Beltana Highwall Mining Pty Limited

Environmental Assessment
Blakefield South Power Generation and Ventilation Air Methane Abatement

December 2009

Umwelt
Environmental Consultants

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Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Beltana Highwall Mining Pty Limited

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1.0 Introduction

Bulga Underground Operations (also known as Beltana Underground Mine (Beltana)) is an underground coal mine located approximately 12 kilometres south-west of Singleton, 1 kilometre north of Broke and 1.5 kilometres east of Bulga, in the Upper Hunter Valley of New South Wales (**Figure 1.1**). Beltana forms part of the Bulga Complex managed by Bulga Coal Management Pty Limited (BCM) on behalf of the Bulga Joint Venture (BJV). The BJV ownership comprises Saxonvale Coal Pty Limited which holds an 87.5% share with the remaining 12.5% held by Nippon Steel Australia Pty Limited. Saxonvale Coal Pty Limited is a wholly owned subsidiary of Oakbridge Pty Limited of which Xstrata Coal Pty Limited owns 78% with the remainder held by Tomen Corporation (5%), Nippon Oil (15.2%) and JFE Shoji Trade Corporation (1.8%).

Beltana Underground Mine comprises Beltana No. 1 Whybrow Seam Longwall Mine and the Blakefield South – Blakefield Seam Mine. Each operation is managed by the Bulga Underground business unit and utilises the services of the Bulga Coal Surface Operations Coal Handling and Preparation Plant (CHPP) and rail loading facility.

The deeper coal seams being mined at Beltana are known to contain substantial methane gas levels. In order to provide a safe working environment within the underground workings, it is necessary to drain the methane from the area to be mined. Currently, this is achieved through a combination of pre and post mining gas drainage techniques, with the drained methane flared or vented to the atmosphere.

Methane is a greenhouse gas which has 21 times the global warming potential of carbon dioxide. The sources of methane generation from the Beltana operations include dilute methane concentrations associated with the mine ventilation system and higher concentration methane drained from the gas drainage wells.

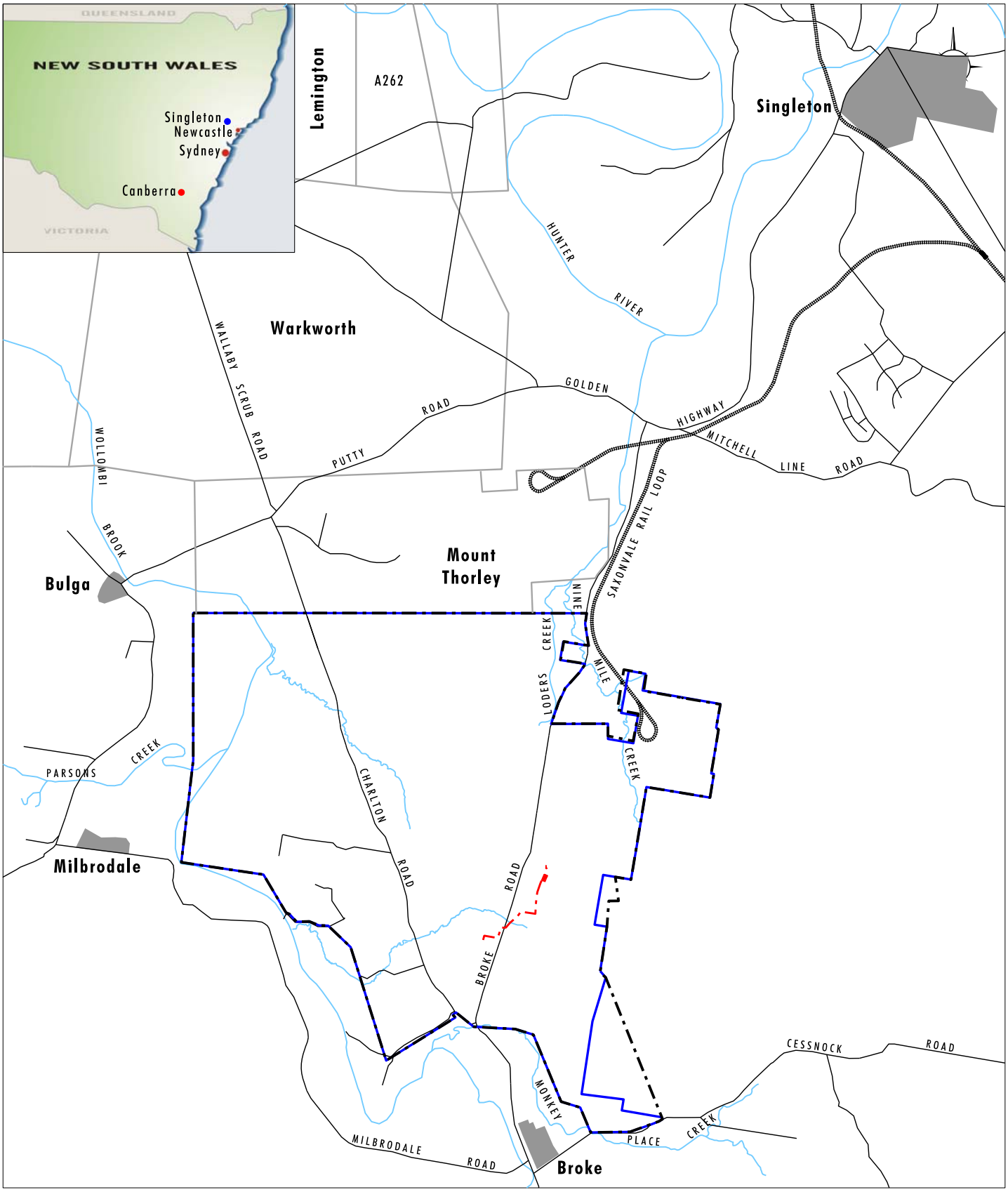
The Blakefield South power generation and ventilation air methane (VAM) abatement project (the Project) aims to capture and treat the methane released from the mine through:

- installation and operation of up to 25 MW of gas fired reciprocating engine power generator units and associated infrastructure; and
- construction and operation of a pilot VAM abatement system.

The main purpose of the Project is to reduce the greenhouse gas emissions associated with the underground mining operations at Beltana, and to better utilise the methane gas resource associated with the mine. The Project will result in a net greenhouse gas benefit compared to existing operations by using the captured methane to produce electricity and by treating a proportion of the methane associated with the mine's ventilation system.

Approval for the Project is sought via a modification to Bulga Underground's existing 2004 development consent (DA 376-8-2003) under Section 75W of the *Environmental Planning and Assessment Act 1994* (EP&A Act). The NSW Minister for Planning is the consent authority.

This Environmental Assessment (EA) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Beltana in accordance with the Director-General's Requirements for the Project issued by the Department of Planning (DoP) (refer to **Section 2.0**). It includes a description of the Project, details of stakeholder consultation, a discussion of the planning and environmental context, provides a detailed environmental impact assessment, identifies the appropriate management and mitigation measures, and contains a statement of commitments that will be implemented by Beltana as part of the Project.



Source: 1:100 000 Cessnock Topographic Map

0 1 2.5 5km
1:100 000

Legend

- Bulga Coal Complex Mining Lease Area
- Approved Development Consent Area
- Proposed Gas Pipeline Route
- Proposed Infrastructure
- Other Coal Lease Boundary
- Road
- Railway
- Watercourse

FIGURE 1.1

Location Plan

1.1 Project Background

Coal mining at the Bulga Complex was first undertaken by BHP in 1982, with this operation known as the Saxonvale Mine. The mine comprised an open cut coal mine, coal preparation plant and rail loading facility. BHP continued to operate the Saxonvale Mine until 1988, when ownership was transferred to Elders Resources. Oakbridge Pty Limited acquired the Saxonvale Mine from Elders Resources in 1989. Approval was granted to Oakbridge to expand the open cut operations in December 1990 to produce up to 5.2 million tonnes per annum (Mtpa). A further approval was granted in December 1999 to increase production to 12.2 Mtpa.

Oakbridge commenced underground coal mining operations using the longwall extraction method in 1994 at a rate of 2.4 Mtpa at the South Bulga Colliery (SBC) following a development consent granted in August 1993. Subsequent modifications to that development consent provided for an increase in CHPP capacity to 13 Mtpa and an increase in production from the SBC to 6 Mtpa. Consent to extend underground operations to the south-east was granted in March 2001.

Beltana was granted development consent in December 2001 to extract coal by longwall mining to the north-west of the SBC operations and to the west of the Bulga Open Cut. The consent provided for a production rate of up to 6 Mtpa ROM coal from the Whybrow seam.

In 2004, consent was granted for mining in up to four seams (Whybrow, Blakefield, Glen Munro and Woodlands Hill) including the SBC and Beltana operations. This consent provided for an annual production from the continued underground operations of up to 14 Mtpa for a 27 year mine life. The 2004 consent also consolidated all of the previous Bulga underground consents including the consents for the Beltana No. 1 Underground Mine.

The 2004 consent provided for gas drainage operations as part of the continued underground operations. As part of the 2007 Blakefield South modifications to the 2004 consent, more effective coal seam gas drainage techniques were proposed to provide a safer, more efficient work environment and also to enable a higher proportion of coal seam methane to be captured for flaring or beneficial use.

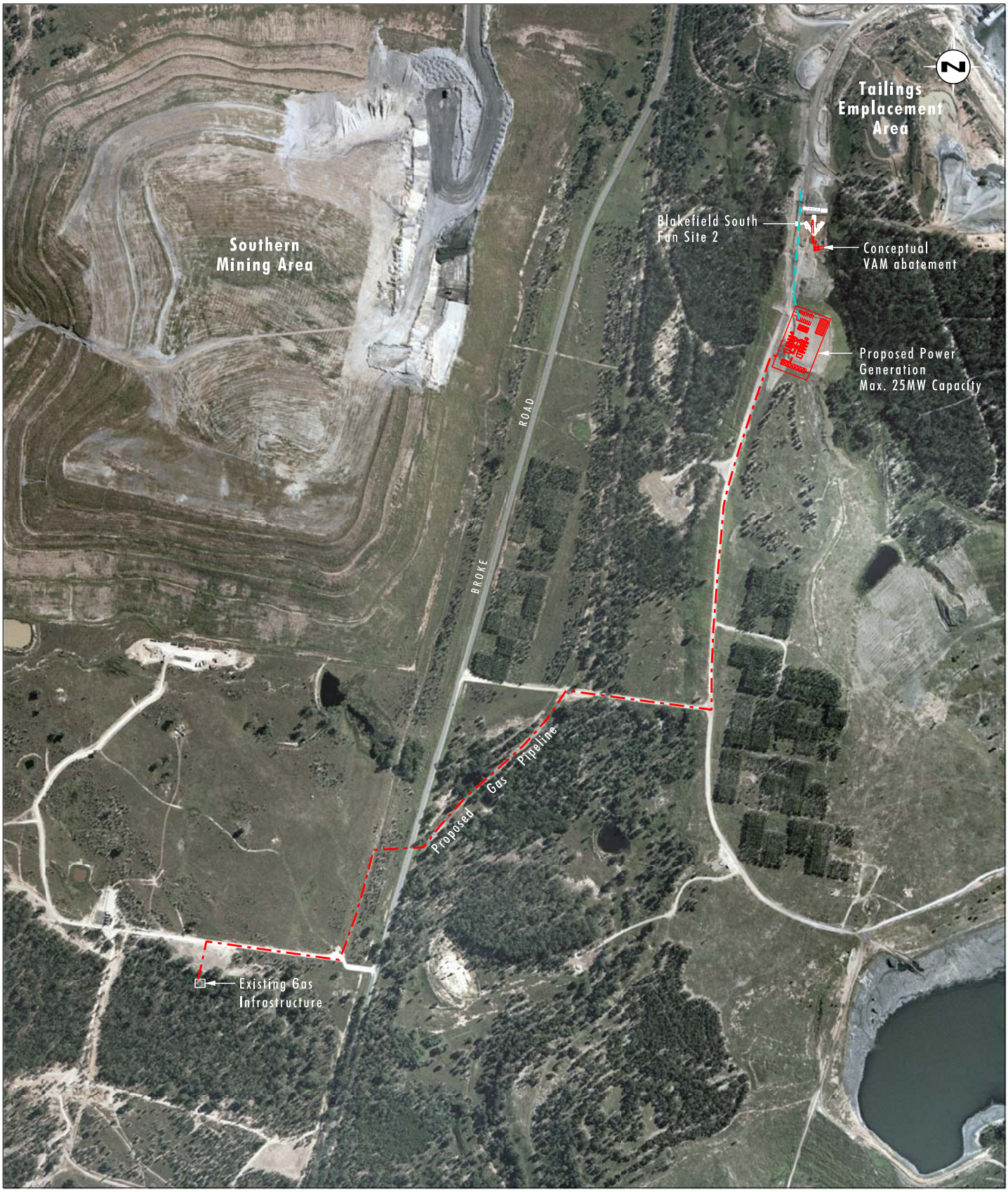
This current modification proposed to the 2004 consent includes an extension of the currently approved gas drainage system by providing the facilities for using the drained methane to generate electricity, flaring the excess gas and treating a proportion of the methane contained in the ventilation air.

1.2 Overview of the Project

The Project involves the capture, treatment and use of the methane drained from the underground operations at Beltana. The two key components of the Project include:

- installation and operation of up to 25 MW of gas fired reciprocating engine power generator units and associated infrastructure; and
- construction and operation of a pilot VAM abatement system.

The small scale power generation component of the Project is proposed to be located on a cleared site approximately 150 metres to the south of the No. 2 Ventilation Fan site (**Figure 1.2**). Up to eight gas fired reciprocating engines generating up to 25 MW of power are proposed to be installed in stages as the gas drainage program for the mine proceeds.



Source: Beltana (2009), Aerial Photo (2008)

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1:10 000

Legend

- Proposed Gas Pipeline Route
- Proposed Infrastructure
- Powerline

FIGURE 1.2

Overview of Project Components

Electricity produced from the power generation units will be used to power some of Beltana's site infrastructure including the ventilation fans. Surplus electricity would be fed back to the national power grid.

A 2.5 kilometre gas pipeline is proposed to be constructed to deliver gas to the power generation plant from the existing Blakefield South gas drainage infrastructure (**Figure 1.2**).

The VAM abatement system is proposed to be sited adjacent to the Blakefield South Ventilation Fan No. 2 which is currently under construction on a site to the east of Broke Road and south west of Bulga Tailings Emplacement Area (**Figure 1.2**). The system will utilise a reverse flow thermal reactor (RFTR) technology (Vocsidizer, VAMOX, Corky's VAN RAB or similar) to capture and convert the dilute methane concentrations associated with the mine ventilation system to carbon dioxide (CO_2) and water vapour.

Further details of the Project are included in **Section 3.0**.

Beltana has existing approval to construct flares for gas drainage management. Seven flares are proposed to be constructed within the power generation compound to flare any gas drained in excess of the generator capacity. The flares do not form part of this project application and information is provided for context only.

1.3 Overview of the Existing Environment

1.3.1 Project Area and Surrounding Land Use

Cattle grazing, mining activity and past land clearance has disturbed much of the Blakefield South mining area, resulting in the vegetation being dominated by pastoral grassland with small isolated pockets of regrowth woodland.

Land uses in the surrounding area include coal mining, grazing, viticulture and rural residential holdings. The land on which the Project components are proposed to be located is within land owned by the BJV, which is currently used for mining related purposes.

The land on which the Project components are to be located was the former site of a haul road and construction material stockpile dating back to the early 1990's, and as such it has been previously disturbed by mining related activities. The area is serviced by existing mine roads with access from the main Beltana access off Broke Road.

1.3.2 Property Description and Land Ownership

The majority of the Blakefield South mining area is located within land owned by BJV, which is used for mining and agricultural purposes. The remainder of the Blakefield South mining area is located under privately owned land primarily used for grazing and rural activities. The bulk of land within the Blakefield South mining area is zoned Rural 1(a), with a small segment zoned 5 Special Uses and Reservation (Commonwealth Land). In addition, Charlton and Broke Roads, which traverse the Blakefield South mining area, are Crown roads under the jurisdiction of Singleton Council.

Both the power generation units and the VAM abatement system are proposed to be sited on Lot 51 DP 755264 which is owned by BJV. This land is zoned Rural 1(a) and is located on the eastern side of Broke Road and south west of the Bulga Tailings Emplacement Area.

The pipeline is proposed to be sited on Lots 3 and 4 DP 247398 and Lot 52 DP 755264 all of which are owned by BJV. This land is zoned Rural 1(a). A section of the pipeline is

proposed to be constructed along the former alignment of Broke Road which is currently a Crown road and is unzoned. An application for the closure of this road was lodged with the Department of Lands in December 2008.

The nearest privately owned residence is located 2.6 kilometres to the west of the power generation and VAM abatement system site (**see Figure 1.3**). Other privately owned residences are located approximately 2.9 kilometres to the south and south-west of the power generation and VAM abatement site.

1.3.3 Overview of Environmental Features

The power generation and VAM abatement components of the Project are located within the Loders Creek catchment with the gas supply pipeline located partly in the Wollombi Brook catchment. The Loders Creek catchment area is approximately 58 km^2 and drains into the Hunter River downstream of the confluence of the Hunter River and Wollombi Brook (approximately 6.7 kilometres upstream (south-west) of Singleton (Umwelt, 2007)). The Wollombi Brook catchment has an area of 200 km^2 and drains to the Hunter River upstream of Singleton (approximately 10.5 kilometres west of Singleton).

The Project site is located in an area between the Bulga Tailings Emplacement Area and Broke Road on a relatively flat area of ground previously disturbed by mining related activities. The pipeline extends to the south-west under Broke Road. The vegetation surrounding the Project comprises mixed Eucalypt woodland, pastoral grasslands and rehabilitated overburden dumps.

The site for the small scale power generation plant and VAM abatement system has been previously cleared for mining purposes and currently has minimal existing vegetation comprising grass species associated with the rehabilitation of the former construction stockpile. The proposed gas pipeline from the existing gas infrastructure to the small scale power plant has been sited along existing access tracks, an electricity easement and areas of previous disturbance. Vegetation adjacent to the pipeline alignment is primarily mixed Eucalypt woodland to the east of Broke Road with areas of pastoral grassland to the west of Broke Road.

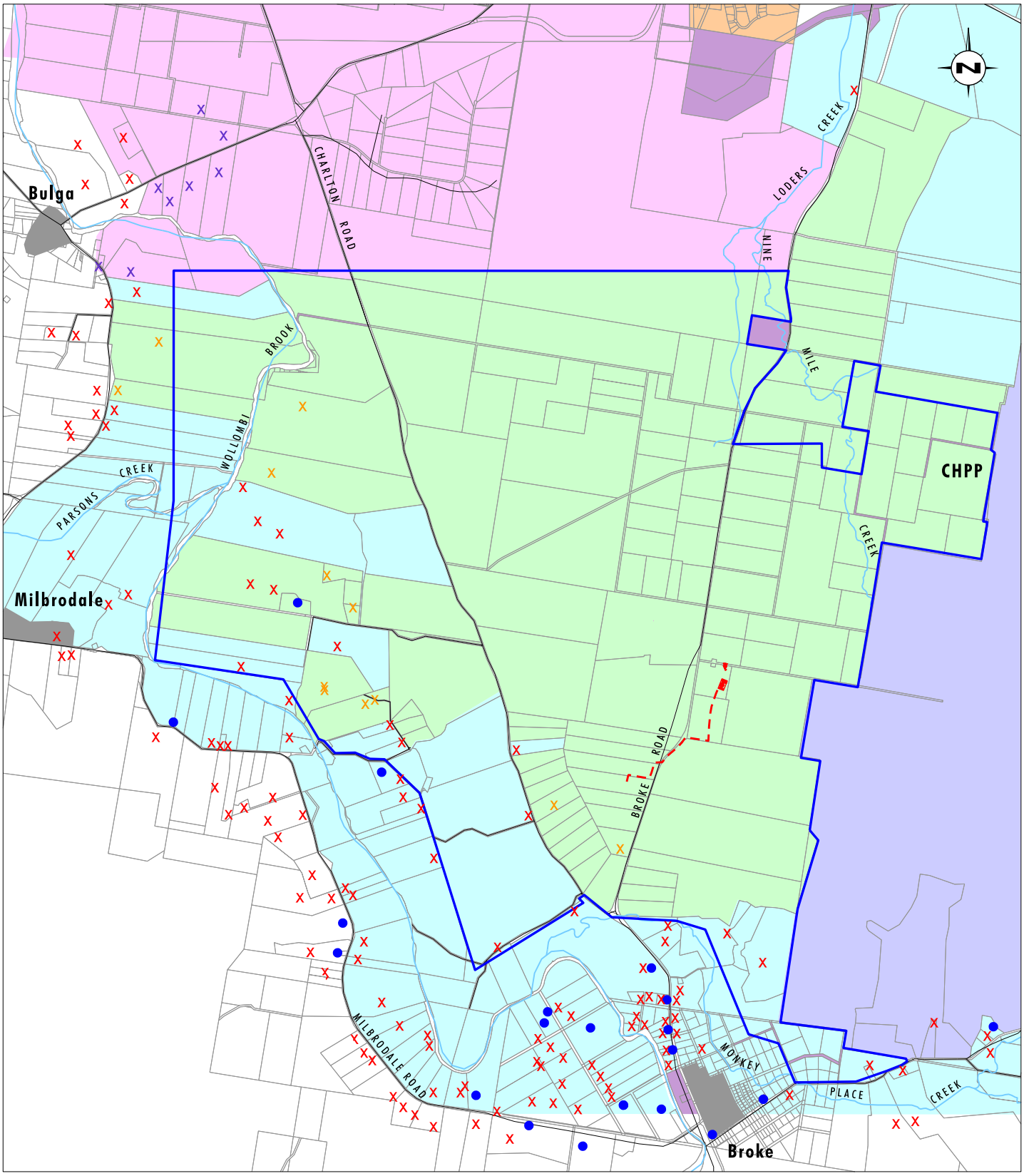
1.3.4 Existing Bulga Environmental Management System

BCM has a comprehensive Environmental Management System (EMS) in place which provides a systematic framework for environmental management at the mine.

The principal objectives of the EMS are to ensure that the company adopts a continuous improvement approach to environmental management issues at the site and wherever practical and economic, implement best practice environmental management. The EMS also serves to ensure that activities at the operations are controlled, such that BCM either prevents or minimises any environmental impacts associated with mining activities.

The Xstrata Sustainable Development Policy underpins the EMS, and states the company's intentions and principles in relation to its environmental performance, and what is expected of all employees and contractors who work at BCM.

Within the framework of the EMS are comprehensive standards, procedures, objectives and targets, which help maintain and continually improve environmental performance. Routine inspections and regular environmental audits are undertaken to assess performance against objectives and targets and identify opportunities for improvement.



Base Source: Bulga Coal Management

0 1 2 3km
1:65 000

Legend

- Bulga Coal Complex Mining Lease Area
- Proposed Gas Pipeline
- Proposed Infrastructure
- Road
- Creek
- Cadastral
- Residence Owned by Bulga Joint Venture
- Other Mine Owned Residence
- Private Residence
- Tourist Facility
- Land Owned by Bulga Joint Venture
- Other Mine Owned Land
- Private Land
- Other Land
- Commonwealth Land (Singleton Army Training Area)
- Crown Land
- Mt Thorley Industrial Area

FIGURE 1.3

Land Ownership

An environmental training program is in place to ensure that all employees and contractors who work at BCM are fully aware of their obligations in regards to the environment. This program covers all important aspects of the mine's activities and highlights the systems in place to minimise environmental impacts. Training on environmental matters is conducted via inductions and regular toolbox talks and feedback sessions.

Monitoring of meteorological conditions, air quality, water levels and quality, noise levels, flora and fauna and rehabilitation is undertaken. This provides BCM with the information required to minimise environmental impacts, and evaluate the effectiveness of the environmental management process and rehabilitation efforts.

1.4 Overview of the Planning and Approval Process

This section contains an overview of the approvals history and planning context for the Project. A detailed discussion of the planning context for the Project is included in **Section 4.0**.

1.4.1 Beltana Approval History

Beltana operates under development consent (DA 376-8-2003) and a Commonwealth of Australia Environment Protection and Biodiversity Conservation Act approval. The development consent has been modified on three occasions as noted in **Table 1.1**. Beltana is now seeking to modify this development consent under Section 75W of the EP&A Act for the installation and operation of up to 25 MW of gas fired reciprocating engine power generator units and associated infrastructure and construction and operation of a pilot VAM abatement system.

Table 1.1 - Summary of Current Development Consents

DA No. and Consent Authority	Approval Date	Development included in application	Relevant Document (and date)
DA376-8-2003 Department of Planning	23 February 2004	• Allows for mining in up to four seams (Whybrow, Blakefield, Glen Munro and Woodlands Hill) with an approved annual production from the continued underground operations of up to 14 million tonnes per annum (Mtpa) for a 27 year mine life. • The principal objective of the consent was to gain approval to mine the Whybrow, Blakefield, Woodlands Hill and Glen Munro coal seams.	EIS Bulga Coal Continued Operations (Umwelt 2003) (2003 EIS)

DA No. and Consent Authority	Approval Date	Development included in application	Relevant Document (and date)
DA376-8-2003 MOD4-1-2006 Department of Planning	April 2006	• Changed the location of access to the Blakefield Seam in the Southern Mining Area • Approved access via a decline drift, rather than conventional main roadways • Approved a coal clearance system for the Blakefield Seam by establishing a conveyor drift from the Blakefield development headings to a boxcut located within the Bulga open cut area to the east of Broke Road.	Section 96(1A) Modification of Bulga Coal Underground Operations (DA 376-8-2003) – Relocation of Men and Materials Drifts (Umwelt, 2005)
DA376-8-2003 MOD13-9-2006 Department of Planning	25 October 2006	• Allowed an increase in throughput of the coal handling and preparation plant from 15Mtpa to 20Mtpa • Allowed an increase in the peak number of daily trains from 9 to 12.	Statement of Environmental Effects titled Coal Handling and Processing Plant – Increased Throughput (Umwelt, 2006)
DA376-8-2003 MOD19-3-2007 Department of Planning	1 October 2007	• The 2004 consent was modified in 2007 to bring forward the mining of the Blakefield seam in the southern area under a modified longwall alignment and to modify the coal handling infrastructure to facilitate this change in timing.	Statement of Environmental Effects - Bulga Underground Southern Mining Area Modification- Section 96(2) Application to Modify Consent DA 376-8-2003 (Umwelt 2007) (2007 SEE)
2002/773 Commonwealth of Australia		• Commonwealth of Australia approval to extend the underground coal mining below Commonwealth Land.	

1.4.2 Overview of the Approval Process

The 2003 EIS (DA 376-8-2003) identified that methane would need to be drained from the mine workings in the Blakefield, Glen Munro and Woodlands Hill seams to maintain a safe working environment, using a combination of pre and post mining gas drainage techniques. The 2003 EIS identified that methane would be drained from the coal seams and goafs via boreholes connected to gas drainage plants on the surface. The methane would be converted to carbon dioxide by combustion unless an economical use could be found for the gas. The 2003 EIS also discussed how BCM were undertaking feasibility studies regarding the options for utilising methane liberated during the mining process.

The 2003 EIS discussed the need for one pre-drainage or in-seam bore and approximately three post drainage goaf bores for each active longwall panel. The exact spacing and location of gas drainage bores was to be subject to mining layout and conditions.

The 2007 SEE (MOD 19-3-2007) identified that improvements in gas drainage drilling technology since the 2003 EIS have allowed Bulga Underground to adopt surface to inseam drilling as well as conventional underground gas drainage drilling. The 2007 SEE proposed that up to four surface to inseam gas wells would be drilled outside of the chain-pillar gate roads for each longwall panel to reduce the gas content of the mining seam to levels that would allow safe and efficient mining operations. Vertical wells for pre and post gas drainage would be drilled in advance of mining and would typically be spaced approximately 100 metres apart along the longwall. Only a portion of the goaf drainage wells would be operational at any one time. Once the goaf wells become redundant the infrastructure would be removed, the bore sealed and the site rehabilitated.

The 2004 consent and subsequent modifications did not include the provision for a VAM abatement system or power plant, although as foreshadowed in the 2003 EIS, the feasibility of these and other options were being investigated. As the proposed modifications would not be generally in accordance with the development consent, further approval is required.

Beltana seeks a modification to DA 376-8-2003 pursuant to Section 75W of the EP&A Act to undertake the Project as discussed in further detail in **Section 4.2.1**. The Minister for Planning is the consent authority and DoP has provided the Director-General's Requirements (DGRs) for this EA (refer to **Section 2.1.1**).

If approval is granted under Section 75W of the EP&A Act, various approvals, licences and permits will be required prior to the commencement of certain activities associated with the Project. These include:

- approval under Section 15 of the *Mine Subsidence Compensation Act 1961* for the construction of surface infrastructure within a mine subsidence district;
- approval under Section 138 of the *Roads Act 1993* for the pipeline crossing of Broke Road and to close the Crown Road reserve of the former alignment of Broke Road ;and
- a modification to the existing Environmental Protection Licence (EPL), No. 563, issued by the Department of Environment, Climate Change and Water (DECCW), to encompass the proposed power generation units and associated infrastructure and VAM abatement system.

1.5 Project Team

Umwelt prepared this EA on behalf of Beltana. The project team for the Project is detailed in **Appendix 1**. Specialist studies conducted by Umwelt include:

- the archaeological assessment;
- the ecology assessment; and
- the greenhouse gas and energy assessment.

The noise assessment was conducted by Global Acoustics Pty Limited.

1.6 EA Structure

The purpose of this EA is to enable the consideration of the environmental and social impacts associated with the Project. The EA has been prepared in accordance with the DGRs, EP&A Act and Regulations (refer to EA Statement of Authorship in **Appendix 1**). An overview of the layout of this EA is provided below.

Section 1.0 provides the background and context for the Project, an overview of the approval process and the EA project team involved in producing the EA.

Section 2.0 describes the consultation process and the environmental and community issues identified as part of this process for detailed assessment in the EA.

Section 3.0 contains an overview of approved operations at Beltana and provides a detailed description of the Project.

Section 4.0 describes the planning context for the Project, including the applicability of Commonwealth and State legislation.

Section 5.0 contains a description of the existing environment and a comprehensive analysis and assessment of the environmental impacts of the Project.

Section 6.0 details the draft Statement of Commitments proposed to be adopted as part of the Project to mitigate potential environment and community impacts.

Section 7.0 contains a discussion of how the Project meets the principles of ecologically sustainable development as required by the DGRs.

Section 8.0 and **Section 9.0** provide a list of references referred to in the EA and a list of abbreviations and glossary of technical terms.

2.0 Stakeholder Consultation and Issues

The DGRs for the Project require consultation with relevant government authorities, service providers, community groups or affected landholders. Details of the relevant stakeholders and the consultation undertaken as part of the preparation of this EA are included in **Sections 2.1** and **2.2**.

2.1 Authority Consultation

The following government agencies were specifically consulted regarding the Project:

- Department of Planning (DoP);
- Singleton Shire Council (SSC);
- Former Department of Primary Industries (DPI) – now part of Department of Industry and Investment (known as Industry and Investment NSW (I&I NSW));
- Department of Environment, Climate Change and Water (DECCW); and
- Former Department of Water and Energy (DWE) – now part of I & I NSW;

A letter to DoP to confirm the approvals path for the Project was sent on 12 February 2009 with a reply from DoP including the Director General's Requirements (DGRs) for the Project being received on 14 April 2009. The DGRs are further discussed in **Section 2.1.1** and are included in **Appendix 2**.

Agency consultation consisted of letters to SSC, DPI, DECCW and DWE dated 5 June 2009 with follow-up contact on 17 June 2009.

Of the agencies consulted, DoP (discussed above), DECC and DPI submitted a response. The DPI response generally indicated that the Project would be a potentially positive step for Beltana in reducing the impacts of its operations.

The key issues raised by DPI included:

- noise, particularly in relation to equipment and operation of the facilities (refer to **Section 5.2**);
- visual impacts from various viewpoints (refer to **Section 5.4**);
- flora and fauna (refer to **Section 5.5**);
- archaeology (refer to **Section 5.6**); and
- air quality, particularly emissions from the stacks (refer to **Section 5.3**).

The response from DECCW indicated that it would review the proposal once it was referred to DECCW by the consent authority. No specific issues were raised.

2.1.1 Director-General's Requirements for the EA

The DGRs for the EA are provided in **Table 2.1**, which also notes the relevant section of this EA that addresses each requirement. A full copy of the DGRs is included in **Appendix 2**.

Table 2.1 - Director General's Requirements Checklist

Requirement	Relevant Section
General Requirements	
The Environmental Assessment (EA) must include:	
• A summary of the existing and approved mining operations/facilities on site, and the existing environmental management regime;	**Section 1.3.4, 1.4.1**
• A description of the proposal;	**Sections 3.2, 3.3** and **3.4**
• A general assessment of the potential impacts of the proposal on the environment;	**Section 5.0**
• A detailed assessment of the key issues specified below, which includes: - a description of the existing environment; - an assessment of the potential impacts of the proposal, taking into consideration any relevant laws, policies, plans or guidelines; and - a description of the proposed measures that would be implemented to avoid, minimise, and if necessary offset any potential impacts of the proposal;	**Section 5.0** **Section 1.3** **Section 4.0**
• A statement of commitments, outlining the proposed environmental management measures;	**Section 6.0**
• A signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading.	**Appendix 1**
Key Issues	
• **Greenhouse Gas**	**Section 5.1** and **Appendix 4**
• **Air**	**Section 5.3**
• **Noise** – including both construction and operational noise	**Section 5.2** and **Appendix 5**
• **Soil and Water** – including erosion and sediment control during construction, stormwater management, and any consequential impacts of the proposal on the mine's water balance	**Section 5.8**
• **Biodiversity** – including potential impacts to any threatened species, populations or ecological communities	**Section 5.5**
• **Aboriginal Heritage**; and	**Section 5.6**
• **Visual**	**Section 5.4**
References	
The Environmental Assessment must take into account relevant State and Commonwealth Government technical and policy guidelines.	**Section 4.0**
Consultation	
During the preparation of the Environmental Assessment, you should consult with relevant local, State or Commonwealth Government authorities, service providers, community groups or affected landowners. In particular, you must consult with:	**Section 2.0**
• Department of Environment and Climate Change	**Section 2.1**
• Department of Primary Industries	**Section 2.1**
• Department of Water and Energy; and	**Section 2.1**
• Singleton Shire Council	**Section 2.1**

2.2 Community Consultation

A community consultation strategy was developed for the Project and included consultation with the Bulga Complex Community Consultative Committee, residents in the immediate vicinity of the Project and the Broke and Bulga communities. **Table 2.2** presents consultation undertaken for the various groups.

Table 2.2 - Stakeholder Consultation

Stakeholder Group	Consultation	Response
Bulga Complex Community Consultative Committee (CCC)	Presentation on the Project provided at the CCC meeting on the 20 May 2009.	Project was supported by meeting participants.
17 Property owners in the immediate vicinity of the project.	Letter to property owners providing project description, identification of key issues being, visual, noise and air quality impacts and offer of further consultation if requested.	No formal or informal responses received from letter.
Bulga Coal Community Barbeques	Presentation on Project provided at the Community Barbeques held at Margan Wines on the 27 November 2008 (51 members of the community in attendance) and 2 April 2009 (35 members of the community in attendance).	Project received considerable informal support at the events with no request for further consultation.
Bulga Coal Complex June 2009 Community Newsletter distributed to 570 Broke and Bulga residences and businesses.	Article on Project included in community newsletter and more detailed dedicated letter also provided with newsletter (see **Appendix 3** for copy of newsletter and letter).	Letter responses received from one neighbouring property owner and the Hunter Valley Protection Alliance (HVPA) (copies included in **Appendix 3**). Meetings have been held with both parties involved on 2 July 2009, and 29 September 2009 where the predicted impacts and benefits were explained.
Noise Impacted Property Owner	Provided Noise Assessment of Project and explained predicted impacts at residence.	A mining impacts compensation agreement has been put in place with the potentially impacted property owner.

3.0 Existing Operations and Description of Proposed Modification

3.1 Overview of Existing Operations

The Bulga Coal Complex is comprised of two existing coal mining operations, Bulga Open Cut Operations, which incorporates a CHPP and rail loading facility, and Bulga Underground Operations. The CHPP and the rail loading facility, located in the north-east corner of the Bulga Coal Complex (refer to **Figure 3.1**), service both operations; however, each operation is managed as a separate business unit. The Bulga Complex is managed by BCM on behalf of the Bulga Joint Venture (BJV).

As previously discussed in **Section 1.0**, the current underground operations at Bulga Coal Complex consist of the Beltana No.1 - Whybrow seam Longwall mine (Beltana No. 1) and the Blakefield South - Blakefield seam mine (Blakefield South). The layout of the respective mines is shown on **Figure 3.1**. The Beltana No. 1 operation is scheduled to finish in mid 2010 at which time the Blakefield South operation is scheduled to commence. During the intervening period the Blakefield South mine development and associated infrastructure will be constructed.

The 2004 consent also includes provision for further underground mining and associated activities including mining in the Glen Munro and Woodlands Hill seams and further mining in the Blakefield seam in the north of the underground mining area (refer to **Figure 3.2**).

Underground mining is conducted using longwall retreat mining techniques. Development headings are often referred to as first workings as they are the first stage in the coal extraction process. The coal from the first workings is cut by a continuous miner. When the coal is removed, the roof is secured using roof bolts. As this process involves supported roofs there is negligible impacts on the surface.

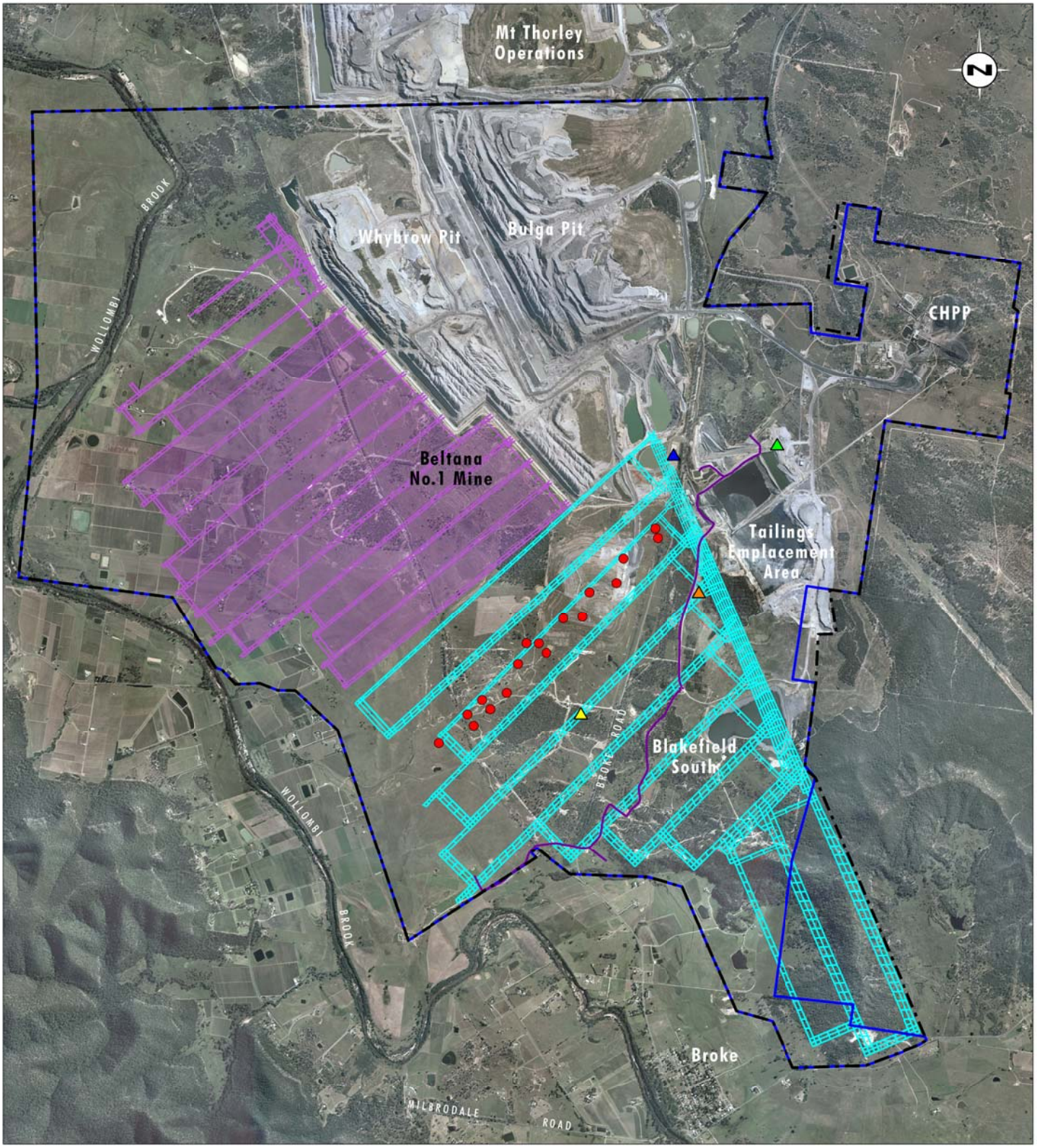
Coal in each longwall panel is removed through the use of a shearer. The shearer moves along the longwall face shearing off coal and then loading it onto a conveyor. Large steel hydraulic supports are used to maintain the roof. As the shearer progresses along the longwall and coal is extracted, the steel hydraulic supports move into the newly extracted area. The mined out area behind the steel hydraulic supports is known as the goaf. As roof supports are moved, the goaf collapses resulting in subsidence on the surface above the longwall panels. This process is continued until the longwall panel has retreated back to the main access roadways.

3.1.1 Beltana No.1 Underground Mine

The Beltana No. 1 mine consists of fourteen longwall panels in the central and western areas of the Bulga lease area. Extraction of coal from the development headings commenced in July 2002 with longwall mining commencing in June 2003.

Mining at Beltana No. 1 has progressed from south to north with a production rate of up to 7 Mtpa. ROM coal extracted from the mine is transported by a series of underground conveyors to the existing South Bulga Colliery ROM coal conveyance system.

In 2009, Beltana will mine approximately 5.7 million tonnes of coal from Longwall panels 11 and 12. The longwall operation at Beltana No. 1 is scheduled to finish in mid 2010.



Base Source: Bulga Coal Management & Aerial Photo (2008)

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1:55 000

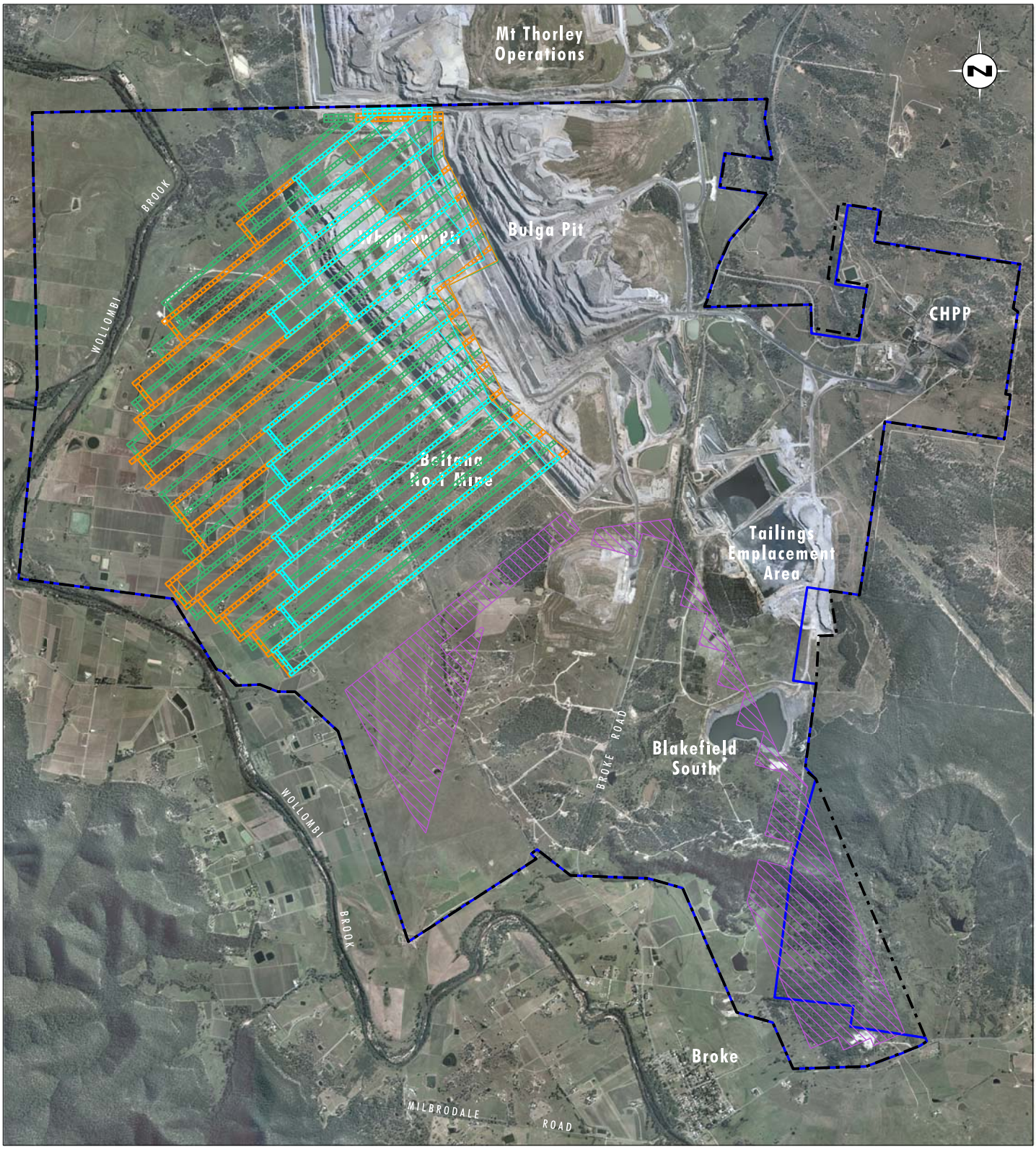
Legend

- Bulga Coal Complex Mining Lease Area
- Approved Development Consent Area
- Dewatering Pipeline
- Existing Methane Flares
- ROM Pad and Conveyor
- Ventilation Fan 1
- Ventilation Fan 2 (Under Construction)
- Gas Drainage Holes

Longwall Mining by Seam
- Blakefield South
- Whybrow
- Completed Whybrow Longwall

FIGURE 3.1

Overview of Existing Beltana Underground Operations



Base Source: Bulga Coal Management & Aerial Photo (2008)

0 1 2 2.5km
1:55 000

Legend

- Bulga Coal Complex Mining Lease Area
- Approved Development Consent Area

Longwall Mining by Seam
- Blakefield South
- Glen Munro
- Woodlands Hill
- Whybrow First Workings

FIGURE 3.2

Approved Mining Operations Not Yet Commenced

3.1.2 Blakefield South

The Blakefield South mine is currently under construction. The Blakefield South overland conveyor, ROM stockpile facility and No 1 Ventilation Shaft and Fans were completed in 2008. The No. 2 Ventilation Shaft and Fans are currently under construction to the north of the proposed power generation and VAM abatement system site. Beltana is developing the gate roads for the Blakefield South operation with longwall mining scheduled to start in the third quarter of 2010.

The Blakefield South mine includes nine Longwall panels in total as shown in **Figure 3.1**. The last panel of the Blakefield South mine is scheduled to be completed in 2016. Infrastructure associated with the Blakefield South mine will include:

- ROM coal clearance system; and
- Ventilation and gas drainage infrastructure, including ventilation shafts and fans, pre and post mining gas drainage plants.

3.1.3 Ventilation and Gas Drainage Operations

The 2003 EIS identified the need for a number of ventilation fans located in the access adits in the Whybrow and Bulga pits and further fans to be relocated as required throughout the life of the mine. This ventilation strategy was amended by the 2007 modification to DA 376-8-2003 as highwall access to the Blakefield seam would not be available due to the bringing forward of mining in the seam. As a result the 2007 SEE provided for the proposed ventilation fans in the Bulga pit to be relocated to the Blakefield South mining area. One downcast ventilation fan and shaft (Ventilation Shaft 1) is located in the main headings adjacent to the tail of the proposed Blakefield South ROM coal conveyor, and one upcast ventilation fan and shaft (Ventilation Shaft 2) is located in the main headings of the Blakefield South longwall panel 2. As discussed in **Section 3.1.2**, Ventilation Shaft No. 1 has been constructed with Ventilation Fan No. 2 currently under construction (see **Figure 3.1**). A further two ventilation shafts and fans, Ventilation Fans 3a and 3b, were proposed as a contingency measure in case additional goaf gas drainage is required but these will not be constructed unless required.

Pre mining gas drainage infrastructure is constructed to help create a safer work place and to allow methane to be captured and flared to reduce its greenhouse gas impact. As discussed in **Section 1.4.2**, the 2003 EIS discussed the need for one pre-drainage or in-seam bore and approximately three post drainage goaf bores for each active longwall panel. This was modified by the 2007 SEE to provide for up to four surface to inseam gas wells to be drilled outside of the chain-pillar gate roads for each longwall panel to reduce the gas content of the mining seam to levels that will allow safe and efficient mining operations. Vertical wells for pre and post gas drainage would be drilled in advance of mining and would typically be spaced approximately 100 metres apart along the longwall (refer to **Figure 3.1**).

During 2007/2008, the drilling phase of seam de-gassing in support of the Blakefield South Mine Longwalls 1 to 6 was completed. In-seam gas drainage boreholes were drilled into the Blakefield seam from the surface by directional drilling methods (surface to in seam (SIS) boreholes). The SIS boreholes are steered into the coal seam, along a pre-determined trajectory, and intersect pre-drilled vertical wells.

Water is drawn from the coal seam (a discrete aquifer) to reduce the hydrostatic pressure and open coal pore spaces to allow desorption and flow of the seam gas. A system of buried pipelines is installed to convey the extracted water back into the mine raw water system and the gas to a central location where the methane is currently flared using eight flares (see **Figure 3.1**). The flaring facility was commissioned in mid 2008, and an expansion of the

flaring facility was commissioned in May 2009. The existing flares have a total capacity of approximately 3,600 L/sec. SIS gas drainage from the Blakefield South mining area is currently at a rate of approximately 2,400 L/sec. All of the captured pre-drainage gas is currently flared, with the exceptions of periods of adverse weather conditions or maintenance of the flares.

3.2 Overview of the Project

The Project will comprise two components, both designed to reduce the greenhouse gas impact associated with gas drainage from the underground workings. The two components of the Project are:

- installation and operation of up to 25 MW of gas fired reciprocating engine power generator units and associated infrastructure; and
- construction and operation of a pilot VAM abatement system.

The small scale gas power generation plant would be established on a site approximately 150 metres to the south of Ventilation Shaft No. 2. Up to eight gas fired reciprocating engine generator units are proposed to be installed, generating up to 25 MW of power using gas drained initially from the Blakefield seam and then from the Glen Munro and Woodlands Hill seams as underground mining progresses. The power generation component would include the pipework and electrical infrastructure associated with the gas drainage connection and power generation.

Beltana is proposing to investigate the use of reverse flow thermal reactor (RFTR) technology for abatement of VAM. A pilot plant consisting initially of one RFTR and associated pipework and infrastructure will be sited on previously disturbed land adjacent to the approved Blakefield South Fan Shaft No. 2 which is currently under construction. Depending on the results of the pilot program, further RFTRs may be proposed to be added to the system.

RFTRs employ a flameless oxidation process which was developed for the treatment of low concentration volatiles in air. RFTRs have been used to treat methane in ventilation air from coal mines and have been installed successfully in coal mines in UK, USA and Australia. West Cliff Colliery in the Illawarra region currently operates a vocsidizer VAM abatement system.

The capital value of the Project works is estimated to be approximately $18 million.

3.3 Small Scale Power Generation

The site for the small scale power plant would comprise an area up to 8,400 m^2 (120 metres by 70 metres) on a site to the south of the proposed VAM abatement system as shown in **Figure 3.3**. An existing mine access road from Broke Road currently provides access to the site.

The power generated from the facility will be used to power some of Beltana's infrastructure, including the ventilation fans. Any surplus power will be fed into the public power grid.

Source: Beltana (2009), Aerial Photo (2008)

Legend

- Proposed Gas Pipeline Route
- Proposed Infrastructure
- Existing Approved Infrastructure
- Powerline
- Power Pole

FIGURE 3.3

Proposed Power Generation and Conceptual VAM Abatement Layout

3.3.1 Generator Units

The proposed power plant will utilise up to eight gas fired reciprocating engine generator units to generate up to 25MW of electricity. Each generator unit is housed in a weatherproof zincaneal enclosure which will provide for sound attenuation and security and vandal proofing of the generator and controls. Each generator unit is approximately 24 metres in length, 4 metres wide and 12 metres high at the top of the engine exhaust stack.

The gas used to power the generators will initially come from both the pre and post mining gas drainage systems currently under construction for the approved Blakefield South underground mine and then from the Glen Munro and Woodlands Hill seams as mining progresses.

3.3.2 Associated Infrastructure

The power generation system will require additional supporting infrastructure for its operation. This additional infrastructure will include:

- electrical supply lines – existing power lines installed to Fan Shaft No. 2 will be extended along the existing access road to the power generation site to transmit power from the system. This is likely to require 3 or 4 new poles as shown on **Figure 3.3**.

- gas monitoring and switch room – this will include the electrical switchroom and cabling to manage the supply from the generator sets to the switchyard, and gas monitoring equipment to monitor the gas supply to the generators.

- control room – including workshop and automatic lubrication and oil change equipment.

- gas treatment plants – two gas treatment plants will be constructed within the power generation compound which will filter the gas to meet the gas engine supplier's specification and dehumidify the gas.

- gas pipeline - the gas gathering system will utilise the existing pre-drainage gas pipeline infrastructure for the Blakefield South operations. An underground High Density Polyethylene (HDPE) pipeline, approximately 2.5 kilometres in length, will be constructed from the existing flaring facility to the west of Broke Road along existing access tracks, a transmission line easement and disturbed areas to the proposed power generation plant (**Figure 1.2**). Under boring will be used to cross the pipeline under Broke Road. A section of the pipeline route is located in a road reserve associated with a former alignment of Broke Road. An application for the closure of this road reserve was lodged with the Department of Lands in December 2008 but is yet to be approved.

Beltana has existing approval to construct flares as part of its gas drainage management system. Seven fully enclosed flares capable of burning approximately 4000 L/sec of methane will be installed within the power generation plant compound. The flares will be approximately 8.5 metres tall, and will be used when the generators are off-line or to flare gas beyond the capacity of the power generation units. These flares do not form part of this modification application.

3.3.3 System Operation

Longwall goaf gas drainage from the Blakefield South area is expected to be at a rate of between 2000L/sec and 4000L/sec (depending on coal production rates).

Each power generation unit will have the capacity to utilise approximately 90 L/sec of methane per MW of generating capacity. With eight operational generator units generating 25 MW of power, approximately 2,250 L/sec of gas would be required.

Based on the proposed capacity of the generator units, at 25MW of installed capacity the system will have capacity to utilise much of the gas drained from the longwall. The excess gas will be flared in the gas flares to be installed within the power generation compound.

It is expected that the flares will have an availability of approximately 95% with only 5% unavailability due to maintenance, power fluctuations or other unplanned events. This will result in most of the excess gas being flared, considerably reducing the amount which would otherwise be free vented.

3.4 VAM Abatement System

The ventilation air exhausting from underground workings in coal seams with moderate to high methane content typically contains only 0.3 to 0.8% methane, but high total volumes of air. At Beltana No. 1 and Blakefield South, mine VAM is normally maintained below 1% and is often as low as 0.3%. At present this exhaust stream is emitted to the atmosphere via the ventilation shafts. Beltana is proposing to install a VAM abatement system utilising a RFTR technology which is capable of handling large volumes of ventilation air and oxidising the low concentrations of methane to carbon dioxide (CO_2) and water vapour.

The RFTRs use an in-bed regenerative heat exchange principle such that there is no burner or combustion chamber. The oxidation reactions which destroy the methane in the air stream occurs entirely within the heat exchange media without the need for any flaming.

3.4.1 Principle of Operation

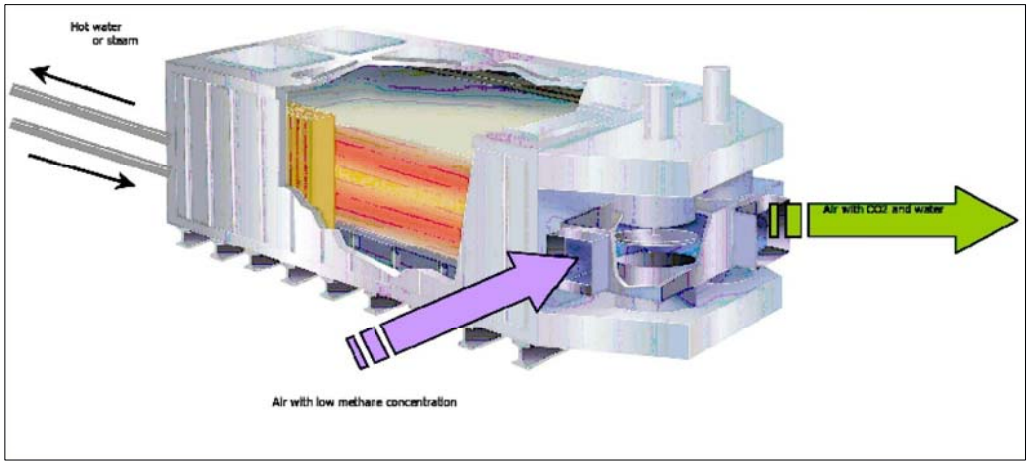
Each RFTR consists of a single heat transfer bed filled with ceramic media. The direction of air flow from the fan is controlled by automated valves (dampers). The dampers will periodically switch position to reverse air flow and allow thermal regeneration of the bed.

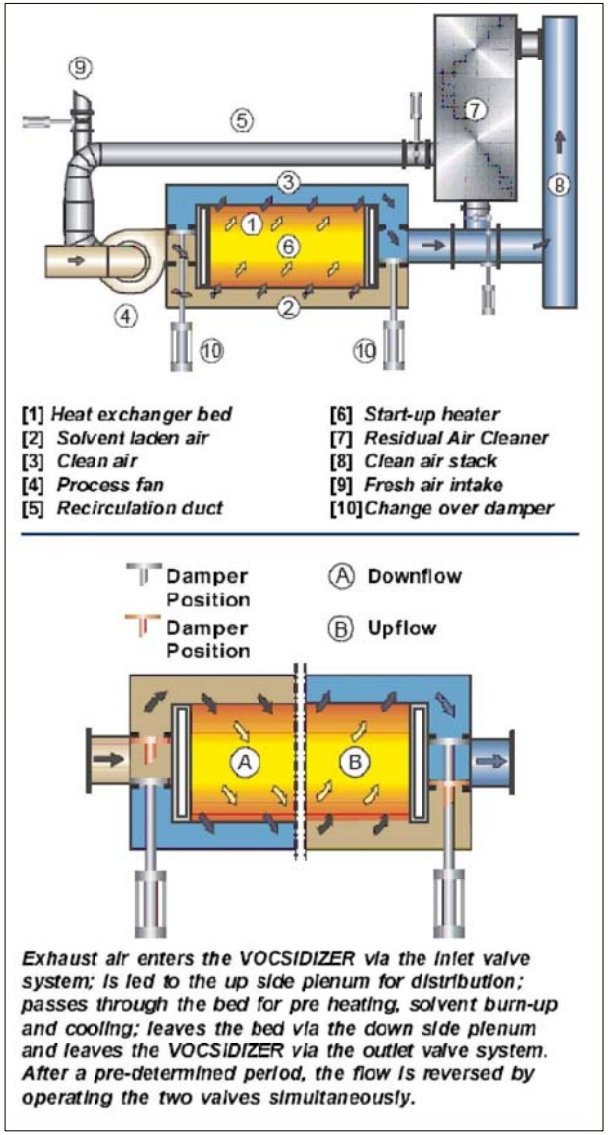
The methane-laden ventilation air is directed through the porous ceramic heat exchange media. As the ventilation air moves through the inlet side of the bed, it gets hot enough to undergo thorough oxidation to water vapour (as steam) and CO_2.The energy in the cleaned process air stream, which includes the thermal energy released during methane oxidation, is recovered by the ceramic media on the outlet side of the bed. The purified air is then released to the atmosphere (Megtec Systems, 2004). Typical emissions from the RFTRs include carbon monoxide (CO), oxides of nitrogen (NOx) and steam.

The principle of operation of the Vocsidizer is shown in **Figure 3.4** as an example of an RFTR. The operational parameters for the proposed system are summarised in **Table 3.1**.

Table 3.1 - System Design Parameters for VAM Abatement

Parameter	Value
Mine Ventilation Air Volume	60,000 Nm^3/hr
Mine Ventilation Air Temperature	10-40^{0}C
Typical Ventilation Air Methane content	0.5% CH_4
Maximum design VAM concentration	0.8% CH_4 @ 62,500 Nm^3/hr
Minimum design VAM concentration	0.3% CH_4
Methane reduction target	97% average reduction





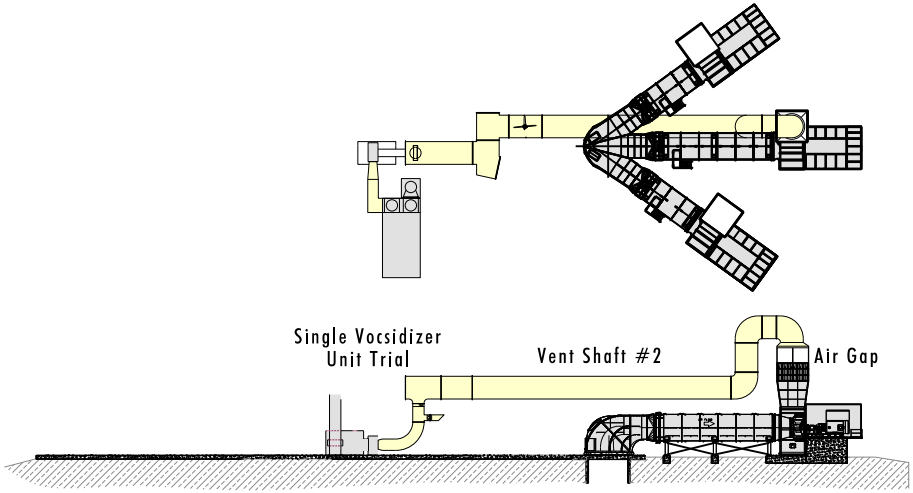


FIGURE 3.4

Vocsidiser Principle of Operation

Source: Beltana, 2009

File Name (A4): R01_V1/2300_019.dgn

Parameter	Value
Typical emissions	Less than 50 mg/Nm^3 as CO Less than 10 mg/Nm^3 as NOx

3.4.2 VAM Abatement System Site Layout

The pilot VAM abatement system proposed for Beltana will include one RFTR and associated ductwork. A potential Vocsidizer arrangement is shown in **Figures 3.3** and **3.4** as an example of a RFTR. The system will be constructed on a previously cleared site to the south of the Blakefield South Fan Shaft No. 2 and will draw in air which is exhausted from the fan shaft.

The site for the proposed VAM abatement system will require an area approximately 20 metres by 50 metres (1,000m^2). The area has been previously disturbed by mining operations including the construction of the No. 2 Ventilation Shaft and Fan. The overall dimensions of a RFTR would be approximately 6 metres wide, 16 metres long and 5 metres high, with a 9 metre exhaust stack.

The ventilation air is reticulated from the underground mine ventilation exhaust fan to the RFTR via ducting. Ventilation fan shaft No. 2 will, when constructed, have a total height of approximately 12 metres. The ducting to connect the ventilation fan to the RFTR will add another 5 metres in height, giving an overall height at the ventilation shaft of approximately 17 metres.

3.5 Construction

Construction of the VAM abatement system and power generation units is expected to take approximately 26 weeks to complete. Construction will be in two stages – civil site works and infrastructure construction. The site civil works will take approximately 6 weeks to complete whilst the infrastructure construction is expected to take approximately 20 weeks to complete.

Key activities during the construction program will include:

- minor earthworks for the installation of the hardstand area;
- trenching, installation and backfilling for required buried services;
- installation of overhead services (electricity);
- forming up of run-off drainage system and sheeting of access roads;
- sheeting of hardstand with suitable all weather, slip and trip reduction gravel;
- installation or construction of generators, RFTR, switchroom, control room and service workshop facilities monitoring equipment, including concrete slab footings;
- landscape works; and
- installation of security fencing.

Entry to both the VAM abatement site and the power generation site will be from Broke Road. An existing mine access road from Broke Road will be used to access the site. The existing internal roads are suitable for all planned loads to the site.

Construction hours are proposed to be limited to daytime hours of 7am to 6pm Monday to Friday and 8am to 1pm on Saturdays. No construction work is proposed to be undertaken on Sundays or public holidays.

Typical construction equipment and machinery will include:

- 2 excavators;
- 3 tipping trucks;
- 2 heavy haulage vehicles for generator delivery;
- 1 backhoe;
- 1 water truck;
- 1 roller compactor;
- 1 small crane;
- 1 large crane;
- I poly welder unit; and
- 4 light vehicles.

Approximately 20 wide, heavy low loads and 20 heavy vehicle movements will be required to transport the generators, RFTR and related infrastructure to the site.

The generators and RFTR will be lifted off the low loaders with a large crane and put in place on footings. Pipework and ductwork will be lifted into place using a smaller crane.

The construction workforce during the civil site construction will average approximately 10 persons per day over the 6 week construction period with a peak workforce of 20 people. For the infrastructure construction, the workforce will also average 10 persons per day over the 20 week construction period with a peak workforce of 30 people.

3.6 Justification for the Proposed Modification

Since 1990, there has been a 78.2% increase in direct greenhouse gas emissions from mining developments across Australia. Increased activity in the mining sector within the last 10 years has resulted in a 26.9% increase in direct emissions since 2000. Of the 57 Mt CO_2 –e direct emissions attributed to the mining industry in 2007, 53% was attributed to coal mining (Department of Climate Change, 2009).

One of the largest contributors of greenhouse gas emissions in the mining industry is the release of methane from the coal seams during mining operations. Atmospheric methane concentrations have increased by more than 25.4 million tonnes from June 2006 to October 2007. Based on the amount of warming it causes (Global Warming Potential (GWP) of 21) and the levels in the atmosphere, methane is considered to be the second worst greenhouse

gas after carbon dioxide (BOM & CSIRO, 2009). Although carbon dioxide has a lower warming potential (GWP=1), the volume of carbon dioxide ranks it higher than methane.

The deeper coal seams being mined at the Bulga underground operations are known to contain substantial methane gas levels in the deeper seams. In order to provide a safe working environment within the underground workings, it is necessary to drain the methane from the area to be mined. Currently, this is achieved through a combination of pre and post mining gas drainage techniques, with the drained methane flared or vented to atmosphere.

In keeping with community and government expectation, Beltana has been investigating opportunities to reduce greenhouse gas emissions of the operations. Beneficial use of the captured methane and reduction of the VAM to carbon dioxide are significant greenhouse gas emission reduction opportunities.

The power generation component of the Project could enable approximately 50% of the coal seam methane to be captured for beneficial reuse in the gas fired generators. Power generation using the captured methane will result in a reduction of indirect emissions of 3,898,200 tonnes CO_2-e over the life of the Project. This is equivalent to the indirect emissions that would result if electricity were purchased from the national grid.

The additional seven flares within the power generation compound combined with the existing flares will be able to burn all of the captured methane, whether the generators are on or off-line.

A single RFTR enables approximately 97% of ventilation methane in the airstream through the unit to be converted to carbon dioxide and water. Whilst the single RFTR at Beltana will only capture and treat a small proportion of VAM from the mining operations, the Project will be used to prove the application of the technology such that further units could be added to the system to further reduce the amount of methane vented to atmosphere through the mine ventilation system.

4.0 Planning Context

The DGRs for the Project require the 'consideration of any relevant statutory provisions'. The following sections assess the applicability of relevant Commonwealth and State legislation, including the approval path for the Project.

4.1 Commonwealth Legislation

A summary of the Commonwealth legislation potentially relevant to the Project is provided in **Table 4.1.**

Table 4.1 - Relevance of Commonwealth Legislation to the Project

Act	Comments	Approval Required for the Project?
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Under the EPBC Act the approval of the Commonwealth Minister for the Environment, Heritage and the Arts is required for any action that may have a significant impact on matters of National Environmental Significance, including world heritage properties, National Heritage Places, Ramsar wetlands, cetaceans, migratory species, threatened species, critical habitats or ecological communities listed in the EPBC Act, commonwealth land, marine areas or reserves and nuclear actions. The only matters of National Environmental Significance with potential relevance to the Project are those related to ecological values. While the Blakefield South mining area does contain Commonwealth land, the project does not impact on Commonwealth land which is located approximately 2.6 kilometres to the south-east of the project. The ecological assessment for the project (refer to **Section 5.5**) has found that the Project will not adversely impact on any matters of National Environmental Significance prescribed by the EPBC Act. Consequently, approval from the Commonwealth Minister for the Environment, Heritage and the Arts is not required for the Project.	No
Native Title Act 1993	The Commonwealth government enacted the *Native Title Act 1993* in response to the High Court of Australia decision in Mabo v Queensland (1992). The Act is administered by the National Native Title Tribunal. The Act prescribes that native title can be extinguished under certain circumstances, including the granting of freehold land. Areas of land within the Project Area where native title may not have been extinguished include public road reserves and Crown land. No native title claims are known to exist over land within the Project Area.	No

4.2 NSW Legislation

4.2.1 Environmental Planning and Assessment Act 1979

Development in NSW is principally controlled by the *Environmental Planning and Assessment Act 1979* (EP&A Act). The objectives of the EP&A Act relevant to the Project are to encourage:

- the proper management, development and conservation of natural resources;
- the promotion and co-ordination of the orderly and economic use and development of land;
- the protection of the environment; and
- ecologically sustainable development.

It is proposed to modify DA 376-8-2003 under Section 75W of the EP&A Act.

The *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) clause 8J(8) prescribes how, in certain circumstances, a development consent granted under Part 4 of the EP&A Act can be modified under Section 75W of the EP&A Act. Clause 8J(8) states that:

> (8) A development consent in force immediately before the commencement of Part 3A of the Act may be modified under Section 75W of the Act as if the consent were an approval under that part, but only if:
>
> a) The consent was granted with respect to development that would be a project to which Part 3A of the Act applies but for the operation of clause 6(2)(a) of State Environmental Planning Policy (Major Projects) 2005, and
>
> b) The Minister approves of the development consent being treated as an approval for the purposes of section 75W of the Act.
>
> The development consent, if so modified, does not become an approval under Part 3A of the Act.

Under *State Environmental Planning Policy (SEPP) (Major Projects) 2005*, the Project is a development for the purposes of coal mining in accordance with clause 5(1)(a) of Schedule 1 and hence satisfies clause 8J(8) of the EP&A Regulation. Consequently, it is available to the Minister for Planning to grant approval for the Project under Section 75W of the EP&A Act.

On 14 April 2009, DoP advised that the Minister had agreed to treat the development consent for the Bulga underground mining operations as an approval for the purposes of Section 75W of the Act, and to consider an application for a modification of this consent under Section 75W.

The Director-General of DoP provided the requirements for the EA as discussed in **Section 2.1.1.**

Permissibility under Singleton Local Environmental Plan 1996

The Project will be assessed under Part 3A of the EP&A Act which primarily considers State planning processes and issues. Local and regional planning issues are generally not considered under Part 3A assessments, however, a project cannot be approved under Part 3A, if it is wholly prohibited by the local land zoning under the relevant Local Environment Plan (LEP).

The land proposed to be affected by the Project is located wholly within the Singleton Local Government Area (LGA) and is covered by the provisions of the Singleton LEP 1996. Under the LEP the Project area is zoned Rural 1(a). The objectives of the 1(a) Rural zone, as described in the Singleton LEP 1996, are:

(a) to protect and conserve agricultural land and to encourage continuing viable and sustainable agricultural land use;
(b) to promote the protection and preservation of natural ecological systems and processes;
(c) to allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining;
(d) to maintain the scenic amenity and landscape quality of the area;
(e) to provide for the proper and co-ordinated use of rivers and water catchment areas; and
(f) to promote provision of roads that are compatible with the nature and intensity of development and the character of the area.

The Project is consistent with the objectives of the Rural 1(a) zone as the project is designed so that mining will not exceed acceptable limits and the scenic amenity and landscape quality of the area will be maintained (refer to **Sections 5.1, 5.2, 5.3** and **5.4**).

Coal mines are permissible with consent in this zone. Therefore the Project is permissible and the Minister for Planning is not precluded from approving the Project.

4.2.2 Other State Legislation

A summary of other State legislation that is potentially relevant to the Project is provided in **Table 4.2**.

Table 4.2 - Summary of State Legislation and Relevance to the Project

Act	Comments	Approval Required for the Project?
Mining Act 1992	Bulga currently holds a number of MLs over the Project area. Both the power generation site and the RFTR site are contained within ML1547. The mining lease permits surface operations within the lease area.	No
Coal Mine Health and Safety Act 2002	The principal aim of the *Coal Mine Health and Safety Act 2002* is to secure the objectives of the *Occupational Health and Safety Act 2000* in relation to coal operations. It does this by imposing certain specific safety requirements on coal mines.	No

Act	Comments	Approval Required for the Project?
Mine Subsidence Compensation Act 1961	Under the *Mine Subsidence Compensation Act 1961*, the approval of the Mine Subsidence Board (MSB) is required for the erection or alteration of improvements and subdivision of land within a mine subsidence district, unless the erection or alteration is a deemed approval. As the Project area is located within the Patricks Plains Mine Subsidence District, approval from the MSB will be required for the construction of the VAM abatement system, power generation units and associated infrastructure.	Yes
Protection of the Environment Operations Act 1997	BCM currently holds an EPL (No. 563) that covers coal mines and waste facilities at Bulga Coal. The EPL currently applies to coal mining works at a scale of greater than 5 Mtpa. A modification to the existing EPL will be sought to encompass the activities associated with the Project.	Yes
Water Management Act 2000	The Project does not involve extraction of water from the Hunter Regulated River Water Source or the Hunter Unregulated and Alluvial Water Sources. The Project will not impact on any watercourses or protected lands.	No
Water Act 1912	The Project Area is subject to the *Hunter Unregulated and Alluvial Water Sources Water Sharing Plan* (gazetted on 1 August 2009) and is therefore governed by the *Water Management Act 2000*.	No
Fisheries Management Act 1994	A permit must be obtained for any works which involve dredging or reclamation, any structure that may inhibit or obstruct the movement of fish within a waterway or cause damage or destruction of marine vegetation. The Project will not impact on fish habitat or impact on waterways and an approval will not be required under this Act.	No
National Parks and Wildlife Act 1974	Under the *National Parks and Wildlife Act 1974* a Section 90 permit is required prior to the destruction of any known Aboriginal archaeological sites and a Section 87 permit is required to conduct excavations for archaeological investigations. The Project is proposed to be located on land that has been previously disturbed. There are no known sites or areas of potential archaeological deposit within the area to be impacted by the Project and therefore no Section 87 or 90 permits are required (refer to **Section 5.6**).	No
Threatened Species Conservation Act 1995	The Project is proposed to be located on land that has been previously disturbed and vegetation clearance is restricted to two small areas of temporary rehabilitation adjacent to the power generation site. The ecological assessment completed for the Project has identified that the Project will not result in a significant impact on any threatened species, populations or communities (refer to **Section 5.5**).	No
Heritage Act 1977	There will be no new land disturbance associated with the Project and consequently no permits will be required under the *Heritage Act 1977*. The Project will not impact on any known heritage sites and therefore a permit under this Act is not required. Refer to **Section 5.6.**	No

Act	Comments	Approval Required for the Project?
Contaminated Land Management Act 1997	This Act enables DECC to respond to contamination that is causing a significant risk of harm to human health or the environment, including issuing orders to investigate contamination and to remediate a site. No orders have been issued relating to the site and there are no known potentially contaminating activities on the site.	No
Roads Act 1993	The *Roads Act 1993* determines the rights of the public and adjacent land owners to use public roads, and establishes procedures for the opening and closing of public roads. Under the Act applications are required to be made to the Minister for Lands for the closure of Crown roads and for works in public road reserves. A licence under Section 138 of the Roads Act is required to undertake works within a road reserve. The applicant then has the responsibility of restoring the surface of the public road to its previous condition. A Section 138 approval will be required for the pipeline crossing of Broke Road and the pipeline alignment within the former Broke Road reserve (depending on its status).	Yes
Crown Lands Act 1989	The *Crown Lands Act 1989* provides for the administration and management of Crown land in the eastern and central divisions of NSW. As discussed above in reference to the Roads Act, a licence to use Crown land is likely to be required for the pipeline alignment along the former Broke Road reserve.	Yes
Aboriginal Land Rights Act 1983	The *Aboriginal Land Rights Act 1983* provides for the constitution of local, regional and State Aboriginal Land Councils. Part 6 of the Act prescribes a mechanism for Land Councils to claim Crown land. No land rights claims currently exist over the Crown land within the Project area. Therefore Part 6 of the Act is not relevant to this assessment.	No

4.2.3 State Environmental Planning Policies

4.2.3.1 State Environment Planning Policy (Major Projects) 2005 (Major Projects SEPP)

The Major Projects SEPP identifies projects to which the development assessment and approval process under Part 3A of the EP&A Act applies. As discussed in **Section 4.2.1**, the project may, with the permission of the Minister for Planning, be assessed as a modification under Section 75W of the EP&A Act.

Although development for the purposes of generating electricity is included in Clause 24 of Schedule 1 of the Major Projects SEPP, the proposed small scale power plant would not fall within the definition of a major electricity generation project because its capital investment value of $18 million would be below the threshold of $30 million as specified in the SEPP. However, Clause 5 of Schedule 1 of the SEPP includes the following as development to which Part 3A applies:

Development for the purposes of mining that

(a) is coal or mineral sand mining; or
(b) is in an environmentally sensitive area of State significance; or
(c) has a capital investment value of more than $30 million or employs 100 or more people.

The Project is considered as being for the purposes of coal mining, therefore it is controlled by Part 3A of the EP&A Act.

4.2.3.2 SEPP Mining, Petroleum Production and Extractive Industries (Minerals SEPP)

The Minerals SEPP was gazetted in February 2007. The Minerals SEPP repeals SEPP 37 - Continued Mines and Extractive Industries and SEPP 45 - Permissibility of Mining. The Minerals SEPP outlines where various minerals activities are permissible both with and without development consent. The Minerals SEPP also defines mining developments that are prohibited, exempt or complying developments.

The project does not comply with the definitions of prohibited, exempt or complying development and therefore development consent is required.

4.2.3.3 SEPP 44 - Koala Habitat Protection

SEPP 44 applies to the extent that a consent authority is restricted from granting approval for a development proposal on land identified as core koala habitat without the preparation of a plan of management. The ecological assessment completed for the project has determined that no areas of core koala habitat exist and therefore SEPP 44 does not place any constraints on the Project.

4.2.3.4 SEPP 33 – Hazardous and Offensive Development

SEPP 33 requires a consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry. Methane gas is classified as Class 2.1 Flammable Gas under the Australian Dangerous Goods Code.

A risk screening exercise was completed in accordance with the SEPP 33 Development Application guidelines (DUAP, 1997) as described further in **Section 5.9**. Operation of both the VAM abatement system and the power generation plant will not require any gas storage. Gas will be fed direct from the gas treatment plant to the gas fired engines or the flares without the need for gas storage.

It has been concluded that the Project is not potentially hazardous or potentially offensive, and is unlikely to be a significant off-site risk and therefore a Preliminary Hazard Analysis is not required.

5.0 Environmental Assessment

The area to be impacted by the Project has been highly disturbed by previous mine related activities, road construction and/or easement clearing. As a result, the Project area has limited vegetation. The Project area is within the current mining lease and adjacent to approved mine operations. Potential impacts associated with the Project are discussed in **Sections 5.1** to **5.9** below.

5.1 Greenhouse and Energy Assessment

The main purpose of the Project is to reduce the greenhouse gas emissions associated with the underground mining operations at Beltana, and to better utilise the methane gas resource associated with the mine. The Project will result in a net greenhouse gas benefit by using the captured methane to produce electricity and by treating the methane associated with the mine's ventilation system.

A Greenhouse Gas and Energy Impact and Abatement Assessment (GHGEIAA) was undertaken to determine projected energy consumption, energy production, and greenhouse gas (GHG) emissions as a direct and indirect result of both the construction and operation of the Project. A summary of the greenhouse assessment is provided in the following sections with a copy of the full report included in **Appendix 4**.

5.1.1 Existing Emissions

The operations at the Blakefield South mine have two key sources of greenhouse gas emissions including:

- Coal seam methane drained from the Blakefield seam in advance of mining which is flared. A proportion of methane (<15%) is not flared due to operational limitations caused by adverse weather conditions and maintenance requirements.

- Dilute concentrations of methane in the mine ventilation air which is currently free vented to the atmosphere.

Over the 20.5 year life of the mine, greenhouse gas emissions from these sources would total 37,356,650.14 tonnes of CO_2-e based on the existing operations.

5.1.2 Projected Emissions

The standard approach to the assessment of sources of GHG emissions is set out in the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (the NGER Determination). The NGER Determination emission sources are based on the relevant international emission categories.

GHG emissions can be categorised as direct and indirect emission sources with the NGER Determination providing for three scopes to delineate the emissions associated with the operation of facilities.

- Scope 1 emissions (also referred to as direct emissions) are GHG emissions which occur as a direct result of activities at a facility, for example, for the Project this would include the operation of the power generation system and VAM abatement system, and the flaring or free venting of methane. Direct emissions are emissions over which the facility operator has a high level of control.

- Scope 2 emissions (also referred to as energy indirect emissions) cover GHG emissions from the generation of purchased electricity, steam, heating or cooling consumed by a facility. For the Project, Scope 2 emissions relate to the consumption of electricity purchased from the national grid. Scope 2 emissions are indirect emissions that organisations can easily measure and influence through energy efficiency measures.

- Scope 3 emissions cover all indirect emissions that are not included in Scope 2. Scope 3 emissions are a consequence of the activities of the facility but occur at sources or facilities not owned or controlled by the organisation. For this Project, Scope 3 emissions will include the emissions associated with the off-site road transport required during the construction of the facility.

Beltana currently flares approximately 85% of the gas drained from the coal seams in the Blakefield South area. The existing rate of gas drainage from the area is approximately 2,400 L/sec. However, future peak gas flows are estimated between 2,000 – 4,000 L/sec depending on rates of coal production. Beltana will endeavour to flare or combust through power generation as much methane as is practical. For assessment purposes the rate of methane combustion will be assumed to be 85% of production during operation, leaving 15% of methane vented to the atmosphere. Given the proposed increase in peak gas flows up to 4,000 L/sec, there will be a larger volume of gas being vented, although the ratio of gas combusted to gas vented will remain the same.

Installation of a single RFTR unit would treat approximately 2.9% of the mine ventilation air and would result in a net reduction of emissions of approximately 942,000 tonnes CO_2-e (2.8% reduction). There is potential for this reduction to be increased if further RFTRs are added to the system at some future stage.

By converting coal seam methane from underground mining operations to generate electricity, the onsite generators will utilise the CH_4 which would otherwise be flared or vented into the atmosphere and contribute significantly to GHG emissions. This Project reduces GHG emissions by offsetting electricity purchased from the grid (Scope 2) by Beltana South operations. The Scope 2 emissions produced if the equivalent power generated by the Project was sourced from the grid is an estimated 3,898,200 t CO_2-e.

The proposed installation of an onsite power generation system and VAM abatement system, combined with the use of existing flaring facilities, will abate and reduce direct GHG emissions from the Beltana by 12.48% over the 20.5 year time frame of the Blakefield South operations. The total GHG abated by the Project over the life Blakefield South operations is 4,662,468.65 tonnes of carbon dioxide equivalent (t CO_2-e). Without the abatement and reduction impact of the Project, GHG emissions from Blakefield South operations would be 37,356,650.14 t CO_2-e.

As the key objective of the Project is to directly abate and reduce fugitive greenhouse gas (GHG) emissions from Blakefield South, no management or mitigation measures for ancillary GHG are proposed or planned.

5.2 Noise

A noise assessment of the Project was undertaken by Global Acoustics for construction and two operating scenarios. A summary of the noise assessment is provided below with full copy of the report provided in **Appendix 5**.

5.2.1 Operational Noise

5.2.1.1 Noise Criteria

DA 376-8-2003 included noise criteria for properties potentially affected by noise from the mining operations (**Table 5.1**) as well as identifying those properties that were subject to acquisition upon request from the owner (**Table 5.2**).

Table 5.1 - Noise Impact Assessment Criteria from DA 376-8-2003

Day/Evening/Night $L_{Aeq(15\ Minute)}$	Night $L_{A1(1\ Minute)}$	Land Number
37	47	Property 20 – Lewis Property 11/12 – Hope
35	47	All other residential or sensitive receptors, excluding those properties subject to acquisition upon request

Table 5.2 - Land Subject to Acquisition Upon Request from DA 376-8-2003

Property ID	Owner	Acquisition Status
Property D (52)[1]	Kennedy	Not acquired
Property F (9)	Russell	Not acquired
Property H (12)	Cobcroft Wines	Acquired
Property L (18)	Dwyer Estates P/L	Not acquired
Property O (24)	McInerney	Not acquired
Property R (25)	Myers	Acquired
Property 75	Hedley	Not acquired

Note 1: Numbers in brackets refer to relevant receptor number used for modelling.

5.2.1.2 Noise Modelling

The noise assessment undertaken for the Project was based on Beltana's existing calibrated noise model which includes existing and approved operations. Receptor locations are shown in **Figure 5.1**. Noise levels for the infrastructure associated with this Project were modelled using ENM (an environmental noise model) to determine the predicted noise impact.

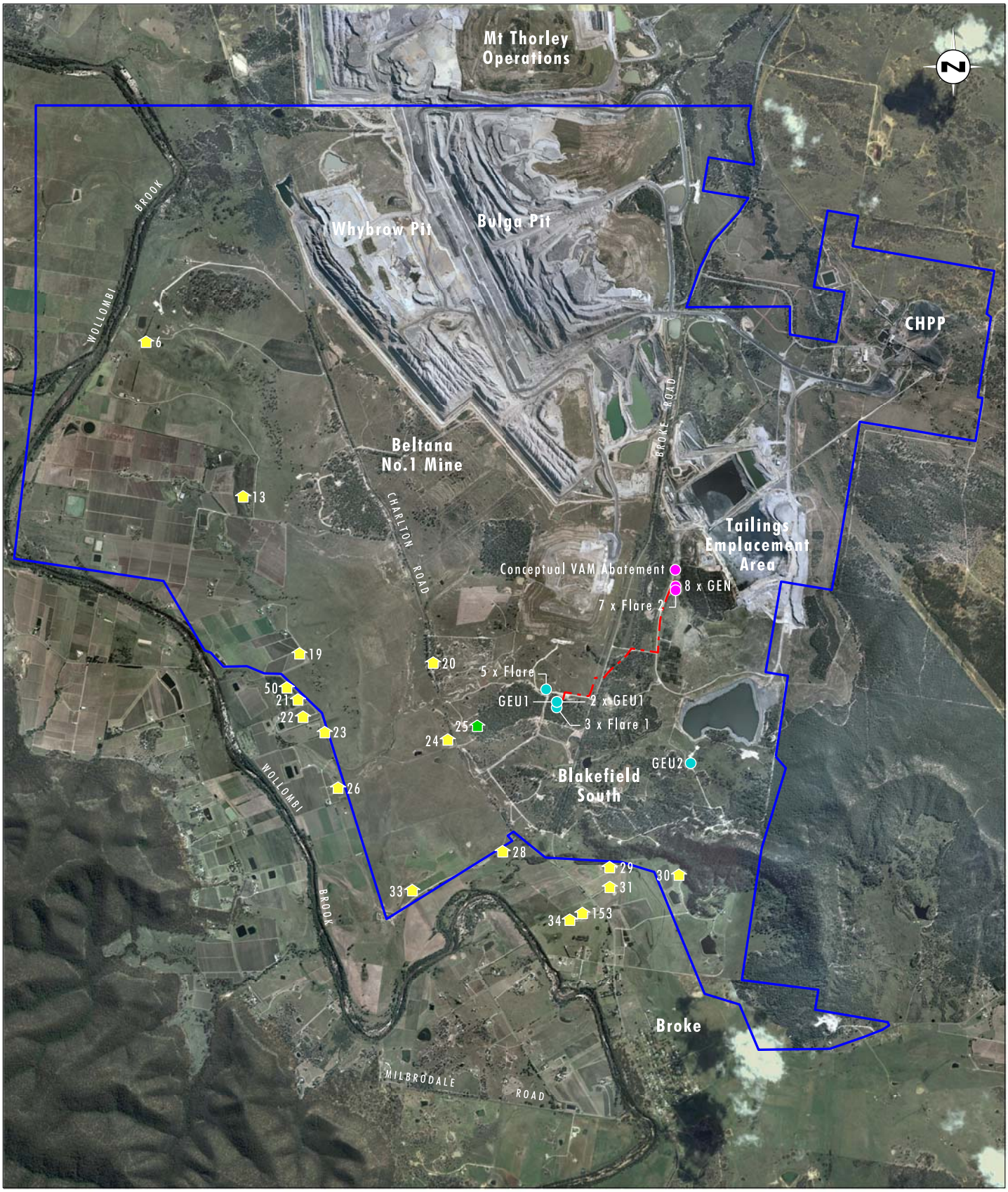
Two scenarios have been modelled, comprising the period 2010 to 2013, and the period 2014 to 2021. For ease of reference these periods have been nominated as Year 1 and Year 5 scenarios respectively. These scenarios are described in the following sections.

Predicted results were then combined with the existing Beltana underground noise model and compared to the consent condition criteria and the worst case 2003 EIS predicted noise levels.

The noise spectrum generated by the Vocsidizer units has been used for assessment of the typical noise generated by whatever RFTR is installed.

Year 1 Model Scenario

The Year 1 model scenario approximates the period 2010 to 2013 and includes infrastructure shown in **Table 5.3** and **Figure 5.1**.



Base Source: Bulga Coal Management & Aerial Photo (2008)

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Legend

- Bulga Coal Complex Mining Lease Area
- Proposed Gas Pipeline Route
- Noise Source - Existing
- Noise Source - Proposed
- Private Residence
- Mine Owned Residence

FIGURE 5.1

Noise Sources and Receptor Locations

Table 5.3 - Year 1 Infrastructure

Label	Source
8xGEN	8 x 3.9 MW Generators
GEU1	4 x Goaf Extraction Units
3xFlare1	3 x Gas Flares
7xFlare2	7 x Gas Flares
Vocsidizer	1 x Vocsidizer

The existing and approved infrastructure including ventilation fans, conveyors, gas flares and goaf plants, coal stockpiles, washery and coal trains has been combined with results from the above infrastructure to allow prediction of combined Beltana Underground noise levels.

Year 5 Model Scenario

The Year 5 model scenario approximates the period 2013 to 2021 and includes infrastructure shown in **Table 5.4** and **Figure 5.1**.

Table 5.4 - Year 5 Infrastructure

Label	Source
8xGEN	8 x 3.9 MW Generators
GEU1	2 x Goaf Extraction Units
GEU2	4 x Goaf Extraction Units
3xFlare1	3 x Gas Flares
7xFlare2	7 x Gas Flares
Vocsidizer	1 x Vocsidizer

At the Year 5 scenario, the number of goaf extraction units at GEU1 reduces from four to two, and four new goaf extraction units will be commissioned at the GEU2 location.

As with Year 1 Model Scenario the existing and approved infrastructure including ventilation fans, conveyors, gas flares and goaf plants, coal stockpiles, washery and coal trains has been combined with results from the above infrastructure to allow prediction of combined Beltana Underground noise levels.

5.2.1.3 Noise Results

The results indicate that the noise levels are predicted to increase between 3 and 6 dBA above the 2003 EIS predicted levels at 10 of the 22 identified receptor locations in the Year 1 scenario and at 11 of the receptor locations in the Year 5 scenario. With the exception of two locations, noise levels at all other private residences are predicted to be less than the noise impact assessment criteria (35 dB(A) $L_{Aeq(15\ Minute)}$).

Residents 20 and 24 are predicted to experience noise levels 4 dB(A) and 6 dB(A) above the noise impact assessment criteria respectively. Resident 24 is already identified in DA 376-8-2003 as being subject to acquisition upon request of the landholder. Beltana currently has an agreement with both Residents 20 and 24 that permits noise levels up to 60 dB(A). Therefore, there are no private residences where noise from the Project is predicted to exceed 35 dB(A) that are not either already subject to acquisition or subject to an existing agreement.

5.2.2 Construction Noise

A construction noise assessment (**Appendix 5**) for the Project was undertaken in accordance with the requirements of the NSW Industrial Noise Policy (EPA, 2000) (INP). A background level of L_{A90} 30 dB(A) has been assumed for the purposes of the construction noise assessment and so the construction noise criterion becomes $L_{Aeq\ 15\ min}$ 35 dB(A) as an intrusiveness criterion as per INP guidelines.

Construction noise levels at the nearest privately owned residence (receptor 20) were predicted using ENM based on the sound power levels of the various items of construction plant. The predicted construction noise level of L_{Aeq} 27 dB at receptor 20 is well below the impact assessment criteria in DA 376-8-2003 and the construction noise criteria of 35dB(A) as per the INP. The noise level at other receptors is expected to be lower due to its increased distance from the construction site.

The construction noise assessment concluded that no construction noise impacts are predicted as a result of the construction activities.

5.2.3 Mitigation Measures

The following measures are proposed to minimise the potential for noise impacts to occur during construction and operation of the Project:

- construction will be limited to daytime hours of 7am to 6pm, Monday to Friday and 8am to 1pm on Saturdays if audible (7am start if not audible). No work will occur on Sundays or public holidays;
- equipment will be maintained and operated to minimise noise emissions;
- existing monitoring programs will continue to monitor noise levels arising from mining activities including the power plant and VAM abatement system;
- the current Bulga Complex Noise Management Plan will be updated for the power generation units and RFTR, prior to operation of the Project; and
- continuous noise monitors will be installed in the community as part of the Bulga Cola Complex noise management initiatives. If excessive noise associated with the Project is identified, mitigative measures will be developed to minimise impacts to residents.

5.3 Air Quality

Monitoring programs conducted as part of the environmental management for the existing Bulga Complex operations have produced a substantial database on existing ambient air quality conditions. The air quality of the area is heavily influenced by the presence of open cut mining and associated activities. Dust or particulate material are generally the key pollutants of concern in relation to air quality arising from the mining operations.

5.3.1 Air Quality Criteria

Although neither the generation of 25MW of electrical power nor the VAM abatement system would be considered scheduled activities under the PoEO Act (Schedule 1), the Bulga Complex is a scheduled premises under the Act (being mining for coal). Therefore the relevant air quality criteria are those defined in Schedules 2 and 4 of the *Protection of the Environment Operations (Clean Air) Regulation 2002* as listed in **Table 5.5**.

Table 5.5 - Air Quality Criteria for Scheduled Premises

Air Impurity	Activity	Standard of Concentration (Group 6)
Schedule 2 - Afterburners, flares and vapour recovery units		
Volatile organic compounds (VOCs), as n-propane equivalent	Flares	40 mg/m^3 VOCs
Smoke	Flares	No visible emission other than for a total period of no more than 5 minutes in any two hours.
Schedule 4 - General activities and plant		
Nitrogen dioxide (NO_2) or Nitric oxide (NO) or both, as NO_2 equivalent	Stationary reciprocating internal combustion engines	450 mg/m^3
Volatile organic compounds (VOCs), as n-propane	Any stationary reciprocating internal combustion engine using a gaseous fuel	40 mg/m^3 VOCs or 125 mg/m^3 CO
Smoke	Any activity or plant in connection with which liquid or gaseous fuel is burnt	Ringelmann 1 or 20% opacity

5.3.2 Impact Assessment

Operation of the power generation plant and VAM abatement system is unlikely to result in any significant air emissions.

Typical emissions from gas fired reciprocating engines are NOx, CO, and VOCs (USEPA, 2000). Emissions of particulate matter from gas fired reciprocating engines are generally minimal and comprise fine filterable and condensable matter. CO and VOC emissions are generally both products of incomplete combustion (USEPA, 2000). The type of reciprocating engines to be used in the power generation units typically have a NOx emission less than 500 mg/m^3 (Deutz, 2006), however the engines are able to be tuned to meet specific NOx criteria and will be tuned to comply with the 450mg/m^3 criteria (Energen Solutions 2009, pers comm.).

Typical flue gas emissions from the flares are expected to be:

- NOx < 150 mg/Nm^3;
- CO < 50mg/Nm^3;
- VOC < 10 mg/Nm^3; and
- NMVOC < 5 mg/Nm^3 (Energen Solutions, 2009).

These emissions are below the air quality criteria for flares as listed in **Table 5.5** and would result in no significant air emissions.

The VAM abatement system is a flameless technology for oxidising methane and does not emit smoke or solid particles (Megtec Systems, 2004). The power generation units are designed to minimise emissions and will not, under normal operating conditions, emit smoke or solid particles in excess of the concentration standards.

Information provided by the vocsidizer manufacturer (Megtec Systems, 2008) identifies that NOx emissions from the vocsidizer system are less than 10 mg/m^3, well below the air quality criteria of 450 mg/m^3. Similarly, CO emissions from the vocsidizer unit are less than 50 mg/m^3, well below the criteria of 125 mg/m^3. Other RFTRs will need to meet similar emission levels to the vocsidizer units to be considered for installation.

The main air quality issues associated with the construction stage of the Project would be short term, primarily during the six week civil construction works, and include dust and emissions from the following sources:

- earthworks;
- vehicle and plant movement creating dust plumes on unsealed access tracks; and
- exhaust emissions from work site vehicles and plant.

Mitigative measures to minimise potential air quality impacts from construction are identified in **Section 5.3.3**.

5.3.3 Mitigation Measures

Although no significant air quality impacts are predicted as a result of the construction and operation of the power generation plant and VAM abatement system and associated infrastructure, the following measures are proposed to minimise the potential for air quality impacts to occur:

- all plant and machinery will be operated and maintained in accordance with the manufacturers specifications;
- vehicle movements across exposed soils will be minimised;
- water carts will be used where necessary on trafficked and exposed areas;
- if excessive dust plumes are being generated by works in windy conditions, works will cease, other than water spray vehicles; and
- vehicles and construction plant will be switched off instead of being left idling to reduce exhaust emissions.

5.4 Visual Impacts

5.4.1 Existing Scenic Quality

The Upper Hunter Valley has a diversity of landforms, vegetation patterns and land uses resulting in considerable variation in scenic quality. In general terms, scenic quality is considered to improve with increasing diversity of topographic ruggedness, vegetation patterns, natural and agricultural landscapes, and waterbodies. **Table 5.6** characterises visual landscape units for the Upper Hunter, based on the DoP (1991) and US Forestry Service (1974) guidelines.

Table 5.6 - Visual Landscape Units - Upper Hunter

Landscape Unit	Scenic Quality
Undulating cleared/semi-cleared grazing land	Moderate
Floodplains adjacent to the Hunter River	High
Open cut coal mine areas, power stations and associated infrastructure	Low
Rugged, forested escarpments forming a visual boundary to the region	High

Extensive clearing for agricultural purposes since non-indigenous settlement has created a strong landscape contrast in the Hunter Valley between the forested slopes and the farmland on the valley floor. The development of the power and coal industries over the past thirty years has added to this contrast, resulting in areas of strong visual contrast to the surrounding vegetated and agricultural areas (DMR 1999).

The Blakefield South mining area generally comprises undulating cleared and semi-cleared grazing land with isolated patches of woodland, and an area of contiguous hilly woodland in the southeast. A high proportion of the surrounding area has extensive views of current coal mining activities and associated service infrastructure, particularly from Broke and Charlton Roads, which are the major transport links in the area. The current visual impact of mining activity on the scenic quality of Broke and Charlton Roads is, however, gradually being reduced through the use of visual bunds, screen plantings and the rehabilitation of existing open cut mining areas. The Project area is considered to have low scenic quality, particularly given its disturbance history as the site of a former haul road and construction material stockpile.

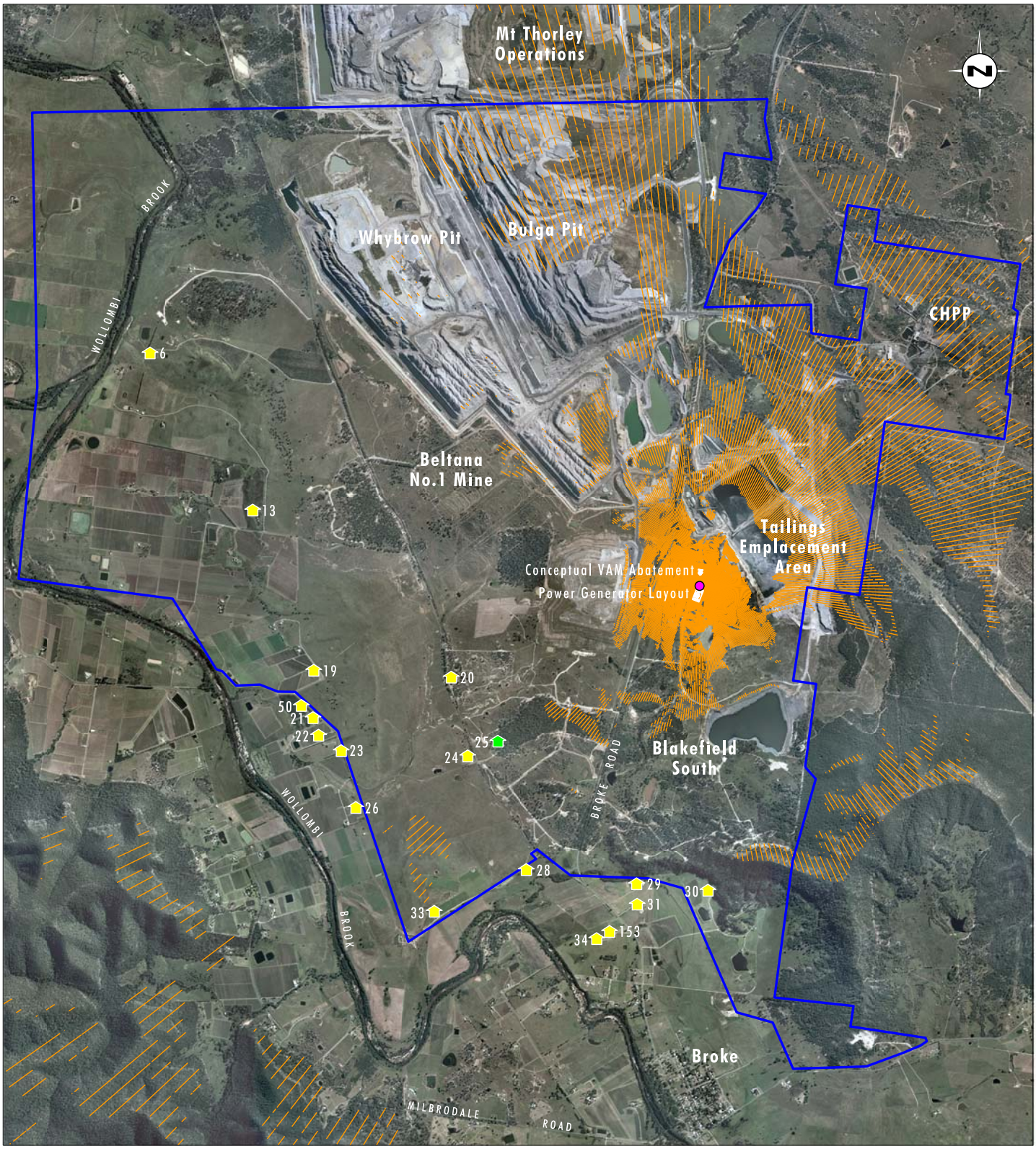
5.4.2 Visual Impact Assessment

The Project components are generally less than 12 metres high (including exhaust stacks), with the exception of the ductwork to connect the RFTR to Ventilation Fan No. 2 which will have a height of 17 metres. A tree screen along Broke Road will provide some screening to the Project. The nearest residential receivers are located approximately 2.5 kilometres to the south and south-west of the Project area.

An initial visual analysis was undertaken for the Project to identify surrounding locations from which views of project related activities may be possible. A radial topographic analysis technique was used as part of this assessment to identify areas potentially visible from a particular viewing location, based on ground topography alone (i.e. no allowance was included for screening vegetation). The assessment included an analysis from the Project area outwards to the surrounding areas (refer to **Figure 5.2**).

The topography of the area will generally result in the Project not being visible from the three closest private residences to the south and south-west of the site, which are at distances approximately 2.5 kilometres or greater. Views to the north, east and west are limited by mining activities in the immediate area surrounding the Project.

Vegetation along the eastern side of Broke Road will generally screen the Project components from being viewed from Broke Road. The canopy height of the vegetation along the eastern side of Broke Road is approximately 25 metres. Glimpses of the top of the RFTR pipework may be visible between the trees but given that Broke Road is a relatively high speed environment (100 km/hr), visual impacts are unlikely to be significant for road users.



Base Source: Bulga Coal Management & Aerial Photo (2008)

0 1 2 2.5km
1:55 000

Legend

- Bulga Coal Complex Mining Lease Area
- Line of Sight
- Visual Assessment Point
- Private Residence
- Mine Owned Residence

FIGURE 5.2

Visual Analysis for VAM Abatement System and Power Generation

Steam may be visible from the RFTR exhaust stack during operation. The exhaust stack has a height of approximately 9 metres and will be shielded from view by the intervening topography and the surrounding vegetation. It is unlikely that steam would be highly visible above the trees and as such the visual impacts are unlikely to be significant.

5.4.3 Mitigation Measures

The following measures are proposed to minimise the potential for visual impacts to occur:

- the existing tree screen along Broke Road will be maintained to minimise views of the RFTR and power generators on the site; and
- construction materials will be designed as far as possible to blend in with the surrounding environment.

5.5 Ecology

A number of ecological studies have been undertaken throughout the Bulga Coal Complex area as part of the following environmental impact statements (EIS):

- South Bulga Colliery EIS (Mitchell McCotter 1992);
- Bulga Open Cut Continued Mining EIS (ERM Mitchell McCotter 1999);
- South Bulga Colliery Southeast Extension EIS (ERM 2000); and
- Bulga Coal Continued Underground Operations EIS (Umwelt 2003).

In addition, Umwelt has undertaken annual ecological monitoring at five sites (BM4, BM5, BM6, BM7 & BM11) within the Blakefield South area, since 2003. The descriptions of existing flora and fauna below are based on the results of the above studies and annual monitoring results.

The impact area has been highly disturbed by previously approved mine related activities, road construction and/or easement clearing. Minimal vegetation clearance will be required for the Project. Two small areas (approximately 1,000m^2 in total) of temporary rehabilitation to the north and south of the power generation compound will be required to be cleared (see **Figure 3.3**). This rehabilitation consists of grass species planted as a cover crop on the former stockpile area.

Appendix 6 lists the threatened flora and fauna species, threatened ecological communities and endangered populations have been previously recorded in the area that could be potentially affected by the development.

5.5.1 Vegetation Communities

Umwelt (2003) identified eight vegetation communities within the Bulga mining lease area. Existing levels of disturbance in these communities range from high over much of the area, to low on the south-eastern steep slopes in the Singleton Army Training Area. Cattle grazing, mining activity and past land clearance has disturbed much of the area, and resulted in large areas of pastoral grassland interspersed with relatively small patches of regrowth woodland with a minimal understorey. There are two vegetation communities of most relevance to the Project, being Pastoral Grassland and Mixed Eucalypt Woodland along the route of the proposed gas pipeline.

5.5.1.1 Pastoral Grassland

The Pastoral Grassland generally lacks tree and shrub vegetation. Scattered individuals of Eucalypt and Bull Oak individuals do occur in some areas. The community shows little variability in species composition and abundance throughout. The community is generally dominated by Threeawn Speargrass (*Aristida ramosa*), Red Grass (*Bothriochloa macra*), Tall Windmill Grass (*Chloris ventricosa*), Windmill Grass (*Chloris truncata*), Slender Rats Tail Grass (*Sporobolus creber*), Browns Lovegrass (*Eragrostis brownii*) and Purple Lovegrass (*Eragrostis lacunaria*).

The Pastoral Grassland community exhibits signs of grazing pressure by domestic species (particularly cattle), pest species (including rabbits and hares), and by native species (particularly kangaroos). Grazing patterns also appear to have affected species abundance, with non-preferred grazing species dominant in some areas. The Pastoral Grassland also appears to be subject to periodic impact from agricultural activities including ploughing and weed control practices.

5.5.1.2 Mixed Eucalypt Woodland

Relatively small pockets of Mixed Eucalypt Woodland also occur throughout the Blakefield South area. The dominant species found in this woodland are Narrow-leaved Ironbark (*Eucalyptus crebra*) and Grey Box (*E. moluccana*). Small-scale differences in the abundance of either of these dominant species are primarily due to past selective logging of Narrow-leaved Ironbarks. Over much of the Blakefield South area, this Mixed Eucalypt Woodland is regenerating in small patches surrounded by pastoral grassland, and cattle have been grazed through the woodland in the past. Therefore understorey vegetation is minimal, encroachment of introduced species such as Prickly Pear (*Opuntia stricta*) and Fireweed (*Seneco madagascariensis*) is common, and the woodland is considered to be highly disturbed.

5.5.2 Threatened Flora Species and Endangered Ecological Communities

The Mixed Eucalypt Woodland community present at the southern end of the pipeline and adjacent to the majority of the pipeline alignment has been preliminarily listed as an endangered ecological community (EEC) (preliminary determination, May 2009) under the TSC Act and is known as the Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions.

Threatened flora known to occur on the Bulga Complex include slaty red gum (*Eucalyptus glaucina*). River red gum (*Eucalyptus camaldulensis*) is listed as an endangered population in the Hunter Catchment and has been recorded on the Bulga Complex. No threatened plant species (as listed under the EPBC Act and TSC Act) have any real likelihood of occurring.

5.5.3 Threatened Fauna

Threatened bird species previously recorded at the Bulga Complex (Umwelt 2009b) include: black-necked stork (*Ephippiorhynchus asiaticus*), brown treecreeper (*Climacteris picumnus*), diamond firetail (*Stagonopleura guttata*), gang-gang cockatoo (*Callocephalon fimbriatum*), glossy black-cockatoo (*Calyptorhynchus lathami*), grey-crowned babbler (*Pomatostomus temporalis temporalis*), hooded robin (*Melanodryas cucullata*), painted honeyeater (*Grantiella picta*), powerful owl (*Ninox strenua*), regent honeyeater (*Anthochaera phrygia*), speckled warbler (*Chthonicola sagittata*), swift parrot (*Lathamus discolor*), barking owl (*Ninox connivens*), black-chinned honeyeater (*Melithreptus gularis*) and varied sittella (*Daphoenositta chrysoptera*).

The area surrounding the Project area most likely provides habitat for the brown treecreeper (*Climacteris picumnus*), speckled warbler (*Chthonicola sagittata*) and grey-crowned babbler (*Pomatostomus temporalis temporalis*).

Previously recorded threatened mammal species include: koala (*Phascolarctos cinereus*) and yellow-bellied glider (*Petaurus australis*). Ten species of microbat were detected in the woodland at the southern end of the pipeline during annual ecological monitoring (Umwelt 2009b). The following species most likely occur within the area adjacent to the pipeline alignment:

- white-striped freetail-bat (*Nyctinomus australis*);
- eastern freetail-bat (*Mormopterus norfolkensis*);
- unknown freetail-bat (*Mormopterus* sp.);
- large-eared pied bat (*Chalinolobus dwyeri*);
- Gould's wattle bat (*Chalinolobus gouldii*);
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*);
- unidentified long-eared bat (*Nyctophilus* sp.);
- southern forest bat (*Vespadelus regulus*);
- eastern cave bat (*Vespadelus troughtoni*);
- little forest bat (*Vespadelus vulturnus*).

5.5.4 Impact Assessment

The site for the power generation system and VAM abatement has been highly disturbed by previous mine related activities including the construction of ventilation shaft No. 2, haul road construction and was the site of a former construction stockpile. The alignment of the proposed powerline extension is adjacent to the existing construction haul road and is within the area previously disturbed. The pipeline alignment has also been disturbed by easement clearing and road construction, including a former alignment of Broke Road.

No tree clearing is required and the Project works are contained within previously disturbed areas. The impacts on flora and fauna, threatened species and ecological communities occurring in the general study area are not expected to be significant as assessed under the relevant New South Wales legislation.

Four species listed as vulnerable under the TSC Act - eastern freetail bat; large-eared pied bat; eastern bentwing-bat; and eastern cave bat - potentially occur within the Project area. These species are unlikely to be impacted by the proposed pipeline, as no natural vegetation or hollow-bearing trees will be cleared.

A test of significance under the *Threatened Species Conservation Act 1995* is not required because there are no species or ecological communities considered potentially sensitive to the development.

The swift parrot (*Lathamus discolor*) and the regent honeyeater (*Anthochaera phrygia*) species listed as endangered under the EPBC Act, have been previously recorded in the Bulga Complex area and have potential to occur within the Project area. The development is assessed as not having a significant impact on the species because it will not:

- lead to a long-term decrease in the size of the population;
- reduce the area of occupancy of the species;
- fragment an existing population;
- adversely affect habitat critical to the survival of the species;
- disrupt the breeding cycle of the population;
- affect habitat to the extent that the species is likely to decline;
- result in invasive species becoming established;
- introduce a disease; or
- interfere with the recovery of the species.

5.5.5 Mitigation Measures

The following mitigation measures will ensure that the disturbance has a minimal ecological impact:

- all works will be contained within existing or previously disturbed areas;
- during trench excavation and pipeline placement, ground disturbance will be minimised to avoid sedimentation of waterways, erosion and root damage to natural vegetation on either side of the pipeline route;
- trenches will be backfilled as soon as feasible after digging to avoid animals falling into the trenches;
- original topsoil will be replaced on top of the backfill so that regeneration is assisted. Reseeding is most likely not necessary as it may introduce exotic species into the surrounding ecological community;
- regular weed control will be undertaken as required to ensure that the regenerating area does not become dominated by weeds, thereby suppressing the natural regeneration of native species;
- standard erosion control measures will be in place prior to and during excavation to ensure soil is not lost from the site; and
- if minimal clearing of trees or other native vegetation is required, a further assessment of potential ecological impacts will be completed to ensure that impacts are minimal.

5.6 Archaeology

5.6.1 Existing Environment

The Bulga area has been the subject of numerous archaeological investigations primarily carried out in relation to impact assessments for proposed mining developments (for examples refer to Dyall 1981, Brayshaw 1991, Koettig 1991, Koettig 1994, Navin 1992, Navin 1994, Navin 1995, ERM 1999, ERM 2000, Heffernan and Klaver 1997; Umwelt 2001, Umwelt 2003b, Umwelt 2008). As a result of this intensive level of investigation more than 200 sites have been recorded within an area bounded by AMG coordinate E315000 – 327000 and N6375000 – 6385000 (Umwelt 2003b:3-4; Umwelt 2008). These sites were mainly isolated finds and artefact scatters, but there have also been four scarred trees, three sets of grinding grooves and two rockshelters with archaeological deposit recorded within and surrounding the Bulga mining lease.

The Project area has been surveyed in part or full by Dyall (1981), ERM (1999) and Umwelt (2003b). During the Aboriginal consultation process for these projects no specific Aboriginal cultural heritage values were identified for the Project area or near environs. A recent search (22 May 2009) of the DECC Aboriginal Heritage Information Management System site register of the area that encompasses the Project area (AMG coordinates E320260 – 323300 and N6378100 – 6381260) resulted in the identification of 33 previously recorded sites (refer to **Appendix 7**). These sites consist of 11 low density artefact scatters, 20 isolated finds and two sites with artefacts (which were not defined as isolated finds or artefact scatters). **Figure 5.3** indicates the location of the sites in relation to the Project area. From **Figure 5.3** it can be noted that there are no registered sites within any of the areas proposed for impact by infrastructure related to the Project and that the closest site (SBU3 - #37-6-0902) is more than 200 metres from the pipeline corridor.

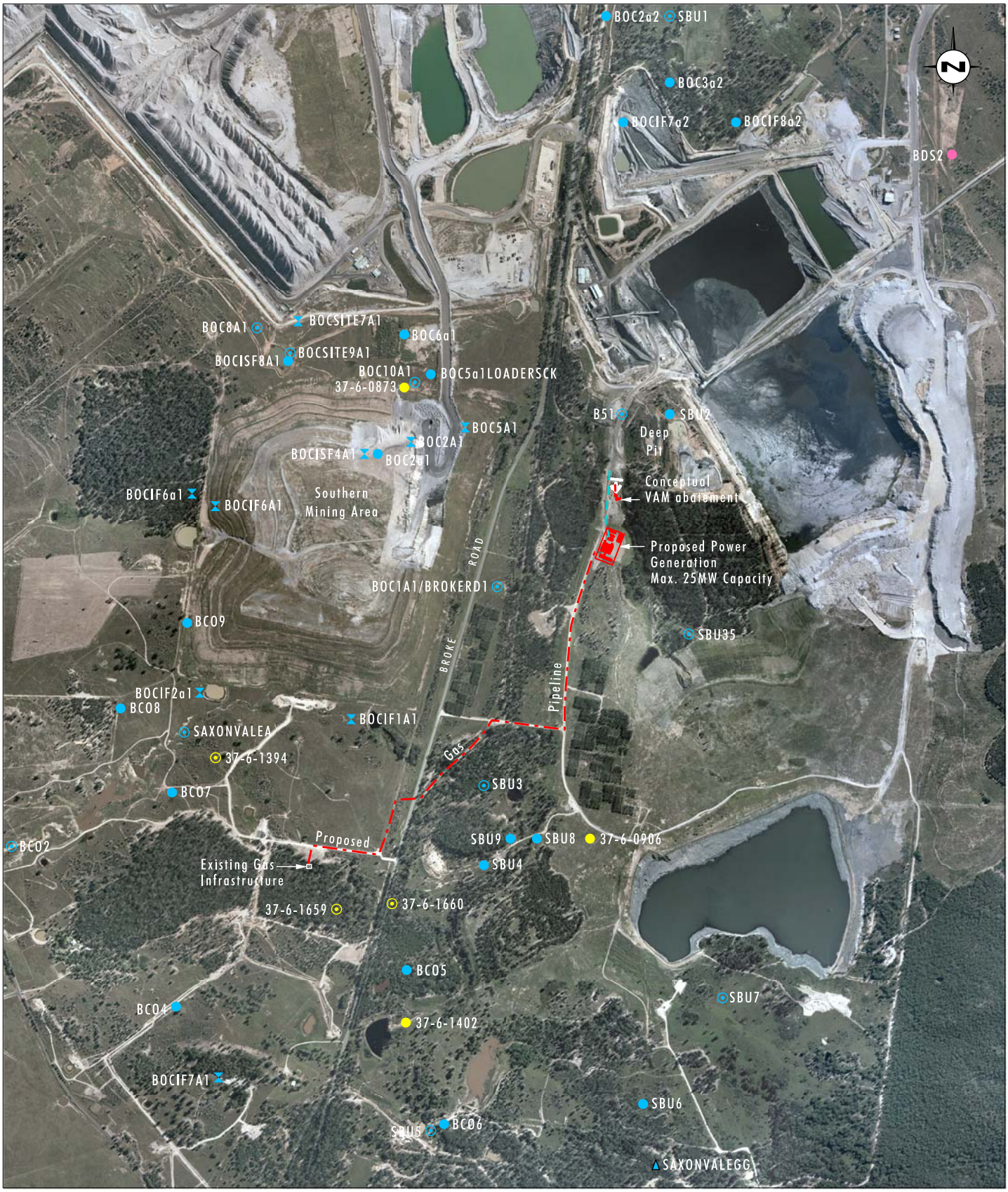
Previous predictive models (Umwelt 2001, Umwelt 2003b) suggest that the current project area would be expected to have only small, low density artefact scatters and multiple isolated finds fairly widely distributed across the landscape. These site types are generally assessed as reflecting the usual background scatter of artefacts expected in the Upper Hunter Valley. Grinding grooves and rockshelters will not be located in this area due to the lack of outcropping sandstone and scarred trees will not be located in the proposed impact areas as they have been cleared as a result of past activities.

5.6.2 Impact Assessment

In relation to assessing the potential archaeological impacts associated with the Project, the following must be taken into account:

- the proposed power plant, RFTR and powerline extension will be located within areas previously disturbed by a former haul road and construction material stockpile;
- the majority of the proposed gas pipeline will be excavated within a corridor that follows a previously cleared and constructed roadway;
- part of the proposed gas pipeline corridor run along the former route of Broke Road; and
- a small section of the proposed gas pipeline corridor crosses a previously cleared power easement.

Thus, it is highly unlikely that the proposed impacts will have any further deleterious effect on the integrity of the soils in the area and any archaeological material they may contain than has already resulted from the prior works.



Source: Beltana, 2009
Note: Refer to Figure 3.3 for Proposed Fan Site details

0 0.25 0.5 1km
1:20 000

Legend

- Proposed Gas Pipeline Route
- Proposed Infrastructure
- Powerline

Previously Recorded Sites
- Sites Destroyed/To be Destroyed
- Artefact Scatter
- Isolated Find

Newly Recorded Sites
- Artefact Scatter
- Isolated Find

FIGURE 5.3

Previously Recorded Archaeological Sites

In summary:

- all works will be contained within existing or previously disturbed areas;
- the entire impact area has been highly disturbed by previously approved mine works, road construction and/or easement clearing;
- the areas proposed for impact have no known archaeological sites; and
- the areas proposed for impact have not been identified during previous assessments as having any specific Aboriginal cultural values.

Therefore, it is highly unlikely that the Project will impact on Aboriginal heritage sites.

5.6.3 Mitigation Measures

During construction, the following measures will be implemented to minimise impacts to archaeological sites:

- BCM will ensure that any employees, contractors working on site are made aware of the location of the previously recorded sites in the general area to ensure that these are not inadvertently impacted;
- should skeletal material identified as human/possibly human be located during any construction works, all works shall cease in the area and the relevant Aboriginal stakeholders, DECC and the NSW Police Department notified immediately. No further works will be undertaken in the vicinity of the skeletal material until management outcomes have been decided in consultation with the relevant Aboriginal stakeholders, DECC and NSW Police Department; and
- should previously unknown artefacts be uncovered during construction works, all works shall cease in the area and the relevant Aboriginal stakeholders and the DECC notified immediately. No further works will be undertaken in the vicinity of the artefactual material until management outcomes have been decided in consultation with the relevant Aboriginal stakeholders and the DECC.

5.7 Traffic and Access

Access to the Beltana facilities is from Broke Road, which intersects the Putty Road to the north and Cessnock Road at Broke to the south. Access to Broke Road from the village of Bulga to the west is via Charlton Road or Milbrodale Road. Broke, Charlton and Milbrodale roads are single-lane, two-way bitumen-sealed public roads with speed limits of 100 kph.

Entry to both the power generation site and the VAM abatement site will be from Broke Road. An existing mine access road from Broke Road currently provides access to the Project area. The existing internal roads are suitable for all planned loads to each site and no further roadworks will be required.

Traffic counts undertaken along Broke Road in February 2009 (NTPE, 2009) indicate that 85-90% of vehicles travelling along Broke Road comprise light vehicles, with only 10-15% medium and heavy vehicles. Northbound traffic on Broke Road peaks between 6am and 8am whilst southbound traffic experiences a peak between 3pm and 5pm. Average two way daily traffic on the road in the vicinity of the Beltana operations is approximately 380 vehicles per day.

A summary of the traffic count information for sites on Broke Road north and south of the Project area is provided in **Table 5.7**.

Table 5.7 - Traffic Counts on Broke Road North and South of Blakefield Project Area

Site No.	Direction	Daily Average (all days) (Number of vehicles)	% Heavy Vehicles	Daily Average (weekdays only) (Number of Vehicles)	% Heavy Vehicles
2	Northbound	168	14	197	15
2	Southbound	182	13	158	14
3	Northbound	137	9	158	10
3	Southbound	176	9	205	9

An average of approximately 10 additional light vehicle movements per day and four to five additional heavy vehicle movements per day are expected over the 26 week construction period. The increase in traffic volumes associated with the Project is expected to be minimal and will not affect the level of service on Broke Road.

The operation of the proposed power generation plant and VAM abatement system will not result in any significant change to the existing Beltana workforce. Therefore, apart from a small number of additional traffic movements associated with maintenance activities, there is expected to be no increase in operational traffic accessing the Bulga site.

To minimise the potential for traffic impacts, existing access points from Broke Road will be used for all access to the site.

5.8 Soil and Water Management

The nearest watercourse to the Project is a minor tributary of Loders Creek which is approximately 150 metres to the east and north of the power generation and VAM abatement system site. Loders Creek will not be impacted by the Project.

None of the Project components will require additional water for operation and there will be no changes to the existing site water management regime or water balance. No water discharges will occur as a result of the Project.

Stormwater drainage systems will be constructed around both the power generation compound and the RFTR compounds. These drainage systems will be designed to drain runoff from the hardstand areas into the minewater drainage system.

A range of mitigation measures will be implemented throughout the construction period to control surface runoff, erosion and sedimentation from the Project area. These measures will include:

- erosion and sediment controls will be incorporated into the final site layout design plans and installed prior to construction commencing;
- all activities associated with the Project will be contained within existing or previously disturbed areas;
- ongoing monitoring and maintenance of the access road and maintenance of the erosion and sediment controls will be undertaken; and
- disturbed areas will be rehabilitated promptly upon completion of construction.

5.9 Hazards and Risks

The power generation units and flares and the VAM abatement system, will not require any gas storage on site. Gas will be fed directly to the various facilities from either the mine ventilation system or the gas drainage system. Generally no hazardous substances will be required to be stored on site for the operation of the facility. Maintenance may require the use of minor quantities of fuels and lubricants, however these will be used as required and not stored on site.

A risk screening procedure in accordance with the DoP guidelines Applying SEPP33 – Hazardous and Offensive Development Application Guidelines (DUAP, 1997) was carried out to identify whether or not the Project represents a hazardous or offensive development.

Methane gas is classified as Class 2.1 Flammable Gas under the Australian Dangerous Goods Code, however the threshold quantities identified in the SEPP 33 guidelines relate to the storage of gas. Quantities of fuels and lubricants required for operation and maintenance are also below the relevant threshold quantities.

Given that no gas storage or other dangerous goods or hazardous materials storage is required, the risk screening procedure (Figure 6 of the Guidelines) has identified that the Project would not be classified as hazardous or offensive according to SEPP 33 and accordingly a preliminary hazard analysis is not required.

6.0 Draft Statement of Commitments

The DGRs for the Project require that the EA includes a Statement of Commitments which details the proposed environmental management measures for the Project.

If approval is granted for the Project, Beltana will commit to the following controls.

Table 6.1 - Statement of Commitments

Environmental Issue	Safeguards	Timing
Noise	Construction will be limited to daytime hours of 7am to 6pm, Monday to Friday and 8am to 1pm on Saturdays if audible (7am start if not audible). No work will occur on Sundays or public holidays;	During construction
	Equipment will be maintained and operated to minimise noise emissions.	During construction and operation
	The current Bulga Complex Noise Management Plan will be updated for the RFTR and power generation units.	Prior to operation of the Project
	Existing monitoring programs will continue to monitor noise levels arising from mining activities including the VAM abatement system and power plant.	During operation
	Continuous noise monitors will be installed in the community as part of the Bulga Coal Complex noise management initiatives. If excessive noise associated with the Project is identified, mitigative measures will be developed to minimise impacts to residents.	During construction and operation
Visual Impacts	The existing tree screen along Broke Road will be maintained to minimise views of the RFTR and power generators on the site.	During operation
	Construction materials will be designed as far as possible to blend in with the surrounding environment.	During construction
Ecology	All works will be contained within existing disturbed areas.	During construction
	During trench excavation and pipeline placement, ground disturbance will be minimised to avoid sedimentation of waterways, erosion and root damage to natural vegetation either side of the pipeline route.	During construction
	Trenches will be backfilled as soon as feasible after digging to avoid animals falling into the trenches.	During construction
	Original topsoil will be replaced on top of the backfill so that natural regeneration of the native ground layer is assisted.	During construction
	Regular weed control will be undertaken as required to ensure that the regenerating area does not become dominated by weeds, thereby suppressing the natural regeneration of native species.	During construction and operation

Environmental Issue	Safeguards	Timing
	Standard erosion control measures will be in place prior to and during excavation to ensure soil is not lost from the site.	Prior to and during construction
	If minimal clearing of trees or other native vegetation is required, a further assessment of potential ecological impacts will be completed to ensure that impacts are minimal.	During construction
Archaeology	All works will be contained within existing disturbed areas.	During construction
	BCM will ensure that any employees, contractors working on site are made aware of the location of the previously recorded sites in the general area to ensure that these are not inadvertently impacted.	During construction
	Should skeletal material identified as human/possibly human be located during any construction works, all works shall cease in the area and the relevant Aboriginal stakeholders, DECC and the NSW Police Department notified immediately. No further works will be undertaken in the vicinity of the skeletal material until management outcomes have been decided in consultation with the relevant Aboriginal stakeholders, DECC and NSW Police Department.	During construction
	Should previously unknown artefacts be uncovered during construction works, all works shall cease in the area and the relevant Aboriginal stakeholders and the DECC notified immediately. No further works will be undertaken in the vicinity of the artefactual material until management outcomes have been decided in consultation with the relevant Aboriginal stakeholders and the DECC.	During construction
Traffic and Access	Existing access points from Broke Road will be used for all access to the site.	During construction and operation
Air Quality	All plant and machinery will be operated and maintained in accordance with the manufacturers specifications.	During construction and operation
	Vehicle movements across exposed soils will be minimised.	During construction
	If excessive dust plumes are being generated by earthworks in windy conditions, works will cease, other than water spray vehicles.	During construction
	Vehicles and construction plant will be switched off instead of being left idling to reduce exhaust emissions.	During construction
Soil and Water Management	Erosion and sediment controls will be incorporated into the final site layout design plans and installed prior to construction commencing.	Prior to and during construction
	All activities associated with the Project will be contained to previously disturbed areas.	During construction
	Ongoing monitoring and maintenance of the access road and maintenance of the erosion and sediment controls will be undertaken.	During construction and operation
	Disturbed areas will be rehabilitated promptly.	At completion of construction

7.0 Ecologically Sustainable Development

Prior to any development taking place in New South Wales, a formal assessment needs to be made of the proposed development to ensure it complies with relevant planning controls and, according to its nature and scale, confirm that it is environmentally, socially and economically sustainable. The EP&A Act provides the framework for the assessment of development proposals and allows for members of the public to participate in the decision making process that will determine future land uses.

The objectives of the EP&A Act are:

(a) to encourage:

i. the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment; and
ii. the promotion and co-ordination of the orderly and economic use and development of land; and
iii. the protection, provision and co-ordination of communication and utility services; and
iv. the provision of land for public purposes; and
v. the provision and co-ordination of community services and facilities; and
vi. the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats; and
vii. ecologically sustainable development, and
viii. the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The Project, including the environmental management procedures outlined in this EA, is considered to meet the relevant objectives of the EP&A Act. In particular:

- the project has been designed to minimise the greenhouse gas emissions associated with the mining operations at Beltana;
- the beneficial re-use of the drained gas to generate power supports the principles of ecologically sustainable development; and
- siting of the project components has been designed to minimise impacts on the environment.

The EP&A Act aims to encourage ESD within NSW. As outlined in **Section 4.0,** the Project requires approval from the Minister under Section 75W of the EP&A Act. As such, the Minister needs to be satisfied that the Project is consistent with the principles of ESD. This section provides an assessment of the Project in relation to the principles of ESD.

To justify the Project with regard to the ESD principles, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The ESD principles encompass the following:

- the precautionary principle;

- inter-generational equity;
- conservation of biological diversity; and
- valuation and pricing of resources.

Essentially, ESD requires that current and future generations should live in an environment that is of the same or improved quality than the one that is inherited.

7.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

> Where 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.
>
> In the application of the precautionary principle, public and private decisions should be guided by:
>
> (i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
> (ii) an assessment of the risk-weighted consequences of various options.

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Project, this EA has undertaken an extensive evaluation of all the key components of the Project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EA.

The assessment process has involved a detailed study of the existing environment and the potential environmental impacts associated with the Project.

The decision making process for the design, impact assessment and development of management processes has been transparent in the following respects:

1. Relevant government authorities and community representatives were consulted during EA preparation (refer to **Section 2.0**). This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures.

2. BCM has an established EMS, incorporating environmental management plans, procedures and environmental monitoring, that has been implemented for its current operations and which will be implemented in regard to the Project. In addition, the management controls that will be implemented by Beltana as part of the implementation of this Project have been clearly specified in **Section 6.0**.

3. This EA has been undertaken on the basis of the best available scientific information about the Project Area. Where uncertainty in the data used in the assessment has been identified, a conservative worst case analysis has been undertaken and contingency measures have been identified to manage that uncertainty.

4. An auditing and review process is an integral component of the existing development consent and EMS at Bulga Complex, providing for verification of Project performance by independent auditors and relevant government agencies. Beltana will continue to implement this auditing and verification process in regard to the Project.

7.2 Intergenerational Equity

The EP&A Regulation defines intergenerational equity as:

> Intergenerational 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.

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, bio-diversity and productivity.

As detailed in **Section 5.0**, the Project can be undertaken without having a significant impact on the local environment or community. The environmental management measures discussed in **Sections 5.0** and **6.0** have been developed to minimise the impact of the Project on the environment and community to the greatest extent reasonably possible.

The management of environmental issues as outlined in this EA will maintain the health, diversity and productivity of the environment for future generations.

7.3 Conservation of Biological Diversity

The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them. All environmental components, ecosystems and habitat values potentially affected by the Project are described in this EA. Potential impacts are also outlined and measures to ameliorate any negative impact are outlined in the statement of commitments (refer to **Section 6.0**).

The Project has been designed to minimise impacts on native vegetation areas, with the Project to be undertaken in areas previously disturbed by mining activity. The ecological assessment completed for the Project (refer to **Section 5.5**) has found that the Project will not have a significant impact on biodiversity.

7.4 Valuation and Pricing of Resources

The goal of improved valuation of natural capital has been included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment. The principle of improved valuation and pricing refers to the need to determine proper values of services provided by the natural environment. The objective is to apply economic terms and values to the elements of the natural environment. This is a difficult task largely due to the intangible comparisons that need to be drawn in order to apply the values.

The project optimises the valuation and pricing of the coal resources with minimal impact by:

- providing opportunities for beneficial reuse of the waste gas; and
- minimising the amount of methane emitted to atmosphere, thereby reducing the carbon footprint.

7.5 Conclusion

The Project is considered to be consistent with relevant objectives of the EP&A Act, including the principles of ESD. Therefore, on considering the balance of environment and community impacts, it is considered that it would be reasonable for the Minister to conclude that the benefits of the Project outweigh the impacts.

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9.0 Abbreviations and Glossary

9.1 Abbreviations

CCC	Community Consultative Committee
CHPP	Coal Preparation Plant
dB	Decibel
dBA	A-weighted decibel
DECC	Department of Environment and Climate Change
DGRs	Director General's Requirements
DoP	Department of Planning
DPI	Department of Primary Industries
DWE	Department of Water and Energy
EA	Environmental Assessment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPA	Environment Protection Authority of NSW (former, now DECC)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPL	Environment Protection Licence
GHG	Greenhouse gas
LEP	Local Environmental Plan
LGA	Local Government Area
m	metres
ML	Mining Lease
Mt	million tonnes
Mtpa	million tonnes per annum

PM_{10}	Particulate matter less than 10 micro metres in diameter
PoEO Act	*Protection of the Environment Operations Act 1997*
ROM	Run of mine
RTA	Roads and Traffic Authority
SEPP	State Environmental Planning Policy
t/hr	Tonnes per hour
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
TSP	Total suspended particulate matter, usually in the size range of zero to 50 micrometres
Umwelt	Umwelt (Australia) Pty Limited
yr	Year

9.2 Glossary

Amenity:	An agreeable feature, facility or service which makes for a comfortable and pleasant life.
Archaeological:	Pertaining to the study of culture and description of its remains.
Background Noise:	Existing noise in the absence of the sound under investigation and all other extraneous sounds.
Catchment Area:	The area from which a river or stream receives its water.
Conservation:	The management of natural resources in a way that will preserve them for the benefit of both present and future generations.
dB (Decibel):	A unit for expressing the relative intensity of sounds on a logarithmic scale from zero (for average least perceptible sound) to about 130 (for the average pain level).
dBA:	A modified decibel scale which is weighted to take account of the frequency response of the normal human ear.
Ecology:	The science dealing with the relationships between organisms and their environment.
Ecosystem:	Organisms of a community together with its non-living components through which energy and matter flow.
Environmental Planning and Assessment Act 1979:	NSW Government Act to provide for the orderly development of land in NSW.

Environment Protection and Biodiversity Conservation Act 1999:	Commonwealth legislation that regulates development proposals that have an actual or potential impact on matters of national environmental significance.
Fauna:	All vertebrate animal life of a given time and place.
Flora:	All vascular plant life of a given time and place.
Habitat:	The environment in which a plant or animal lives; often described in terms of geography and climate.
***In situ*:**	In its original place.
L_{A1} Noise Level:	The noise level exceeded for one per cent of the time. It is used in assessment of sleep disturbance.
L_{A90} Noise Level:	The noise level, measured in dB(A), exceeded for 90% of the time, which is approximately the average of the minimum noise levels. The L90 level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L_{Aeq} Noise Level:	The equivalent continuous noise level, measured in dB(A), during a measurement period.
Landform:	Sections of the earth's surface which have a definable appearance (e.g. cliff, valley, mountain range, plain, etc).
Mean:	The average value of a particular set of numbers.
Mitigate:	To lessen in force, intensity or harshness. To moderate in severity.
Native:	Belonging to the natural flora or fauna in a region.
Particulates:	Fine solid particles which remain individually dispersed in gases.
Protection of the Environment Operations Act 1997:	NSW legislation administered by DECC that regulates discharges to land, air and water.
Seam:	An identifiable discrete coal unit.
Sound Power Level:	The total sound energy radiated per unit time measured as 10 times a logarithmic scale, the reference power being 12 picowatts.
Surface Infrastructure:	Any human made object, facility or structure on the surface of the land.
Topography:	Description of all the physical features of an area of land and their relative positions, either in words or by way of a map.

Total Suspended Particulates (TSP): A measure of the total amount of un-dissolved matter in a volume of water or air usually expressed in milligrams per litre (mg/L) (for water) or micrograms per cubic metre ($\mu g/m^3$) for air.

Woodland: Land covered by trees that do not form a closed canopy.

APPENDIX 1

Statement of Authorship

STATEMENT OF AUTHORSHIP

Submission of Environmental Assessment (EA) under Section 75H of the Environmental Planning and Assessment Act 1979

EA prepared by	
Name:	Michelle Kirkman
Qualifications:	B Env Sc, Grad Dip Policy Studies
Address:	Umwelt (Australia) Pty Limited PO Box 838 Toronto NSW 2283
In respect of:	Proposed Modification of Bulga Underground Development Consent
Applicant Name:	Beltana Highwall Mining Pty Limited
Applicant Address:	Broke Road Singleton NSW 2330
Land to be developed:	Refer to attached **Table 1.**
Proposed Development:	Proposed modifications to Bulga Underground development consent as described in Section 3.0 of the Environmental Assessment.
Environmental Assessment	An environmental assessment (EA) is attached.
Certification	I certify that I have prepared the contents of this environmental assessment and to the best of my knowledge: • it is in accordance with Sections 75E and 75F of the *Environmental Planning and Assessment Act 1979*, and • it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.
Signature:	M Kirkman.
Name:	Michelle Kirkman
Date:	21 December 2009

Project Team

Umwelt (Australia) Pty Limited – Environmental Assessment Preparation

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Grant Collins, Environmental Scientist B Sc (Environmental Management and Mathematics)	Greenhouse Gas and Energy Assessment
Rebecca Abbott	Drafting Supervisor
Kathy Down	Report review, formatting and quality control

Other Specialist Investigations

Global Acoustics	Noise Assessment

Beltana Highwall Mining and Xstrata Coal

The assistance of the following Beltana and Xstrata personnel during preparation of this EA is gratefully acknowledged.

David O'Brien	Xstrata Coal NSW Group Environment and Community Manager
Ralph Northey	Beltana Environment & Community Coordinator
Clint Todhunter	Gas Drainage Co-ordinator

Table 1 – Schedule of Affected Land

Schedule of Affected Land – Bulga Underground modification of consent – DA 376-8-2003

Lot	DP	Parish	County
51	755264	Vere	Northumberland
52	755264	Vere	Northumberland
3	247398	Wollombi	Northumberland
4	247398	Wollombi	Northumberland
		Broke Road	
		Former alignment of Broke Road	

APPENDIX 2

Director-General’s Requirements

NSW GOVERNMENT
Department of Planning

Major Project Assessment
Industry & Mining
Phone: (02) 9228 6306
Fax: (02) 9228 6466
Email: belinda.parker@planning.nsw.gov.au
Room 305
23-33 Bridge Street
GPO Box 39
SYDNEY NSW 2001

Ms Michelle Kirkman
Umwelt (Australia) Pty Limited
PO Box 838
TORONTO NSW 2283

Our Ref: S02/02148

Dear Ms Kirkman

Bulga Coal Mine
Section 75W Modification (DA 376-8-2003 MOD 4)

I refer to your recent letter on the proposal to establish a ventilation air methane abatement system and small gas-fired power plant at the Bulga coal mine.

I can advise that the Minister has agreed to treat the development consent for the Bulga underground mining operations (DA 376-8-2003 MOD 4) as an approval for the purposes of Section 75W of the EP&A Act, and to consider an application for a modification of this consent under Section 75W to enable to the proposal to proceed.

This application should be accompanied by an environmental assessment that addresses the attached Director-General's requirements.

If you have any enquiries about these requirements, please contact Belinda Parker.

Yours sincerely

14.4.09

Chris Wilson
Executive Director
Major Project Assessment
As delegate for the Director-General

Director-General's Requirements

Section 75W of the *Environmental Planning and Assessment Act 1979*

Application Number	DA 376-8-2003 MOD 4
Proposed Modification	Establishment of a ventilation air methane abatement system and small gas-fired power plant.
Location	Bulga Coal Mine, 12 kilometres southwest of Singleton
Proponent	Beltana Highwall Mining Pty Limited
Date of Issue	14 April 2009
General Requirements	The Environmental Assessment of the proposal must include: • a summary of the existing and approved mining operations/facilities on site, and the existing environmental management regime; • a description of the proposal; • a general assessment of the potential impacts of the proposal on the environment; • a detailed assessment of the key issues specified below, which includes: - a description of the existing environment; - an assessment of the potential impacts of the proposal, taking into consideration any relevant laws, policies, plans or guidelines; and - a description of the proposed measures that would be implemented to avoid, minimise, and if necessary offset the potential impacts of the proposal; • a statement of commitments, outlining the proposed environmental management measures; • a signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading.
Key Issues	• **Greenhouse Gas**; • **Air**; • **Noise** – including both construction and operational noise; • **Soil & Water** – including erosion and sediment control during construction, stormwater management, and any consequential impacts of the proposal on the mine's water balance; • **Biodiversity** – including potential impacts to any threatened species, populations or ecological communities; • **Aboriginal Heritage**; and • **Visual**.
References	The Environmental Assessment must take into account relevant State and Commonwealth Government technical and policy guidelines. While not exhaustive, the following attachment contains a list of some of the guidelines, policies and plans that may be relevant to the environmental assessment of this proposed modification.
Consultation	During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups or affected landowners. In particular you must consult with the: • Department of Environment and Climate Change; • Department of Primary Industries; • Department of Water and Energy; and

	• Singleton Shire Council. The consultation process and the issues raised must be described in the Environmental Assessment.

Policies, Guidelines & Plans

Aspect	Policy / Methodology
Greenhouse Gas	
	• *AGO Factors and Methods Workbook* (Australian Greenhouse Office)
Air Quality	
	• *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DECC).
Noise	
	• *NSW Industrial Noise Policy* (DECC);
	• *Environmental Noise Control Manual* (DECC);
Biodiversity	
	• Draft Guidelines for Threatened Species Assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (DECC)
	• NSW Groundwater Dependent Ecosystem Policy (DLWC)
	• State Environmental Planning Policy No. 44 – Koala Habitat Protection

APPENDIX 3

Community Newsletters and Responses

BULGA COAL COMPLEX UPDATE

The Bulga Coal Complex Community Update **June 2009**

Welcome

The Bulga Coal Complex which includes Bulga Coal Open Cut, Beltana Underground and the Coal Handling and Preparation Plant, is managed by Xstrata Coal. Xstrata Coal is not immune to the tightening economy and we are continuing to review costs and processes at all operations.

News from the open cut

Paste thickener at the Coal Handling and Preparation Plant

This year Bulga Coal is working towards our annual target of 9 million tonnes. Improving short and long term water management has resulted in construction of two additional storage areas, reducing our reliance on Hunter River water:

- Vaux Pit: 2,000 mL storage dam
- Coal Handling and Preparation Plant (CHPP): 3,000mL storage dam. Expected completion of both dams is early 2010.

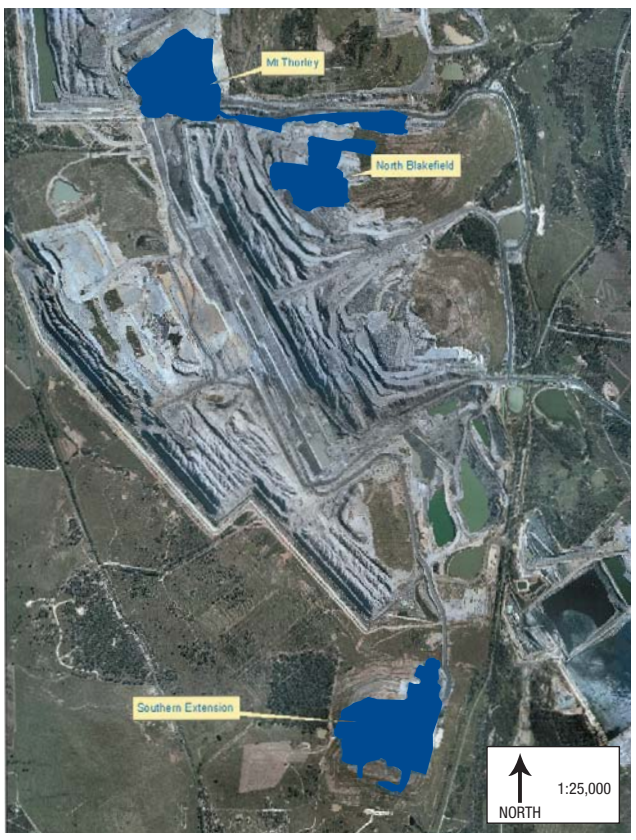
We have commissioned a Paste Thickener at the CHPP which thickens the tailings, saving water, power and reducing space required for tailings storage.

REHABILITATION UPDATE

During 2008, 120 hectares of rehabilitation was completed. All areas were rehabilitated using a combination of tree and pasture seed.

- North Blakefield – rehabilitation includes both pasture and tree species. Rehabilitation completed in September is producing some promising results with ideal rainfall falling over the last quarter of 2008. (pic)
- Mount Thorley Dump – rehabilitation was completed last year with promising strike. Some minor earthworks and water management structures to be undertaken over the next couple of months.
- Southern Extension Dump – rehabilitation of this dump was finalised in 2008. The eastern face that runs adjacent to Broke Road is now completed and is producing promising early results.

90 hectares of rehabilitation is planned for 2009.



TOP: Rehabilitation North Blakefield site; ABOVE: Southern Extension Dump site

Dragline Profile

Value
$75 million
Rated suspended load
260 tonnes
Boom length
97.5 metres
(taller than the opera house)
Working weight
5,134 tonnes
Bucket capacity
88 cubic metres

'CASH FOR FAT' HEALTH INITIATIVE

NSW Minerals Council Innovation Award Finalist

As part of Bulga Coal's commitment to a healthy workforce at home and work, the 'Cash for Fat' initiative was developed as a team based challenge where all money raised will go to charity. Around 70% of Bulga Coal employees are participating in the voluntary program where every kilo lost earns $10.

'Cash for Fat' is supported by an education program in healthy eating and other health topics. Gym access has been provided to all Bulga Coal employees.

Employee weighing in

SUPPORTING THE LOCAL COMMUNITY

- Singleton Summer Time Reading Program: Bulga coal was the major sponsor
- Milbrodale Schoolyard Blitz

Apprentices and staff from Bulga Coal and Beltana 'blitzed' the schoolyard at Milbrodale to improve outdoor areas late last year.

The blitz included construction of a bike track, vegie garden, goal posts and field markings, concrete pathways, long jump pit and new outdoor table. For the children it provided a learning opportunity in teamwork and measurements like volume, length and area. Well done to everyone involved!

XSTRATA COAL SUPPORTS COMMUNITY IN SINGLETON

Xstrata Coal donated just over $1.7 million across the areas of health, arts and culture, education and community in the local region as part of its Corporate Social Involvement.

One of the eight local projects to receive funding, the **Singleton Dads' Take Home Reading Program**, encourages fathers to be involved in their children's education.

EMPLOYEE PROFILE: SCOTT BOWDEN

Shotfirer – Bulga Coal Open Cut

Lives: in Singleton with wife Cindy, daughter Jaimee and son Liam

Describe your job: Our crew assembles, positions and detonates explosives to dislodge rock and soil, making it easier for machinery. My day starts at 5.30am and is non-stop. At the shot area, we prime and measure holes, then start loading with explosives. Once loading is finished, we return left over accessories, balance the books and complete statutory book work.

It's a rewarding job and the statutory regulations keep you on your toes to work as diligently and safely as you can – so we return home to our families every day.

COMMUNITY FEEDBACK LINE

For any issues regarding Bulga Coal Open Cut operations, please phone **1800 332 693**

24 hours a day, 7 days a week.

ENVIRONMENT AND COMMUNITY **CONTACTS**

Mel Hawthorne Environment & Community Superintendent
P: 6570 2409 M: 0414 251 130
mhawthorne@xstratacoal.com.au

Stephen Shoesmith Environment & Community Officer
P: 6570 2529 M: 0439 246 764
sshoesmith@xstratacoal.com.au

BULGA COAL COMPLEX UPDATE

The Bulga Coal Complex Community Update **June 2009**

News from Beltana

This year, Beltana will mine around 5.8 million tonnes of coal from Longwall panels 11, 12 and 13. We are working hard preparing for Longwall mining at Blakefield South. This includes completion of the gas drainage system, development of Longwall panels and preparation for subsidence management.

Our administration centre has moved to the Blakefield South offices, formerly South Bulga, on the east side of Broke Road.

Beltana's significant greenhouse gas reduction initiatives include the construction of up to 25 megawatts of gas-fired power generation and ventilation air methane abatement infrastructure.

For more information on these initiatives, please read the enclosed flyer.

REDUCING OUR GREENHOUSE GAS EMISSIONS

Beltana is aiming to significantly reduce its greenhouse gas emissions through the following initiatives:

Flaring

Beltana is flaring methane collected by our gas drainage system, reducing the greenhouse gas impact by 21 times. Three new flares were recently constructed and will flare all of the captured methane from the existing gas drainage system. These flares are located in bushland, reducing the visual impact and will replace the five existing flares visible from Broke and Charlton Roads.

Power generation units

Beltana is currently preparing a development consent modification to construct up to 25MW of power generation. This could consume all of the methane currently being drained. We are also evaluating options for utilising all the captured methane for the life of the mine, including the potential construction of a substantial power generating facility and/or supply of methane to a third party for power generation.

Ventilation Air Methane Abatement

Ventilation air circulated through the underground mine to allow the workers to breathe can contain up to 2% methane.

There is technology available which can turn methane in mine ventilation air into CO^2 to reduce the greenhouse gas impact.

For more information on Beltana's ventilation air methane project, please read the enclosed flyer.

BELTANA SUPPORTS THE LOCAL COMMUNITY

- Broke P & C: school disco
- A Little Bit of Italy in Broke
- Annual Singleton Junior Judging Competition – Singleton Beef and Land Management Association
- Branxton Netball Club – training and development for coaches and managers
- Jake Hunter – 12 year old showjumper
- Newcastle Variety Bush Bash
- Community Barbeques at Broke and Bulga, developing relationships with the community.

EMPLOYEE PROFILE: PHIL ADAMTHWAITE

Crew Supervisor - Services at Beltana

Lives: in Bulga

Family: My wife Jan and two sons

In my spare time: I like to sail 40 foot yachts in the Bay.

I enjoy living in Bulga: because it's a nice place to live. We've got wineries and easy access to the city for theatre and music

Enjoys: collecting clocks, machinery and just about anything! I have the original Bundy Clock from Bradmill Workwear in Maitland

Tell us something we don't know: I'm looking forward to holidays at the Top End with Jan, the caravan and my fishing rod.

RESTORING THE MAJESTIC RIVER RED GUM

The River Red Gum once graced the banks of the Wollombi Brook and Monkey Place Creek. There are now only a handful of these majestic trees left in the Broke area. Beltana has collected tree seed from River Red Gums in Broke and propagated them into tubestock.

The River Red Gums will be planted as tubestock with around 2,000 shrubs and trees to create a River Red Gum ecological community on the banks of the Brook near Fordwich.

Re-establishing the River Red Gum ecological community is one of Beltana's many land management and biodiversity projects.

Planting out of River Red Gum tube stock. River Red Gum is known locally as Swamp Gum.

WORLD'S MOST ADVANCED LONGWALL SYSTEM

Longwall mini-build construction for testing and operator training before being transported underground in 2010

Beltana has purchased a powerful, state of the art Longwall Mining system which will cut coal more efficiently and improve safety standards.

Currently a world leader in automation, Beltana's Longwall system will lift standards even higher by creating safer zones, removing operators from dust, noise and fly rock, and improving productivity.

A mini-build using 40 of the 199 roof supports will allow for testing and operator training. The Longwall will then be transported underground, piece by piece in January 2010.

The current Longwall will be retired in 2010 after a prosperous career.

Longwall components

- 199 roof supports, each weighing 34 tonnes. Yield load of 1,270 tonnes
- 199 conveyor pans that convey the coal to the stockpile
- Shearer weighing 92 tonnes

Longwall facts

- 400 metres wide (existing Longwall is 260 metres)
- 10,000 tonnes of steel
- Uses recycled mine water

Construction of longwall mini-build

ENVIRONMENT AND COMMUNITY **CONTACTS**

Ralph Northey Environment & Community Coordinator
P: 6570 4354 M: 0418 439 874
rnorthey@xstratacoal.com.au

Ned Stephenson Environment & Community Officer
P: 6570 4366 M: 0400 266 877
nstephenson@xstratacoal.com.au

June 2009

744 BROKE ROAD, SINGLETON NSW 2330

Dear Resident

Beltana is seeking approval to modify our current development consent (DA 376-8-2003) to:

- Install up to 25 MW of gas-fired engine generator units; and
- construct a pilot ventilation air methane (VAM) abatement system

These initiatives will significantly reduce our greenhouse gas impact.

Beltana is currently developing the roadways for the Blakefield South operation ready for Longwall mining scheduled to start in 2010. Coal seam gas is being drained ahead of mining in order to provide a safe and efficient work place. The drained gas, which is approximately 97% methane, is currently being flared to reduce the greenhouse gas impact. Beltana is investigating the short and long term options for utilising the drained methane and other opportunities to reduce our greenhouse gas impact.

A typical gas-fired power generating unit

REDUCING OUR GREENHOUSE GAS IMPACT

The main purpose for the proposed modification is to reduce Beltana's greenhouse gas impact and to better utilise the natural gas resource associated with the mine. The proposed modifications will result in a net greenhouse gas benefit by using captured methane to produce electricity and treating the mine VAM. Both the gas-fired generators and VAM abatement system are proposed to be located over 300 metres east of Broke Road as shown in *Figure 1*.

GENERATING POWER

We are proposing to install a gas-fired power generation facility south of Blakefield South Ventilation Shaft No 2. This site was chosen because it is already cleared, will not be visible from Broke Road and is over 2.6 km from the nearest privately owned residence.

Up to ten gas-fired generator units would be installed, generating up to 25 MW of power. The gas used to power the generators will come from both pre and post mining gas drainage systems. The pipeline supplying the gas is proposed to be located on previously disturbed land and would pass under Broke Road using a sleeved under boring and then along the previous alignment of Broke Road.

The power generation facility would include the pipe work and electrical infrastructure needed for gas drainage connection and power generation. The facility would be an area of approximately 8400 m^2 (120 metres by 70 metres). The proposed site was cleared for haul road construction in the 1980s. The power generated from the facility will be to be used to power some of Beltana's infrastructure, most importantly the ventilation fans. Any surplus power will be fed into the public power grid. Also included within the facility will be four enclosed flares which would burn methane when the gas flow exceeds the generation capacity or during generator maintenance.

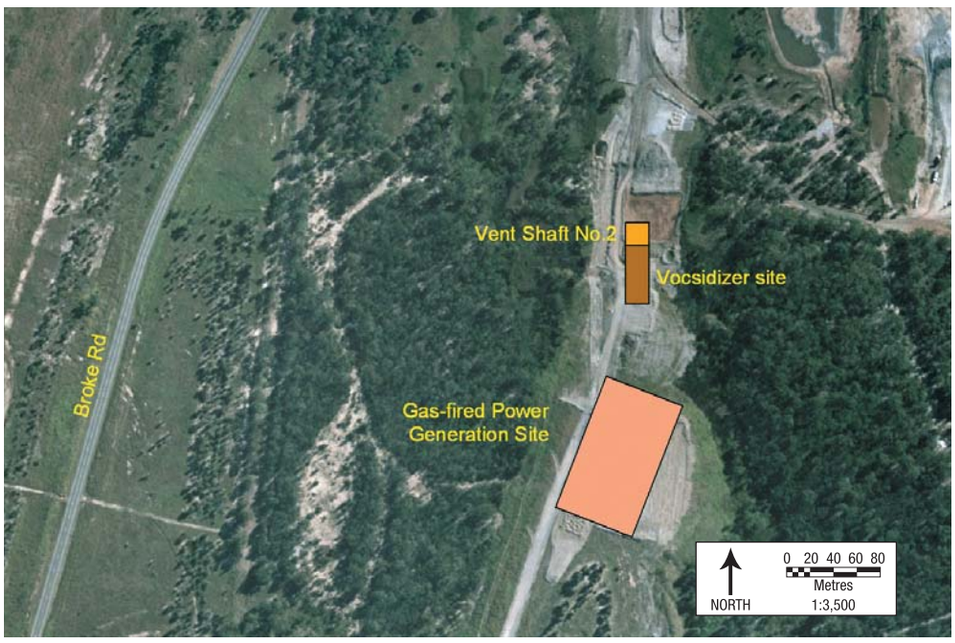


Figure 1: Locations of gas-fired generators and VAM abatement system

Key issues for the installation of the power generation facility include:

- Potential noise impacts from the generator units – although the nearest residence is approximately 2.6 km away, there is potential for noise to be generated from the gas engines.
- Visual impact – the power generation facility is located away from Broke Road and screened by a mixed eucalyptus woodland.
- Construction of the facility – the major components of the facility would be manufactured off site, reducing site construction noise and time. Approximately 10 wide heavy loads and 20 standard semi-trailer loads would be required to transport the infrastructure to the site. It would take around 6 months to construct and commission with on average, approximately 10 people on site per day and a peak site personnel requirement of approximately 30 people.

VENTILATION AIR METHANE (VAM) ABATEMENT SYSTEM

From a statutory perspective, mine ventilation air can contain up to 2% methane. At Beltana and Blakefield South, mine VAM is normally maintained below 1% and is often as low as 0.3%. Although the methane concentration within the ventilation air is low, the total volume of ventilation air is large and therefore the amount of methane discharge is substantial. Currently Vocsidizers are the only commercially available technology that can potentially oxidize methane to carbon dioxide at the low concentrations of VAM. Investigations indicate that as many as 30 Vocsidizer units would be required to oxidize the methane present in the Blakefield South ventilation air. The effectiveness of the Vocsidizers at low concentrations of methane and the high cost of installation mean that it is prudent to trial the system prior to committing to full implementation.

HOW DOES A VOCSIDIZER WORK?

Ventilation air is reticulated from the underground mine surface ventilation exhaust fan to the Vocsidizer via ducting. The ventilation air is then fed through a contained ceramic bed which has been heated using electrical elements. The VAM is heated to the point where the methane oxidizes to produce carbon dioxide, steam and heat without the generation of a flame. When sufficient heat from the process has been generated, electrical heating is no longer required. The heat generated from the process is dissipated via cooling radiators and fans located on the top of the unit. The reduced ventilation air is discharged via an exhaust stack.

The overall unit dimensions are approximately 6 metres wide, 16 metres long and 4 metres high with a 9 metre high exhaust stack. Vocsidizer technology was developed in Sweden and has been used successfully used in coal mines in the UK, USA and Australia.

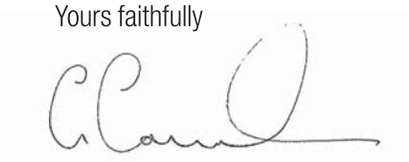
Beltana is seeking a development consent modification to install and operate a single Vocsidizer unit which would be ducted from Blakefield South Ventilation Shaft No 2. The construction of the single Vocsidizer unit requires an area of approximately 20 metres by 50 metres with the final installation only occupying a small potion of this area. Similar to the gas-fired generators the proposed Vocsidizer construction site is located on a haul road constructed in the 1980s. No additional clearing would be required. Installation of 30 Vocsidizer units would require an area of approximately 100 metres by 70 metres as the units can be stacked two high.

Key issues for the installation of the Vocsidizer include:

- Visual impact – the height of the Vocsidiser unit and associated stack and ducting.
- Noise – potential for noise to be generated from the VAM abatement system.
- Air quality – potential for air emissions from the Vocsidizer stack.

For more information about the power generation facility or VAM abatement system, please contact Ralph Northey on 6570 4354 or email *morthey@xstratacoal.com.au*

Yours faithfully



Gary Cambourn
Operations Manager

xstrata coal

BELTANA





12 June 2009

Mr & Mrs Gillies
1297 Broke Road
Broke NSW 2330

Dear Mr & Mrs Gillies

Re: Beltana Highwall Mining – Gas Fired Power Generation and Ventilation Air Methane Abatement

Beltana Highwall Mining Pty Limited (Beltana) is proposing to seek approval from the Department of Planning (DoP) to modify its current development consent (DA 376-8-2003) under Section 75W of the Environmental Planning & Assessment Act 1979 to:

- install up to 25 MW of gas fired engine generator units; and
- construct a pilot ventilation air methane (VAM) abatement system.

The purpose of this letter is to provide relevant background for the project, describe the proposed modifications and to provide opportunity for you to raise any specific issues you would like addressed in the Environmental Assessment.

1. PROJECT BACKGROUND

Beltana is currently developing the gate roads for the Blakefield South operation in preparation for Longwall mining scheduled to commence in the 2nd quarter of 2010. Coal Seam gas is being drained ahead of mining in order to provide a safe and efficient work place. The drained gas which is approximately 97% methane is currently being flared to reduce the greenhouse gas impact. Beltana is investigating the short and long term options for utilisation of the drained methane and other opportunities to reduce our greenhouse gas impact. The gas fired power generation and VAM abatement system described in this letter are the significant greenhouse gas reduction initiatives Beltana is pursuing at present.

2. PROPOSED MODIFICATIONS

The main purpose for the proposed modification is to reduce the operation's greenhouse gas impact and to better utilise the natural gas resource associated with the mine. The proposed modifications will result in a net greenhouse gas benefit by using the captured methane to produce electricity and treating the mine VAM. Both the gas fired generators and VAM abatement system are proposed to be located over 300m east of Broke Road as shown on the attached location plan, Figure 1.

2.1. Power Generation

It is proposed to install a gas power generation facility south of Blakefield South Ventilation Shaft No 2. This site was chosen because it is already cleared, will not be

visible from Broke Road and it is over 2.6km from the nearest privately owned residence. Up to ten gas fired reciprocating gas engine generator units would be installed, generating up to 25 MW of power. The gas used to power the generators will come from both pre and post mining gas drainage systems. The pipeline supplying the gas is proposed to be located on previously disturbed land and would pass under Broke Road using a sleeved under boring and then along the previous alignment of Broke Road.

The power generation facility would include the pipe work and electrical infrastructure associated with the gas drainage connection and power generation. The facility would comprise an area of approximately 8400 m2 (120 metres by 70 metres). The proposed site was cleared for mine haul road construction in the 1980's. The power generated from the facility will be used to power some of Beltana's infrastructure most importantly the ventilation fans. When the power is surplus to Beltana's requirements it will be fed into the public power grid. Also included within the bounds of the power generation facility would be 4 enclosed flares which would be used to burn methane when the gas flow exceeds the generation capacity or during generator maintenance.

Key issues for the development of the power plant will include:

- Potential noise impacts from the power plants – although the nearest residence is approximately 2.6 kilometres away, there is potential for noise to be generated as a result of the operation of the reciprocating gas engines.

- Visual impacts – the power generation facility is located away from Broke Road and screened by a mixed eucalyptus woodland.

- Construction of the facility- the major components of the facility would be manufactured off site thus reducing site construction noise and time. Approximately 10 wide heavy loads and 20 standard semi-trailer loads would be required to transport the infrastructure to site. It would take approximately 6 months to construct and commission with on average approximately 10 people on site per day and a peak site personnel requirement of approximately 30 people.

2.2. VAM Abatement System

From a statutory perspective mine ventilation air can contain up to 2% methane. At Beltana and Blakefield South mine VAM is normally maintained below 1% and is often as low as 0.3%. Although the methane concentration within the ventilation air is low the total volume of ventilation air is large and therefore the amount of methane discharge is substantial. Currently Vocsidizers are the only commercially available system technology that can potentially oxidize methane to carbon dioxide at the low concentrations of VAM. Investigations indicate that as many as 30 Vocsidizer units would be required to oxidize the methane present in the Blakefield South ventilation air. The effectiveness of the Vocsidizers at low concentrations of methane and the high cost of installation mean that it is prudent to trial the system technology prior to committing to full implementation.

Vocsidizer Operation

Ventilation air is reticulated from the underground mine surface ventilation exhaust fan to the Vocsidizer via ducting. The ventilation air is then fed through a contained ceramic bed which has been heated using electrical heating elements. The VAM is heated to the point where the methane oxidizes to produce carbon dioxide, steam and heat without the generation of a flame. When sufficient heat from the process has been generated, electrical heating is then no longer required. The heat generated from the process is dissipated via cooling radiators and fans located on the top of the unit. The reduced ventilation air is discharged via an exhaust stack. The overall unit dimensions are approximately 6m wide, 16m long and 4 m high with a 9m high exhaust stack. Vocsidizer technology was developed in Sweden and has been used successfully used in

coal mines in the UK, USA and Australia. West Cliff Colliery in the Illawarra region currently has a Vocsidizer VAM abatement system.

Beltana is seeking a development consent modification to install and operate a single Vocsidizer unit which would be ducted from Blakefield South Ventilation Shaft No 2. The construction of the single Vocsidizer unit requires an area of approximately 20metres by 50 metres with the final installation only occupying a small portion of this area. Similar to the gas fired generators the proposed Vocsidizer construction site is located on a haul road constructed in the 1980's. No additional clearing would be required. Installation of 30 Vocsidizer units would require an area of approximately 100 metres by 70 metres as the units can be stacked two high.

The nearest neighbour is at a distance of approximately 2.6 kilometres from the proposed Vocsidizer site.

Key issues for the installation of the Vocsidizer include:

- Visual issues – the height of the Vocsidizer unit and associated stack and ducting.
- Noise – potential for noise to be generated from the operation of the VAM abatement system.
- Air quality – potential for air emissions from the Vocsidizer stack.

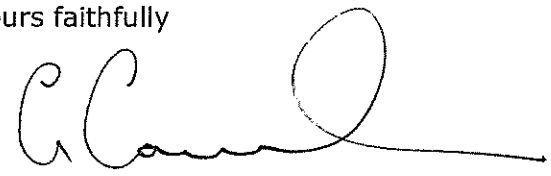
2.3. Community Consultation

A consultation strategy for the project has been developed and will involve consultation with the mines Community Consultative Committee, liaison with adjacent landholders and key stakeholders, and consultation with relevant government agencies.

We would be happy to meet with you if required to further discuss the project. Alternatively we would appreciate if you could advise of any specific issues you may have for the environmental assessment.

Should you require any further information, please contact Ralph Northey on 6570 4354.

Yours faithfully



GARY CAMBOURN
Operations Manager
Beltana Highwall Mining Pty Limited

Figure 1: Vocsidizer Location Plan

BELTANA

Figure 1.

Location Plan

DISCLAIMER
Xstrata Coal NSW makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.

Xstrata Coal NSW cannot guarantee and accepts no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Xstrata Coal NSW has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

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Projection: GDA94
Date Printed: June 2008
Photo: March 2008

Elizabeth
Johnstone
Solicitor

Our Ref: EJ:1126
Your Ref: Gary Cambourn

24 June 2009

Beltana High Mining Pty Limited
PMB 15 Broke Road
Singleton NSW 2330

Fax:6579 1207

Dear Sir

Gas Fired Power Generation and Ventilation Air Methane Abatement

I refer to your letter dated 12 June, 2009 regarding your companies proposals.

I note that the Location Plan attached does no include any landmarks which would enable us to locate our property in relation to the proposed site. Please provide a diagram of the enlarged area indicating Mt Eyre Estate and including our dwelling.

You will appreciate that we are extremely concerned by your immediate proposal for a trial site and of course by the long term implications should any trial prove successful and a much larger operation be built.

We would like to meet with you as soon as possible to discuss the proposal and its likely impacts on our property.

I can be contacted on the number set out below or at home on 6579 1134.

I await your reply.

Yours faithfully

Elizabeth Johnstone

Suite 11,135 Vincent Street Cessnock 2325 P.O. Box 499 Cessnock 2325
Phone: +61 2 4990 7107 Fax: +61 2 4990 7022 elizabeth.johnstone@bigpond.com

HUNTER VALLEY
PROTECTION ALLIANCE

PO BOX 120 BROKE NSW 2330
PH 0400456374

2 July 2009

Community Feedback
Bulga Coal Complex
Reply Paid 84676
SINGLETON DC NSW 2330

In response to your latest Newsletter (June 09) we are writing to ask you a number of questions specifically concerning the proposed construction of a gas-fired power generation site off Broke Road and also to advise you of our interest in gas-related matters within the Broke Valley generally.

As a reference, you may wish to log-on to our website and see the grave concerns we hold in regard to AGL's activities within the Broke/Fordwich defined viticultural area.

We are not taking a position of being anti-gas or anti-energy. We specifically want to protect existing land usages within the Valley and are extremely concerned as to other developments that impact on the area.

We have a clear understanding of your general activities and the fairly good relationship you have with the community. However, we need to bring your attention to the great concerns we have with what you are proposing within your land and the operation of the power plants.

We have been given access to letters that property owners abutting your land have written and we note in those letters that reference is made to the following:

Noise

We endorse their concerns and will be looking to achieve an understanding with you and relevant authorities that residents of the Valley will not be subject to further inroads of their "quiet enjoyment".

External Lighting

There has been a marked increase in "light pollution" over the coal mining area. The red glow on the horizon has certainly increased and is becoming a blight on the land.

Air Quality

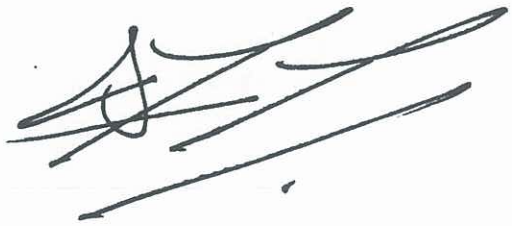
We remain extremely concerned about the nature of air quality and the dust and dirt that is generally being put back into the atmosphere from you your activities.

2...

HUNTER VALLEY
PROTECTION ALLIANCE

We would appreciate your advice in respect to the above issues and perhaps you could meet with us at an appropriate time when you have had time to consider how you can adequately meet our concerns.

Yours faithfully



STEWART EWEN OAM

APPENDIX 4

Greenhouse Gas and Energy Assessment

Beltana Highwall Mining Pty Limited

Blakefield South Power Generation & VAM Abatement

Greenhouse Gas and Energy Impact and Abatement Assessment

December 2009

Umwelt
Environmental Consultants

Blakefield South Power Generation and VAM Abatement

Greenhouse Gas and Energy Impact and Abatement Assessment

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Beltana Highwall Mining Pty Limited

Project Director:	Michelle Kirkman		
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Report No.	2300/R02/Final	Date:	December 2009

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Executive Summary

Umwelt (Australia) Pty Limited was commissioned by Beltana Highwall Mining Pty Limited (Beltana) to conduct a Greenhouse Gas and Energy Impact and Abatement Assessment (GHGEIAA) of the Blakefield South Power Generation and VAM Abatement project (the Project) that will use Beltana vented coal seam methane (CH_4) to produce energy for electricity generation.

Bulga Underground Operation (also known as Beltana Underground Mine) is an underground coal mine complex located approximately 12 kilometres (km) south-west of Singleton in the Upper Hunter Valley of New South Wales. Beltana forms part of the Bulga Complex managed by Bulga Coal Management Pty Limited (Bulga Coal) on behalf of the Bulga Joint Venture (BJV). Beltana comprises Beltana No. 1 Whybrow seam longwall mine and the Blakefield South Blakefield Seam Mine. Each operation is managed by the Bulga Underground business unit and utilises the services of the Bulga Surface operations Coal Handling and Preparation Plan (CHPP) and the rail loading facility.

The GHGEIAA forms a component of the Environmental Assessment (EA) provided for the Section 75W application under the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project will require the approval of the NSW Minister for Planning. The proposed modifications to DA 376-8-2003 involve the capture and treatment of CH_4 through the:

1. Installation and operation of up to 25MW of gas-fired reciprocating engine power generator units and associated infrastructure; and

2. Construction and operation of a reverse flow thermal reactor (RFTR), for the abatement of Blakefield South ventilation air methane (VAM) (refer to **Appendix A**).

The key objective of the Project is to directly abate and reduce fugitive greenhouse gas (GHG) emissions released into the atmosphere from exposed coal during the underground mining process. In generating onsite power through the combustion of coal seam methane, a significant reduction in indirect Scope 2 emissions through the decreased need for the outside purchase of electricity is expected. The capture and utilisation of fugitive CH_4 emissions onsite, is therefore expected to reduce the existing and projected GHG liability from the Blakefield South mine.

This GHGEIAA is representative of the assessment and reporting requirements established for greenhouse gases (GHG), energy consumption and energy production assessment at a national and international level. While the Project is expected to consume energy and combust GHG in both the construction and operation phases, it is also designed specifically to harness the in situ GHG and generate power onsite.

The proposed installation of an onsite power generation system and VAM abatement system, combined with the use of existing flaring facilities, will abate and reduce direct GHG emissions from the Beltana by an estimated 12.48 per cent over the 20.5 year time frame of the Blakefield South operations. The total GHG abated by the Project over the life Blakefield South operations is 4,662,468 tonnes of carbon dioxide equivalent (t CO_2-e). Without the abatement and reduction impact of the Project, GHG emissions from Blakefield South operations would be 37,356,650.14 t CO_2-e.

By converting coal seam methane from underground mining operations to generate electricity, the onsite generators will utilise the CH_4 which would otherwise be flared or vented into the atmosphere and contribute significantly to GHG emissions. This Project

reduces GHG emissions by offsetting electricity purchased from the grid (Scope 2) by Beltana South operations. The Scope 2 emissions produced if the equivalent power generated by the Project was sourced from the grid is an estimated 3,898,200 t CO_2-e.

As the key objective of the Project is to directly abate and reduce fugitive greenhouse gas (GHG) emissions from Blakefield South, no management or mitigation measures for ancillary GHG are proposed or planned.

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APPENDICES

1.0 Introduction

1.1 Description of the Project

Umwelt (Australia) Pty Limited was commissioned by Beltana Highwall Mining Pty Limited (Beltana) to conduct a Greenhouse Gas and Energy Impact and Abatement Assessment (GHGEIAA) of the Blakefield South Power Generation and VAM Abatement project (the Project) that will use Beltana vented coal seam methane (CH_4) to produce energy for electricity generation and treat methane in mine ventilation air to reduce greenhouse gas (GHG) emissions.

Bulga Underground Operation (also known as Beltana Underground Mine) is an underground coal mine complex located approximately 12 kilometres (km) south-west of Singleton in the Upper Hunter Valley of New South Wales. Beltana forms part of the Bulga Complex managed by Bulga Coal Management Pty Limited (Bulga Coal) on behalf of the Bulga Joint Venture (BJV). Beltana comprises Beltana No. 1 Whybrow seam longwall mine and the Blakefield South Blakefield Seam Mine. Each operation is managed by the Bulga Underground business unit and utilises the services of the Bulga Surface operations Coal Handling and Preparation Plan (CHPP) and the rail loading facility.

The GHGEIAA forms a component of the Environmental Assessment (EA) provided for the Section 75W application under the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project will require the approval of the NSW Minister for Planning. The proposed modifications to DA 376-8-2003 involve the capture and treatment of CH_4 through the:

1. installation and operation of up to 25MW of gas-fired reciprocating engine power generator units and associated infrastructure; and

2. construction and operation of a reverse flow thermal reactor (RFTR) technology for the abatement of Blakefield South ventilation air methane (VAM abatement system) (refer to **Appendix A**).

Electricity produced from the power generation units will be used to power some of Beltana's site infrastructure including the ventilation fans. Surplus electricity would be fed back to the national power grid.

The Whybrow seam being worked in the Beltana No. 1 mine is not generally gassy. However, the deeper seams to be mined at Beltana are known to contain substantial methane gas levels. The gas drainage and treatment infrastructure at Beltana will initially be used for the treatment of methane from the Blakefield South mine which will be mining the Blakefield seam, a seam with relatively high gas levels.

The key objective of the Project is to directly abate and reduce fugitive greenhouse gas (GHG) emissions released into the atmosphere from exposed coal during the underground mining process. In generating onsite power through the combustion of coal seam methane, a significant reduction in indirect Scope 2 emissions through the decreased need for the outside purchase of electricity is expected. The capture and utilisation of fugitive CH_4 emissions onsite, is therefore expected to reduce the existing and projected GHG liability from the Blakefield South mine.

The VAM abatement system will utilise a RFTR technology (Vocsidizer, VAMOX, Corky's VAN RAB or similar) to capture and convert the dilute methane concentrations associated with the mine ventilation system to carbon dioxide (CO_2) and water vapour.

The VAM abatement system is developed from the understanding that underground coal mines have high capacity ventilation systems that entrain and dilute the CH_4, and vent it to the atmosphere. Irrespective of any GHG implications, the release of coal seam CH_4 into the confined spaces of underground coal mines presents an extreme safety hazard for coal mine workers.

In recent years CH_4 drainage systems have been installed at some of the most Class A 'gassy' mines that generally have an average in situ CH_4 content of between 3.40 and 6.78 cubic metres/tonne (m^3/t) (DCC, 2006). Ventilation systems extract CH_4 from the coal seam in advance of mining through holes drilled into the coal seams. Gas released during mining is extracted through bore holes drilled from the surface into rock layers adjacent to the coal seam.

When the extracted CH_4 is not highly diluted with air, it may be suitable for use as a fuel for a variety of purposes. In most of the systems currently operating, the CH_4 is used to generate electricity. The CH_4 extracted and used in this way is appropriately adjusted for calorific value, in the natural gas consumption component of national energy statistics (DCC, 2006).

Beltana has existing approval to construct flares for gas drainage management. Seven flares are proposed to be constructed within the power generation compound to flare any gas drained in excess of the generator capacity. The flares do not form part of this project application and information is provided for context only.

1.2 Bulga Coal Underground Operations

1.2.1 Fugitive Emission Resources

Beltana No. 1 currently mines the Whybrow seam using longwall retreat mining techniques; however this operation is scheduled to finish in mid 2010, at which time the Blakefield South operation will commence production. In-seam gas drainage boreholes have been installed which intersect vertical drilled wells. Water is removed from the coal seams to allow the flow of coal seam gas via pumps installed in the vertical wells. From these wells a system of buried pipelines has been installed and commissioned to convey the extracted water back into the mine raw water system, and the gas to a central location where the CH_4 content is currently flared or vented.

The flaring facility was commissioned in mid 2008. An expansion of the flaring facility commenced in late 2008 and was commissioned in May 2009. Current flaring is expected to combust 85 per cent of all gas drained. The current methane flaring and free venting statistics are shown in **Table 1.1**.

Table 1.1 – Existing Operations CH_4 Flaring / Free Venting Analysis

Existing Operations CH_4 Flaring / Free Venting Analysis			
	CH_4 Drainage	**CH_4 Flared**	**CH_4 Free Vented**
Existing Volume (L/sec)	2500	2125	375
Percentage (%)	100	85	15
Estimated Peak Volume (L/sec)	4000	3400	600
Percentage (%)	100	85	15

The existing operations drain CH_4 at a rate of 2500 litres a second (L/sec) of which approximately 2125 L/sec is flared with the remaining 375 L/sec free vented. Peak gas flows are estimated between 2000 – 4000 L/sec with the maximum value of 4000 L/sec (3400 L/sec combusted) being used in calculations for this assessment.

1.2.2 Small Scale Power Generation and VAM Abatement

The power generated from the facility will be used to power some of Beltana's infrastructure, including the ventilation fans. Any surplus power will be fed into the public power grid.

1.2.2.1 Gas-Fired Reciprocating Engine Generator Units

The proposed power plant will utilise up to eight gas fired reciprocating engine generator units to generate up to 25 MW of electricity in total. The gas used to power the generator units will come from both the pre and post mining gas drainage systems currently under construction for the approved Blakefield South mine. The power generated from the facility will be used to power some of Beltana's site infrastructure including the ventilation fans. Any surplus power will be fed into the national power grid. Details of the proposed generator units are specified below in **Table 1.2.**

Table 1.2 – Design Parameters for Small Scale Power Generation

Design Parameters for Small Scale Power Generation	
Parameter	**Value**
Unit Model	Energen G3094
Engine	Duetz TCG2032 V16 Engine
Output per unit	3.93 MW
Proposed installation	Up to 8 units
Total Output	Up to 25 MW
Methane Utilisation	90L/sec per MW of generating capacity
Proposed Project Methane Utilisation (8 units at 25MW)	2,250 L/sec
Availability	96 to 98 per cent

The engine to be utilised in each generator unit is likely to be a Duetz TCG2032 V16 engine or similar. The Duetz gas engines do not use a pre-combustion chamber to achieve a gas-air mixture and ignition. The system mixes the gas and air before the turbocharger resulting in a mixture entering straight into the combustion chamber and removing the need for pre-combustion. The use of a direct gas-air feed into the combustion chamber of the engine using a venturi-type mixture arrangement before the turbo charger results in much lower NOx emissions than a conventional gas engine (Energen, 2008).

Each generator unit will have the capacity to utilise approximately 90 L/sec of methane per MW of generating capacity. With eight operational generator units generating a total of 25 MW of power, approximately 2,250 L/sec of gas will be consumed.

1.2.2.2 Associated Infrastructure

Gas will be collected from underground mining via the existing gas collection infrastructure and delivered to the current flare site on the western side of Broke Road. From here, an underground High Density Polyethylene (HDPE) pipeline, approximately 2.5 kilometres in

length, will be constructed along existing access tracks and other disturbed areas to the proposed power generation plant.

The power generation system will require additional support infrastructure for its operation. The additional infrastructure is described in **Table 1.3.**

Table 1.3 – Power Generation Unit System Additional Infrastructure

Infrastructure	Description
Gas Monitoring and Switch Room	Electrical switch room and cabling to manage the supply from the generator sets to the switchyard, and gas monitoring equipment to monitor the gas supply to the generators.
Control Room	Includes workshop and automatic lubrication and oil change equipment.
Gas Treatment Plants	Two gas treatment plants will be constructed within the power generation compound which will filter the gas to meet the gas engine suppliers specification and dehumidify the gas by heating it.
Flares	Seven fully enclosed flares capable of burning approximately 4000 L/sec of methane (minimum) will be installed within the power generation plant compound. The flares will be used to flare excess gas beyond the capacity of the power generation units. The flares are expected to have an availability of 95% with unavailability due to maintenance, power fluctuations and other unplanned events.
Electrical Supply Lines	Existing power lines will be extended within existing power line easements from Fan Shaft No. 2 to provide power to the system.

The operation of the power generation units and additional infrastructure is expected to consume 200kWh per day.

1.2.2.3 VAM Abatement System

Beltana is proposing to investigate the use of RFTR technology for abatement of VAM. A pilot plant consisting initially of one RFTR and associated pipework and infrastructure will be sited on previously disturbed land adjacent to the approved Blakefield South Fan Shaft No. 2 which is currently under construction. Depending on the results of the pilot program, further RFTRs may be proposed to be added to the system.

RFTRs employ a flameless oxidation process which was developed for the treatment of low concentration volatiles in air. RFTRs have been used to treat methane in ventilation air from coal mines and have been installed successfully in coal mines in UK, USA and Australia. West Cliff Colliery in the Illawarra region currently operates a vocsidizer VAM abatement system.

The ventilation air exhausting from underground workings in coal seams with moderate to high methane content typically contains only 0.3 to 0.8% methane, but high total volumes of air. At Beltana No. 1 and Blakefield South, mine VAM is normally maintained below 1% and is often as low as 0.3%. At present this exhaust stream is emitted to the atmosphere via the ventilation shafts. Beltana is proposing to install a VAM abatement system utilising a RFTR technology which is capable of handling large volumes of ventilation air and oxidising the low concentrations of methane to carbon dioxide (CO_2) and water vapour.

The RFTRs use an in-bed regenerative heat exchange principle such that there is no burner or combustion chamber. The oxidation reactions which destroy the methane in the air stream occurs entirely within the heat exchange media without the need for any flaming.

1.2.3 Principle of Operation

Each RFTR consists of a single heat transfer bed filled with ceramic media. The direction of air flow from the fan is controlled by automated valves (dampers). The dampers will periodically switch position to reverse air flow and allow thermal regeneration of the bed.

The methane-laden ventilation air is directed through the porous ceramic heat exchange media. As the ventilation air moves through the inlet side of the bed, it gets hot enough to undergo thorough oxidation to water vapour (as steam) and CO_2.The energy in the cleaned process air stream, which includes the thermal energy released during methane oxidation, is recovered by the ceramic media on the outlet side of the bed. The purified air is then released to the atmosphere (Megtec Systems, 2004). Typical emissions from the RFTRs include carbon monoxide (CO), oxides of nitrogen (NOx) and steam.

The operational parameters for the proposed system are summarised in **Table 1.4**.

Table 1.4 - System Design Parameters for VAM Abatement

Parameter	Value
Mine Ventilation Air Volume	60,000 Nm^3/hr
Mine Ventilation Air Temperature	10-40^{0}C
Typical Ventilation Air Methane content	0.5% CH_4
Maximum design VAM concentration	0.8% CH_4 @ 62,500 Nm^3/hr
Minimum design VAM concentration	0.3% CH_4
Methane reduction target	97% average reduction
Typical emissions	Less than 50 mg/Nm^3 as CO Less than 10 mg/Nm^3 as NOx

The Vocsidizer unit as an example of a VAM abatement system can accommodate up to 16.7m^3 of ventilation air per second at normal temperature and pressure (Nm^3/sec). It is expected to emit air with a CH_4 level reduced by 97 per cent of the inflow, containing less than 50mg of CO and 10mg of NO_2 per cubic metre. The unit will consume electricity at a rate of 395 kW per hour (Megtec, 2009).

The proposed Blakefield South operations will exhaust up to 580 Nm^3/sec of ventilation air with an average methane concentration of 0.6 per cent from ventilation Shaft 2 (Holmes, 2007). The VAM abatement system unit will be constructed on a cleared site, south of the Blakefield South Fan Shaft No. 2.

2.0 Abatement and Impact Assessment Objectives

2.1 Objectives and Scope

The objective of the GHGEIAA is to calculate the GHG abatement and reduction from the Project over the life of Blakefield South mine. Calculations of total energy produced, energy consumed and GHG produced, abated are analysed in detail. Also calculated are the potential energy consumed and GHG generated from the Blakefield South mine, without the abatement of the Project.

The scope will include an assessment of the following:

- reduction in and abatement of GHG emissions as a result of the Project over the life of the Blakefield South mine (20.5 years);
- emissions and energy produced from the combustion of coal seam methane onsite during power generation, including: CH_4 flaring, CH_4 energy production/flaring;
- emissions produced and energy consumed from the operation of the VAM abatement system at the Fan Shaft 2 site;
- emissions produced and energy consumed from the transport of construction material to the Project site;
- emissions produced from the free-venting of drained coal seam methane and ventilation shaft air CH_4; and
- benefits from the GHG emissions reduced from the Project according to the principles of ecologically sustainable development (ESD).

2.2 Limitations

Energy projections are an estimate or forecast of the amount of energy that is expected to be produced, consumed, or in the case of the Project reduced, over a specified future time period. Equally, GHG emissions projections are an estimate or forecast of the GHG emissions that are expected to emit over a specified future time period. A number of issues arise in the quality and application of this data due to its inherent level of uncertainty (refer to **Section 3.3**). The accuracy of projected data generally declines, as the time period to which the projection applies stretches further into the future, for example, the life of mine for a project.

Operational structures and activities frequently change over time as a result of a vast range of social, environmental and economic factors, which can be difficult to predict. In response to these factors, for example, an operation may install new equipment, increase or decrease its level of production and change staff numbers, which will in turn directly affect the amount of GHG emissions released or energy produced or consumed. Projections have been used in this GHGEIAA as a basis for assessment of the potential impacts and benefits from the Project.

2.3 Framework

A comprehensive framework of energy and GHG reporting is established at a national and international level. While the framework, definitions and methodology for Scope 1 and Scope 2 emissions are generally consistent across the framework, this GHGEIAA refers to various elements of each reporting/assessment specification. Where methodology and specifications are not provided in guidelines and legislation, industry studies and best practice have been sourced. For example, the offsite transport related to the construction of the Project (a Scope 3 domestic emission). This GHGEIAA refers directly to the framework of national and (where applicable) international assessment and reporting specifications and methodology.

The international, national guidelines and industry reports listed in **Table 2.1** are referred to directly in the GHGEIAA.

Table 2.1 – International, National and Industry Reports

Scope	Report/Reference
International	United Nations Framework Convention on Climate Change: 4th Assessment Report for the Intergovernmental Panel on Climate Change (UNFCCC, 2007) (UNFCCC 4AR).
International	The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UN, 1998) (Kyoto Protocol).
International	The Greenhouse Gas Protocol: GHG Protocol for Project Accounting (WRI/WBCSD, 2004) (GHG Protocol).
National	National Greenhouse and Energy Reporting Streamlining Protocol (DCC, 2009a) (NGER Protocol).
National	National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2009, (DCC, 2009b) (the NGER Technical Guidelines).
Industry	United States Environmental Protection Agency, 2008. Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance: Optional Emissions from Commuting, Business Travel, and Product Transport (USA EPA).
Industry	Holmes Air Sciences, 2007. Blakefield South Project, Air Quality Assessment
Industry	Megtec Systems AB, 2008. Technical Commercial Proposal for the Supply, Installation and Commissioning of: VOCSIDIZER™ technology for the Abatement of Ventilation Air Methane at Xstrata Coal - a system for 60 000 Nm3/h for the United Mine in NSW. Letter to Xstrata Coal dated 15 August 2008.

3.0 Assessment Methodology

3.1 Definitions and Sources

3.1.1 Greenhouse Gas Emission Scopes

The standard approach to coverage of sources of GHG emissions is set out in the NGER Determination 2009. The NGER Determination 2009 emission sources are based on the UNFCCC and IPCC emission categories (refer to **Section 3.1.3**).

To delineate direct and indirect emissions sources, improve transparency and provide for flexibility, three 'scopes' (Scope 1, Scope 2 and Scope 3) have been defined for GHG assessment, accounting and reporting purposes in the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (the GHG Protocol) published by the World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) (WRI/WBCSD, 2001).

As the objective of this GHGEIAA is to calculate the abatement and reduction of GHG over from the Project, Scope 1, Scope 2 and Scope 3 emissions are used only to determine the abatement and operation of the Project.

Scope 1 Scope 1 (also referred to as direct) emissions are GHG emissions which occur as a direct result of activities at a facility, for example, emissions from combustion in facility boilers, furnaces, flares or vehicles. Direct emissions are emissions over which entities have a high level of control.

Scope 2 Scope 2 (also referred to as energy indirect) emissions cover GHG emissions from the generation of purchased electricity, steam, heating or cooling consumed by a facility. 'Purchased' under the GHG Protocol definition means brought into the organisational boundary of the entity. Scope 2 emissions are indirect emissions that entities can easily measure and significantly influence through energy efficiency measures.

Scope 3 Scope 3 covers all indirect emissions that are not included in Scope 2. Scope 3 emissions are a consequence of the activities of the facility/entity, but occur at sources or facilities not owned or controlled by the entity. For example, GHG emissions associated with the entity's product or service across all relevant stages (production, delivery, use and disposal) of the life cycle. Scope 3 emissions are generally covered by voluntary programs aimed at assessing or reducing the life cycle emissions of an entity's products or services.

3.1.2 Greenhouse Gas Definitions and Sources

As defined by the *National Greenhouse and Energy Reporting Act (2007),* the UNFCCC and the IPCC, this GHGEIA refers to the six Kyoto Protocol GHGs as indicated in **Table 3.1**.

Also indicated are current Global Warming Potential (GWP) estimations as identified through the recently released Climate Change 2007: the Fourth Assessment Report (AR4) of the United Nations Intergovernmental Panel on Climate Change by Working Group 1 (UNFCCC, 2008).

Table 3.1 – Kyoto Protocol GHG Categories Applied to Bulga Gas GHGEIAA

Kyoto Protocol GHG Category Applied to Bulga Gas GHGEIAA	
Kyoto GHG	**Global Warming Potential (GWP)**
	100 year time interval (UNFCCC, 2008)
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous oxide (N_20)	310
Sulphur hexafluoride (SF_6)	23,900
A hydrofluorocarbon (HFC): of a kind specified in the NGER Regulations	120 – 11,700
A perfluorocarbon (PFC): of a kind specified in the NGER Regulations	6,500 - 9,200

GWP is a measure of how much a given mass of GHG is estimated to contribute to global warming. It is a relative scale which compares a specified GHG to that of the same mass of CO_2 (whose GWP is, by definition 1) over a specific time interval (UNFCCC, 2008).

3.2 Methodology

Detailed calculations of the Project Emissions, using the methodology detailed in **Appendix B**, are provided in **Appendix C**. A summary of the GHG abatement and reduction from the Project are provided in **Section 4**.

No calculation of the placement of any emissions generated in operating the Project at a National and International level are calculated in this current assessment.

3.2.1 Blakefield South Emission Sources

For the purposes of this GHGEIAA, Blakefield South operational activities have been defined as all activities carried out directly by Beltana (refer to **Section 2.1.1**). The various Scope 1, 2, and 3 GHG emissions associated with the Project and included in this GHGEIAA are summarised in **Table 3.2**.

Table 3.2 – Blakefield South Emissions Scope by Activity

Blakefield South Emissions Activity	**Emission Scope**
Onsite Fuel (Fugitive) Combustion (Coal Seam Methane).	Scope 1
Fugitive Emissions from Venting and Flaring (Coal Seam Methane)	Scope 1
Energy consumed from the operation of the VAM abatement System and Power Generation units	Scope 2
Energy Production by Generators	Scope 2
Emissions produced and energy consumed from the offsite transport of construction materials and services	Scope 3

3.2.2 Assumptions and Exclusions

The use of Scope 1, Scope 2 and Scope 3 emissions methodology are used only to determine the abatement and operation of the Project.

For all GHG abatement and reduction calculations, this GHGEIAA relies directly on data provided by Beltana. The impact assessment assumes that the aggregate energy demand, electricity consumption and fuel consumption data, provided by Beltana, is full, complete and accurate. No physical testing or auditing has been conducted by Umwelt to verify the accuracy of the data. The data from the years 2007-2008 is considered the baseline in this GHGEIAA.

The year 2009 is considered the commencement date of the Project. Additionally, this GHGEIAA excludes the following emission sources and activities (refer to **Table 3.3**). The activities and emission sources are currently considered variable, immaterial and incidental (IHAP, 2007). Further assessment is required to quantify the incidental emissions that will also be expected to be captured by the NGERS 2008/2009 reporting period.

Table 3.3 – Blakefield South GHGEIAA Emissions Exclusions

Blakefield South GHGEIAA Emissions Exclusions	
UNFCCC Category	**Description**
UNFCCC Category 1A Emissions from the combustion of fuel for energy *(Scope 1 and Scope 3)*	• Employee business travel; • Employees commuting to and from work; • Extraction, production and transport of other purchased materials and goods; and • Outsourced activities.
UNFCCC Category 2 Emissions from industrial processes *(Scope 1)*	• Sulphur hexafluoride (high voltage switch gear); • Hydrofluorcarbon (commercial and industrial refrigeration; and • Perfluorocarbon (manufacturing).
UNFCCC Category 6 Emissions from waste disposal *(Scope 1)*	• Disposal of waste generated.
National and International Inventory Comparison	• No direct comparison with National and International GHG Inventories is included with this GHGEIAA.

3.2.3 Assessment of Uncertainty

To standardise the calculation of uncertainly estimates, the *GHG Protocol guidance of uncertainty assessment in GHG inventories and calculating statistical parameter uncertainty* (September, 2003) v1.1 (the Protocol) has been used to estimate the uncertainty of emissions. This is provided in NGERS: TG (DCCc, 2008). Uncertainty must be assessed in accordance with the Protocol so that the range for an emissions estimate encompasses the actual amount of the emissions with 95% confidence.

The following uncertainty levels (refer to **Table 3.4**) apply to the Beltana GHGEIAA calculations, when using Method 1:

Table 3.4 – Uncertainty Levels for the Estimation of GHG (Method 1)

NGERS Item	Fuel Combusted/Emission	Uncertainty Level (%)
1	Diesel Oil	2
18	Coal seam methane	4

As indicated in **Table 3.4** there is a reasonably high level of confidence regarding the calculation of GHG emissions from combustion of diesel and coal seam methane which are major contributors to the predicted emissions for the Project.

4.0 Assessment Results

4.1 Blakefield South Greenhouse Gas and Energy Results

4.1.1 GHG Abatement and Reduction Results

The proposed installation of an onsite power generation system and VAM abatement system, combined with the use of existing flaring facilities, will abate and reduce direct GHG emissions from the Beltana by an estimated 12.48 per cent over the 20.5 year time frame of the Blakefield South operations. As indicated in Table E of **Appendix C**, total GHG emissions abatement as a result of the Project is 4,662,468 t CO_2-e.

The net emissions reduction from the VAM abatement system is 827,162.28 t CO_2-e (Table A of **Appendix C**)**.**

Assuming that the generator units are used at full capacity at all times, these units will produce 219,000 MWh per year. This equates to **788,400 gigajoules** (GJ) per year of energy production. The emissions produced if this energy was sourced from the grid equate to 194,910 t CO2-e / year or 3,898,200 t CO2-e for the project duration (Table B of **Appendix C**).

Part B of **Appendix C** calculates the GHG emissions and energy consumption framework of the operations at Blakefield South mine, without the abatement benefits of the Project.

4.1.2 Indirect Emissions Results

4.1.2.1 Offsite Transport (Scope 3)

The estimated GHG emissions for the supply of construction materials, equipment and services outside the parameters of the site are 2.67 t CO_2-e. This is also the total for Scope 3 fugitive fuel combustion emissions and has been estimated over a 26 week construction and 20 year operational period.

As stated, the laden one-way road trip is an estimated distance of 12.4 miles to Singleton and 55.85 miles to Newcastle. No estimate for offsite road transport emissions during the operational period has given as it is expected to be minimal. It is important to note indirect emissions from domestic offsite transport as a result of the Project are considered as negative abatement emissions.

4.1.2.2 Offsite Transport (Scope 3)

The total emissions from electricity consumption for the Project are estimated as 62,890.96 t CO_2-e / kWh with annual mean stationary source emissions (over 20 years) estimated as 3144.55 t CO_2-e/kWh.

It is understood electricity consumption data provided by Beltana may feasibly be considered an overestimate. No electricity consumption data was provided for the construction phase of the project. It is important to note electricity consumption emissions as a result of the project are considered as negative abatement emissions.

5.0 Greenhouse Gas Abatement Assessment

The objective of GHG abatement is to reduce net GHG emissions by supporting activities that are likely to result in substantial emissions reductions or activities to offset greenhouse emissions. As the Project is specifically designed to harness CH_4 to generate onsite electricity, no further management and mitigation measures to reduce GHG emission from the site are proposed.

The proposed installation of an onsite power generation system and VAM abatement system, combined with the use of existing flaring facilities, will abate and reduce direct GHG emissions from the Beltana by an estimated 12.48 per cent over the 20.5 year time frame of the Blakefield South operations. The total GHG abated by the Project over the life Blakefield South operations is 4,662,468 tonnes of carbon dioxide equivalent (t CO_2-e). Without the abatement and reduction impact of the Project, GHG emissions from Blakefield South operations would be 37,356,650.14 t CO_2-e.

By converting coal seam methane from underground mining operations to generate electricity, the onsite generators will utilise the CH_4 which would otherwise be flared or vented into the atmosphere and contribute significantly to GHG emissions. This Project reduces GHG emissions by offsetting electricity purchased from the grid (Scope 2) by Beltana South operations. The Scope 2 emissions produced if the equivalent power generated by the Project was sourced from the grid is an estimated 3,898,200 t CO_2-e.

As the key objective of the Project is to directly abate and reduce fugitive greenhouse gas (GHG) emissions from Blakefield South, no management or mitigation measures for ancillary GHG are proposed or planned.

While the specific details and parameters of Greenhouse Projects are yet to be defined through NGERS and the Carbon Pollution Reduction Scheme (CPRS), it is assumed that upcoming Greenhouse Project objectives will not differ significantly to those defined by the existing Greenhouse Friendly (GF)™ program (DCC, 2009a). The NSW Greenhouse Gas Reduction Scheme (GGAS) and the Greenhouse Gas Abatement Program (GGAP) administered by the Department of Environment Water Heritage and the Arts are additional GHG abatement projects that will potentially be integrated with Greenhouse Projects under NGERS and the CPRS.

It is assumed that Greenhouse Projects will be reported under NGERS and will be eligible, in a limited capacity to reduce a corporation's / facility's carbon liability through the CPRS. As indicated, by converting coal seam methane from underground mining operations to generate electricity, the onsite generators will utilise the CH_4 which would otherwise be vented into the atmosphere and contribute significantly to GHG emissions.

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APPENDIX A

Megtec Systems AB Vocsidizer Specifications

MEGTEC Systems AB
Proposal Ref 1000 6574 Rev 3
Australia

RM080815

MEGTEC Systems AB Technical Commercial Proposal for the
Supply, Installation and Commissioning of:

VOCSIDIZER™ technology for the Abatement of Ventilation Air Methane at Xstrata Coal
- **a system for 60 000 Nm3/h for the United Mine in NSW**

Our Ref 1000 6574 Rev 3

To

Jim Sandford
XSTRATA COAL NSW
Private Mail Bag 8
Singleton NSW 2330
Australia

Date 15 August 2008

Prepared by:

Richard Mattus

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PROPOSAL SECTION **PAGE**

Executive Summary

The following is a proposal from MEGTEC Systems AB in response to an Inquiry from Xstrata Coal in Australia for installation at the United Mine site in NSW as early as possible in 2009.

Global Warming is becoming a rapidly increasing concern for the World community. For this reason, international coordinated actions are being taken in order to decrease emissions of Greenhouse Gases. The most important action taken is the Kyoto Protocol, which has been signed by 163 nations. Based on the Kyoto Protocol, a mechanism of trading of Emission Reduction Certificates whereby emitting industries and nations can choose to invest in reducing emissions or to buy Carbon Credits from projects reducing emissions elsewhere. In this way, emissions are reduced in the most cost efficient way – to the benefit of Global Environmental Development.

The Australian Government is actively promoting reductions of GHG emissions. Local trading schemes of Carbon Credits in the form of NGAC's are established and increasing in importance in several of the Australian states, whereof the one in NSW is the largest one. With the recent decision of Australian Government to sign the Kyoto Protocol, reducing GHG emissions with be an increasingly important issue.

The largest influence in total comes from emissions of the gas CO_2. For this reason, all other gases are compared in relation to CO_2 as CO_2 -equivalents, or CO_{2e}. The second largest Greenhouse Gas by influence is methane (CH_4), which is deemed to be over 20 times more potent as a Greenhouse Gas than CO_2. Methane also has a shorter life time in atmosphere with 12 years instead of tens of thousands of years for CO_2 . This means that major reductions of methane emissions will have a quick and large impact.

This Proposal is for supply, installation and commissioning of 1 single VOCSIDIZER and 1 fan for the abatement of Coal Mine Ventilation Air Methane at the United coal mine located near Singleton in Hunter Valley, NSW.

It is the intention of Xstrata Coal that after the evaluation of this first VAM Project, to follow up with additional VAM projects. The follow up projects can be for Abatement Only, as the first project, or they can also include Heat Recovery in the form of hot water or steam.

MEGTEC's flameless VOCSIDIZER technology is well proven in over 800 industrial installations. For the abatement of Coal Mine VAM (Ventilation Air Methane), it was first successfully demonstrated during several months in 1994 at the Thoresby Mine in the UK – well in advance of the Kyoto Protocol (established in 1997). MEGTEC then demonstrated the ability to efficiently recover the energy of VAM by operating a small scale (6000 Nm^3/h) installation at the Appin Colliery of BHP in Australia, generating steam during 12 months in 2001 – 2002.

The first two large scale installations of MEGTEC's VOCSIDIZER technology have been commissioned in 2007. An installation of 50 000 Nm^3/h for Abatement Only has been commissioned at the Windsor mine, belonging to CONSOL Energy in the USA. The World's first large VAM Power Plant, handling 250 000 Nm^3/h of ventilation air to produce steam operating a 6 MWe conventional steam turbine generating electricity at the West Cliff Colliery of BHP Billiton in Australia was officially opened by the honourable Morris Iemma, Premier of NSW, on 14 September 2007 after having been successfully in full operation for several months. By end of May 2008, the VAM Power Plant WestVAMP had generated around 270 000 tons of CO2e, traded as NGAC's on the NSW trading scheme.

Delivery of the VOCSIDIZERs will be made Ex Works Europe. Transport from Ex Works can be handled by customer or by MEGTEC. MEGTEC will on a pro rata basis provide supervision of installation (contracted locally by customer). MEGTEC will also provide start up, commissioning and training.

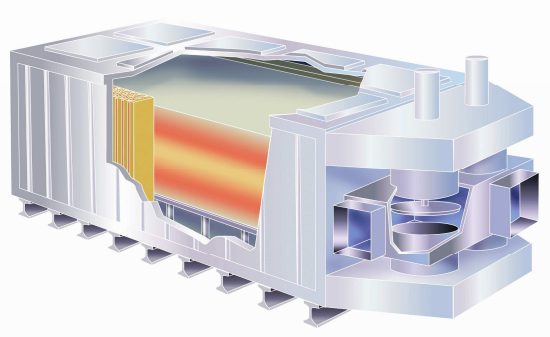
Typical delivery time is 6 – 9 months. However, provided firm order latest by the end of August, delivery Ex Works Europe is expected to be done in December 2008.

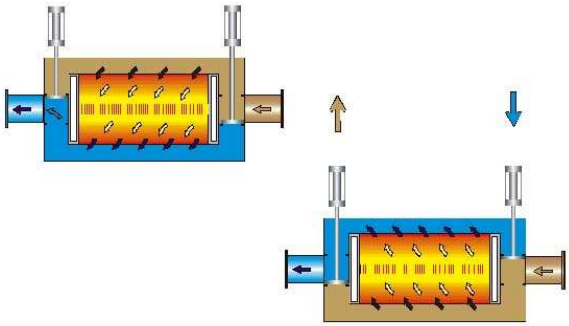
Design Data

The oxidation system has been designed on the following parameters:

Parameter	3015/2MG-M1-200FD-HT
Mine Ventilation Air Volume	60,000 Nm³/hr
Mine Ventilation Air Temperature	10 – 40℃
Typical Ventilation Air Methane (VAM) Concentration	0.5% CH_4
Maximum Design VAM concentration	0.8 % CH_4 @ 62,500 Nm³/hr
Minimum Design VAM concentration	0.3 % CH_4
Methane reduction Target	97% average reduction
Warranted Emissions – See warranty section	Less than 50 mg/Nm³ as CO Less than 10 mg/Nm³ as NOx
Particulates in Mine Ventilation Air to VOCSIDIZER Total Particulates combustible Total Particulates incombustible (including silicones, metals etc.). Total Sulphur (S) Droplets and condensate	 Less than 10 mg/Nm³ Less than 1 mg/Nm³ Less than 10 mg/Nm³ Less than 10 mg/Nm³

VOCSIDIZER Description of Operation





VOCSIDIZER™ Construction

The VOCSIDIZER consists of a ceramic bed material contained in an airtight steel container resting on a sturdy steel frame. The steel is of quality SS 141312-00 (BS 4360:40B). Above and below the bed, air plenum chambers are placed to facilitate an even distribution of the inlet air. The bed is built up of ceramic material ensuring optimum flow / temperature distribution over the bed. Electrical heating elements are placed in the bed by means of which the required start up temperature is obtained. The heaters can never used while the VOCSIDIZER air fan is in operation. The installed power requirement is then equals the bigger of the two numbers.

The process fan is placed at the inlet side of the VOCSIDIZER and forces the collected Ventilation Air Methane (VAM) from the mine via dampers into the VOCSIDIZER, through the preheated bed where the air is heated to a temperature where the methane is completely oxidised. Before the air if leaving the bed the major part is recovered back to the bed.

To maintain the high oxidation temperature zone centred in the ceramic bed, the airflow is cyclic reversed through the bed by means of a pair of dampers.

In cases when the energy content of the Ventilation Air Methane (VAM) is insufficient to maintain the temperature in the bed, drained methane or air with higher concentration of methane then the VAM, can be added to the VAM. This injection of enrichment methane will be made in the inlet duct to the VOCSIDIZER. The VOCSIDIZER is internally insulated by high temperature ceramic insulation and other means to minimise energy looses to the surrounding.

For monitoring and control of the temperature as well as a safeguard against overheating, thermocouples are installed in the bed. The thermocouples are contained in protecting thermo wells enabling easy change.

Guarantees and Performance

Guarantees and Performance for VOCSIDIZER

Emission Guarantee

MEGTEC Systems guarantees that the VOCSIDIZER will comply with the following emission concentration and efficiency limits expressed as 30 minute averages, based on the design data detailed herein and assumes no nitrogen-containing solvent in the waste gas stream.

VOCSIDIZER

Methane	< 3% of inlet content
Carbon Monoxide	< 50 mg/Nm³
Nitrogen oxides (expressed as nitrogen dioxide)	< 10 mg/Nm³

Performance Warranty

MEGTEC Systems warrants that the VOCSIDIZERs during the warranty period defined hereafter will maintain a methane destruction efficiency as specified above.

In respect of the arrangements in case the unit does not perform as predicted, MEGTEC Systems would seek your co-operation to allow access to the unit and time to review the operational settings and carry out changes to enable the unit to perform satisfactorily.

The VOCSIDIZERs must be operating in accordance with the design characteristics (including flow, temperature, Methane concentration, moisture and particulate content) and also in accordance with the operating manual provided with the equipment by MEGTEC Systems.

Non-conformance with this warranty shall be demonstrated to the satisfaction of MEGTEC Systems by and at the expense of BUYER.

PRODUCT WARRANTY

MEGTEC Systems will provide the following warranty service for the stated periods from start-up. This warranty includes parts, labour and all expenses and is subject to entry into a MEGTEC annual service contract.

- A twelve month warranty will cover the following items: the VOCSIDIZER shell, insulation, cold face supports, heat exchanger media, collection and exhaust plenums, exhaust stack and dampers.
- A twelve month warranty will cover the following items: The AC drive, PLC, motors, expansion joints, pneumatic unit and actuators.
- Warranty service means remedying any defects in workmanship and material found in the equipment.
- Expendable parts will not be included under warranty, i.e. thermocouples, pressure switches.

VOCSIDIZER Scope of Delivery

The technical specification summary has more detailed descriptions of some items.

The proposed supply if for one MEGTEC VOCSIDIZER consisting of:

3015/2NG-M1-200FD-HT

- 1 (one) Main VOCSIDIZER body, media and poppet valves.
- Forced draught, direct driven exhaust fan with motor.
- Variable Fan Drive (VFD) Reliance electrical, IP54 protection (built into cabinet). Volume flow control by a pressure transducer flow controller.
- IP54 main Control Panel, with Allen Bradley PLC and operator's panel, for internal installation.
- One combined containerised control room.
- Field wiring between oxidiser and control cabinet (assumes 10 m to VOCSIDIZER)
- Pneumatically operated inlet and outlet poppet valves.
- Main shut off valve and fresh air valve for idle air inlet and start-up.
- Pneumatic pipe work within system battery limits.
- Interconnecting ductwork from and including fresh air inlet up to inlet fan, from fan to VOCSIDIZER and from VOCSIDIZER to exhaust duct.
- Exhaust pipe to six (6) meter above VOCSIDIZER.
- Mechanical connection of delivered items.
- Data recorder, memory and telephone modem.
- Heat resistant paint finish.
- Start up, check out of VOCSIDIZER and operator training.

Exclusions unless elsewhere specifically included, or taken as a cost option;

Installation Includes	Includes	Excludes
Transportation to site		✓
Cranage for Offloading and positioning of equipment		✓
VAM ductwork from evasée to fresh air inlet near VOCSIDIZER		✓
Preparation and design of foundations.		✓
Contractor for installation works (under MEGTEC supervision)		✓
Inlet LEL control.		✓
HAZOP analysis beyond the MEGTEC scope of supply.		✓
HAZOP attendance for items beyond the MEGTEC scope of supply.	Optional	
Suitable fused and isolated power supply to MEGTEC Systems control panel.		✓
Uninterruptible power supply.		✓
Telephone line for modem interlink.		✓
Suitable compressed air supply	✓	
Suitable enrichment methane supply up to connection point to gas trains		✓
Any import duties, VAT or other taxes payable.		✓

Please note that all of the above items can be priced and included by MEGTEC Systems, to provide a turnkey installation cost for this project.

Technical Specification

♦ ENCLOSURE:

- The main housing consists of a carbon steel enclosure and is painted for outdoor installation
- Standard is Silver Grey Heat Resistant paint
- Aluminium or galvanised steel sheet cladding over heat and sound insulated parts
- Above and below the bed are air plenum chambers to facilitate an even air distribution
- Electrical coil-type heating elements are placed in the bed to obtain the required start up temperature
- Insulated with Microporous insulating blocks or ceramic fibre
- Maximum operating temperature of 1200°C

♦ HEAT EXCHANGE MEDIA

- The VOCSIDIZER bed is built up of ceramic minilith material ensuring optimum flow/temperature distribution over the bed
- Media is chemically inert and thermally stable to >1250°C
- Sufficient quantity of ceramic media will be provided to obtain 95% nominal thermal efficiency

♦ SYSTEM FAN(S) – ONE PER PAIR OF VOCSIDIZERS

- The fan proposed is a forced-draught fan with vibration dampers
- High Efficiency Motor
- The fan will be supplied with an AC Drive (VFD)

♦ VOCSIDIZER FAN TO POPPET INLET DUCT

- Inter-connection duct, fabricated from carbon steel and welded air tight

♦ POPPET VALVES

- Pneumatically Actuated
- The pneumatic feed system, comprising air filter, pressure gauge, pressure controller etc. is installed in a separate cabinet.
- Air receiver, to even the air feed demand, is installed by the poppet valves on the VOCSIDIZER unit.
- The valves are provided with inspection access door with bolts and gasket

♦ DAMPERS

- **Purge Damper** enables the VOCSIDIZER exhaust fan to run without drawing air from the mine during standby and oxidiser purge periods. Damper is constructed of carbon steel. Damper is pneumatically actuated. Dampers shall be mounted in the ductwork prior to the oxidiser system fan.

- **Isolation Damper** Used as the main inlet shut-off controls it allows isolation of the VOCSIDIZER from the rest of the Mine ventilation system. Allows for ease of maintenance without having to shut down the entire system. Damper is constructed of carbon steel. Damper is pneumatically actuated. Dampers shall be mounted in the ductwork prior to the VOCSIDIZER system fan.

♦ CONTROL CABINET/FACEPLATE

The HMI consist of a 10.4" backlit TFT screen with logger capabilities and graphic process view as standard.

- Mounted in the control cabinet door.
- Video display operator interface.
- Designed for indoor locations.

♦ ELECTRICAL CABINET

- For location indoors in a non-explosive environment
- Power cabinet contains main disconnect, motor starters and three phase to single phase transformers and protection
- Control cabinet contains programmable controller relays and other control components pre-wired to common terminal strip
- The control panel is of standard execution with doors.
- The cabinet is furthermore equipped with air filter and cooling fan
- The electrical cabinet and the inverter drive are both designed to type IP54
- Require an indoor environment with surrounding temperatures of +5 to + 40^{0}C

♦ PROGRAMMABLE LOGIC CONTROLLER (PLC)

- An Allen-Bradley SLC 5 PLC is installed in the control panel.
- The built-in control programme undertakes the necessary logic and sequence controls as well as monitoring the various plant/process parameters. The following safety and alarm functions are incorporated in the standard supply:

  * High and Low bed temperature
  * High exhaust temperature (after the bed)
  * Low compressed air pressure
  * High and Low pressure on inlet air
  * Low airflow - inlet air
  * Double Block and Bleed valve for Enrichment methane.
  * High Enrichment methane pressure

In case of alarm, the feed of the enrichment methane injection are stopped, as well as the main fan. The compressed air to the pneumatic actuators on the main isolation damper is shut.
All alarms are connected to an alarm panel and/or separate indicating lamps.

♦ THERMOCOUPLES & SENSORS

- Thermocouples are of type K installed in inconel and ceramic thermocouple pockets. The TC is connected to the PLC with remote I/O.
- Other sensors are mainly pressure gauges connected to the PLC and/ or hardwired functions.

♦ ELECTRICAL AND AUTOMATIC CONTROL SYSTEM

- Heating elements for start-up heating are controlled by a temperature-controller
- Thermocouple sensors placed in the bed with corresponding control and overheating protection
- Pressure switches and pressure controllers in the methane enrichment system are connected to the air ducts and the enrichment methane pipe work to ensure the safety.
- The electrical and automatic control system will be designed and supplied according to the prevailing CE regulation at the time of supply.
- All electrical motors and other equipment are supplied ready connected to the terminal box and motor breakers respectively in the control panel.
- Connection from mains is made to the terminal box for the main switch in the control panel.

♦ SUPPLEMENTARY FUEL FEED SYSTEM - SPECIAL GAS TRAINS FOR DRAINAGE GAS INJECTION

- A system for injecting enrichment methane in the ducting ahead of the VOCSIDIZER fan is included in the proposed scope of supply.

♦ TESTS AND MEASUREMENTS

- The VOCSIDIZER is tested in respect of all mechanical and electrical components and their functions at the workshop before dispatch
- The final testing takes place after completed erection on site in connection with the start up of the unit
- The unit will be tested at low flow and full flow conditions and tested for suitable temperature set points
- Measurements will be taken by MEGTEC Systems at the test run to check that the methane abatement efficiency is in accordance with the warranty
- For design, evaluation and guarantees the following guide lines for measurements are pre-supposed:

* Temperatures:	± 2^{o}C, Measured with thermocouples or glass thermometer.
* Air flows:	± 5%, Measured by traversing pitot tube.
* Methane concentration:	Measured with instruments for which the accuracy is assumed to be ±15% of absolute values (±3% relative in/out).
* Electricity:	Voltage (V) ± 5% Current (I) ± 5%
* Electrical power	calculated as P = $(3)^{½}$ x V x I x cos ϕ
* Pressure:	± 2 mm WC
* Flow meters	± 10% (for example VAM flow meter or compressed air meter).

Technical Specification Summary

Parameter		
VOCSIDIZER type		3015/2MG-M1-200FD-HT
Media	Minilith type	$M1_{ht}$
Max Mine ventilation flow	Total Twin Bed Module	60 000 Nm^3/h
Dimensions	L x W x H per VOCSIDIZER bed	11.0 x 4.5 x 3.2 m
Weight	Full & transport	65 000 kg
Poppet Dampers	Number	2 x diam1400mm
Compressed air consumption at 7 bar	Normal Start-up	465 nl/min 1355 nl/min
Flow control	Frequency inverter	Pressure transducer
Fan volume turn-down ratio		1:3
Fan type/ power	Forced draught	200 kW
Heating elements		195 kW
Supply Voltage		3 x 400 V AC, 50 Hz, 425 A 1 x 230 V AC, 50 Hz, 10 A
PLC system	Allen Bradley Operator panel	SLC500 Cimrex 91
Fuel methane enrichment system	Fuel type Connection pressure Capacity (as 100% methane)	Drain Methane 100 mbar 300 Nm^3/hr
Painting type [1] **(unit colour can altered)**		Heat resistant colour
Noise Level [2]	Standard Supply	80 dBA on 1m

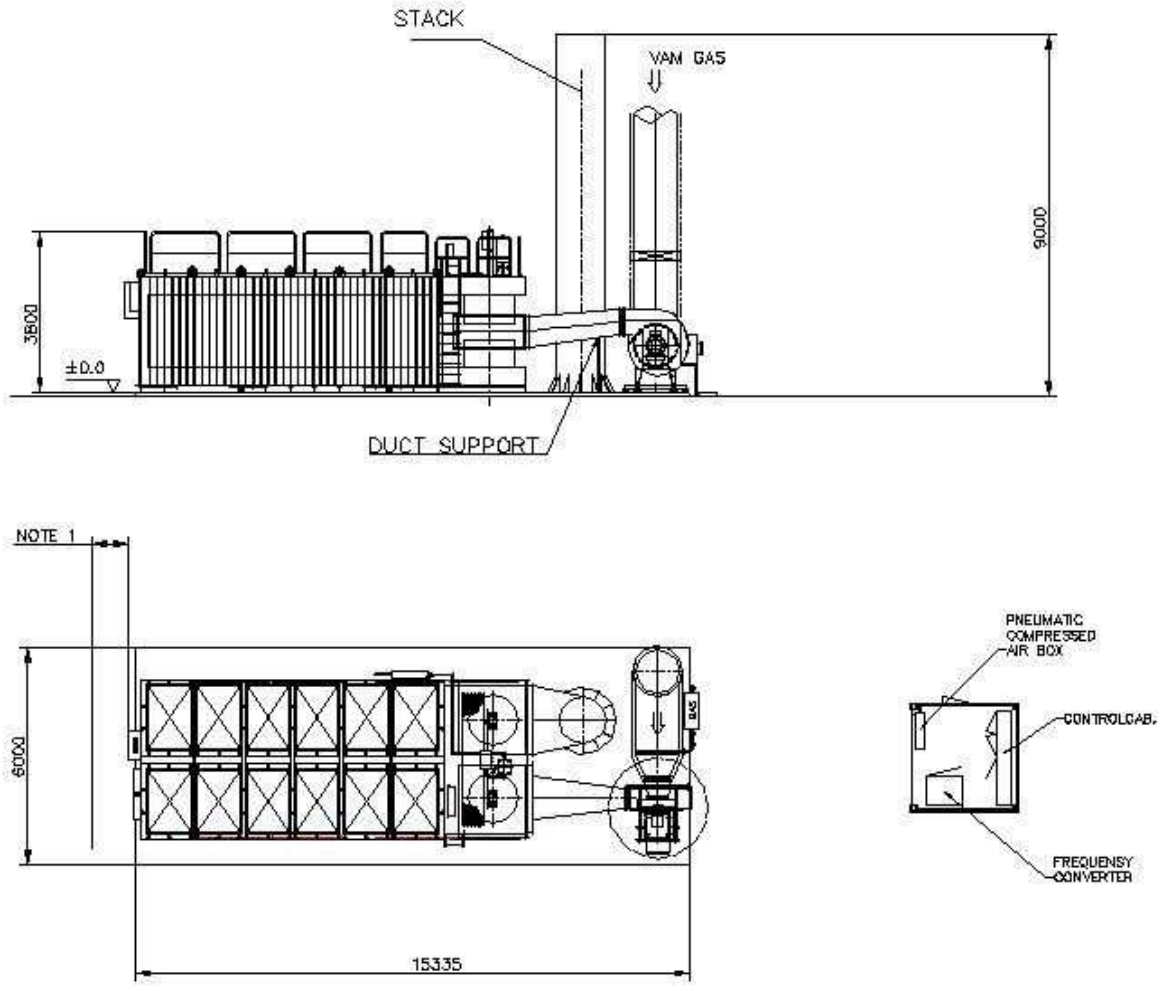
All the above are subjetc to final confrimation.

1) The painting program varies depending on operating temperature on the unit. Low temperature areas, exposed to ambient temperatures will have a 2-pack epoxy coating. High temp surfaces and insulated surfaces are painted with a high temperature resistant paint.

2) The noise level will be measured at one (1) metre from an imaginary enveloping surface around the plant. The enveloping surface shall be based on the plant's simplified physical outer contours. In its simplest form it will be a cube. A minimum of six (6) individual measurements shall be selected on either side/ face of the enveloping cube, in an evenly distributed pattern. The arithmetic mean of these individual measured noise levels shall represent the evaluated noise level for this particular side/face.

Preliminary Layout Drawing of single VAM VOCSIDIZER

The following is a principle layout of a single VOCSIDIZER, containerized control room, one fan, exhaust ducts and interconnecting duct work.



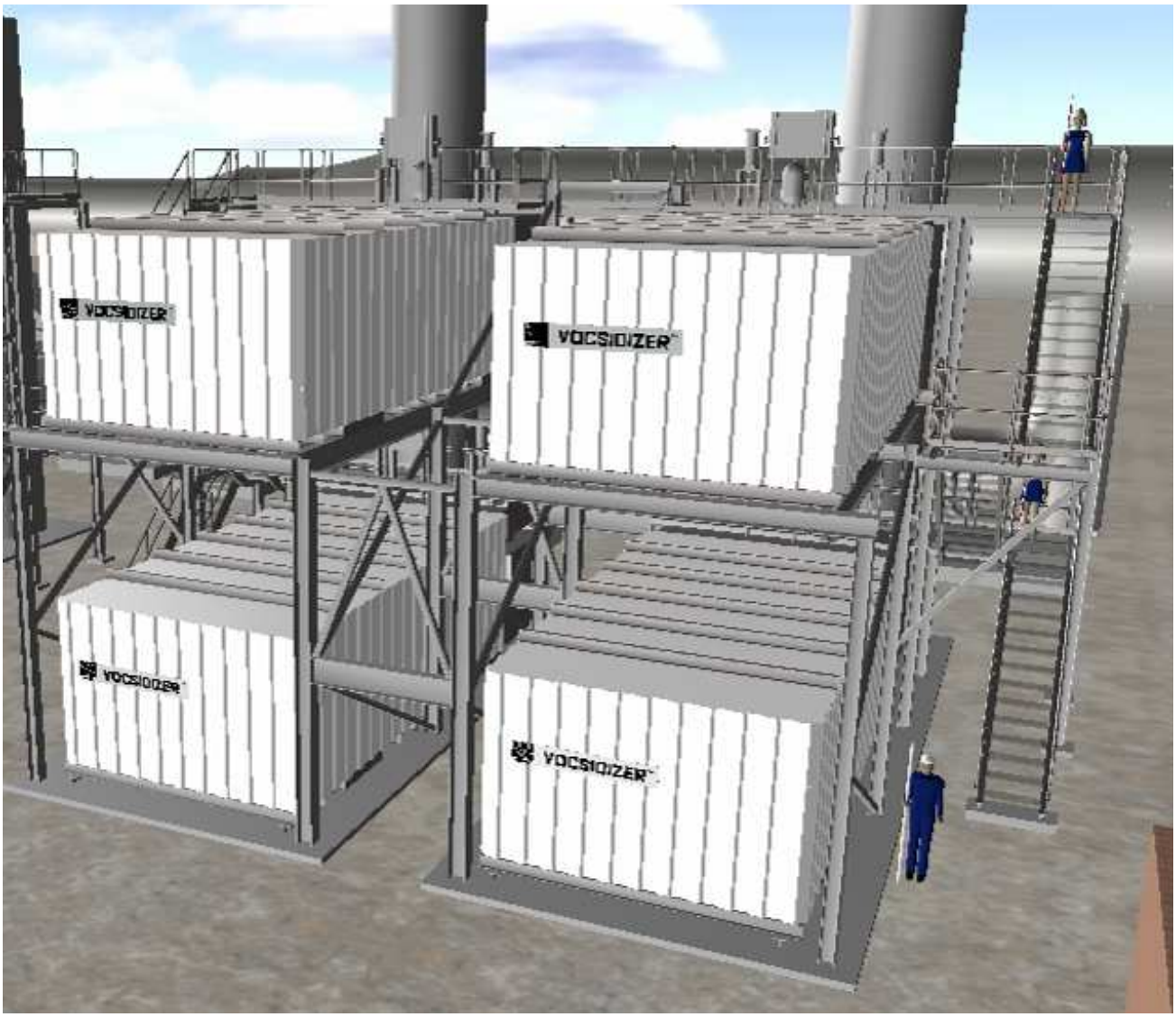
NOTES:

1. MIN.DISTANCE FOR ELECTRICAL SAFETY. 1000 mm
2. TOPSURFACE OF ALL FOUNDATIONS ±0.0 TO BE MIN. 100 mm ABOVE GROUND LEVEL.

Preliminary Arrangement of a VOCSIDIZER Building Block for 250 000 Nm2/h

The following is an illustration of the arrangement of a VOCSIDIZER Building Block consisting of 4 (four) VOCSIDIZERs and 2 (two) fans for the handling of 240 000 to 250 000 Nm3/h of Ventilation Air. Larger installations for VAM treatment are intended to consist of multiples of such Building Blocks.

For this first Xstrata Coal VAM installation, the intention is to install and evaluate 1 single VOCSIDIZER as a preparation for a full size installation taking the full ventilation air flow from Blakefield South, an installation based on multiples of the type of Building Blocks illustrated below.



Start-up, Commissioning and training

The following assumes one single trip, additional trips, or delays between the items below will result in additional costs being charged at the daily rates listed in the Bid Form.

Start-up

The loop tests and initial heat-up of the system is estimated to take 4 days and an additional 2 days for checks on control and safety functions system verification and for operation.

Commissioning

MEGTEC Systems will carry out commissioning on the delivered system and connecting flow management systems. The commissioning is assumed to be scheduled by the client and MEGTEC will therefore have a commissioning engineer available for a period of 1 (one) week.

Training

MEGTEC Systems will carry out training of the client personnel. The training consist of a one (1) day theoretical training, explaining the principles of thermal oxidation, flameless combustion and flow management controls.

Practical training will provided for three groups during a two (2) days period. Training can also be provided during start-up and commissioning period.

kW Energy Consumption Charts

Operation

Flow Nm³/hr	%methane		0.3	0.4	0.5	0.6
25 000	Fan (kW)		22	23	24	25
35 500	Fan (kW)		48	51	53	55
50 000	Fan (kW)		90	95	99	103
62 500	Fan (kW)		149	158	116	174

Per Start up from cold units of 48 hours

- no flow	El. Heater kW	195	x	18h	=	3510 kWh
- no flow	El. Heater kW	100	x	30h	=	3000 kWh

Assumptions

Energy consumption in operation includes:

- 20 to 30^{O}C average process temperature.
- 500 Pa control negative pressure margin for pressure flow control.
- 300 Pa Pressure losses on inlet and stack side.

Prices	
Item	*VOCSIDIZER for 60 000 Nm3/h EUR total*
1. VOCSIDIZER 3015/2MG-M1-200FD-HT Ex Works Europe *- Fixed*	*730,000*
2.Special gas train for drainage gas injection *- Fixed*	*72,000*
3.VOCSIDIZER Packaging & Transport (to site*)* *- estimate*	*~80,000*
4.Supervision during installation *- estimate*	*~20,000*
5.Start up and Commissioning, including training *- estimate*	*~25,000*
6.HAZOP attendance – 5 days on site, travel, expenses and 2 days office based work *- Fixed*	*10,000*
Estimated Total Price	***~937,000***

This price is based on information and assumptions that been available to MEGTEC Systems at present date and that are given account for in this proposal. A change in condition may change the definitive price.

Cost Basis The above costs are based on an exchange rate of 9.4 Euro/SEK.

Delivery Provided that order is placed latest by end August 2008, delivery Ex Works Europe is expected by December 2008.

Terms of delivery: Ex Works Europe

Terms of payment:

Milestone 1 - 20% of items #1+2 within 30 days after mutual execution of this Agreement.

Milestone 2 - 10% of items # 1+2 within 30 days after client approval of the Design Deliverables.

Milestone 3 - 30% of items # 1+2 within 30 days after MEGTEC has successfully fabricated 50% of the Equipment.

Milestone 4 - 30% of items # 1+2 plus 50% of item #3 within 30 days after delivery of the Equipment Ex Works Europe.

Milestone 5 - 10% of items # 1+2 plus 50% of item #3 within 30 days after the Equipment has been installed at Client, and completion of commissioning as defined by the parties and the Equipment has been finally accepted by Client, but in no event later than 120 days after delivery to Client.

Items # 4, 5 and 6 invoiced after occurance.

Terms and Conditions Orgalime SE 01.

Validity This proposal is valid for final agreement latest by September 2008. Due to the instability of the global steel market, the proposal can, if required, be reconfirmed/updated one month at the time.

Source of Supply: The equipment will be supplied and guaranteed by MEGTEC Systems AB.

Orders made to

MEGTEC Systems AB
Theres Svenssons gata 10
417 55 GÖTEBORG
Sweden
Tel: +46-31 65 78 00
Fax: +46-31 22 83 19

APPENDIX B

Blakefield South GHGEIAA Calculation Methodology

APPENDIX B

BLAKEFIELD SOUTH GHGEIAA CALCULATION METHODOLOGY

Direct (Scope 1) Emissions

Direct Fugitive Emissions

Direct Scope 1 Fugitive Emissions are those that are produced from activities within the parameters of Blakefield South and as a result of the current and projected operational activities. These emissions specifically arise from activities involving the release or combustion of solid, liquid or gaseous fuels.

Fugitive Emissions from Fuel Combustion

Emission Source 1

UNFCCC Category 1.B

Emission Source Reference: *The National Greenhouse and Energy Reporting (Measurement) Technical Guidelines v1.1, Department of Climate Change.*

Fugitive emissions are those that are emitted during the process of coal production, storage and transport. Blakefield South CH_4 will be used to generate electricity, with excess amounts of the fuel flared to reduce site GHG emissions. Emissions produced comprise mainly of CO_2 with CH4, N_2O, NOx, CO, SO_2 and non-methane volatile organic compounds (NMVOCs) all emitted in small quantities. An estimated 85 per cent of all gas drained will be combusted (2125 L/sec during existing operations and 3400 L/sec during future peak gas flows).

The CO_2 emissions from the combustion of gaseous fuels are calculated by *Tier 1* methods by multiplying the fuel consumption by a country-specific or default CO_2 emissions factor (in g/MJ) and an oxidation factor. This assigns the total carbon content of the fuel to CO_2 emissions and solid products, even though under normal conditions a portion of the carbon in fuel is released as CH_4, CO and NMVOCs. All emissions factors relating to energy consumption are given in terms of gross calorific value (GCV) (DCCc, 2009).

Emissions Formula 1

Division 2.20 of the NGER Technical Guidelines defines Method 1 – Emissions from Carbon Dioxide, Methane and Nitrous Oxide (DCC, 2009c). The following formula estimates GHG emissions from the combustion of gaseous fuel. The formula refers to Table 2.3.2 in the NGER Technical Guidelines for the calculation of Energy Content Factor (GJ/kL) and the Emission Factor (EF) (kg CO_2-e/GJ) with relevant oxidation factors incorporated. The emissions are generally expressed in tonnes of CO_2 per GJ and the GWP of the relatively small quantities of CH_4 and N_2O emitted.

$$\mathbf{E_{ij} = Q_i \times EC_i \times EF_{oxij}/1000} \qquad \textbf{(Formula 1)}$$

where:

E_{ij} is the emissions of GHG from CH_4 combustion (t $CO_{2\text{-}e}$/annum);

Q_i is the quantity of CH_4 combusted onsite through the generation of electricity and emission flaring over a period of time measured in cubic metres (m^3);

EC_i is the energy content factor of fuel type (i) measured as energy content GJ/ m^3*;* and

EF_{oxij} is the emission factor for each gas type released from the operation Blakefield South during the year (which includes the effect of an oxidation factor) measured in kg/CO_{2-e}/GJ of fuel type (j).

Fugitive Emissions from Venting

Emissions Source 2

UNFCCC Category 1.B

Emission Source Reference: *Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2006, Energy (Fuel Fugitive Emissions), National Greenhouse Gas Inventory Committee.*

Direct emissions sources comprise the free venting of shaft ventilation flow, CH_4 drained (and not combusted due to inadequate flare capacity) and CH_4 drained during periods of power generation and flaring downtime. Venting is the process of releasing gas into the atmosphere without combustion. This process disposes of non-commercial gas, to relieve system pressure when required or to maintain atmospheres in underground mines that are safe for employees (DCC, 2006). Data has been provided by Beltana while additional data on shaft flow rates and characterisation has been sourced from the Blakefield South Project, Air Quality Assessment (Holmes, 2007).

Emissions Formula 2

The existing rate of gas drainage from the Blakefield South area is approximately 2,500 L/sec. Peak gas flows are estimated between 2000 - 4000 L/sec.

Existing site combustion is expected to be 85 per cent of gas drainage. This equates to 2125 L/sec during current operations and 3400L/sec during future peak gas once the Project is operational.

All gas volumes provided by Beltana have been recorded at normalized values of zero degrees Celsius (273 K) and one atmosphere. Onsite direct emissions are estimated using the ideal gas law to calculate the number of moles of CH_4 vented from the gas volume recorded. The number of moles multiplied by the CH_4 molecular weight (16g) equates to the emission estimate for CH_4 in tonnes. Finally the emission estimate is converted (multiplied by 21) into the amount of carbon dioxide equivalent (CO_{2-e}) tonnes. The GHG emissions from CH_4 venting were estimated using the following equation.

Ideal Gas Law

$$n = PV/RT \qquad \textbf{(Formula 2)}$$

$$CH_{4\ vented} = n \times MW_{CH4} \times GWP_{CH4} / 10^6$$

where:

$CH_{4\ vented}$ is the amount of CH_4 vented measure in tonnes of CO_{2-e};

n is the amount of CH_4 in moles;

P is the absolute pressure measured in atmospheres (atm) which for all Beltana monitoring is 1 atm;

V is the volume of methane measured in litres (L);

R is the gas constant, which is the same for all gases and equals 0.0821 L·atm·mol-1·K-1;

T is the temperature measured in Kelvin (K) which for all Beltana monitoring is 273 K (0^{o} C);

MW_{CH4} is the molecular weight of CH_4 which is 16 grams; and

GWP_{CH4} is the Global Warming Potential (GWP) of methane which is equal to 21 (DCC, 2009c).

Indirect (Scope 2) Project Emissions

Electricity Consumption Emissions

Emissions Source 3

UNFCCC Category 1.A and Scope 2

Emission Source Reference: *National Greenhouse and Energy Reporting (Measurement) Technical Guidelines v1.1. Part 7: Scope 2 Emissions.*

Stationary source (*indirect*) emissions are those that are physically produced by another organisation, most particularly in the form of electricity. The methodology and EF used to estimate annual emissions of GHG from stationary sources within the energy sector covers fuels including: coal, coke, brown sand briquettes and coke oven gas, petroleum products, natural gas, and town gas.

The electricity consumption estimate has been provided by Beltana (Blakefield South, 2009) and is based on current operations and the proposed construction and operation of the VAM abatement system and power generation units. As such, the electricity consumption for the Project is a general estimate only.

Emissions Formula 3

Division 7.2 of the NGER Technical Guidelines provides a methodology to estimate GHG emissions from the combustion of thermal coal to produce electricity. Blakefield South then use this purchased electricity for Project operations. Table 7.2 of the NGER Technical Guidelines provides the Indirect (Scope 2) emission factors for consumption of purchased electricity from a grid. The emission factors are categorised by State. This is because electricity that flows between States is constrained by the capacity of the interstate interconnectors and in some cases there are no interconnections. The GHG emissions in tonnes of CO_2-e attributable to the quantity of electricity purchased may be calculated with the following equation. Beltana expects that electricity purchase will remain constant throughout the Project.

$E_{CO2\text{-}e} = Q \times EF_{ep} / 1000$ (Formula 3)

where:

$E_{CO2\text{-}e}$ emissions of GHG from the consumption of electricity purchased (t $CO_{2\text{-}e}$/annum);

Q is the electricity consumed expressed in kWh;

EF_{ep} is the emission factor expressed in kg $C0_2$-e/kWh for State or Territory or electricity grid in which the consumption occurs as detailed in Table 7.2 (Item 77 in Table 7.2 of the NGER Technical Guidelines (DCC, 2009c) New South Wales has an emission factor of 0.89 kg CO_2-e/kWh.

Indirect (Scope 3) Impact Emissions

Scope 3 fugitive emissions relating to the Project are those that occur outside of the parameters of Blakefield South. The World Business Council for Sustainable Development and the World Resources Institute *Greenhouse Gas Protocol 2004* (WRI/WBCSD, 2004) specifically acknowledge the importance of the avoidance of double-counting of GHG emissions.

There are considerable speculative and assumption-based scientific and practical implications from such assessment of Scope 3 and indirect emissions. Although not specifically required by the DGRs issued for the Project, with the stated exclusions, the GHGEIAA includes an assessment of Scope 3 fugitive emissions for context, global perspective, and consideration of ESD principles only. These emissions are produced by third party organisations outside the parameters and direct influence of the Project.

Transport (Scope 3) Indirect Fugitive Emissions

Domestic Offsite Transport (Road)

Emission Source 4

UNFCCC Category 1.A.3

Emission Source Reference: *Greenhouse Gas Protocol – Mobile Guide v1.3: Calculating CO2 Emissions from Mobile Sources (Guidance to Calculation Worksheets).*

Fuel combustion from the offsite transportation of materials and services required during the construction period are included in the aggregate data set provided by Beltana (refer to **Appendix 2**). GHG emissions from mobile sources consist of gaseous products of engine fuel combustion (exhaust emissions) and gas leakage from vehicles (fugitive emissions). These emissions comprise CO_2 emissions due to the oxidation of fuel carbon content during fuel combustion: CH_4, N_2O, NOx, CO, SO_2 and non-methane volatile organic compounds (NMVOCs) emission.

The CO_2 emissions from the combustion of transport fuels are calculated by *Tier 1* methods by multiplying the fuel consumption for each type of mobile engine by a country-specific or default CO_2 emissions factor (in g/MJ) and an oxidation factor. This assigns the total carbon content of the fuel to CO_2 emissions and solid products, even though under actual engine operating conditions a portion of the carbon in fuel is released as CH_4, CO and NMVOCs. All emissions factors relating to energy consumption are given in terms of GCV (DCC, 2009c)**.**

The construction period is expected to take approximately 26 weeks (Monday to Friday) to complete, consisting of 6 weeks of civil site works and 20 weeks of infrastructure construction. Typical construction equipment and machinery will include: two excavators, three tipping trucks and one water truck, one backhoe and one roller compactor, one small and one large crane, one poly welder unit, one heavy haulage vehicle for generator delivery; and four light vehicles. It is expected that the Project site will be accessed by 40 heavy delivery vehicles delivering 20 wide heavy low loads and 20 normal loads over the infrastructure construction period.

An estimated 40 per cent of heavy vehicles will originate from Singleton. The remaining estimated 60 per cent have been assumed to originate from Sydney. No data had been received regarding civil construction movements (refer to **Table 1**).

Table 1 – Construction Traffic Movement

Expected Construction Period Truck Movements		
Traffic Origin	**Movement Quantity**	**Percentage (%)**
Singleton	16	40
Newcastle	24	60

An estimation of emissions for the supply of construction materials, equipment and services by road is provided with reference to industry studies. No assumption of the direction or potential freight of a return trip is made in this GHGEIAA (Anvil Hill IHAP, 2007), as there is a high potential that a back load will be transported on the return trip. The formula used in the Beltana GHGEIAA is assumed transferable from the guidance document *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance: Optional Emissions from Commuting, Business Travel, and Product Transport* (USA EPA, 2008).

The offsite fuel consumption data (as required by the NGERS Technical Guidelines formulae) was substituted with a calculation of total heavy vehicle movements including supply and delivery routes to calculate distances travelled. Emission factors were based on vehicle type to estimate emissions. Diesel oil combustion generates CO_2, CH_4 and N_2O gases. The GHG are expressed together as CO_2-e.

Emission Formula 4

The following equation was used to calculate GHG emission estimates for the supply of construction materials, equipment and services by road.

$$\mathbf{E_{Road} = VMT \times (EF_{CO2} + (EF_{CH4} \times 0.021) + (EF_{N2O} \times 0.310))/1000}$$

where:

E_{Road} GHG emissions from road vehicle transport (t CO_2-e);

VMT is the vehicle miles travelled *(one-way trip to Singleton is estimated at 12.40 miles, one-way trip to Newcastle is estimated at 55.85 miles)*;

EF_{CO2} is the CO_2 emission factor *(1.726 for medium and heavy duty trucks)*;

EF_{CH4} is the CH_4 emission factor *(0.021 for medium and heavy duty trucks)*;

EF_{N2O} is the N_2O emission factor *(0.017 for medium and heavy duty trucks)*;

0.021 CH_4 conversion factor; and

0.310 N_2O conversion factor.

Energy Production

UNFCCC Category 1.A.1.C.ii

Energy Production Reference: *National Greenhouse and Energy Reporting (Measurement) Technical Guidelines v1.1. Part 6.1: Energy Production.*

Energy Production Source

Part 6.1 of the NGER Technical Guidelines (DCC, 2009) specifies the requirements in assessing Energy Production from the operation of a facility during a year. This data is provided for context and perspective in this GHGEIAA. The quantity of energy produced from the operation of the facility during the year must be estimated in Part 6.2 (c) of the NGER Technical Guidelines (DCC, 2009), as follows:

(c) If the energy is electricity produced for use in the operation of the facility – as the difference between:

(i) the amount of electricity produced by the electricity generating unit for the facility as measured at the unit's terminals; and

(ii) the sum of the amounts of electricity supplied to an electricity transmission or distribution network.

As specified in the Table provided in Part 6.3A of the NGER Technical Guidelines (DCC, 2009), the fuel related to energy production at Beltana will be Item 18, Coal Seam Methane that is captured for combustion. The purpose of this section, therefore, is to estimate the energy content of the energy produced from the proposed installation and operation of up to 25 Megawatts (MW) of gas fired reciprocating engine generator units. These generator units will be supplied with biogas (coal mine methane), a by product of the coal extraction process and is considered a source of green energy.

Energy Production Formula 1

Part 6.3 of the NGER Technical Guidelines defines the following formula to estimate the energy content of fuel produced.

$$\mathbf{Z_i = Q_i \times EC_i} \qquad \textbf{(Energy Formula 1)}$$

where:

$\mathbf{Z_i}$ is the energy content of fuel type (i) produced during the year and measured in gigajoules.

$\mathbf{Q_i}$ is the quantity of fuel type (i) produced during the year.

$\mathbf{EC_i}$ is the energy content factor of fuel type (i), measured as energy content according to the fuel type measured in gigajoules. For electricity measured in kilowatt hours, ECi is equal to 0.0036; or for fuels measured in gigajoules, ECi is equal to 1.

APPENDIX C

Blakefield South Abatement Calculations

APPENDIX C

BLAKEFIELD SOUTH ABATEMENT CALCULATIONS

PART A – ABATEMENT CALCULATIONS

A. VAM Abatement

Emissions released per annum for treated ventilation air result in **1,421.25 t CO_{2-e}** being emitted compared to **47,374.71 t CO_{2-e}** being emitted if the ventilation air was not treated. This result's in a net reduction of **45,533.46 t CO_{2-e}** per annum. With the availability of VAM treatment at 90% it is estimated **827,162.28 t CO_{2-e}** will be abated over the operational life of the project (20 years).

Table A – Calculation of VAM Abatement

Item	VAM Untreated	VAM Treated
Flow rate	16.7 Nm3/sec	16.7 Nm3/sec
Output methane proportion	0.60%	0.018%
Relative methane output flow rate	100.2 L/sec	3.006 L/sec
Vented emissions per annum	47,374.71 t CO2-e	1,421.25 t CO2-e
Net emissions reduction per annum (100% Availability)		**45953.46**
VAM treatment availability (%)		**90**
Net emissions reduction for project duration (20 years operation) t CO2-e		**827,162.28**

B. Power Generation Abatement

Assuming that the generator units are used at full capacity at all times, these units will produce **219,000 MWh** per year. This equates to **788,400 gigajoules** (GJ) per year of energy production. The emissions produced if this energy was sourced from the grid equate to **194,910 t CO2-e / year or 3,898,200 t CO2-e for the project duration.**

Table B – Calculation of Abatement from Power Generation

Item	Calculation	Result
Electricity production per year	= 25 MW x 24 hr x 365 days	219,000 MWh / year
Energy production per year	= 219,000 MWh x 3.6 GJ/MWh	788,400 GJ / year
Emissions produced if power was sourced from grid (per year)	= 219,000 x .89 t C02-e/MWh	194,910 t CO2-e / year
Emission produced if power was sourced from grid (20 years)	= 219,000 x .89 t C02-e/MWh x 20 years	3,898,200 t CO2-e

C. Indirect Emissions from Domestic (Offsite) Road Transport

The estimated GHG emissions for the supply of construction materials, equipment and services outside the parameters of the site are **2.67 t CO_2-e**. This is also the total for Scope 3 fugitive fuel combustion emissions and has been estimated over a 26 week construction and 20 year operational period. As stated, the laden one-way road trip is an estimated distance of 12.4 miles to Singleton and 55.85 miles to Newcastle. No estimate for offsite road transport emissions during the operational period has given as it is expected to be minimal. It is important to note indirect emissions from domestic offsite transport as a result of the project are considered as negative abatement emissions.

Table C – Calculation of Emissions from Domestic (Offsite) Road Transport

Period	Formula		Calculation
Construction Phase	VMT (Construction)	= # Trips (40% Singleton, 60% Newcastle) x Distance	= (16 x 12.40) + (24 x 55.85)
			= 1,538.8 miles
	Offsite Fuel Combustion (t CO_2-e) (Truck)	= VMT x (EF_{CO2} + (EF_{CH4} x 0.021) + (EF_{N2O} x 0.310))/1000	= 1,538.8 x (1.726 + (0.021 x 0.021) + (0.017 x 0.310))/1000
		Total (construction supply)	= 2.67 t $CO_{2\text{-}e}$
Total Indirect Emissions from Domestic (Offsite) Transport			**= 2.67 t $CO_{2\text{-}e}$**

D. Electricity Consumption Emissions

The total emissions from electricity consumption for the Project are estimated as **62,890.96 t CO_2-e / kWh** with annual mean stationary source emissions (over 20 years) estimated as **3144.55 t CO_2-e/kWh**. It is understood electricity consumption data provided by Beltana may feasibly be considered an overestimate. No electricity consumption data was provided for the construction phase of the project. It is important to note electricity consumption emissions as a result of the project are considered as negative abatement emissions.

Table D – Calculation of Electricity (Stationary Source) Consumption Emissions

Period	Formula		Calculation
Power Generation, Flaring and Associated Infrastructure (per annum)	Stationary Source Emissions (t CO_2-e)	= Q x EF/1000	= 73,000 x 0.89 / 1000
			= 64.97
VAM Abatement System (per annum)	Stationary Source Emissions (t CO_2-e)	= Q x EF/1000	= 3,460,200 x 0.89 / 1000
			= 3079.58
		Total Annual Mean	= 3144.55 t CO_2-e / kWh
		Operations Duration (Years)	= 20
		Total for Project	= 20 x 3144.55
		Total Stationary Source Emissions	**= 62,890.96 t CO_2-e / kWh**

E. Project Abatement Summary

The total abatement from the project is estimated to equal **4,662,468 t CO_2-e** over the LOM assessment period of 20.5 years. This equates to a **12.48%** reduction in Beltana LOM Emissions. The largest abatement is the result of the onsite power generation with **3,898,200 t CO_2-e** abated. Note that onsite fuel combustion and electricity consumption as result of the project are considered negative abatement.

Table E – Summary of Abatement as a Result of the Project

Abatement Type	**Total (t CO_2-e)**
Emissions produced if power produced was sourced from grid (20 years)	3,898,200
Vam Treatment	827,162
Offsite fuel combustion	-2.67
Electricity consumption	-62,890
Total Abatement	**4,662,468**
Without Project Emissions	37,356,650
% Reduction in Beltana LOM Emissions	**12.48**

PART B – BLAKEFIELD SOUTH WITHOUT PROJECT CALCULATIONS

F. Onsite Fuel Combustion (Coal Seam Methane)

Table F1 – Calculation of Gas Volumes for Onsite Fuel Combustion

Item	Current Gas Drainage	Peak Gas Drainage
Drainage flow rate (L/sec)	2,500.00	4,000.00
Amount Combusted (L/sec)	2,125	3,400
Drainage flow rate (m3/sec)	2.1	3.4
Flare/electricity generator availability (%)	100.00	100.00
Total Combusted (m3)	33,529,950.00	107,295,840.00
Time Period	6 months	Per annum

Table F2 – Calculation of Fugitive Emissions from Onsite Fuel Combustion

Period	Formula	Calculation
Current gas drainage (6 months duration)	= Qi x EC_i x Ef_{ijoxec} / 1000	= 33,529,950 x 0.0377 x 51.33 / 1000 = 64,885.18
Peak gas drainage (per annum)	= Qi x EC_i x Ef_{ijoxec} / 1000	= 107,295,840 x 0.0377 x 51.33 / 1000 = 207,632.58
Annual mean (Peak gas drainage)		= 207,632.58 t CO2-e
Peak gas drainage duration (years)		= 20
Peak gas drainage total (estimated)		= 207,632.58 x 20
		= 4,152,651.58 t CO2-e
Total emissions from onsite fuel combustion		= 4,152,651.58 + 64,885.18 = 4,217,536.76 t CO2-e

G. Fugitive Emissions from Onsite Direct Emissions - Ventilation Shaft (Venting)

Table G1 – Calculation of Methane Gas Volumes from Ventilation Shaft Direct Emissions Sources

Time Period	6 months	Per annum
Ventilation flow rate	470,000 L/sec	470,000 L/sec
Methane proportion	0.60%	0.60%
Relative methane flow rate	2820 L/sec	2820 L/sec
Total Output (L)	44,496,216,000	88,992,432,000

Table G2 - Calculation of Fugitive Emissions from Ventilation Shaft Direct Emissions Sources

Period	Formula		Calculation
6 Months	Number of moles vented (6 months)	n= PV/ RT	= 1 x 44,496,216,000 / 0.0821 x 273
			= 1,985,259,466.48 moles
	Estimate of emissions (6 months)	$CH_{4\ vented} = n \times MW_{CH4} \times GWP_{CH4} /10^6$	= 1,985,259,466.48 x 16 x 21 / 10^6
			= 667,047.18 t CO2-e
Per Annum	Number of moles vented (per annum)	n= PV/ RT	= 1 x 88,992,432,000 / 0.0821 x 273
			= 3,970,518,932.95 moles
	Estimate of emissions (per annum)	$CH_{4\ vented} = n \times MW_{CH4} \times GWP_{CH4} /10^6$	= 3,970,518,932.95 x 16 x 21 / 10^6
			= 1,334,094.36 t CO2-e
Annual Mean (per annum)			= 1,334,094.36
			= 1,334,094.36 t CO2-e
Per annum duration (years)			= 20
20 year Total (estimated)			= 20 x 1,334,094.36
			= 26,710,312.23 t CO2-e
6 month total (estimated)			= 667,047.18 t CO2-e
Ventilation Shaft Methane Venting Total (20 years + 6 months)			= 26,710,312.23 + 667,047.18
Estimated			**= 27,377,359.41 t CO2-e**

H. Fugitive Emissions from Onsite Direct Emissions – Gas Drainage (Venting)

Table H1 – Calculation of Methane Gas Volumes from Coal Seam Drainage Direct Emissions Sources

	Current Gas Drainage	Peak Gas Drainage
Drainage flow rate (L/sec)	2500	4000
Not Combusted flow rate (L/sec)	375	600
Methane proportion (%)	100.00	100.00
Total Output (L)	**5,913,000,000**	**18,921,600,000**
Time Period	**6 months**	**Per annum**

Table H2 - Calculation of Fugitive Emissions from Coal Seam Drainage Direct Emissions Sources

Period	Formula		Calculation
Current gas drainage (6 months duration)	Number of moles vented (6 months)	n= PV/ RT	= 1 x 5,913,000,000 / 0.0821 x 273
			= 263,816,573.20 moles
	Estimate of emissions - free venting (6 months)	CH_4 vented = n x $MWCH_4$ x $GWPCH_4$ /10^6	= 263,816,573.20 x 16 x 21 / 10^6
			= 88,642.37 t CO2-e
Peak gas drainage (per annum)	Number of moles vented (per annum)	n= PV/ RT	= 1 x 18,921,600,000 / 0.0821 x 273
			= 844,213,034.23 moles
	Estimate of emissions - free venting (per annum)	CH_4 vented = n x $MWCH_4$ x $GWPCH_4$ /10^6	= 844,213,034.23 x 16 x 21 / 10^6
			= 283,655.58 t CO2-e
Annual mean (Peak gas drainage)			= 283,655.58 t CO2-e
Peak gas drainage duration (years)			= 20
Peak gas drainage total (estimated)			= 20 x 283,655.58
			= 5,673,111.59 t CO2-e
Construction phase total (estimated)			= 88,642.37 t CO2-e
Coal Seam Drainage Methane Venting Total			= 5,673,111.59 + 88,642.37
			= 5,761,753.96 t CO2-e

I. Without Project Emissions Summary

Table I – Summary of Without Project Emissions

Emission Type	Total (t CO_2-e)
Onsite Fuel Combustion	4,217,536.76
Onsite Direct Emissions - Ventilation Shaft (Venting)	27,377,359.41
Onsite Direct Emissions - Gas Drainage (Venting)	5,761,753.96
Total Emissions Without Project	**37,356,650.13**

APPENDIX 5

Noise Impact Assessment

Blakefield South 25MW Power Generation & Ventilation Air Methane Abatement System

Assessment of Noise Impacts

Prepared for
Beltana Highwall Mining Pty Ltd

Global Acoustics

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Blakefield South 25MW Power Generation & Ventilation Air Methane Abatement System, Assessment of Noise Impacts

Reference: 08117_R05.doc

Report Date: 19 August 2009

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Environmental Scientist

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

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1 INTRODUCTION

The Beltana Underground mine currently operates pursuant to development consent DA 376-8-2003, granted by the Minister for Planning in February 2004 (the 2004 Consent). The consent was modified in April 2006, October 2006 and October 2007. The 2007 modification brought forward mining of the Blakefield seam in the Southern Mining Area and extended and changed the alignment of some longwall blocks. A program of gas drainage works was included in the original consent and was subsequently modified in 2007. The relevant noise sections of the development consent are provided in Appendix A.

Beltana Highwall Mining Pty Limited (Beltana) is proposing to seek approval from the Department of Planning (DoP) to modify its current development consent (DA 376-8-2003) under Section 75W of the Environmental Planning & Assessment Act 1979 to:

- construct a ventilation air methane (VAM) abatement system; and
- install up to 25 MW reciprocating gas fired engine generator units.

Global Acoustics was engaged by Beltana to undertake a noise assessment of the proposed Blakefield South 25MW Power Generation & Ventilation Air Methane Abatement System (PGVAMAS).

1.1 BACKGROUND

Global Acoustics previously conducted an acoustic assessment of the Beltana Underground in 2003 as part of the "Bulga Coal Continued Underground Operations Environmental Impact Statement" (Umwelt Australia, 2003) (the EIS).

Global Acoustics also has undertaken a noise impact assessment for the 2007 modification to consent titled "Blakefield South Project, Environmental Noise Impact Assessment Report" (Global Acoustics, 2007), which included relocation of a ROM stockpile area and associated plant, ventilation fans and gas drainage infrastructure, and revised conveyor layouts.

Beltana have indicated that two fan sites proposed for the Blakefield South Project, designated Fan3a and Fan3b in previous modelling, will not be required, and five existing flares for Blakefield South will be replaced by three new flares located west of Broke as shown on Figure1. Therefore, noise impacts from the Blakefield South Project, in the absence of these fans and gas flares have been used to represent noise levels from Beltana Underground alone. Noise predictions from the PGVAMAS will be added to these existing predicted levels to assess a combined impact.

1.2 SCOPE OF ASSESSMENT

This noise assessment investigates noise impacts from the following PGVAMAS infrastructure:

- Existing and/or approved operations including:
  - Up to four goaf extraction units (GEUs) at two sites (for low pressure-high methane concentration in the goaf); and
  - Three gas flares on a site west of Broke Road;
- Proposed infrastructure for which development consent is sought:
  - Eight 3.9 MW gas powered generators (for free drainage-high methane concentration from coal seam);
  - Seven gas flares within the proposed power generation compound (for free drainage-high methane concentration from coal seam); and
  - 1 Vocsidizer (ventilation air methane oxidation from current workings).

The locations of PGVAMAS infrastructure and receptor locations used for modelling are provided in Figure 1 and Figure 2.

Two scenarios have been modelled, comprising the period 2010 to 2013, and the period 2014 to 2021 to reflect the change in number and location of goaf extraction units. For ease of reference these periods have been nominated as Year 1 and Year 5 scenarios respectively.

Predicted PGVAMAS noise levels have been combined with existing Beltana Underground predicted levels, then compared against previously approved EIS predicted noise levels or the EIS project specific criteria, whichever is higher, to assess impact.

Definitions of terminology used in this report are provided in Appendix B.

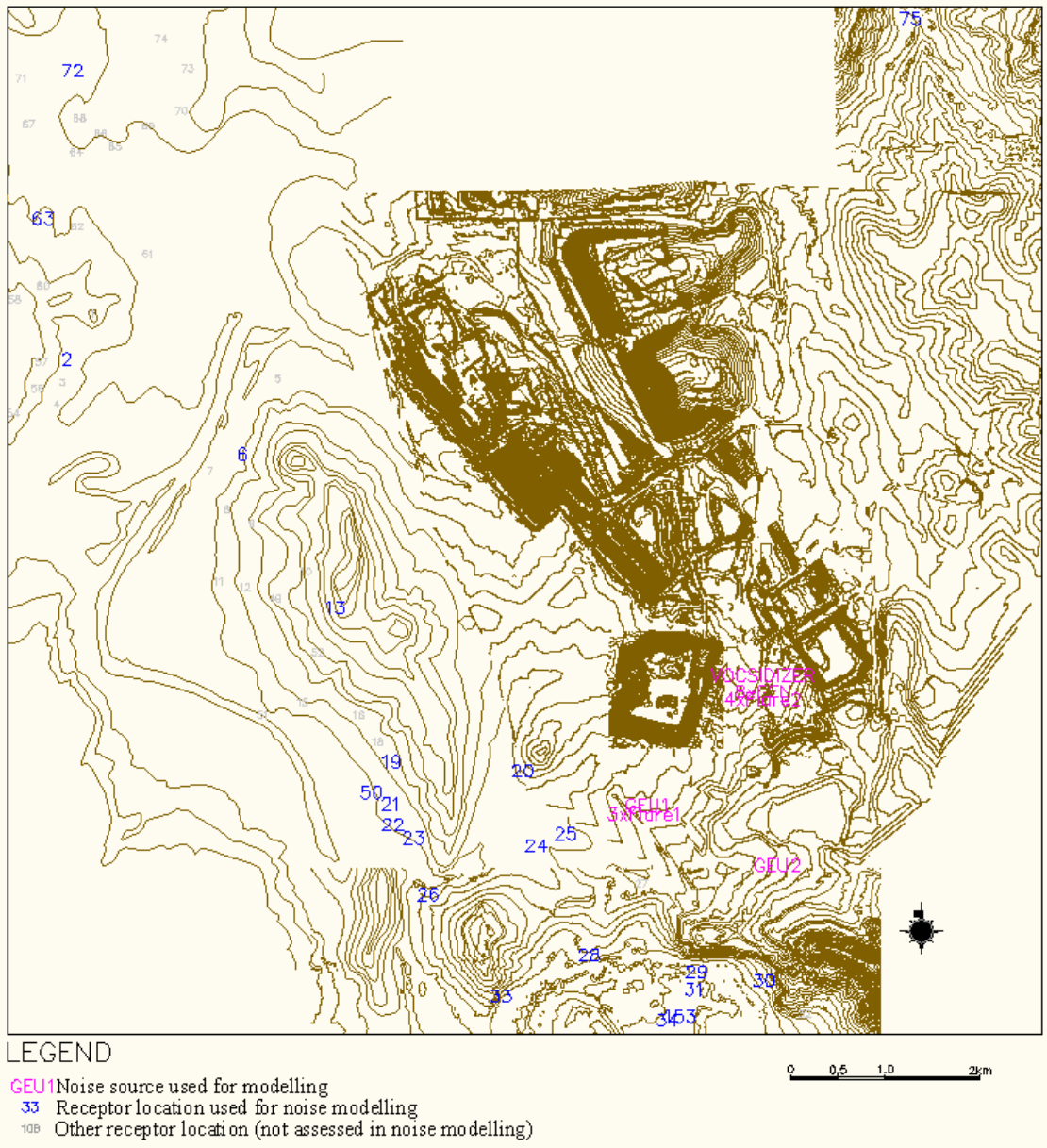

Figure 1 PGVAMAS Infrastructure and Receptor Locations

2 MODELLING

2.1 NOISE MODEL METHODOLOGY

Noise levels were predicted using ENM, an environmental noise model, to determine the acoustic impact of the PGVAMAS infrastructure. The model takes into account geometric spreading, atmospheric absorption, barrier attenuation, and ground attenuation.

Updated topographical data, supplied by Beltana, was used to set up the noise model in AutoCAD. A closer view of PGVAMAS infrastructure locations and near receptor locations are shown in Figure 2.

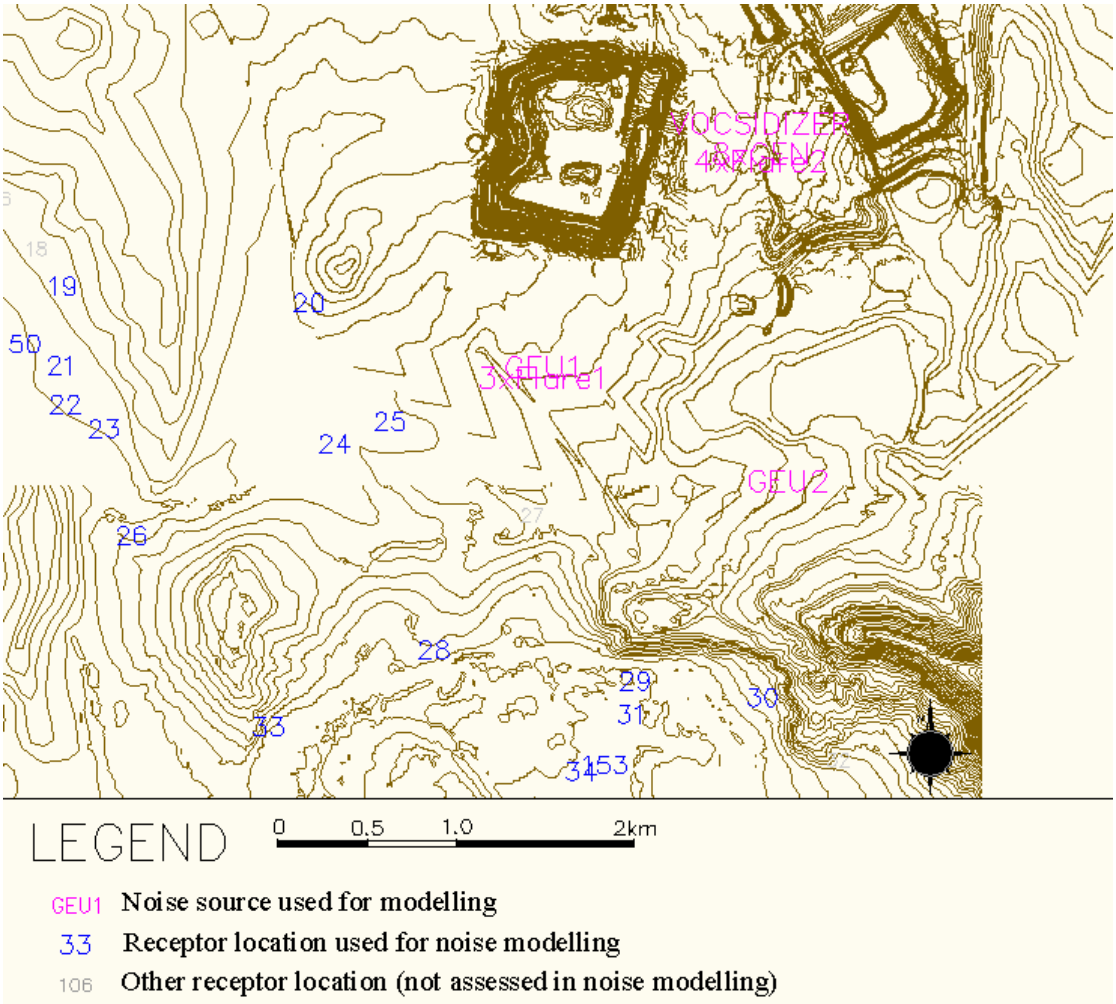

Figure 2 PGVAMAS infrastructure and near receptor locations

Calculations have been undertaken for a range of temperature gradients, wind speeds and wind directions (in combination) for the four seasons, as outlined below.

Long-term meteorological data from the Bulga Coal Management (BCM) weather station (in this case 10 years of data) was used to define the probability of occurrence of these atmospheric conditions and associated noise levels, thereby accounting for the likely range of noise levels at each receptor. Sigma-theta data was analysed, in accordance with procedures in Appendix E of the Industrial Noise Policy (INP) (Department of Environment and Climate Change, formerly the EPA), to determine the appropriate stability class and associated vertical temperature gradient for each weather record.

The calculation methodology employed provides a range of results whereas a single value is required for comparison with the limiting criterion. As discussed below, it is considered appropriate to use the 90^{th} percentile result (10 percent of results are higher than this number) to represent intrusive noise impact.

This method has previously been considered appropriate by the DECC. In a Submission in Reply by the Environment Protection Authority to the Commission of Inquiry into a proposal to establish the Mount Pleasant Open Cut Coal Mine, February 1999, the EPA stated that '*The EPA accepts that this ten percentile of noise levels under all weather conditions is a reasonable representation of what would normally occur under adverse meteorological conditions … but clearly does not and should not include all extreme or unusual conditions*'.

Results provided are 90th percentile L_{Aeq} values, that is, a range of L_{Aeq} results (198 meteorological conditions) have been calculated for each receptor and the 90th percentile L_{Aeq} determined based on the percentage distribution of meteorological conditions.

However, rather than calculate a result based on the annual distribution of meteorological conditions, results were determined for each season and the worst-case season result adopted as the predicted level.

This methodology requires more calculation than would a procedure involving a single set of meteorological parameters but represents best available technology and is among the most comprehensive methods to estimate the range of likely noise levels for a receptor. This level of information about the likely noise environment gives regulatory bodies, and residents, sufficient detail to form a comprehensive understanding of potential noise impacts from the development.

Predicted results are L_{Aeq} as per the INP requirements.

2.2 SOURCE SOUND POWER

Equipment suppliers provided noise data for the various infrastructures. The noise data supplied was typically sound pressure level at a distance as an overall A-weighted total.

Without more detailed information, acoustic spectrum information was sourced from the Global Acoustics database for what, in our opinion, would be a similar noise source. An acoustically treated generator spectrum shape was used to represent the goaf extraction unit and gas generator units. A centrifugal fan spectrum was used to represent the Vocsidizer, the fans of which are understood to be the greatest noise source. The existing five gas flares at Beltana were measured directly to use as a spectrum shape for the proposed gas flares.

The $L_{eq,15min}$ sound power spectra used as input for modelling is presented in Table 2.1.

Table 2.1 SOURCE SOUND POWER DATA $L_{eq,15min}$ (dB)

Item	No.	Octave Band Sound Power								Total Lin	Total Awt
		63	125	250	500	1000	2000	4000	8000		
3.9MW Generator	8	82	90	87	91	89	92	92	92	99	98
4 x Goaf Extraction Units	1	84	92	89	93	91	94	94	94	101	100
2 x Goaf Extraction Units	1	81	89	86	90	88	91	91	91	98	97
7 x Gas Flares	1	118	111	109	107	101	102	103	105	120	111
3 x Gas Flares	1	115	108	106	104	97	99	100	102	117	108
Vocsidizer	1	110	108	100	97	89	86	82	74	114	98

2.3 YEAR 1 MODEL SCENARIO

The Year 1 model scenario approximates the period 2010 to 2013 and includes infrastructure shown in Table 2.2. Refer to Figure 2 for source locations.

Table 2.2 YEAR 1 PGVAMAS INFRASTRUCTURE

Label	Source
8xGEN	8 x 3.9 MW Generators
GEU1	4xGoaf Extraction Units
3xFlare1	3 x Gas Flares
7xFlare2	7 x Gas Flares
Vocsidizer	1 x Vocsidizer

Conveyor layouts and infrastructure from the existing Year 1 Blakefield South Project model (which includes Beltana Infrastructure) in the absence of ventilation fans 3a and 3b, and gas flares have been combined with results from the above infrastructure to allow prediction of combined Beltana Underground noise levels.

2.4 YEAR 5 MODEL SCENARIO

The Year 5 model scenario approximates the period 2013 to 2021 and includes infrastructure shown in Table 2.3. Refer to Figure 2 for source locations.

Table 2.3 YEAR 5 PGVAMAS INFRASTRUCTURE

Label	Source
8xGEN	8 x 3.9 MW Generators
GEU1	2 x Goaf Extraction Units
GEU2	4 x Goaf Extraction Units
3xFlare1	3 x Gas Flares
7xFlare2	7 x Gas Flares
Vocsidizer	1 x Vocsidizer

At the Year 5 scenario, the number of goaf extraction units at GEU1 reduces from four to two, and four new goaf extraction units will be commissioned at the GEU2 location.

Conveyor layouts and infrastructure from the existing Year 13 Blakefield South Project model have been combined with results from the above infrastructure to allow prediction of combined Beltana Underground noise levels.

2.5 YEAR 1 AND YEAR 5 SCENARIO MODEL RESULTS

Predicted noise levels from Year 1 model scenario are presented in Table 2.4.

Table 2.4 YEAR 1 PREDICTED NOISE LEVELS, L_{Aeq} dB

Receptor	Worst-case EIS / Consent Criteria	Greater of Consent or Worst Case EIS	Previous Model - Year 1 Blakefield South[2]	Year 1 PGVAMAS Only	Total Blakefield South and PGVAMAS	Relative to Greater of Consent / EIS	Notes
2 (3[1])	33 / 35	35	32	20	32	-3	OK
6	33 / 35	35	33	21	33	-2	OK
13 (52[1])	35 / 35	35	38	28	38	**3**	BJV owned
19	32 / 35	35	33	30	35	0	OK
20	37 / 37	37	34	41	42	**5**	Exceedance
21	32 / 35	35	32	29	34	-1	OK
22	32 / 35	35	31	29	33	-2	OK
23	31 / 35	35	28	29	32	-3	OK
24	37 / ACQ	37	36	40	41	**4**	Exceedance
25	38 / ACQ	38	37	43	44	**6**	BJV owned
26	34 / 35	35	32	32	35	0	OK
28	33 / 35	35	32	25	33	-2	OK
29	26 / 35	35	22	22	25	-10	OK
30 (31[1])	30 / 35	35	28	29	32	-3	OK
31	30 / 35	35	27	19	28	-7	OK
33	31 / 35	35	30	24	31	-4	OK
34	32 / 35	35	30	27	32	-3	OK
50	33 / 35	35	32	28	33	-2	OK
63	32 / 35	35	28	18	28	-7	OK
72	32 / 35	35	31	18	31	-4	OK
75	44 / ACQ	44	40	22	40	-4	OK
153 (34[1])	32 / 35	35	29	29	32	-3	OK

Note: 1. Receptor 3, 52, 31 and 34 used for comparison for EIS values, as 2, 13, 30 and 153 were not modelled in the EIS.

2. Fan sites 3a and 3c and gas flares from original Blakefield South model not included in results. Beltana indicated these will not operate concurrently with PGVAMAS infrastructure.

3. ACQ indicates receptor location is subject to acquisition upon request in accordance with the development consent DA 376-8-2003 Condition 1.

Predicted noise levels from Year 5 model scenario are presented in Table 2.5.

Table 2.5 YEAR 5 PREDICTED NOISE LEVELS, L_{Aeq} dB

Receptor	Worst-case EIS / Consent Criteria	Greater of Consent or Worst Case EIS	Previous Model - Year 13 Blakefield South	Year 5 PGVAMAS Only	Total Blakefield South and PGVAMAS	Relative to Greater of Consent / EIS	Notes
2 (3[1])	33 / 35	35	28	20	29	-6	OK
6	33 / 35	35	31	21	31	-4	OK
13 (52[1])	35 / 35	35	35	28	36	**1**	BJV owned
19	32 / 35	35	33	30	35	0	OK
20	37 / 37	37	35	40	41	**4**	Exceedance
21	32 / 35	35	32	29	34	-1	OK
22	32 / 35	35	31	29	33	-2	OK
23	31 / 35	35	12	29	29	-6	OK
24	37 / ACQ	37	35	40	41	**4**	Exceedance
25	38 / ACQ	38	37	43	44	**6**	BJV owned
26	34 / 35	35	31	32	35	0	OK
28	33 / 35	35	32	27	33	-2	OK
29	26 / 35	35	22	23	26	-9	OK
30 (31[1])	30 / 35	35	28	29	32	-3	OK
31	30 / 35	35	27	20	28	-7	OK
33	31 / 35	35	30	25	31	-4	OK
34	32 / 35	35	31	28	33	-2	OK
50	33 / 35	35	32	28	33	-2	OK
63	32 / 35	35	28	18	28	-7	OK
72	32 / 35	35	27	18	28	-7	OK
75	44 / ACQ	44	40	21	40	-4	OK
153 (34[1])	32 / 35	35	29	30	33	-2	OK

Note: 1. Receptor 3, 52, 31 and 34 used for comparison, as 2, 13, 30 and 153 were not modelled in the EIS.
2. ACQ indicates receptor location is subject to acquisition upon request in accordance with the development consent DA 376-8-2003 Condition 1.

Table 2.4 and Table 2.5 indicate that Beltana Underground noise levels (Total Blakefield South and PGVAMAS) are predicted to increase above EIS predicted levels at 10 of 22 receptor locations in the Year 1 scenario and at 11 of 22 receptor locations in the Year 5 scenario. Predicted levels at all locations where increases have occurred are less than allowed by the current consent, with the exception of four locations two of which are owned by BJV.. A review of model result files indicates the 3 x Flares (existing) are the major contributors.

Noise levels are predicted to exceed current development consent limits by more than 2 dB at four receptor locations (Receptors 13, 20, 24, and 25). Bulga Joint Venture owns receptors 13 and 25 so these are not considered further. However, exceedances of 4-5 dB are predicted at receptors 20 and 24.

Acquisition limits (L_{Aeq} 42 dB) are not exceeded at any of the privately owned receptor locations that are not already subject to acquisition upon request.

3 SUMMARY

A noise assessment of the Blakefield South 25MW Power Generation & Ventilation Air Methane Abatement System (PGVAMAS) has been undertaken for two operating scenarios, being a Year 1 scenario (2010 to 2013), and a Year 5 scenario (2014 to 2021).

Predicted noise levels from existing Beltana Underground infrastructure have been combined with results of PGVAMAS scenarios to predict a combined noise level from both.

The results from both the Year 1 and Year 5 scenarios indicate that noise levels will increase above EIS predicted levels at up to 11 of 22 receptor locations, and be equivalent or less at the remaining receptors. Predicted levels at all locations where increases have occurred are less than allowed by the current consent, with the exception of four locations two of which are owned by BJV. The three existing gas flares at the GEU1 location are the major contributors.

Noise levels are predicted to exceed current development consent limits by more than 2 dB at four receptor locations (receptors 13, 20, 24, and 25). Bulga Joint Venture owns receptors 13 and 25 so these are not considered further. However, exceedances of 4-5 dB are predicted at receptors 20 and 24. It is understood that a negotiated agreement exists with the owner of receptor 20. The terms of the agreement are understood to allow that the development consent noise limits may be exceeded at receptor 20.

Receptor 24 is subject to acquisition upon request, as detailed in the current development consent DA 376-8-2003, and as such does not have specific noise criteria, although the consent does indicate that whilst privately owned, “all practicable measures” should be implemented in order that impacts of the development comply with the predictions of the EIS.

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Appendix

A: Development Consent Extracts

Development Consent DA 376-8-2003 Extracts

Bulga Coal Management was given consent in 2004 to continue underground mining in the Bulga Complex and process ROM coal (consent DA 376-8-2003).

It should be noted that properties Kennedy (R52), Russell (R9), Cobcroft Wines (R49), Hedley (R75), Dwyer (R18) and McInerney (R24) are subject to acquisition upon request, as detailed in Condition 1 of the consent. As such, the noise impact assessment criteria and acquisition criteria of Table 11 and Table 12 of the consent do not apply directly to these properties.

It is also noted however that Condition 3 of the consent indicates *"While the land listed in Conditions 1 and 2 are privately owned, the Applicant shall implement all practicable measures to ensure that the impacts of the development comply with the predictions in the EIS, to the satisfaction of the Director-General."* Therefore, the noise impact assessment criteria and acquisition criteria are referred to in this report for comparison only.

Relevant noise sections of the consent are reproduced below.

Noise Impact Assessment Criteria

29 The applicant shall ensure that the noise generated by the development does not exceed the noise impact assessment criteria presented in Table 11 at any privately owned land.

Table 11: Noise Impact Assessment Criteria (dB(A))

Day/Evening/Night $L_{Aeq(15\ minute)}$	***Night*** $L_{A1(1\ minute)}$	***Land Number***
37	*47*	*Property 20 – Lewis* *Property 11/12 - Hope*
35	*47*	*All other residential or sensitive receptors, excluding the land referred to in condition 1 above*

Notes:

a) Noise from the development is to be measured at the most affected point, or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary, to determine compliance with the $L_{Aeq(15\ minute)}$ noise limits in the above table. Where it can be demonstrated that direct measurement of noise from the development is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.

b) Noise from the development is to be measured at 1 metre from the dwelling façade to determine compliance with the $L_{A1(1\ minute)}$ noise limits in the above table.

c) The noise emission limits identified in the above table apply under meteorological conditions of:

- *Wind speeds of up to 3m/s at 10 metres above ground level; or*
- *Temperature inversion conditions of up to 3 degrees/ 100 metres, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land acquisition Criteria

30. If the noise generated by the development exceeds the criteria in Table 12, the Applicant shall, upon receiving a written request for acquisition from the land owner, acquire the land in accordance with the procedures in Conditions 9 – 11 of Schedule 5.

Table 12: Noise Impact Assessment Criteria (dB(A))

Day/Evening/Night $L_{Aeq(15\ minute)}$	***Land Number***
42	*All residential or sensitive receptors, excluding the receptors listed in condition 1 above*

Appendix

B: Terminology

Some definitions of acoustic terminology, which may be used in this report, are provided in Table A1.

Table A.1 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Aeq}	The average noise energy during a measurement period
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	The period 10:00pm to 7:00am
PGVAMAS	Power Generation & Ventilation Air Methane Abatement System
GEU	Goaf Extraction Unit

Blakefield South 25 MW Power Generation and Vocsidizer

Construction Noise Assessment

December 2009

Prepared for
Beltana Highwall Mining Pty Ltd

Global Acoustics

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Blakefield South 25 MW Power Generation and Vocsidizer Noise Assessment

Reference: 08117_R08.doc

Report Date: 9 December 2009

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Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

This report provides information regarding a noise assessment of a proposed construction site at Bulga Coal Mine. Infrastructure to be installed at the site are a ventilation air methane (VAM) abatement system and up to 25 MW reciprocating gas fired engine generator units.

The project has a civil site construction timeline of approximately 6 weeks with operating equipment including graders, tip trucks, water carts, compactors and excavators. An average of 10 people will be working on site, with a peak of 20.

The expected infrastructure construction timeline is 20 weeks. All infrastructure will be fabricated/manufactured off site and delivered to site by road transport. Approximately 20 wide heavy low loads and another 20 normal loads will be required. During this period an average of 10 people will be working on site, with a maximum of 30.

The time frame for the construction is 26 weeks, consisting of site civil works followed by construction of infrastructure associated with the Project.

Proposed construction hours are Monday to Friday 7am to 6pm and 8am to 1pm on Saturdays.

No construction noise impacts are predicted. The calculated noise level for the nearest residence during construction is L_{Aeq} 27 dB; all other receptors would receive less.

TABLE OF CONTENTS Page

1 INTRODUCTION

1.1 BACKGROUND AND PROJECT DESCRIPTION

This report provides information regarding a noise assessment of a proposed construction site at Bulga Coal Mine. Infrastructure to be installed at the site are a ventilation air methane (VAM) abatement system and up to 25 MW reciprocating gas fired engine generator units.

The time frame for construction is 26 weeks, consisting of site civil works followed by construction of infrastructure associated with the Project.

Proposed construction hours are Monday to Friday 7am to 6pm and 8am to 1pm on Saturdays.

The site civil works consist of:

1. cutting and filling for graded installation hardstand area,
2. trenching, installation and backfilling for required buried services,
3. installation of overhead services (electricity),
4. forming up of run-off drainage system and sheeting of access roads,
5. sheeting of hardstand with suitable all weather slip and trip reduction gravel,
6. installation of concrete slab footing for generators, switch room, control room and service workshop facilities,
7. landscape beautification works and installation of security fencing and monitoring equipment.

Following the completion of the civil works (approximately 6 weeks duration), the power generators, vocsidizer and associated infrastructure will be constructed.

Equipment modelled as operating on and around the construction site will include:

1. 2 x excavators
2. 3 x tipping trucks
3. 2 x heavy haulage vehicles
4. 1 x backhoe
5. 1 x water truck
6. 1 x roller/compactor
7. 1 x small crane (>25 tonnes)
8. 1 x large crane (60-99 tonnes)
9. 1 x grader.

Figure 1 shows the location of the construction site.

The major components of the facility would be manufactured off site thus reducing site construction noise and time. Approximately 20 wide heavy loads and 20 standard semi-trailer loads would be required to transport the infrastructure to site. It would take approximately 6 months to construct and commission with an average of approximately 10 people on site per day and a peak site personnel requirement of approximately 30 people.

In addition, site establishment will include installation of required amenities road construction (200 m) using equipment detailed in Table 3.1.

Figure 1 Study Area

1.2 TERMINOLOGY

Some definitions of terminology, which may be used in this report, are provided in Table 1.1.

Table 1.1 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Aeq}	The average noise energy during a measurement period
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data
Day	The period 7:00am to 6:00pm
Evening	The period 6:00pm to 10:00pm
Night	The period 10:00pm to 7:00am

2 CRITERIA

2.1 CONTRUCTION

The Department of Environment, Climate Change and Water (DECCW) have recently released the 'Interim Construction Noise Guideline' (ICNG, July 2009). The guideline specifically relates to construction, maintenance and renewal activities.

The guideline specifies standard construction hours as:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8:00 am to 1:00 pm; and
- No construction work on Sunday and public holidays.

For construction projects such as this, a quantitative assessment is required, with comparison to relevant criteria. The criteria for work undertaken in the standard construction hours are:

- $L_{Aeq,15min}$ equal to background plus 10 dB; and
- $L_{Aeq,15min}$ 75 dB.

An L_{Aeq} criterion of background plus 5 dB is specified for work outside the standard construction hours.

However, the ICNG states in Section 1.2 that it does not cover:

> *"noise from industrial sources (for example, factories, quarrying, mining, and including construction associated with quarrying and mining) – this is assessed under the NSW Industrial Noise Policy (EPA 2000)."*

A background level of L_{A90} 30 dB has been conservatively assumed for this assessment, this is the lowest background possible as per the DECCW Industrial Noise Policy (INP), and so the construction noise criterion becomes $L_{Aeq,15min}$ 35 dB as an intrusiveness criterion as per INP guidelines. This is the lowest possible criterion.

3 METHODOLOGY

Noise levels were predicted using ENM (environmental noise model) to determine the acoustic impact of the proposed construction activities detailed below. The model takes into account atmospheric absorption and ground attenuation. L_{Aeq} sound power levels (L_w) for construction equipment is detailed in Table 3.1. Table 3.2 shows distance from the construction site (source) to the nearest receptor. Figure 2 shows the nearest receiver locations, the source, and, the surrounding topography.

Table 3.1 PLANT ITEM LIST - CONSTRUCTION

Plant Item[1]	Number	Sound Power Lw_A dB
Excavators	2	113
Tipping trucks	3[2]	109
Heavy haulage vehicles	2[2]	109
Backhoe	1	105
Water truck	1	109
Roller compactor	1	112
Small crane	1	104
Large crane	1	109
Grader	1	114
Total	11	123

Notes: 1 Sound power estimated from similar size and type of equipment where data for specific equipment not available

2 Only 2 tipping trucks were assumed to be operating on the site at any one time;

2. Only 1 heavy haulage vehicle was assumed to be operating on the site at any one time.

Table 3.2 DISTANCES FROM SOURCE TO RECEVIER

Receiver	Distance to source (m)
20	2663

Notes: 1 Receptor number is as per Global Acoustics report 08117_R05

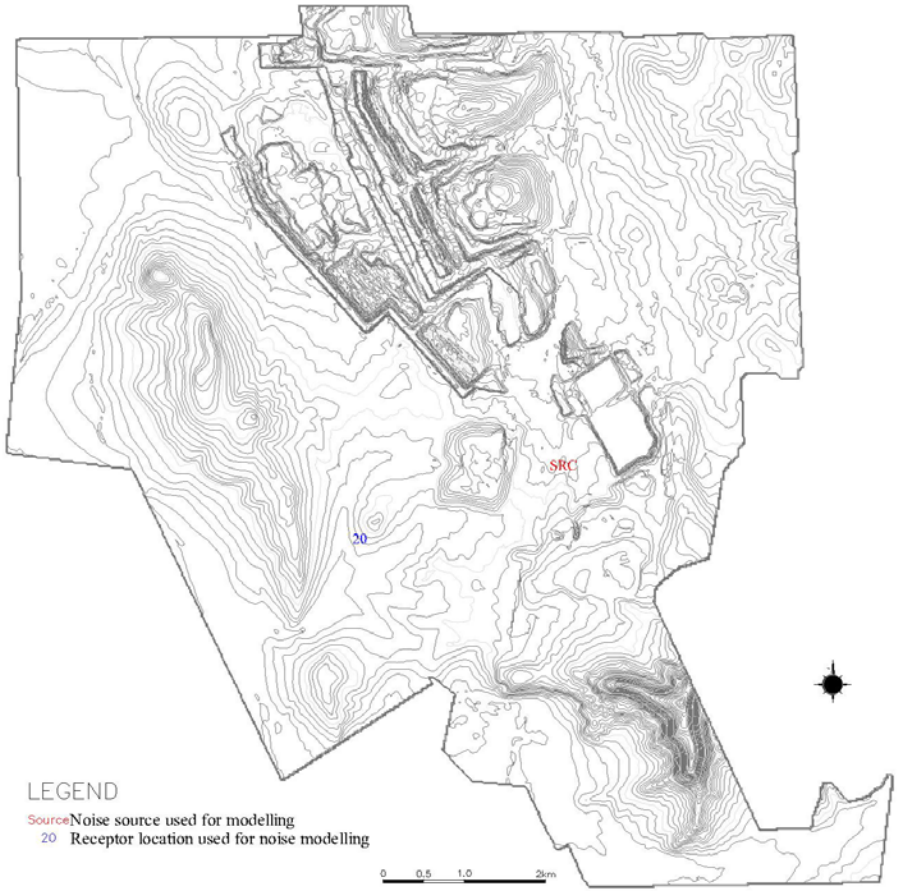

Figure 2 Model Layout

4 RESULTS

4.1 CONSTRUCTION

A result for the nearest receiver (20) to the construction site has been calculated and is detailed in Table 4.1.

Table 4.1 CONSTRUCTION NOISE IMPACTS

Receiver identity	Received noise L_{Aeq} dB
No. 20	27

As shown in Table 4.1, the highest construction noise level predicted for receiver 20 is L_{Aeq} 27 dB. All other receptors can be expected to have lower received noise levels than receiver 20 due to increased distance from the construction site.

5 CONCLUSION

5.1 CONCLUSION

An assessment of construction noise emissions from the proposed construction site at Bulga Coal Mine was conducted.

Using an environmental noise model the predicted noise level for the nearest receiver was found to be L_{Aeq} 27 dB.

No construction noise impacts are predicted, with the highest predicted noise levels well within the maximum recommended management level of $L_{Aeq,15min}$ 35 dB as specified by DECCW, 2009.

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APPENDIX 6

Ecological Assessment

Appendix 6 – Ecological Values Assessment

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Flora						
Bothriochloa biloba	V (EPBC)	Grows in woodlands and grasslands on poorer soils.	Regionally recorded across much of the central and upper Hunter Valley with fewer records in the lower Hunter but as far east as Maitland.	Wollemi NP – 1	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
White-flowered wax plant *Cynanchum elegans*	E (TSC) E (EPBC)	This species usually occurs on the edge of dry rainforest vegetation.	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley.	Wollemi NP - 3	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Singleton mallee *Eucalyptus castrensis*	E (TSC)	Occurs on a low broad ridgetop on loam over sandstone. The understorey consists of grasses and scattered shrubs, with bare ground and litter.	Known only from a single dense stand near Singleton in the lower Hunter Valley. Here it is locally dominant stand over about ten hectares with a number of smaller outlying stands over a 2.5 km range.		The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Broken Back ironbark *Eucalyptus fracta*	V (TSC)	The dominant tree in a narrow band along the upper edge of a sandstone escarpment. Occurs in dry eucalypt woodland in shallow	Confined largely to State Forest. Locally common but restricted to the northern Broken Back Range near Cessnock, NSW.		The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
		soils.			species.	
Slaty red gum *Eucalyptus glaucina*	V (TSC) V (EPBC)	This species grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	Found only on the north coast of NSW and in separate districts: near Casino (where it can be locally common) and further south, from Taree to Broke, west of Maitland. Scattered occurrences around Singleton. The Survey Area is within the known distribution of this species.	Belford NP – 2	The species has been recorded over 6 km to the north-east of the survey area, however the species was not recorded within the site. There is no potential for a significant impact on this species.	No
Pokolbin mallee *Eucalyptus pumila*	V (TSC)	The single known population occupies north-west-facing slopes derived from sandstone.	Currently known only from a single population west of Pokolbin in the Hunter Valley. Historical records also exist for Wyong and Sandy Hollow, however, has not been recorded recently in these areas.	Pokolbin FR	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Lasiopetalum longistamineum	V (TSC) V (EPBC)	The species typically grows in rich alluvial deposits and flowers in spring. Little is known about this species' ecology or biology.	This species occurs in the Mt Dangar – Gungal area within Merriwa and Muswellbrook LGAs. Three sites are recorded within Goulburn River NP.	Goulburn River NP – 3	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Darwinia biflora	V (TSC) V (EPBC)	The species occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include *Eucalyptus haemastoma, Corymbia gummifera* and/or *E. squamosa*. The vegetation structure is usually woodland, open forest or scrub-heath.	Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai local government areas.	Wollemi NP – 1	The species has been recorded over 6 km to the west of the survey area, however suitable habitat for this species does not occur on the site. There is no potential for a significant impact on this species.	No
Endangered Populations						
Acacia pendula weeping myall	EP (TSC)	Grows on major river floodplains on heavy clay soils, sometimes as the dominant species and forming low open woodlands. Within the Hunter catchment it typically occurs on heavy soils, sometimes at the margins of small floodplains, but also in more undulating locations remote from floodplains, such as at Jerrys Plains.	There are 17 confirmed and four unconfirmed naturally occurring remnants of the *A. pendula* population in the Hunter catchment. These range as far east as Warkworth, and as far west as Kerrabee, west of Sandy Hollow. *Acacia pendula* is not known to occur naturally further north than the Muswellbrook-Wybong area. Eight planted *A. pendula* populations (not naturally occurring) have been recorded in the Hunter, and it is likely that numerous more	Not known to occur in conservation reserves.	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
			planted populations occur.			
Tiger orchid *Cymbidium canaliculatum*	EP (TSC)	This species occurs within dry sclerophyll forests and woodlands of tablelands and western slopes, growing in hollows of trees. It is usually found occurring singly or as a single clump, typically between two and six metres above the ground.	The population of *Cymbidium canaliculatum* in the Hunter Catchment is at the south-eastern limit of the geographic range for this species.	Not known to occur in conservation reserves.	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
River red gum *Eucalyptus camaldulensis*	EP (TSC)	River red gums are located on the banks and floodplains of watercourses on alluvial soils. This endangered population may occur with Eucalyptus tereticornis, Eucalyptus melliodora, Casuarina cunninghamiana subsp. cunninghamiana and Angophora floribunda.	The Hunter population occurs as far east as Hinton, east of Maitland, west to Bylong, and north to near Scone. Currently only 28 populations are known in the Hunter Valley, covering an area of only 83 hectares and constituting about 1840 trees, and occurring over a range of at least 2000 km^2.	Not known to occur in conservation reserves.	The species has been recorded over 4 km to the west of the survey area, however the species was not recorded within the survey area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Leionema lamprophyllum subsp*. obovatum*	EP (TSC)	Found on a rocky cliff line in a dry eucalypt forest.	The Hunter Catchment population of *L. lamprophyllum* subsp. *obovatum* is currently known to occur in Pokolbin State Forest. The total number of mature individuals is estimated to be very low with only 4 individuals currently known.		The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Endangered Ecological Communities						
Hunter Lowland Redgum Forest	EEC (TSC)	This EEC occurs on the Permian sediments of the Hunter Valley floor. Much of the remaining community is disturbed and fragmented. The floristic composition and structure of the community is influenced by both the size and disturbance history of the remaining fragments. Consequently at heavily disturbed sites only some of the species which characterise the community may be present.	This EEC occurs from Muswellbrook to the Lower Hunter in the Sydney Basin and North Coast bioregions. It has been recorded from the Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton LGAs, but may occur elsewhere in these bioregions.		The site does not provide suitable habitat for this community and it has not been recorded at the site. There is no potential for a significant impact on this community.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
River-Flat Eucalypt Forest on Coastal Floodplains	EEC (TSC)	Given its habitat, the community has an important role in maintaining river ecosystems and riverbank stability. Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Generally occurs below 50 m elevation, but may occur on localised river flats up to 250 m above sea level.	Known from parts of the LGAs of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Palerang, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions.		The site does not provide suitable habitat for this community and it has not been recorded at the site. There is no potential for a significant impact on this community.	No
Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	EEC (TSC) PD	This community generally occurs on Permian sediments in the Hunter Valley. This community is typically identified on slopes and undulating hills and forms a woodland or open forest. Typical canopy layer species are inclusive of (*Eucalyptus crebra*) and (*Eucalyptus moluccana*).	This community is distributed throughout the NSW North Coast and Sydney Basin Bioregion. It has been recorded from the LGAs of Muswellbrook, Singleton and Cessnock, but may occur elsewhere in the Sydney Basin Bioregion.		The community occurs at the site. It is not potentially sensitive to the development because no natural vegetation will be impacted.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Fauna						
Black-necked stork *Ephippiorhynchus asiaticus*	E (TSC)	Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries.	This species is widespread across coastal northern and eastern Australia, becoming uncommon further south into NSW, and rarely found south of Sydney.		This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Glossy black-cockatoo *Calyptorhynchus lathami*	V (TSC)	Habitat for this species includes forests on low-nutrient soils, specifically those containing key Allocasuarina feed species. They will also eat seeds from eucalypts, angophoras, acacias, cypress pine and hakeas, as well as eating insect larvae. Breeding occurs in autumn and winter, with large hollows required.	The glossy black-cockatoo has a sparse distribution along the east coast and adjacent inland areas from western Victoria to Rockhampton in Queensland. In NSW, it has been recorded as far inland as Cobar and Griffith.	Wollemi NP – 136 Yengo NP – 61 Mount Royal NP – 8 Manobolai NR - 6 Barrington Tops NP – 9	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. Allocasurina is present on the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Gang-gang cockatoo *Callocephalon fimbriatum*	V (TSC)	In summer this species occurs in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter this species moves to drier more open eucalypt forests and woodlands. It favours old growth trees for nesting and roosting.	In NSW this species occurs from the south east coast to the Hunter region and inland to the Central Tablelands and South-west Slopes.	Wollemi NP – 193 Yengo NP - 97 Barrington Tops NP – 1	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Swift parrot *Lathamus discolor*	E (TSC) E (EPBC)	This species often visits box-ironbark forests, feeding on nectar and lerps. In NSW, typical tree species in which it forages include mugga ironbark, grey box, swamp mahogany, spotted gum, red bloodwood, narrow-leaved red ironbark, forest red gum and yellow box.	In NSW this species has been recorded from the western slopes region along the inland slopes of the Great Dividing Range, as well as forests along the coastal plains from southern to northern NSW.	Wollemi NP – 2	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Turquoise parrot *Neophema pulchella*	V (TSC)	This species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It nests in tree hollows, logs or posts, from August to December.	The turquoise parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.	Wollemi NP – 81 Yengo NP – 26	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Powerful owl *Ninox strenua*	V (TSC)	The powerful owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It generally requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation.	The powerful owl occurs in eastern Australia, mostly on the coastal side of the Great Dividing Range, from south western Victoria to Bowen in Queensland.	Wollemi NP – 34 Yengo NP – 12 Mt Royal NP – 6 Belford NP - 1 Manobolai NR - 3 Barrington Tops NP – 9	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Barking owl *Ninox connivens*	V (TSC)	Habitat for this species includes dry forests and woodlands, often in association with hydrological features such as rivers and swamps.	The barking owl is distributed sparsely throughout temperate and semi-arid areas of mainland Australia, however it is most abundant in the tropical north. Most records for this species occur west of the Great Dividing Range.	Wollemi NP – 6 Yengo NP – 9 Manobolai NR - 1 Barrington Tops NP – 1	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Masked owl *Tyto novaehollandiae*	V (TSC)	This species is generally recorded from open forest habitat with sparse mid-storey but patches of dense, low ground cover. It is also recorded from ecotones between wet and dry eucalypt forest, along minor drainage lines and near boundaries between forest and cleared land.	The masked owl occurs sparsely throughout the continent and nearby islands, including Tasmania and New Guinea.	Wollemi NP – 5 Yengo NP – 3 Mt Royal NP – 4 Manobolai NR - 1 Barrington Tops NP – 12	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Brown treecreeper *Climacteris picumnus*	V (TSC)	Typical habitat for this species includes drier forests, woodlands and scrubs with fallen branches; river red gums on watercourses and around lake-shores; paddocks with standing dead timber; and margins of denser wooded areas. This	This species occurs over central NSW, west of the Great Dividing Range and sparsely scattered to the east of the divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys.	Wollemi NP – 91 Yengo NP – 10 Manobolai NR - 9	This species has been previously recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
		species prefers areas without a dense understorey.				
Speckled warbler *Chthonicola sagittata*	V (TSC)	The speckled warbler occurs in eucalypt-dominated communities that have a grassy understorey, leaf litter and shrub cover, often on rocky ridges or in gullies.	Patchy distribution throughout south-eastern Queensland, eastern half of NSW and into Victoria, as far west as the Grampians.	Wollemi NP – 39 Yengo NP – 13 Belford NP - 2 Manobolai NR - 8	This species has been previously recorded near the site. There is no potential for a significant impact on this species.	No
Regent honeyeater *Anthochaera phrygia*	E (TSC) E (EPBC)	This species generally occurs in temperate eucalypt woodlands and open forests of south eastern Australia. It is commonly recorded from box-ironbark eucalypt associations, wet lowland coastal forests dominated by swamp mahogany, spotted gum and riverine Casuarina woodlands. An apparent preference exists for the wettest, most fertile sites within these associations, such as creek flats, river valleys and foothills.	Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland.	Wollemi NP – 38 Yengo NP - 3	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Black-chinned honeyeater (eastern subspecies) *Melithreptus gularis gularis*	V (TSC)	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*), Yellow Box (*Eucalyptus melliodora*) and Forest Red Gum (*Eucalyptus tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	The subspecies is widespread, from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond River district. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions.	Yengo NP – 12 Wollemi NP – 66	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Painted honeyeater *Grantiella picta*	V (TSC)	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	The greatest concentrations of this species bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution.	Wollemi NP – 4	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Hooded robin *Melanodryas cucullata*	V (TSC)	Hooded robins are found in lightly timbered woodland, mainly dominated by acacia and/or eucalypts.	Hooded robins are found all over mainland Australia, except Cape York and eastern Gulf of Carpentaria or inland around the Simpson Desert, on the Nullarbor Plain or south of the Kimberley Ranges. They are more commonly found in south-eastern Australia from Adelaide to Brisbane.	Wollemi NP - 2	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Grey-crowned babbler *Pomatostomus temporalis temporalis*	V(TSC)	Open box-gum woodlands on the slopes. Box-cypress-pine and open box woodlands on alluvial plains. Also found in acacia shrubland and adjoining areas.	Occurs throughout northern and south-eastern Australia. In NSW, this species occurs on the western slopes of the Great Dividing Range and on the western plains reaching as far west as Louth and Hay. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW.	Belford NP – 1 Wollemi NP – 5 Yengo NP – 6 Belford NP - 2	This species occurs within the site and there is evidence of it breeding on the site. There is no potential for a significant impact on this species.	No
Diamond firetail *Stagonopleura guttata*	V (TSC)	Habitat includes a range of eucalypt dominated communities with a grassy understorey, including woodland, forest and mallee. It appears that populations are unable to persist in areas where there are no vegetated remnants	The diamond firetail occurs through central and eastern NSW, north into southern and central Queensland and south through Victoria to South Australia. In NSW it mainly occurs west of the Great Dividing Range, although populations are known from drier coastal areas such as the Cumberland Plain and the	Wollemi NP – 18	This species has been previously recorded near the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
		larger than 200 hectares.	Hunter, Clarence, Richmond and Snowy River valleys.			
Giant barred frog *Mixophyes iteratuts*	E (TSC)	This species forages and lives amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m. They breed around shallow, flowing rocky streams.	Coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. North-eastern NSW, particularly the Coffs Harbour-Dorrigo area, is now a stronghold.		The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Red-crowned toadlet *Pseudophryne australis*	V (TSC)	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters.	This species is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.	Wollemi NP - 48 Yengo NP - 27	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Green and golden bell frog *Litoria aurea*	E (TSC) V (EPBC)	Occurs amongst emergent aquatic or riparian vegetation and amongst vegetation, fallen timber, including grassland, cropland and modified pastures. Breeds in still or slow flowing waterbodies with some vegetation such as *Typha* spp. and *Eleocharis* spp.	NSW North Coast near Brunswick Heads, southwards along the NSW Coast to Victoria where it extends into east Gippsland. The Survey Area is close to the inland limit of this species' known distribution.		The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Spotted-tailed quoll *Dasyurus maculatus*	V (TSC) E (EPBC)	Habitat for this species is highly varied, ranging from sclerophyll forest, woodlands, coastal heathlands and rainforests. Records exist from open country, grazing lands and rocky outcrops. Suitable den sites including hollow logs, tree hollows, rocky outcrops or caves.	In NSW the spotted-tailed quoll occurs on both sides of the Great Dividing Range, with the highest densities occurring in the north east of the state. It occurs from the coast to the snowline and inland to the Murray River.	Wollemi NP – 9 Yengo NP – 1 Mt Royal NP – 15 Belford NP - 1 Barrington Tops NP – 33	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Brush-tailed phascogale *Phascogale tapoatafa*	V (TSC)	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter.Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	This species has a patchy distribution around the coast of Australia. In NSW it is more frequently found in forest on the Great Dividing Range in the north-east and south-east of the State. There are also a few records from central NSW.	Mt Royal NP – 1 Barrington Tops NP – 5	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Koala *Phascolarctos cinereus*	V (TSC)	This species inhabits eucalypt forest and woodland, with suitability influenced by tree species and age, soil fertility, climate, rainfall and fragmentation patterns. The species is known to feed on a large number of eucalypt and non-eucalypt species, however it tends to specialise on a small number in different areas. Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis, E. microcorys, E. robusta, E. albens, E. camaldulensis and E populnea are some preferred species.	The koala has a fragmented distribution throughout eastern Australia, with the majority of records from NSW occurring on the central and north coasts, as well as some areas further west. It is known to occur along inland rivers on the western side of the Great Dividing Range.	Wollemi NP – 38 Yengo NP - 66 Mt Royal NP – 6 Manobolai NR - 2 Barrington Tops NP – 22	This species has been previously recorded on the Bulga Complex; however, the species was not detected within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Yellow-bellied glider *Petaurus australis*	V (TSC)	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests	The yellow-bellied glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Yengo NP - 64 Werakata NP - 9 Watagans NP – 9 Sugarloaf SCA	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
		in the north; moist coastal gullies and creek flats to tall montane forests in the south.				
Squirrel glider *Petaurus norfolcensis*	V (TSC)	Inhabits a variety of mature or old growth habitats, including box, box-ironbark woodlands, river red gum forest, and blackbutt-bloodwood forest with heath understorey. It prefers mixed species stands with a shrub or acacia mid-storey, and requires abundant tree hollows for refuge and nest sites.	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.	Wollemi NP – 20 Yengo NP – 4 Mt Royal NP – 1	There is no potential for a significant impact on this species.	No
Brush-tailed rock-wallaby *Petrogale penicillata*	E (TSC) V (EPBC)	This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. It browses on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. This species shelters or bask during	The brush-tailed rock-wallaby was once abundant and ubiquitous throughout the mountainous country of south-eastern Australia. Its distribution roughly followed the Great Dividing Range for 2500km from the Grampians in West Victoria to Nanango in south-east Queensland, with outlying populations in coastal valleys and ranges to the east of the divide, and the slopes and plains as far west as Cobar in NSW and	Wollemi NP – 75 Yengo NP – 28 Manobolai NR - 3 Barrington Tops NP – 2	The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
		the day in rock crevices, caves and overhangs and is most active at night.	Injune (500km NW of Brisbane) in Queensland.			
Grey-headed flying-fox *Pteropus poliocephalus*	V (TSC) V (EPBC)	This species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Grey-headed flying-foxes are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria.	Yengo NP – 9 Wollemi NP – 32 Barrington Tops NP – 1	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Eastern freetail-bat *Mormopterus norfolkensis*	V (TSC)	This species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures.	The eastern freetail-bat is found along the east coast from south Queensland to southern NSW.	Wollemi NP – 18 Yengo NP – 6 Manobolai NR - 1 Belford NP - 1 Barrington Tops NP – 1	This species has been previously recorded on the Bulga Complex; however, the species was not surveyed within the site. Tree hollows are present on the site and it could occur there. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Little bentwing-bat *Miniopterus australis*	V (TSC)	Prefers moist eucalypt forest, rainforest or dense coastal banksia scrub. This species roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Occurs in coastal north-eastern NSW and eastern Queensland.	Wollemi NP - 3	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Eastern bentwing-bat *Miniopterus schreibersii oceanensis*	V (TSC)	This species hunts in forested areas and uses caves as the primary roosting habitat, but also uses derelict mines, storm-water tunnels, buildings and other man-made structures. It forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Eastern bent-wing bats occur along the east and north-west coasts of Australia.	Yengo NP – 21 Wollemi NP – 62 Mount Royal NP – 1 Belford NP - 2 Manobolai NR - 1 Barrington Tops NP – 4	This species has been previously recorded on the Bulga Complex; however, the species was not surveyed at this site. Although the site does not provide suitable roosting habitat, it does provide suitable foraging habitat for this species. However, there is no potential for a significant impact on this species.	No
Eastern long-eared bat (SE form) *Nyctophilus timoriensis*	V (TSC)	Inhabits a variety of vegetation types, including mallee, buloak *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species.	Manobolai NR - 1 Wollemi NP - 2	This species has not been previously recorded on the Bulga Complex; however, the species was not surveyed within the site. Tree hollows are present on the site and it could occur there. There is no potential for a significant	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
		box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.			impact on this species.	
Large-eared pied bat *Chalinolobus dwyeri*	V (TSC) V (EPBC)	The large-eared pied bat is generally found in a variety of drier habitats, including dry sclerophyll forests and woodlands, however, it probably tolerates a wide range of habitats. It tends to roost in the twilight zones of mines and caves, generally in colonies or common groups.	This species has a distribution from south western Queensland to NSW from the coast to the western slopes of the Great Dividing Range.	Wollemi NP – 79 Yengo NP – 37 Manobolai NR - 3	This species has been previously recorded on the Bulga Complex; however, the species was not surveyed within the site. The site does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No
Eastern false pipistrelle *Falsistrellus tasmaniensis*	V (TSC)	Habitat for this species includes sclerophyll forest. It prefers wet habitats, with trees over 20 metres high, and generally roosts in tree hollows or trunks.	This species has a range from south eastern Queensland, through NSW, Victoria and into Tasmania, and occurs from the Great Dividing Range to the coast.	Wollemi NP – 39 Yengo NP – 2 Barrington Tops NP – 2	This species has been previously recorded on the Bulga Complex; however, the species was not surveyed within the site. Tree hollows are present on the site and it could occur there. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Large-footed myotis *Myotis adversus*	V (TSC)	This species generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. It forages over streams and pools catching insects and small fish by raking its feet across the water surface.	The large-footed myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers.	Wollemi NP – 4 Belford NP - 1	This species has not been previously recorded on the Bulga Complex; however, the species was not surveyed within the site. Tree hollows are present on the site and it could occur there. There is no potential for a significant impact on this species.	No
Greater broad-nosed bat *Scoteanax rueppellii*	V (TSC)	The greater broad-nosed bat appears to prefer moist environments such as moist gullies in coastal forests, or rainforest. They have also been found in gullies associated with wet and dry sclerophyll forests and open woodland. It roosts in hollows in tree trunks and branches and has also been found to roost in the roofs of old buildings.	The greater broad-nosed bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however it does not occur at altitudes above 500 m.	Wollemi NP – 21 Yengo NP – 11 Barrington Tops NP – 1	This species has not been previously recorded on the Bulga Complex; however, the species was not surveyed within the site. Tree hollows are present on the site and it could occur there. It is potentially sensitive to the development.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Site	Reservation in the Region	Occurrence in Site and Potential for Significant Impact	Detailed Assessment of Significance Required?
Eastern cave bat *Vespadelus troughtoni*	V (TSC)	This species is a cave-roosting bat that is usually found in dry open forest and woodland, near cliffs or rocky overhangs. It has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals, and is occasionally found along cliff-lines in wet eucalypt forest and rainforest.	The eastern cave bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT.	Wollemi NP – 9 Manobolai NR - 1 Yengo NP - 2	The site does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

E: endangered
CEEC: critically endangered ecological community
EEC: endangered ecological community
EPBC: Environment Protection Biodiversity Conservation Act
K: poorly known
LGA: Local Government Area
NR: Nature Reserve
NP: National Park
PD: preliminary determination
TSC: Threatened Species Conservation Act
V: vulnerable

APPENDIX 7

Archaeological AHIMS Search Results

Fax to:	Nicola Roche	of:	Umwelt(Australia)Pty Ltd
Fax no:	4950 5737		
From:	Shannon Freeburn	of:	Culture & Heritage Division
Phone:	9585 6471		
cc:			
Date:	07/04/2009	No of pages (including this page):	

RE: Emegency AHIMS Search

Hi Nicola

Here is your express AHIMS result's .

Regards,

Shannon Freeburn

PO Box 1967, Hurstville NSW 2220
43 Bridge Street, Hurstville NSW
Tel: (02) 9995 5000 Fax: (02) 9585 6555
ABN 30 841 387 271
www.environment.nsw.gov.au

Department of **Environment & Climate Change** NSW

Department of
Environment and Climate Change (NSW)

Your reference : [Unknown]
Our reference : AHIMS #25558

Umwelt (Australia) Pty Limited
PO Box 838
Toronto NSW 2283

Tuesday, 07 April 2009

Attention: Nicola Roche

Dear Sir or Madam:

Re: AHIMS Search for the following area at E:323000-326000;N:6382000-6384000

I am writing in response to your recent inquiry in respect to Aboriginal objects and Aboriginal places registered with the NSW Department of Environment and Climate Change (DECC) at the above location.

A search of the DECC Aboriginal Heritage Information Management System (AHIMS) has shown that *10* Aboriginal objects and Aboriginal places are recorded in or near the above location. Please refer to the attached report for details.

The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.

The following qualifications apply to an AHIMS search:

- AHIMS only includes information on Aboriginal objects and Aboriginal places that have been provided to DECC;
- Large areas of New South Wales have not been the subject of systematic survey or recording of Aboriginal history. These areas may contain Aboriginal objects and other heritage values which are not recorded on AHIMS;
- Recordings are provided from a variety of sources and may be variable in their accuracy. When an AHIMS search identifies Aboriginal objects in or near the area it is recommended that the exact location of the Aboriginal object be determined by re-location on the ground; and
- The criteria used to search AHIMS are derived from the information provided by the client and DECC assumes that this information is accurate.

All Aboriginal places and Aboriginal objects are protected under the *National Parks and Wildlife Act 1974* (NPW Act) and it is an offence to destroy, damage or deface them without the prior consent of the DECC Director-General. An Aboriginal object is considered to be known if:

- It is registered on AHIMS;
- It is known to the Aboriginal community; or
- It is located during an investigation of the area conducted for a development application.

PO Box 1967 Hurstville NSW 2220
43 Bridge Street Hurstville NSW 2220
Telephone (02) 9585 6345
Facsimile (02) 9585 6094
ABN 30 841 387 271
ahims@environment.nsw.gov.au
www.environment.nsw.gov.au

If you considering undertaking a development activity in the area subject to the AHIMS search, DECC would recommend that an Aboriginal Heritage Assessment be undertaken. You should consult with the relevant consent authority to determine the necessary assessment to accompany your development application.

Yours Sincerely

Freeburn, Shannon
Administrator
Information Systems & Assessment Section
Culture & Heritage Division
Phone: 02 9585 6471
Fax: 02 9585 6094

AHIMS Aboriginal Heritage Information Management System

Department of Environment & Climate Change NSW

List of Sites (List - Short)

Emergency Search

Grid Reference Type = AGD (Australian Geodetic Datum), Zone = 56, Easting From = 323000, Easting to = 326000, Northing From = 6382000, Northing to = 6384000, Feature Search Type = AHIMS Features

Site ID	Site Name	Datum	Zone	Easting	Northing	Context	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)	State Arch. Box No (for office use only)
37-6-0144	Nine Mile Creek ;	AGD	56	323435	6383433	Open Site	AFT : -	Open Camp Site	Dyall	311, 1452	NRS/17798/1/229
		Status Destroyed									
		Primary Contact							Permit(s)		
37-6-0145	Nine Mile Creek;	AGD	56	324349	6383450	Open Site	AFT : -	Open Camp Site	ASRSYS	311, 669	NRS/17798/1/229
		Status Valid									
		Primary Contact							Permit(s)		
37-6-0584	South Bulga 1;Saxonvale Coal;	AGD	56	324760	6382050	Open Site	AFT : -	Open Camp Site	Klaver, Navin	2268	NRS/17798/1/235
		Status Destroyed									
		Primary Contact							Permit(s) 842, 3066, 3085		
37-6-0757	IF 1 Bulga Sth.;	AGD	56	324600	6382100	Open Site	AFT : -	Isolated Find	Klaver, Navin	2268	NRS/17798/1/237
		Status Valid									
		Primary Contact							Permit(s) 842		
37-6-1410	BCO18	AGD	56	323115	6382572	Open Site	AFT : -	None	Wilson, McAdam, Mathews		NRS/17798/1/246
		Status Valid									
		Primary Contact							Permit(s)		
37-6-1411	BCO19	AGD	56	323704	6382378	Open Site	AFT : -	None	Wilson, McAdam, Mathews		NRS/17798/1/246
		Status Valid									
		Primary Contact							Permit(s)		
37-6-1412	BCO20	AGD	56	323396	6382111	Open Site	AFT : -	None	Wilson, McAdam, Mathews		NRS/17798/1/246
		Status Valid									
		Primary Contact							Permit(s)		
37-6-1797	XCN 1	AGD	56	324165	6382264	Open Site	AFT : 1	None	Umwelt (Australia) Pty Limited		
		Status Valid									
		Primary Contact							Permit(s) 2890, 2891		

List of Sites (List - Short)

Emergency Search

Grid Reference Type = AGD (Australian Geodetic Datum), Zone = 56, Easting From = 323000, Easting to = 326000, Northing From = 6382000, Northing to = 6384000, Feature Search Type = AHIMS Features

Site ID	Site Name	Datum	Zone	Easting	Northing	Context	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)	State Arch. Box No (for office use only)
37-6-1930	BDS18	AGD	56	324927	6382125	Open Site	AFT : 6	None	Umwelt (Australia) Pty Limited	101207	
		Status Destroyed									
		Primary Contact							Permit(s) 3066, 3085		
37-6-1934	BDS3	AGD	56	323709	6382089	Open Site	AFT : 6	None	Umwelt (Australia) Pty Limited	101207	
		Status Valid									
		Primary Contact							Permit(s)		

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2/20 The Boulevarde
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Toronto NSW 2283

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Fax 02 4950 5737