under the arrangements of the existing road maintenance agreement with Gunnedah Shire Council to ensure the subject roads continue to be adequately maintained.

In February 2010, the RTA provided the following written advice (see **Appendix E**) in response to initial consultation regarding the Rocglen Extension Project:

*At present road works are about to commence for the Kamilaroi Highway and its junctions with Blue Vale Road and the Coal Loader Road to cater for the impact of the existing approved mines that use this route, as required by the previous conditions of consent.*

*As it appears that there will be no increase in traffic generation the previous conditions would be adequate for the proposed extension to the mine.*

*At this time the RTA does not envisage that any further road works will be required on the Kamilaroi Highway for the proposed development.*

### 7.12.1 Management

While the Project does not pose any additional impacts upon the local road network or traffic volumes, it is still necessary to take reasonable and practicable measures to prevent or minimise the potential for conflict. Rocglen already employs a range of complementary traffic management strategies and mitigation measures, and these will continue to be implemented in order to effectively cater for the Rocglen Extension Project. The following safeguards will continue to be employed at Rocglen:

- All transport activities, including the haul route use between Rocglen and the Whitehaven CHPP and the hours of coal haulage, will continue to be undertaken strictly in accordance with that approved under PA 06\_0198.
- On school days, Whitehaven will continue to maintain the communication system between the truck drivers and the local school bus driver. The system has been negotiated between Whitehaven and the local bus drivers and involves two-way radio communication to ensure that trucks do not exceed 40 km per hour when travelling in the vicinity of the school bus. The regular communication of a morning and afternoon for the short period when the school buses are operational provides for a high level of safety and minimal disruption to coal transportation.
- Continuing to ensure that all trucks transporting coal from the mine and backloading reject from the Whitehaven CHPP are covered with fitted roll-over tarpaulins.
- Ensuring all trucks transporting coal are well maintained and operating optimally to minimise the potential for breakdowns and emissions (noise and/or air emissions).
- Drivers are required to operate in accordance with a Transport Policy and Code of Conduct, which identify aspects such as travelling speeds, general behaviour, avoidance of exhaust brakes, load coverage, complaints and disciplinary procedures. The Policy and Code apply to all employee and contractor-owned vehicles.
- Maintain routine consultation with residents along the haul route to ensure their satisfaction with all aspects of coal and mine-related transport.

### 7.13 Waste Management

The Rocglen Extension Project will not generate any new waste materials or additional waste volumes on an annual basis. Additional waste volume will be generated on a life of mine basis given the extended operational mine life, however this volume of waste will continue to be managed in accordance with current approved waste management strategies.

The management of production wastes, comprising overburden from the development of the open cut and coarse and fine reject material from processing of the coal at the Whitehaven CHPP, is outlined in **Section 4.12.1**. The management of non-production wastes generated by Rocglen operations, including general wastes, routine maintenance consumables, waste oils and grease, sewage and hydrocarbon-contaminated water, is outlined in **Section 4.12.2**.

The underpinning waste management strategy will continue to be minimisation and segregation at source. Waste materials produced by the Project will be managed in accordance with the following principles:

- Waste avoidance;
- Waste re-use;
- Waste recycling; and
- Waste removal and disposal.

## 7.14 Bushfire Hazard

While much of the Project Site comprises land that has been cleared for past agricultural production and/or existing mining activities, remnant areas of mature or regenerating trees do exist. Furthermore, the site is located within a rural environment adjacent to the Vickery State Forest.

To assess the bushfire hazard of the Project Site, R.W. Corkey & Co. (2007) undertook a Type A assessment for bushfire prone areas (NSW RFS 2001) for the original Rocglen development. Despite much of the site comprising cleared agricultural land, the vegetation was categorised as open woodland and the terrain was categorised as predominantly level (0 to 5 degrees) rising to hilly (5 to 10 degrees). Following the assessment guide of NSW RFS (2001), RWC (2007) determined the Project Site as displaying a low-medium hazard rating.

The adjacent Vickery State Forest contains significant areas of dense woodland/forest vegetation over hilly terrain. This would increase the risk of bushfire within the Project Site.

The Rocglen Extension Project does not pose any significant additional or altered activities within the Project Site, and therefore the bushfire hazard is expected to remain unchanged to that assessed by R.W. Corkey & Co. in 2007.

### 7.14.1 Management

The activities of the Project that may increase the risk of fire and the current controls in place at Rocglen are summarised in **Table 56**.

**Table 56 – Bushfire Hazard – Activities and Controls**

Activity	Possible Ignition Source	Safeguards
Blasting	Coal dust and ejected shot	<ul style="list-style-type: none"> <li>Vegetation cleared away from blast (&gt;20 metres).</li> <li>All coal removed from open cut around blast.</li> <li>Blast design undertaken by qualified personnel.</li> <li>Inspection of blast conducted prior to blast.</li> <li>Blasting Management Plan.</li> <li>Water truck available to douse any smouldering vegetation etc.</li> </ul>
Refuelling	Spilt fuel ignited by spark	<ul style="list-style-type: none"> <li>Refuelling undertaken within designated fuel bays or within cleared area of the Project Site.</li> <li>Vehicles turned off during refuelling.</li> <li>No smoking policy enforced in designated areas of the Project Site.</li> <li>Fire extinguishers maintained within site vehicles.</li> </ul>
Product Stockpiling	Spontaneous combustion	<ul style="list-style-type: none"> <li>The coal has a low propensity for spontaneous combustion.</li> <li>Stockpiles are regularly inspected and watered.</li> <li>Stockpile height and volume controlled to limit the duration coal retained in stockpiles.</li> </ul>
General Activities	Cigarettes and rubbish such as glass and metal	<ul style="list-style-type: none"> <li>No smoking policy enforced in designated areas of the Project Site.</li> <li>Focus on housekeeping maintained by mine management.</li> <li>Water cart available to assist in extinguishing any fire ignited.</li> <li>Site vehicles carry a fire extinguisher.</li> </ul>

Source: RWC (2007)

The safeguards listed in **Table 56** will continue to be implemented by Whitehaven for the duration of the Project. Whitehaven will also regularly liaise with the NSW Forests and NSW Rural Fire Service in relation to the bushfire hazard presented by the Vickery State Forest and to a lesser extent the nearby CCC Zone 2 Kelvin.

## 7.15 Socio-Economic Considerations

To assess the socio-economic implications of the original Rocglen Coal Mine development, RWC (2007) built on the results of a previous socio-economic study completed by Key Insights and Castlecrest Consulting for a similar scale coal mine development known as East Boggabri Coal Mine in 2005. The key findings and conclusions of RWC (2007) assessment have been used in consideration of the Rocglen Extension Project.

Rocglen is located within a regional and rural setting in central northern NSW which, like many other regional areas, has been in relative decline in socio-economic terms over the past 20 years. Demographic trends over this time in Australia have demonstrated acceleration in the “move to the coast” phenomenon, or to large community centres, placing considerable stress and change on areas in decline. Regional areas are often sensitive to employment loss where the economic support for villages and towns can be relatively single dimensional by being dominated by one to two industries or even employers (RWC 2007).

In recent times, the re-introduction of a viable coal mining industry in the Gunnedah LGA has provided welcome diversification of industry, employment generation and skills provision. Whitehaven has become the leading coal producer in the Gunnedah Basin, directly employing over 250 people and generating significant indirect employment and flow-on benefits. Since Whitehaven entered the area in 1999, Gunnedah has grown and evolved with additional employment opportunities and diversity, increased housing capacity and commercial development.

While the Rocglen Extension Project does not involve any increase to the coal production rate or employment, it is anticipated that the Project will enable open cut mining for approximately 11 years following the issue of Project Approval and the subsequent issue of a new or amended mining lease. This represents an increase to the projected life of the mine, for coal extraction, of up to four years, which, in turn, will secure on-going employment opportunities and socio-economic flow-on benefits over this time.

### Social

In addition to the direct and indirect employment opportunities, RWC (2007) identified the following additional positive potential social impacts:

- Reduction of social stress through employment in the mining and related industry. The Rocglen Extension Project will enable the current 35 full-time operators, 14 full-time fitters and 5 full-time staff members to be maintained for up to an additional 4 years. Furthermore, there is flow on employment for truck drivers (coal haulage contract) and additional indirect employment through service and supply from local businesses.
- Training opportunities for local people, including young people and indigenous people, in a growth industry (mining);
- Stimulus to local businesses, particularly in Gunnedah, including motel and hotel trade, cafes and restaurants, mining-related servicing and engineering business, and general surplus spending activity such as gyms, cinema, recreational goods and services, beauty salons, and hair dressers;
- Maintenance of, or increase to, the population to participate in locals clubs, sporting groups, cultural activities, and organisations, therefore contributing to stronger social networks and social capital; and

- More volunteers for community service organisations.

In terms of potentially adverse social impacts, GSSE does not believe that the Rocglen Extension Project poses any notable implications over and above those assessed and approved under PA 06\_0198. Potential social issues primarily relate to environmental emissions (air quality, noise, blasting), traffic generation and the temporary cessation of agricultural activities within the Project Site. Each of these issues has been appropriately addressed within the EA, with no significant or limiting factors identified.

### Economic

The output of the Rocglen Coal Mine, in terms of direct and indirect employment and flow-on benefits, is anticipated to make a significant contribution to the local and regional economy.

**Table 57** presents the annual economic contribution made by Whitehaven in the form of wages, other payments and taxes/royalties for the Rocglen Coal Mine at full operation and production.

**Table 57 – Annual Economic Contribution of Rocglen Coal Mine**

<b>Local and Regional Contributions</b>	
Wages	\$9,430,000
Payments to coal haulage contracting company	\$4,420,000
Expenditure on other local goods and services	\$6,670,000
<b>Sub-Total</b>	<b>\$20,520,000</b>
<b>NSW, Australia and Global Contributions</b>	
Income tax (estimated)	\$1,900,000
Royalty paid on the coal	\$5,340,000
Payroll tax to the NSW Government	\$450,000
Payments to rail-related contracting companies	\$11,880,000
Payments to other contracting companies and expenditure of other good and services	\$26,270,000
<b>Sub-Total</b>	<b>\$45,840,000</b>
<b>Total</b>	<b>\$66,360,000</b>

Source: Whitehaven

Rocglen also indirectly generates employment opportunities through requirement for ancillary services to the mine and general stimulus to the local economy. The average income derived from indirect employment is thought to be less than that of the direct employees of the mine, however anticipated to be, on average, the median household income for the Gunnedah LGA (2006 Census - \$714 per week).

Whitehaven contributed \$153,644 to Council for road maintenance works associated with the coal haulage route over the 2009-2010 period, and also expended \$1.4 million on the Wean Road upgrade completed in 2010.

Whitehaven also provides regular contributions to projects deemed of community value. As an example, Whitehaven has provided for on-going training and employment opportunities for the local Aboriginal community through the establishment of a tree planting initiative. Whitehaven donated land and provided for start-up services such as power and water (to the estimated value of \$30,000) for a joint TAFE / Red Chief LALC project to initiate a native tree nursery and tree-planting service. Community-based and charitable contributions such as these would be continued as part of Whitehaven's on-going commitment to ensuring the economic benefits of the Rocglen Coal Mine are not restricted to the company, employees and various levels of government.

### **7.15.1 Management**

Whitehaven is committed to on-going community consultation and will continue to engage the community in consultation for the purposes of providing information relating to the Project and company operations in general. This will also enable the community to provide feedback to Whitehaven and raise any issues or concerns. It is anticipated that consultation will include the following:

- Circulation of information and newsletters, as required, relating to mining activities (for example, blasting schedule); and
- Continuation of the Rocglen CCC established under PA 06\_0198 for the existing Rocglen operation. This CCC comprises representatives from local government and the community, and meets on a quarterly basis.

Further, Whitehaven undertakes to respond to any community complaints within 24 hours of receipt. All complaints will be investigated and the results of the investigation reported to the complainant in a timely manner.

## **8.0 STATEMENT OF COMMITMENTS**

The DGRs for the Project require that the EA includes a Statement of Commitments detailing the measures proposed by Whitehaven for environmental mitigation, management and monitoring of the Rocglen Extension Project. If approval is granted under Part 3A of the EP&A Act for the Project, Whitehaven will commit to controls listed in the below sub-sections.

### **8.1 Compliance with the EA**

- (a) Whitehaven will carry out the development for the Project generally in accordance with the Project Application and this EA report.

### **8.2 General Operation**

#### **Production Limit**

- (a) Whitehaven will not extract more than 1.5 Mtpa of ROM coal from the Project Site

#### **Hours of Operation**

- (b) Mining operations may be undertaken 24 hours a day, Monday to Saturday, with the exception of public holidays.
- (c) Coal transport will be undertaken between 7am and 9:15pm Monday to Friday, and between 7am and 5:15pm on Saturdays.

#### **Refinement of Mine Plan**

- (d) Any refinements to the concept mine plan outlined in this EA report will be detailed and assessed as part of the MOP process managed by the I&I NSW.

#### **Consultation**

- (e) Routine consultation will be undertaken with residents surrounding the Project Site and along the coal transport route, as well as with the CCC, to ensure any concerns relating to mine operations are identified and appropriately addressed.

### **8.3 Environmental Monitoring and Reporting**

#### **Revision of Environmental Management Plans and Monitoring Programs**

- (a) Within 12 months of approval, Whitehaven will review, update and integrate relevant aspects of the environmental management of the Project in the existing set of environmental management plans for the Rocglen Coal Mine. This will be undertaken in consultation with the relevant government agencies.
- (b) Within 12 months of approval, Whitehaven will review, update and integrate relevant aspects of the environmental monitoring of the Project in the existing set of environmental monitoring programs for the Rocglen Coal Mine. This will be undertaken in consultation with the relevant government agencies.

#### **Annual Environmental Management Plan**

- (c) Whitehaven will prepare an AEMR for the Project for submission to the Director-General and relevant government agencies.

## 8.4 Soil Stripping, Stockpiling and Re-Spreading

- (a) Soil materials within the Project Site will be stripped, handled and stockpiled in a manner that minimises the potential for soil loss and structural deterioration.
- (b) Topsoil stockpiles will be established to a maximum height of 3 metres.
- (c) Soil material will be maintained in a slightly moist condition during stripping, and will not be stripped in either an excessively dry or wet condition.
- (d) If mining sequencing, equipment scheduling and weather conditions permit, stripped material will be placed directly onto reshaped emplacement areas and spread immediately to avoid the requirement for stockpiling.
- (e) The surface of soil stockpiles will be left coarsely textured in order to promote infiltration and minimise erosion until vegetation is established, as well as to prevent anaerobic zones forming.
- (f) Where long-term stockpiling is planned (that is, greater than 3 months) the stockpiles will be seeded and fertilised as soon as possible. An annual cover crop that produces sterile florets or seeds will be sown.
- (g) Prior to re-spreading stockpiled material onto completed mining or overburden emplacement areas, an assessment of weed infestation on stockpiles will be undertaken to determine if individual stockpiles require herbicide application and/or 'scalping' of weed species prior to spreading.
- (h) A soil inventory will be maintained to ensure adequate material is available for planned rehabilitation activities.
- (i) Where natural protection from surface runoff flows is not available or achievable, protective earthworks, such as contour banks, and/or straw bale protection will be installed. Silt fencing (or similar) will be installed immediately downslope of any stockpile area potentially susceptible to erosion and maintained until the stockpile is considered stable with an effective vegetation cover.
- (j) Whitehaven will adopt the general practice, where appropriate subsoil is available and targeting areas being rehabilitated to pasture, of including an intermediate layer of subsoil between the overburden material and the topdressing to improve the water holding capacity of the rehabilitated landform and reinstate a more natural soil profile. For areas being rehabilitated to bushland, Whitehaven may preferentially reduce the subsoil replacement depth and/or exclude subsoil replacement in selected areas to establish trial areas to monitor bushland development in different soil profiles.
- (k) Where resources allow, topsoil and subsoil will each be spread to a nominal depth of between 100 to 150 mm, giving a combined depth of soil material on the rehabilitated landform of between 200 and 300 mm.
- (l) The subsoil layer will be spread on an even but roughened surface that has been ripped along the line of the contour to break any compacted and/or smooth surfaces. Ripping will also assist the keying of subsoil into the overburden, which will, in turn, assist in the prevention of land slip and can help vegetation penetrate deep into the soil profile, encourage ingress of water and minimise erosion.
- (m) Stripped soil material will be spread, treated with fertiliser and seeded in one consecutive operation in order to reduce the potential for soil loss to wind and water erosion.

## 8.5 Geotechnical Stability – Open Cut Pit and Highwall

- (a) Progressive stability reviews and monitoring of geological conditions will be undertaken once the pit moves within 250 metres of the realigned Wean Road to ensure geotechnical stability and safe conditions. If any unfavourable conditions are observed or detected, a detailed assessment will be undertaken by a suitably qualified geotechnical engineer before mining is allowed to continue towards Wean Road.
- (b) When the Belmont Fault (or fault zone) is more than 150 metres from Wean Road, operations will mine through the Belmont Fault. The uppermost alluvial material and weathered rock on the eastern side of the fault will have individual face angles no steeper than 45 degrees.
- (c) Benching will be adopted at a maximum interval of 25 metres in alluvial, weathered rock and brecciated rock.
- (d) In fresh strata face angles will be designed at 75 degrees to pit bottom. If in following the upturned Belmont Seam down to pit bottom the floor rock is strong and competent, then the face will be developed on the dip slope without the need for benches in rock beneath the Belmont Seam.
- (e) When the top of the stable highwall reaches 50 metres from Wean Road (i.e. when the eastern limit of the Belmont Fault zone reaches 150 metres from Wean Road), the eastern end wall will be turned at right angles to the west. Once the turned highwall encounters sound rock, as it continues to the west, it can be turned again to develop parallel to the Belmont Fault until it reaches the planned pit limit.
- (f) The turned highwall in the fault zone will be notched to achieve a stable face. This notch will not approach Wean Road any closer than 150 metres without geotechnical advice.
- (g) A block of unmined ground will be left to contain the Belmont Fault zone and prevent it causing collapse back towards Wean Road. The size of this block of unmined ground will be determined by geotechnical investigation by the time a change in highwall direction is required.
- (h) If the highwall is free of faulting mining will resume southeast towards the currently planned pit limit. Such mining will cease when the pit crest reaches 50 metres from Wean Road. If additional faulting is detected in this advancing face then the relevance of such structure on highwall stability will be investigated before continuation of highwall development.

## 8.6 Rehabilitation and Mine Closure

### Progressive Rehabilitation

- (a) Whitehaven will adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, topdressed and vegetated to provide a stable landform. Early reshaping and revegetation of the external batter slopes of the emplacement areas is particularly important and will be targeted as a priority.
- (b) Disturbed areas will generally undergo rehabilitation within one year of overburden emplacement and reshaping.

### Overburden Placement and Shaping

- (c) Placement and shaping of overburden will be undertaken to achieve stable slopes.
- (d) Placement and shaping of overburden will be undertaken in a manner which, wherever practicable, ensures that any friable or weathered materials are placed below the subsoil and topsoil layers in order to provide a cover of more competent material and avoid the exposure of large rocks on the final surface.

- (e) Any coarse coal rejects placed in the mine void will be covered with at least 3 metres of overburden material.

#### **Subsoil and Topsoil Replacement**

- (f) Refer to commitments listed above in **Section 8.4**.

#### **Drainage and Surface Water Structure Installation**

- (g) Surface water management structures will be progressively installed on the rehabilitated landform. The heights (effective depths) and cross-sectional areas of the individual banks will be determined on the basis of individual sub-catchment areas, but will typically be less than 0.7 metres and 3 square metres (m<sup>2</sup>), respectively. Rock-lined drains will be used, where required, to convey water safely from the rehabilitated landform into the surface water management system that takes water from the site.

#### **Revegetation**

- (h) The topdressed surfaces of those areas designated to be restored to rehabilitated pasture will be sown with a mixture of pasture species appropriate for the season. The seed mixture will include fast growing, short-lived species and perennial grasses and legumes.
- (i) The topdressed surfaces of those areas designated to be restored as rehabilitated bushland will be initially stabilised with a non-persistent cover crop followed by planting of a selection of locally occurring tree and shrub species that will encourage the re-establishment of the pre-mining vegetation communities and, in the medium to longer term, create habitat and corridors for native fauna.
- (j) All areas identified for bushland and pasture re-establishment will be fenced and have stock excluded until it can be demonstrated that the vegetation is stable and self-sustaining, and that grazing will not impact upon its establishment.

#### **Rehabilitation Monitoring and Maintenance**

- (k) Areas being rehabilitated will be regularly inspected and assessed against the long and short-term rehabilitation objectives. During regular inspections, aspects of rehabilitation to be monitored will include:
- Evidence of any erosion or sedimentation from areas with establishing vegetation cover;
  - Success of initial grass cover establishment;
  - Success of tree and shrub plantings;
  - Adequacy of drainage controls;
  - Presence/absence of weeds; and
  - General stability of the rehabilitation site.
- (l) Where the rehabilitation success appears limited, maintenance activities will be initiated. These may include re-seeding and where necessary, re-topdressing and/or the application of specialised treatments such as composted mulch to areas with poor vegetation establishment. Tree guards will be placed around planted tube stock if grazing by native animals is found to be excessive.
- (m) If drainage controls are found to be inadequate for their intended purpose or compromised by grazing stock or wildlife, these will be repaired and/or temporary fences installed to exclude animals. Should areas of excessive erosion and sedimentation be identified, remedial works such as importation of additional fill, soil material and/or the redesigning of water management structures to address erosion will be undertaken.

- (n) Monitoring will be conducted periodically by independent, suitably skilled and qualified persons at locations that are representative of the range of conditions on the rehabilitating areas. Annual reviews will be conducted of monitoring data to assess trends and monitoring program effectiveness.

#### **Conceptual Post-Mining Land Use**

- (o) The disturbed area within the Project Site will be restored to either rehabilitated bushland or rehabilitated pasture, with approximately 5 hectares (1 percent) remaining as a stabilised highwall of the final void.
- (p) Along the eastern boundary of the Project Site, adjacent to the realigned Wean Road, a strip of rehabilitated bushland will be established to screen the view of the final void and generally improve the visual amenity from Wean Road, as well as provide vegetation connectivity north-south on the eastern side of the void.
- (q) In addition to the large area to be rehabilitated to bushland, strategically placed tree lots will be established within rehabilitated pasture areas to break-up the landform and act as wildlife refuges and linkages.
- (r) Tree trunks and branches less than 300 mm diameter and other smaller vegetative debris removed during clearing activities will be spread over those areas to be restored as rehabilitated bushland where practical.

#### **Final Void Management**

- (s) The final void will be designed and managed as a stable landform. Appropriate long-term land use options for the void will be considered and adequately assessed in consultation with relevant stakeholders as the mine approaches closure.

#### **Final Void Stability – Low Walls**

- (t) The low walls will be battered back from the angle of repose to ensure the long term geotechnical stability of the face, with the determination of geotechnical stability and recommendations as to the final slope undertaken by a qualified geotechnical engineer on the basis of an assessment of the overburden material, the likely degree of settlement, and the degree of weathering expected in the long term. It is expected that the low wall sides of the final void will be battered back to a maximum of 18 degrees with a goal of 10 degrees being optimal.
- (u) Surface water drainage on and over the low wall will be minimised through the construction of drainage control structures, the construction of Dam F, and the aim of diverting as much of the catchment as possible away from the final void and back into the surface water system.
- (v) Erosion of the low wall will be controlled by limiting the length of slope through the use of contour and graded drains, minimising the slope, and by the establishment of suitable vegetation.

#### **Final Void Stability – Highwall**

- (w) To ensure the safety of the final void, the surrounding final slopes will be left in a condition where the risk of slope failure is minimised. The highwall of the final void will be left at 45 degrees to ensure long term geotechnical stability. This will be assessed by a suitably qualified geotechnical engineer.
- (x) Whitehaven will undertake progressive stability reviews and monitoring of the highwall once it moves to within 250 metres of the Wean Road deviation to ensure safe working conditions. If any failures are observed, or additional faulting is detected, then a detailed assessment will be undertaken by a suitably qualified geotechnical engineer before mining is allowed to continue towards Wean Road.

- (y) Whitehaven will adopt the geotechnical stability commitments listed above in **Section 8.5** as the open cut pit progresses and the final landform is being formed.

## **8.7 Biodiversity Offset Strategy**

- (a) The revised *Biodiversity Offset Strategy* described in **Section 5.8**, which has been prepared on the basis of the BioBanking Methodology to 'improve or maintain' assessment, will be implemented. This *Strategy*, in summary, comprises the retirement of 4,859 credits from the Whitehaven Regional BioBank Site, which is in the final stages of registration by the DECCW as a BioBank Site under Part 7A of the TSC Act. It provides an offset (525 hectares) to impact (110.44 hectares comprising 95.44 hectares of impacts for mine extension and the equivalent of 15 hectares of original impacts which now needs a replacement offset) ratio of 4.75:1.
- (b) The Whitehaven Regional BioBank Site will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks via a BioBanking Agreement registered on the land title in-perpetuity.

## **8.8 Air Quality**

### **Vegetation Clearing and Soil Stripping**

- (c) Cleared trees and branches will be retained for use in stabilising slopes identified for restoration of rehabilitated woodland. No burning of vegetation is permitted or occurs on-site.
- (d) Where practicable, soil stripping will be undertaken when there is sufficient soil moisture to prevent lift-off dust and at times that avoid periods of high winds. Where this is not possible, dust suppression by water application will be undertaken to increase soil moisture.
- (e) Land disturbance, including groundcover removal, will be limited in advance of mining activities consistent with operational requirements. Under normal circumstances, a maximum of 100 metres will be prepared in advance of mining.
- (f) Groundcover will be removed with the topsoil, as opposed to prior to topsoil removal.
- (g) Where long-term stockpiling of soil materials is planned (typically greater than 3 months) the stockpiles will be seeded and fertilised as soon as possible.

### **Drilling and Blasting Activities**

- (h) Water injection will be used on the drilling rig.
- (i) Coarse aggregates will be used for blasthole stemming at all times.
- (j) Where practicable, blasting will be restricted during unfavourable weather conditions.
- (k) When necessary, dust aprons will be lowered during on-site drilling.

### **Overburden Ripping and Placement**

- (l) Where practicable, ripping of softer overburden material will be avoided during periods of high winds.

### **Coal Mining**

- (m) When necessary, low moisture coal will be sprayed with water prior to excavation.

### Crushing and Screening

- (n) Notwithstanding the generally moist nature of the ROM coal pad, when necessary, water will be applied to the coal at the feed hopper, crusher and at all conveyor transfer and discharge points.
- (o) When necessary, some flexibility does exist to enable cessation of coal processing activities during periods of concurrent high winds and temperatures that have the potential to cause coal dust dispersal independent of water applications.

### Internal Transport

- (p) As required, internal roads will be watered, with emphasis on those subject to frequent trafficking.
- (q) The speed of all on-site vehicles and equipment will be restricted.
- (r) All internal roads will be clearly defined to control their locations.
- (s) As roads within the Project Site become obsolete, they will be promptly ripped and revegetated.

### External Transport

- (t) All trucks hauling product coal and coal rejects between Rocglen and the Whitehaven CHPP will be required to be fitted with roll-over tarpaulins.
- (u) All trucks transporting coal will be well maintained to ensure optimal operation, which will minimise the potential for noise emissions.

### Rehabilitation

- (v) As per the commitments listed in **Section 8.6**, Whitehaven will adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, topdressed and vegetated to provide a stable landform.

### Monitoring

- (w) The existing *Air Quality Monitoring Program* (Whitehaven 2009a) will be reviewed and, as necessary, updated to integrate relevant aspects of the Project.
- (x) A real-time PM<sub>10</sub> monitor (fitted with a weather station) will be installed and operated. As recommended by PAEHolmes (2011), it is proposed to locate this monitor at the "Roseberry" residence, co-located within one of the existing HVAS.
- (y) The existing weather station and HVAS within the "Glenroc" property will be relocated. As recommended by PAEHolmes (2011), it is proposed to move these items to "Costa Vale", which is along the axis of prevailing winds.

## 8.9 Noise

### Project Design

- (a) The external batter slopes of the expanded Northern Emplacement Area will be re-shaped and revegetated in Years 1 and 2 of the Project to, amongst other things, minimise the projection of noise from overburden transportation and emplacement activities towards privately owned residences located to the north and north-east later in the mine life.

### General Operation

- (b) Contractors, including all personnel and sub-contractors, will be advised of noise compliance limits prior to their work commencing. Contractors will be expected to take practical measures to limit noise generation during their activities where possible.
- (c) Prior to being brought on-site, all earthmoving equipment will be tested to ensure sound power levels are consistent with the previous assessments undertaken by Spectrum Acoustics.
- (d) Site personnel will be required to pay due attention to site weather conditions and modify or stand down from operational activities if directed by mine management.
- (e) Where possible, equipment with lower sound power levels will be used in preference to more noisy equipment.
- (f) All equipment used on-site will be regularly serviced to ensure the sound power levels remain at or below the levels used in the modelling undertaken by Spectrum Acoustics.
- (g) Mid-high frequency broadband reverse beepers are fitted to on-site mobile mining equipment.
- (h) The on-site road network will be maintained to limit vehicle body noise.

### External Transport

- (i) All transport activities, including the haul route used between Rocglen and the Whitehaven CHPP and the hours of coal haulage, will continue to be undertaken strictly in accordance with that approved under PA 06\_0198.
- (j) The haul route between Rocglen and the Whitehaven CHPP is fully sealed and will continue to be maintained under an existing contribution plan with Council.
- (k) Drivers will be instructed to operate in accordance with an existing Transport Policy and Code of Conduct, which identify aspects such as travelling speeds, general behaviour, avoidance of exhaust brakes, load coverage, complaints and disciplinary procedures. The Policy and Code apply to all employee and contractor-owned vehicles.
- (l) The trucks will be speed limited to 93 km per hour to, amongst other things, minimise engine noise.
- (m) All trucks transporting coal will be well maintained to ensure optimal operation, which will minimise the potential for noise emissions.

### Monitoring

- (n) As per the commitments listed in **Section 8.3**, the existing *Noise Monitoring Program* (Whitehaven 2008d) will be reviewed and, as necessary, updated to integrate relevant aspects of the Project. Specifically, "Retreat" or "Penryn" will be included as a noise monitoring location in the revised Program in place of "Costa Vale" (which is now owned by Whitehaven).
- (o) Traffic noise monitoring will continue to be conducted at the "Brooklyn" and "Werona" residences on Blue Vale Road in accordance with the existing *Road Noise Management Plan* (Spectrum Acoustics 2008).

## 8.10 Blasting and Vibration

### Blast Design

- (a) Blast design and implementation will be undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.
- (b) Burden distances and stemming lengths will be designed to ensure that explosion gases are almost completely without energy by the time they emerge into the atmosphere.

- (c) Blast design will ensure charges consistently detonate in carefully designed sequences.
- (d) Meteorological conditions will be analysed prior to blasting to avoid times when the potential for impact is heightened, and also endeavours will be made to blast at around midday over the winter period to avoid temperature inversions.

#### **Air Vibrations (Noise and Airblasts)**

- (e) Noise and airblast generation will be controlled to ensure that all, or the majority of, explosion energy is consumed in fragmenting and displacing the overburden by the time the gases vent (via the broken burden rock and/or ejected stemming material) into the atmosphere. This will be achieved via:
  - Ensuring blasthole spacing is implemented in accordance with blast design;
  - Careful selection and implementation of burden distance and stemming length;
  - Using appropriate materials (for example, 20 mm aggregates) for stemming;
  - Ensuring that charges detonate in the correct sequence and with inter-row delays that provide good progressive release of burden;
  - Limited the maximum weight of explosive detonated in a given delay period (the maximum instantaneous charge (MIC)) to conservative and proven levels; and
  - Refining these controls on the basis of the blast monitoring program.

#### **Ground Vibrations**

- (f) Blast design will ensure the minimum practicable weight of explosive detonates at an instant (minimising the MIC) by using the maximum number of delay periods in each blast.
- (g) Blast design will ensure that most of the energy liberated by the charge(s) on a given delay number is consumed in providing good fragmentation, adequate displacement and/or a loose, highly diggable muckpile.

#### **Dust and Other Post-Blast Emissions**

- (h) Stemming columns will be designed to ensure ejection velocities are low.
- (i) Appropriate aggregates for blasthole stemming and nonel delay-type or electronic detonators will be used to initiate charges.

#### **Road Closures**

- (j) For all blasts within 500 metres of Wean Road, the road will be closed with blast notice boards updated at least 24 hours prior to each blast. Road closures typically occur for a period of up to 10 minutes.
- (k) Whitehaven will inspect the road following the blast and any rock fragments removed from the road surface prior to re-opening.
- (l) Whitehaven will monitor the distance flyrock travels (if any) beyond the designed blast envelope and identify if further safeguards are required.

#### **Consultation**

- (m) The proposed blasting schedule will be provided to all residents within a 3 km radius of the blast providing advance notice of the date and time of each proposed blast. A verbal confirmation on the day of the blast will also be undertaken.
- (n) Whitehaven will erect a blast notice board near the mine entrance on Wean Road notifying passing motorists when the next blast is scheduled.

## Monitoring

- (o) As per the commitments listed in **Section 8.3**, the existing *Blasting Monitoring Program* (Whitehaven 2008a) will be reviewed and, as necessary, updated to integrate relevant aspects of the Project. Specifically, "Retreat", as the nearest privately-owned residence to the north of the Project Site, will be included as a blast monitoring location in the revised Program in place of "Costa Vale" (which is now owned by Whitehaven).

## 8.11 Surface Water

### General

- (a) All hydrocarbon products will be securely stored.
- (b) All of the mining fleet will be refuelled within designated areas of the Project Site.
- (c) With the exception of some maintenance activities on mobile equipment, all maintenance works requiring the use of oils, greases and lubricants would be undertaken within designated areas of the Project Site.
- (d) All water from wash-down areas and workshops would be directed to oil/water separators and containment systems.
- (e) All storage tanks will be either self-bunded tanks or bunded with an impermeable surface with a capacity to contain a minimum of 110% of the largest storage tank capacity.
- (f) Chemical flocculation to help increase the settling times of the sediment (TSS) in the water column will also be employed as required.
- (g) As required, appropriate drainage structures and erosion and sediment controls will be installed and maintained.
- (h) All efforts will be undertaken to ensure that any water discharged from the Project Site via the LDPs meets the quality limits imposed by the DECCW on the site's EPL.
- (i) Key changes, as detailed in **Appendix M**, to be integrated into the existing surface water management system are:
- Additional water management controls to deal with water from the increased disturbance footprint in the northern area of the site;
  - Additional water management controls to address TSS issues during wet weather discharge;
  - Relocation of the Mine Water Dam; and
  - More effective diversion of clean water from off-site catchments to the east.
- (j) Dirty water generated from disturbed areas to be captured and diverted using contour banks and drop structures in a manner that minimises the potential for concentrated overland flow and subsequent erosion. This water will be channelled through a series of sediment basins to reduce sediment loads prior to discharge.
- (k) Water generated within the open cut pit, primarily as a result of rainfall/runoff and some groundwater seepage, to be managed within the open cut via in-pit sumps. This water will be directed to and contained within these in-pit sumps until it is necessary to pump the water to the new Mine Water Dam, which will be constructed as a 'turkeys nest' to receive mine water only.
- (l) Clean water diversions will be constructed wherever possible upstream of disturbance areas to minimise the amount of dirty water to be contained and treated within the dirty water management system.

- (m) Progressive rehabilitation of all re-shaped surfaces to assist in reducing the level of TSS (and possible high pH and salinity) in runoff from disturbed areas. This will also reduce the dependence on sediment controls and generally assist in improving water quality.
- (n) Water collected in the open cut extraction pit and/or dirty water dams will be used, as much as possible, for dust suppression purposes. This is the preferential use of water on-site to minimise the chance of pollution to downstream waterways.
- (o) Sediment control structures will be maintained to ensure the design capacities are preserved for optimum settling rates. This will be most critical for those 'end-of-line' sediment basins that discharge from the Project Site.
- (p) Implementation of an effective revegetation, maintenance and monitoring program.

#### **Site Water Management Plan**

- (q) Within 12 months of Project Approval, a new *Site Water Management Plan* will be prepared in accordance with regulatory requirements and the *Blue Book (Volume 1 and Volume 2E)*.

#### **Site Water Balance and Discharge**

- (r) Whitehaven will consider and, where appropriate, adopt the following to improve site water balance and minimise uncontrolled overflow discharge:
  - The proposed dams will be built to at least the specified sizes, and made larger where practical to provide additional storage in order to further reduce the chance of uncontrolled overflow discharge. Increasing the total storage will provide opportunity to retain and treat water prior to controlled discharge;
  - Water will be promptly transferred amongst sediment basins to ensure the maximum available on-site storage capacity of rainfall events is maintained; and
  - That controlled discharge of treated (settled and/or flocculated) water will be undertaken to draw down the water storage within all the dirty water dams on-site, which will provide the capacity to contain the majority rainfall events and reduce uncontrolled overflow discharge.

#### **Drainage Lines**

- (s) Sections of drainage lines that are or will be impacted upon by the mining operation will be rehabilitated post-mining generally in accordance with Section 5.3.3 of the *Blue Book (Volume 1)* and the *Guidelines for Controlled Activities – In-Stream Works* (DWE 2008, as cited in GSSE 2010c) for watercourse rehabilitation and riparian zone rehabilitation.

#### **Licensed Discharge Points**

- (t) While LDP 11 will continue to be used at the southern end of the Project Site, LDP 12 will be superseded and relocated in consultation with the DECCW.

#### **Monitoring**

- (u) As per the commitments listed in **Section 8.3**, the existing surface water monitoring program will be reviewed and, as necessary, updated to integrate relevant aspects of the Project. **Table 47** presents a summary of the proposed surface water monitoring.

## 8.12 Groundwater Monitoring

- (a) All hydrocarbon products will be securely stored.
- (b) All of the mining fleet will be refuelled within designated areas of the Project Site
- (c) With the exception of some maintenance activities on mobile equipment, all maintenance works requiring the use of oils, greases and lubricants would be undertaken within designated areas of the Project Site.
- (d) All water from wash-down areas and workshops would be directed to oil/water separators and containment systems.
- (e) All storage tanks will be either self-bunded tanks or bunded with an impermeable surface with a capacity to contain a minimum of 110% of the largest storage tank capacity.
- (f) As per the commitments listed in **Section 8.3**, the existing groundwater monitoring program will be reviewed, updated and implemented to integrate relevant aspects of the Project.
- (g) Bores will be cleaned out (air-lift developed) and depth checked with a weighted tape. Bores will then be geophysically wireline logged (SP/SPR and Gamma) to confirm slotted intervals and the nature of the strata over slotted intervals.
- (h) All monitoring bores will be surveyed for location and level (both ground level and the level of the RP from which groundwater levels are measured).
- (i) Monitoring of groundwater levels will initially be undertaken on a monthly basis for the first year of the Project, after which the interval may potentially be relaxed subject to review of the results. In the longer term a monitoring interval of three months is anticipated. Samples will be analysed for all major ions, including carbonate.
- (j) Pressure transducers/dataloggers will be installed in monitoring bores MP-01 to MP-05 for the continual recording of groundwater levels. These instruments will be downloaded every 2 months. MP-04 and MP-05 will be deepened to at least 10 metres below the water table.
- (k) In order to address the concerns of the NOW in regard to the potential for impact on alluvial aquifers of the Namoi River and associated tributaries, the following program of investigations will be undertaken:
  - Bores MP-04 and WB-01 are nominally located within the alluvium south and north of the mine, respectively. Once this is confirmed through the above commitments, a second bore will be drilled adjacent to each of them, to a depth at which the base of the alluvium is intersected. This adjacent bore will be completed as a monitoring bore in the Maules Creek Formation and have a pressure transducer/datalogger installed for continuous water level monitoring. Such actions will need to be agreed to by the relevant landowners; and
  - There is some uncertainty regarding the nature of the interface between the southern alluvium and the weathered conglomerate profile of the Maules Creek Formation at the southern end of the proposed pit. On this basis, a pair of piezometers will be installed immediately to the south of the proposed pit, one in the Belmont Seam and one in the alluvium/weathered conglomerate. Also, hydraulic testing will be undertaken on the bore in the alluvium/weathered conglomerate to allow refinement of the groundwater model in this regard.

## 8.13 Flora and Fauna

- (a) All efforts will be made by Whitehaven to avoid disturbance of the vegetation communities within the Project Site and to maintain and enhance as much of the existing remnant vegetation on-site, in addition to the proposed biodiversity offset areas (see **Section 5.8**), as possible.

- (b) A high level of hygiene will be adopted in respect to vehicle and machinery to help prevent soil-borne disease transmission and weed seed dispersal.
- (c) Strict erosion and sediment control measures will be installed, monitored and maintained to prevent the erosion and sedimentation impact on adjacent areas.
- (d) Dust control measures will be implemented to protect adjacent retained vegetation communities.
- (e) The minimal practicable amount of clearing will be undertaken as a general objective, particularly within those areas that currently contain identified threatened species or ecological communities.
- (f) Where possible disturbance areas will be marked to protect adjoining vegetation prior to disturbance activities in order to reduce potential damage from uncontrolled or accidental access.
- (g) Stockpiling of materials will occur within already disturbed areas.
- (h) Weed management, monitoring and control practices will be implemented to minimise the spread of exotic species into natural areas within the site.
- (i) A tree felling protocol will be developed, by a suitably qualified and licensed ecologist with previous experience supervising the felling of trees, in order to minimise harm to fauna species during clearing activities.
- (j) Where possible, tree felling will be supervised by the ecologist that developed the tree felling protocol or by another suitably qualified and licensed ecologist.
- (k) Where trees are to be removed an assessment of the surrounding level of tree hollow provision will be undertaken by a suitably qualified ecologist in order to determine the need for local supplementing of tree hollows (using salvaged tree hollows or nest boxes).
- (l) Mature and hollow-bearing trees will be retained wherever feasible within the site.
- (m) Vegetation to be removed will be clearly marked in the field using temporary fencing (flagging tape or similar) so that the boundaries are clearly established and to minimise the potential for equipment to accidentally enter areas to be retained.
- (n) Where possible, the timing of clearing activities will be undertaken at such times to avoid removal of hollow-bearing trees during breeding season of threatened species.
- (o) Regular monitoring of the vegetation within the Project Site and offset areas will be undertaken in order to enable effective management with regards to rehabilitation (planting), regeneration, watering, fencing and weed control.

#### **8.14 Aboriginal Heritage**

- (a) As per the commitments listed in **Section 8.3**, the existing ACHMP (Whitehaven 2008c) will be reviewed and, as necessary, updated to integrate relevant aspects of the Project.
- (b) All efforts will be made by Whitehaven to minimise disturbance within the Project Site.
- (c) Liaisons will continue to be undertaken with the registered Aboriginal stakeholders and other interested parties until all issues in relation to the management of Aboriginal cultural heritage have been resolved.
- (d) If impact to the Aboriginal sites identified with the Project Site (RPS Rocglen IF1, RPS Rocglen AS1 and RPS Rocglen AS2) is unavoidable, a surface salvage will be undertaken in accordance with Section 3 of the ACHMP (Whitehaven 2008c). Artefacts salvaged will be transferred to relevant Aboriginal groups under a Care and Control Permit under Section 85A of the NP&W Act.

- (e) Protective measures designed to prevent damage to the scarred trees (NPWS # 20-4-0194 and NPWS #20-4-0195) will be enacted upon as per recommendations in Appleton (2007) and the ACHMP (Whitehaven 2008c).
- (f) In areas where surface excavation might occur in the future within 25 metres of the east-west oriented drainage line, Whitehaven will follow protocols in Section 4.1(iii) of the ACHMP (Whitehaven 2008c).
- (g) In general during the course of the Project, if it is suspected Aboriginal cultural heritage material has been encountered, work will cease immediately in that locale. The DECCW, along with the RCLALC, BBGTP, GGAC and MMAC, will be notified. Works will only recommence when an appropriate and approved management strategy has been agreed to by all of the relevant stakeholders.
- (h) In the event that skeletal remains are uncovered during operations, work will stop in the vicinity immediately and the NSW Coroner's Office and NSW Police contacted. If skeletal remains are deemed to be of Aboriginal origin, a representative of the local Aboriginal Community and the DECCW will be consulted.

### **8.15 European Heritage**

- (a) If significant European cultural heritage material is uncovered during site works, work will cease in that area immediately. An archaeologist will be contacted to assess the significance of the remains and works will only recommence when an appropriate and approved management strategy is instigated.

### **8.16 Visual Amenity**

- (a) All efforts will be made by Whitehaven to minimise the visual impact of the mine during and post-operation.
- (b) As per the commitments listed above in **Section 8.6**, Whitehaven will adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, topdressed and vegetated. Early reshaping and revegetation of the external batter slopes of the emplacement areas will be targeted as a priority.
- (c) In addition to retaining areas of existing remnant vegetation, it is proposed to restore approximately 206 hectares (58 percent) of the disturbed area within the Project Site as rehabilitated bushland. This large area, which includes the western slopes of the Northern and Western Emplacement Areas, will blend in well with the retained remnant vegetation areas within the Project Site and within the adjacent Vickery State Forest and "Yarrowonga" property.
- (d) Strategically placed bushland tree lots will be integrated into the post-mining landform to break-up the landform and provide visual texture. This will be complimented by the establishment of pasture grass areas that will provide short-term visual impact mitigation prior to the trees becoming established.
- (e) An earthen bund of appropriate height will be established between the realigned Wean Road and the active pit area. This bund will be vegetated immediately following construction. The bund will provide an effective visual screen of the site from Wean Road. In addition to the bund, a strip of bushland will be established to screen the view of the final void and generally improve the visual amenity from Wean Road.

- (f) The requirements of the Australian Standard *AS 4282 1997 – Control of Obtrusive Effects of Outdoor Lighting* will be taken into consideration when placing lights required when working outside of daylight hours. In particular, lighting plant will be positioned and directed away from surrounding residences and aimed downwards to avoid light spill onto adjoining lands and public roads.

## 8.17 Greenhouse Gas Emissions

- (a) The *Greenhouse and Energy Efficiency Plan* prepared by Denis Cooke & Associates in June 2009 in accordance with PA 06\_0198 will continue to be implemented at Rocglen in order to promote continuous change and sustainable improvement in energy management and efficiency.

## 8.18 Traffic and Transport

- (a) Coal transportation will be undertaken via the approval haulage route between Rocglen and the Whitehaven CHPP.
- (b) Coal transport will be undertaken between the approved times of 7am and 9:15pm Monday to Friday, and between 7am and 5:15pm on Saturdays.
- (c) On school days, Whitehaven will maintain the communication system between the truck drivers and the local school bus driver. The system has been negotiated between Whitehaven and the local bus drivers and involves two-way radio communication to ensure that trucks do not exceed 40 km per hour when travelling in the vicinity of the school bus.
- (d) All trucks transporting coal from the mine and backloading reject from the Whitehaven CHPP will be covered with fitted roll-over tarpaulins.
- (e) All trucks transporting coal will be well maintained to ensure optimal operation.
- (f) Drivers will be instructed to operate in accordance with a Transport Policy and Code of Conduct, which identify aspects such as travelling speeds, general behaviour, avoidance of exhaust brakes, load coverage, complaints and disciplinary procedures. The Policy and Code apply to all employee and contractor-owned vehicles.
- (g) The on-going use of the road network will be covered under the arrangements of the existing road maintenance agreement with Gunnedah Shire Council to ensure the subject roads continue to be adequately maintained.

## 8.19 Waste Management

- (a) All production wastes and non-production wastes will be managed in accordance with current approved waste management strategies (see **Section 4.12**).
- (b) Whitehaven will approach waste generation and management according to the following principles – (a) waste avoidance; (b) waste re-use; (c) waste recycling; and (d) waste removal and disposal.

## 8.20 Bushfire Hazard

- (a) Vegetation will be cleared away from around blast sites for a distance of greater than 20 metres.
- (b) All coal will be removed from open cut around blast sites.

- (c) Blast design and implementation will be undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.
- (d) An inspection of blast sites will be undertaken prior to blast.
- (e) Water truck/cart will be available to douse any fire ignited or smouldering vegetation.
- (f) Refuelling will be undertaken within designated fuel bays or within cleared area of the Project Site and vehicles will be turned off while refuelling.
- (g) No smoking policy will be enforced in designated areas of the Project Site.
- (h) Fire extinguishers will be maintained within site vehicles.
- (i) Coal stockpiles will be regularly inspected and, as required, watered.
- (j) The height and volume of coal stockpiles will be controlled to limit the duration coal is retained in stockpiles.
- (k) Whitehaven will regularly liaise with the NSW Forests and NSW Rural Fire Service in relation to the bushfire hazard presented by the Vickery State Forest and to a lesser extent the nearby CCC Zone 2 Kelvin.

## **8.21 Socio-Economic**

- (a) Whitehaven will continue to engage the community in consultation for the purposes of providing information relating to the Project and company operations in general. It is anticipated that consultation will include:
  - Circulation of information and newsletters, as required, relating to mining activities (for example, blasting schedule); and
  - Continuation of the Rocglen CCC established under PA 06\_0198 for the existing Rocglen operation.
- (b) Whitehaven will respond to any community complaints within 24 hours of receipt. All complaints will be investigated and the results of the investigation reported to the complainant in a timely manner.

## 9.0 JUSTIFICATION AND CONCLUSION

### 9.1 Environmental Impacts

As detailed in **Section 7.0**, the potential environmental impacts of the Rocglen Extension Project have been identified and assessed. The key issues identified were the subject of comprehensive specialist assessments, which are appended to this EA.

While the information presented within **Section 7.0** and appended to this EA should be read in its entirety, **Table 58** provides a very broad overview of the key outcomes of the environmental assessment.

**Table 58 – Broad Overview of Environmental Assessment Issues**

Environmental Issue	Overview of Key Findings (following intended management and mitigation)
Air Quality	<ul style="list-style-type: none"> <li>• Modelled predictions indicate acceptable air quality impact at all privately-owned residences throughout the life of the mine.</li> <li>• The 24-hour average PM<sub>10</sub> criterion is predicted to be exceeded at “Yarrowonga” during Year 1 by 10 µg/m<sup>3</sup>, putting the property within the DoP’s acquisition criterion. However “Yarrowonga” is owned by Whitehaven and, as such, the acquisition criterion becomes irrelevant.</li> <li>• Using the 70<sup>th</sup> percentile approach leads to predicted exceedances of the cumulative 24-hour average PM<sub>10</sub> criteria at “Yarrowonga”, “Yarrari”, “Belah” and “Roseberry”. The only one of these residences not currently owned by Whitehaven is “Roseberry” where the exceedance is only predicted for operations in Year 10. Further analysis for “Roseberry” was undertaken to determine how many times this exceedance may occur, with the conclusion being that the mine is predicted to comply with the DoP’s acquisition criterion at “Roseberry”.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• Exceedance of the criterion have been predicted at “Costa Vale”, however this property is now owned by Whitehaven and, as such, is considered project-related.</li> <li>• The most impacted receiver (apart from “Costa Vale”) is “Retreat” to the north of the site. Maximum noise levels estimated from individual sources at “Retreat” are more than 10 dB below the 45 dB(A) sleep disturbance ‘screening’ level and are also no greater than the total LAeq level from the entire mine.</li> <li>• Measured traffic noise levels range from 3 to 9 dB below the 60 dB(A) criterion. The project will not alter the total number of trucks and therefore off-site traffic noise levels are expected to remain compliant.</li> </ul>
Blasting and Vibration	<ul style="list-style-type: none"> <li>• Historical blast monitoring results show no exceedances of either the applicable ground vibration or blast overpressure criteria at the nearest residences surrounding the Project Site. On this basis, Spectrum Acoustics (2010) concludes that no significant blasting impacts are expected as a result of the Rocglen Extension Project.</li> </ul>
Surface Water	<ul style="list-style-type: none"> <li>• The site has adequate water supply primarily through the rainfall runoff captured in sediment basins, which can be supplemented through the use of bore water when required.</li> <li>• The use of bore water appears highly dependent on the water management practices adopted. Assuming controlled discharge is undertaken to draw down the dirty water dams, the typical bore water usage will be 40 to 50 ML/year and will be within the licensed entitlement of 120 ML/year.</li> </ul>

	<ul style="list-style-type: none"> <li>• The number of overflow discharges appears to be also highly dependent on the water management practices adopted. Assuming controlled discharge is undertaken, likely average annual overflow discharges of one day is expected, which will occur under extreme rainfall events (greater than the license threshold of 38.4 mm in 5 days). In practice the mine pit would provide substantial additional on-site storage (temporarily), which would reduce the potential for overflow discharge to occur.</li> <li>• A new <i>Site Water Management Plan</i> will be prepared in accordance with regulatory requirements and conditions of consent. It will be developed in accordance with the <i>Blue Book (Volume 1 and Volume 2E)</i> and will address potential impacts, management strategies and mitigation measures.</li> <li>• Key changes to be integrated into the existing surface water management system are:             <ul style="list-style-type: none"> <li>- Additional water management controls to deal with water from the increased disturbance footprint in the northern area of the site;</li> <li>- Additional water management controls to address TSS issues during wet weather discharge;</li> <li>- Relocation of the Mine Water Dam; and</li> <li>- More effective diversion of clean water from off-site catchments to the east.</li> </ul> </li> <li>• No additional licensing requirements. However LDP 12 will require relocation to the outlet of the proposed Dam 'B' at the northern boundary of the site to enable discharge into Driggle Draggie Creek.</li> </ul>
<p>Groundwater</p>	<ul style="list-style-type: none"> <li>• Apart from the groundwater levels recorded for monitoring bore WB-05, which is likely to be anomalous and affected by nearby pumping, it is apparent that the mine has had very little impact on surrounding groundwater levels over the period mid 2008 to present.</li> <li>• Modelling results indicate high drawdowns in close proximity to the mine site, with relatively low impacts to the east of the faulting. The predicted impacts on the alluvium are also low, however are slightly higher in the alluvium immediately south of the pit in the case that a permeable fault was present to the west of the site. The extent of the impacts on groundwater head are expected to be less than previously predicted by RCA Australia (2007) for areas outside of the area of faulting.</li> <li>• Groundwater flow rates into the pit are generally expected to decrease as mining continues in the northern end of the pit, however are expected to increase as the mining progresses to the south due to the increased area of the pit and because the flow is less restricted by the faulting at the northern end of the pit. The range of possible inflows to the pit, based on the credible range of parameters, ranges from 1,057 to 3,381 m<sup>3</sup>/day, however it is unlikely that the annual flow rates into the pit will exceed the existing groundwater interference licence of 700 ML/year (1,918m<sup>3</sup>/day). It is noted that there is some uncertainty in the site conditions, in particular to the south west of the site, and flows greater than 700 ML/year may be possible if adverse conditions occur. Therefore a robust on-going monitoring program and updating of the predictive model are recommended as mining continues.</li> <li>• It is expected that once mining is complete, recharge of groundwater and rainfall infiltration into the pit will result in the formation of a water table within the backfill. It is likely that this will eventually lead to the formation of surface water in the southern part of the pit with the locally deeper final surface level. The inflow to the pit will be offset by evaporation from the area of surface water and therefore it is unlikely that the groundwater levels within the pit will ever fully recover to pre-</li> </ul>

	<p>development levels. It is estimated that the final equilibrium water levels may take 20 to 50 years to occur and would also be subject to variations according to climatic conditions.</p> <ul style="list-style-type: none"> <li>• In general, the pore water in the backfilled mine spoil is expected to become less saline over time due to the percolation of rainfall through the spoil pile. The exception to this will be in the area of surface water in the non-backfilled portion of the pit. In this location, the salinity is expected to increase over time as the evaporation leads to reduction in water volume and leaves the dissolved salt behind. The increase in concentration is expected to be generally isolated to the surface water in the locally deep area, with some minor mixing with the adjacent pore water in the mine spoil. It is considered that, although the proposed final void form will, over time, lead to increasing salt concentrations in the localised area of surface water within the final void, this will be of minimal impact outside the final void.</li> </ul>
<p>Flora and Fauna          (Biodiversity)</p>	<ul style="list-style-type: none"> <li>• No threatened flora species were observed within the Project Site, and it is therefore considered that the Rocglen Extension Project will not have any significant effect on locally occurring threatened flora species.</li> <li>• It is expected that the Project will result in the removal of 5.9 hectares of the White Box Yellow Box Blakely's Red Gum Woodland EEC along Wean Road (note that a large portion of Wean Road occurs within areas covered by the original mine approval) and Jaeger Lane, and 10.9 hectares of derived native grassland of the EEC from the within the Project Site. Habitat critical to the survival of this EEC has not been gazetted within the TSC Act or EPBC Act. Therefore the Project is not likely to impact any habitat critical to this community. The importance of the patch of White Box Yellow Box Blakely's Red Gum Woodland EEC to be removed is considered to be 'medium'. The revised Biodiversity Offset Strategy (ELA 2010) provides a 'maintain or improve' outcome for the removal of this vegetation community.</li> <li>• A small stand (0.14 hectares) of Brigalow trees (<i>Acacia harpophylla</i>) is present within the proposed mine expansion area. The presence of this species is not definitive but is indicative of the EEC "Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions EEC" listed under the TSC Act. This stand is considered not viable due to its small size, lack of recruitment, depauperate condition, isolation and lack of an adequately sized gene pool for continued survival. However, the revised Biodiversity Offset Strategy (ELA 2010) provides a 'maintain or improve' outcome for the removal of this vegetation community.</li> <li>• The Project would be unlikely to significantly affect any threatened, migratory or protected fauna species occurring within the subject site.</li> <li>• As required by the <i>Draft Guidelines for Threatened Species Assessment for Part 3A Applications</i> (DEC/DPI 2005, as cited in RPS 2010a), RPS (2010a) provided the following assessment of Key Thresholds for the Project:             <ul style="list-style-type: none"> <li>- It is considered that the information presented within the <i>Flora and Fauna Assessment</i> (RPS 2010a), combined with the revised <i>Biodiversity Offset Strategy</i> (ELA 2010), is likely to result in a maintained, if not an improved, long term outcome for biodiversity within the region.</li> <li>- The threatened species, populations and ecological communities within the Project Site are, or are likely, well represented in the surrounding habitat areas of Vickery State Forest and Kelvin Aboriginal Area. The removal of the relatively small area of habitat for the Project is considered unlikely to reduce the long-term viability of any species, population or EEC.</li> <li>- The threatened species, populations and ecological</li> </ul> </li> </ul>

	<p>communities within the Project Site are, or are likely, well represented in the surrounding habitat areas of Vickery State Forest and Kelvin Aboriginal Area as well as the wider region. The removal of the relatively small area of habitat for the Project is considered unlikely to accelerate the extinction or place at risk of extinction any species, population or ecological community.</p> <ul style="list-style-type: none"> <li>- There is no declared “Critical Habitat” within the Rocglen Coal Mine locality, and as such the Project will not adversely affect any such habitat.</li> <li>• Due to the relatively small area of forest and woodland vegetation within the Project Site in comparison to the area of also suitable forest and woodland vegetation in the adjacent Vickery State Forest, it is unlikely that the koala would be significantly affected by the Project.</li> <li>• To address and offset impacts, a revised <i>Biodiversity Offset Strategy</i> has been prepared that meets the offset requirements for an approval under the EP&amp;A Act and the EPBC Act. The BioBanking Methodology was used to ‘inform’ the ‘improve or maintain’ assessment and provide a ‘quantum’ of area required to offset the impacts of the Project. This <i>Strategy</i>, in summary, comprises the retirement of 4,859 credits from the Whitehaven Regional BioBank Site, which is the final stages of registration by the DECCW as a BioBank Site under Part 7A of the TSC Act. It provides an offset (525 hectares) to impact (110.44 hectares comprising 95.44 hectares of impacts for mine extension and the equivalent of 15 hectares of original impacts which now needs a replacement offset) ratio of 4.75:1.</li> </ul>
Aboriginal Heritage	<ul style="list-style-type: none"> <li>• Three stone artefacts sites were located by RPS (2010b) within the Project Site, comprising one isolated find and two artefact scatters. If impact to these is unavoidable, a surface salvage will be undertaken in accordance with the existing ACHMP (Whitehaven 2008c).</li> <li>• Two scarred trees are located on the eastern side of the Wean Road reserve. Protective measures designed to prevent damage to these will be enacted upon as per recommendations in Appleton (2007) and the ACHMP (Whitehaven 2008c). Whitehaven has restricted the proposed mine extension in this area and has committed to ensuring that no disturbance to the scarred trees or immediate surrounds will occur as a result of the Project.</li> </ul>
European Heritage	<ul style="list-style-type: none"> <li>• The “Glenroc” residence and associated outbuildings are not considered to have any historic significance. No other items of heritage significance were observed.</li> </ul>
Visual Amenity	<ul style="list-style-type: none"> <li>• The impact of the Project on the post-mining visual amenity of the local area is considered to be acceptable. While the existing topography and remnant vegetation generally contained within road reserves around the Project Site offer natural screening, distant views of the expanded Northern Emplacement Area will be seen from surrounding residences.</li> </ul>
Greenhouse Gas Emissions	<ul style="list-style-type: none"> <li>• There are not likely to be any measurable environmental effects due to the emissions of greenhouse gases from the Project.</li> </ul>
Traffic and Transport	<ul style="list-style-type: none"> <li>• The Project does not involve any change to the coal production rate, transport fleet, hours of coal haulage or coal haulage route used between Rocglen and the Whitehaven CHPP. On this basis, the Project does not pose any additional impacts on an annual basis upon the local road network or traffic volumes, nor does it pose any additional conflict with other road users. It will result in the transport route being utilised for a longer period of time than initially identified, however any associated impacts on the road network will be managed via the existing road maintenance agreement with Council.</li> </ul>
Waste Management	<ul style="list-style-type: none"> <li>• The Rocglen Extension Project will not generate any new waste materials or additional waste volumes on an annual basis, and all waste streams will continue to be managed in accordance with current</li> </ul>

	<p>approved waste management strategies.</p> <ul style="list-style-type: none"> <li>Waste materials produced by the Project will be managed in accordance with the following principles - waste avoidance; waste re-use; waste recycling; and waste removal and disposal.</li> </ul>
Bushfire	<ul style="list-style-type: none"> <li>While much of the Project Site comprises land that has been cleared for past agricultural production and/or existing mining activities, remnant areas of mature or regenerating trees do exist. Furthermore, it is located within a rural environment adjacent to the Vickery State Forest.</li> <li>Following the assessment guide of NSW RFS (2001), the Project Site is considered to have a low-medium bushfire hazard rating, as determined by RWC (2007) for the original proposal in 2007.</li> </ul>
Socio-Economic	<ul style="list-style-type: none"> <li>While the Project does not involve any change to the coal production rate or employment, it is anticipated that the Project will enable open cut mining for approximately 11 years. This represents an increase to the projected life of the mine, for coal extraction, of up to four years, which, in turn, will secure on-going employment opportunities and socio-economic flow-on benefits over this time.</li> </ul>

The potential environmental impacts of the Project have been kept to a minimum through:

- Undertaking preliminary feasibility assessments for several development layout options (both within the Project Site and extending beyond the Project Site) and subsequently selecting a configuration considered optimal in light of mining efficiency, operational, environmental, economic and land ownership considerations;
- Obtaining a detailed understanding of the issues and potential impacts via consultation and assessment to a level of detail commensurate with the scale of the Project, industry standards and the legislative framework under which the Project is permitted;
- The existing proactive strategies employed at Rocglen to avoid, minimise, mitigate, offset or manage potential impacts;
- A commitment to undertake site rehabilitation on a progressive basis;
- The development of appropriate and long-term beneficial post-mining landforms and land uses;
- A commitment to review and update the suite of environmental management plans and monitoring programs already implemented at Rocglen; and
- A thorough Statement of Commitments (see **Section 8.0**).

## 9.2 Benefits of the Project

The socio-economic assessment in **Section 7.15** outlines a range of positive benefits that will accompany the Project at a local, regional and state level.

While the Rocglen Extension Project does not involve any change to the coal production rate or employment, it is anticipated that the Project will enable open cut mining for approximately 11 years following the issue of Project Approval and the subsequent issue of a new or amended mining lease. This represents an increase to the projected life of the mine, for coal extraction, of up to four years, which, in turn, will secure on-going employment opportunities and socio-economic flow-on benefits over this time.

Notable positive socio-economic benefits include, but are not limited to, the following:

- Maintenance of direct employment levels (54 full-time jobs) and indirect employment levels for up to an additional 4 years;

- Training opportunities for local people, including young people and indigenous people, in a growth industry (mining);
- Stimulus to local businesses, particularly in Gunnedah, including motel and hotel trade, cafes and restaurants, mining-related servicing and engineering business, and general surplus spending activity such as gyms, cinema, recreational goods and services, beauty salons, and hair dressers;
- Maintenance of, or increase to, the population to participate in locals clubs;
- Contribution of close to \$21 million per year of operation to the local and regional economies through wages, payments to contracting companies and expenditure of other local goods and services;
- Contribution of close to \$46 million per year of operation to the NSW, Australian and global economies through income tax, royalties, payroll tax, payments to rail-related contracting companies and expenditure of other goods and services; and
- Community-based and charitable contributions ensuring that the economic benefits of the Rocglen Coal Mine are not restricted to the company, employees and various levels of government.

### 9.3 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) has emerged as a primary objective of environmental protection in NSW. ESD is an objective of the EP&A Act under Section 5(a)(vii) and is defined under Section 6(2) of the *Protection of the Environment Administration Act 1991* as:

*6(2) For the purposes of subsection (1)(a), ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:*

- (a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation...*
- (b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
- (c) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
- (d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services....*

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future.

Whitehaven has shown a commitment to the principles of ESD and understands that social, economic and environmental objectives are interdependent. Whitehaven also acknowledges that a well designed and effectively managed operation will avoid significant and/or costly environmental impact or degradation. The suite of environmental management plans and monitoring programs are designed to demonstrate environmental due diligence and to implement procedures that provide on-going management and monitoring of the Rocglen operation in-line with the objectives of ESD.

### 9.3.1 The Precautionary Principle

The Precautionary Principle, in summary, holds that where there are threats of serious or irreversible environmental damage, the lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

A detailed understanding of the issues and potential impacts associated with the Rocglen Extension Project has been obtained via consultation and assessment to a level of detail commensurate with the scale of the Project, industry standards and the legislative framework under which the Project is permitted. Specialist assessments, including the use of engineering and scientific modelling, have been undertaken for the design of the mine expansion and for impacts relating to air quality (including greenhouse gas), noise and vibration, surface water, groundwater, flora and fauna, and Aboriginal heritage. Assessment has also been undertaken for other issues, including visual amenity, traffic and transport, waste management, bushfire hazard and socio-economic considerations. To this end, there has been careful evaluation undertaken in order to avoid, where possible, serious or irreversible damage to the environment.

The various consultation activities that have been undertaken (see **Section 2.3**) and the engagement of suitably qualified and experienced consultants have ensured that the planning, design and assessment phases of the Project have been transparent.

The contents of this EA report (including appendices), combined with the consultation activities, has enabled Whitehaven to understand the potential implications of the Project, and therefore identify the required management strategies, mitigation measures and monitoring activities.

### 9.3.2 Intergenerational Equity

Intergenerational Equity is centred on the concept that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. There is a moral obligation to ensure that today's economic progress, which will benefit both current and future generations, is not offset by environmental deterioration.

The primary objective of the Project is to maximise resource recovery and maintain continuity of coal production from the existing Rocglen Coal Mine beyond the currently projected life of mine in an environmentally responsible manner. The management strategies, mitigation measures and monitoring programs discussed in **Section 7.0** and listed in **Section 8.0** have been identified to minimise adverse impact upon the local environmental and surrounding populace. Emphasis has been placed on anticipation and prevention of potential impacts, as opposed to undertaking later remedial action.

These actions and initiatives will assist in ensuring that current and future generations can enjoy equal and equitable access to social, environmental and economic resources through the maintenance of the health, diversity and production of the environment.

### 9.3.3 Conservation of Biological Diversity and Ecological Integrity

The principle of Conservation of Biological Diversity and Ecological Integrity holds that the conservation of biological diversity and ecological integrity should be a fundamental consideration for development proposals. The potential environmental impacts, including upon ecological communities and habitat values, of the Project and measures to ameliorate these impacts are detailed in this EA. Whitehaven has sought to avoid and minimise potential impacts on ecological values within the Project Site. This has resulted in a focus to minimise disturbance, the development of a revised *Biodiversity Offset Strategy* (see **Section 5.8**) and the development of a Rehabilitation and Decommissioning Strategy (see **Section 5.7**) that will result in approximately 206 hectares (58 percent) of disturbed area within the Project Site restored to rehabilitated woodland.

### 9.3.4 Improved Valuation, Pricing and Incentive Mechanisms

The principle of Improved Valuation, Pricing and Incentive Mechanisms deems that environmental factors should be included in the valuation of assets and services. The cost associated with using or impacting upon an environmental resource is seen as a cost incurred to protect that resource.

The application of this principle remains in its infancy and, to date, there are few widely accepted methods by which monetary values are attributed to environmental factors. However the Project optimises the valuation and pricing of the coal resources by optimising the use of an existing operation (Rocglen), existing coal handling and preparation facilities (Whitehaven CHPP) and existing transportation facilities to extract, process and transport additional coal resources to existing markets. Furthermore, if the additional 5 Mt of coal is not recovered by Whitehaven as part of the existing Rocglen operation, the likelihood of the resource being extracted in the future is considered low. The high cost of re-establishing within the site, compared to the additional coal quantity, would likely result in that resource being isolated and sterilised.

Whitehaven will accept the full costs associated with the avoidance, minimisation, mitigation, offsetting and management of potential environmental and social impacts.

## 9.4 Conclusion

Following further drilling and definition of local geological features, as well as additional reviews of the mine plan, Whitehaven proposes to expand operations at the Rocglen Coal Mine in order to maximise resource recovery and allow for improved mine progression. The objectives of the Rocglen Coal Mine Extension Project are to:

- Develop the on-going open cut operations with a focus on:
  - maximising resource recovery and maintaining continuity of coal production from the existing Rocglen Coal Mine beyond the currently projected life of mine;
  - maximising the use of existing infrastructure; and
  - securing on-going employment opportunities and socio-economic flow-on benefits;
- Provide additional out-of-pit emplacement area to accommodate overburden material from the existing operations and proposed pit expansion; and
- Continue to conduct mining at Rocglen in an environmental responsible manner to ensure the potential for adverse impact is minimised.

It is intended that the Rocglen Extension Project will be fully integrated with the remaining operational life of the current approved Rocglen mine, which will enable Whitehaven to operate under a single Project Approval over the life of the Project.

The assessment of the Project has been multi-disciplinary and involved consultation with various government agencies, surrounding landholders and community groups. Emphasis has been placed on anticipation and prevention of potential environmental and social impacts, with management strategies, mitigation measures and monitoring activities identified to kept potential impacts to a minimum.

The socio-economic output of the Rocglen Extension Project, particularly in terms of direct and indirect employment and flow-on benefits, is anticipated to make a significant contribution to Gunnedah and the surrounding region.

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## 11.0 ABBREVIATIONS

ACHMP	Aboriginal Cultural Heritage Management Plan
AEMR	Annual Environmental Management Report
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ASX	Australian Securities Exchange
BBGTP	Bigundi Biame Gunnedar Traditional People
CCA	Community Conservation Area
CHPP	Coal Handling and Preparation Plant
CMA	Catchment Management Authority
DECCW	NSW Department of Environment, Climate Change and Water
DEWHA	The former Commonwealth Department of Environment, Water, Heritage and the Arts
DGRs	Director-General's Requirements
DoP	NSW Department of Planning
EA	Environmental Assessment
EEC	Endangered Ecological Communities
ELA	Eco Logical Australia
ENM	Environmental Noise Model
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development
GGAC	Gunida Gunyah Aboriginal Corporation
GHA	GE Holt & Associates Pty Ltd
GHG	Greenhouse Gas
GSSE	GSS Environmental
HVAS	High Volume Air Sampler
I&I NSW	NSW Department of Industry and Investment
LEP	Local Environment Plan
LGA	Local Government Area
LMU	Land Management Unit
ML	Mining Lease
MMAC	Min Min Aboriginal Corporation
MOP	Mining Operations Plan
Mtpa	Million tonnes per annum
NGA	National Greenhouse Accounts

NGER	National Greenhouse and Energy Reporting
NES	National Environmental Significance
NOW	NSW Office of Water
PA	Project Approval
POEO Act	NSW Protection of the Environment Operations Act 1999
PRA	Preliminary Risk Assessment
RCLALC	Red Chief Local Aboriginal Land Council
RH	Relative Humidity
ROM	Run of Mine
RWC	R.W. Corkery & Co.
SEPP	State Environmental Planning Policy
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Community
SWMP	Site Water Management Plan
RTA	NSW Roads and Traffic Authority
TSC Act	NSW Threatened Species Conservation Act 1995
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency