appendix 11

Greenhouse Gas and Energy Assessment

Oceanic Coal Australia Limited

West Wallsend Colliery
Continued Operations Project

Greenhouse Gas and Energy Impact Assessment

May 2010

Umwelt
Environmental Consultants

West Wallsend Colliery
Continued Operations Project

Greenhouse Gas and
Energy Impact Assessment

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

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Executive Summary

This Greenhouse Gas and Energy Impact Assessment (GHGEIA) provides an analysis and estimate of the greenhouse gas (GHG) and energy impacts associated with the West Wallsend Continued Operations Project (the Project). West Wallsend Colliery (WWC) is an underground coal mine located approximately one kilometre east of Killingworth and approximately 1.25 kilometres south-west of Barnsley within the Newcastle Coalfields of New South Wales (NSW). WWC is located in the Lake Macquarie Local Government Area (LGA). WWC is operated by Oceanic Coal (Australia) Pty Limited (OCAL) on behalf of the Macquarie Coal Joint Venture (MCJV). OCAL, which also owns OCAL Macquarie Pty Ltd, is wholly-owned by Xstrata Coal Pty Limited.

The overall aim of the project application is to provide for the continuation of longwall mining in CCL 718, 725 and ML 1451, for the continued operation of the existing surface facilities and to enable continued operations under one consolidated approval that will cover the remaining operations of WWC. At present the requirement for an updated approval is based on the fact that two small portions of the future workings (CCL 725 and ML 1451) of WWC are currently based upon the Savings Provisions of the Lake Macquarie Local Environmental Plan (LEP) which will expire in December 2010 and hence WWC will require a new development consent for these areas.

No significant changes to the existing underground mining or associated surface operations are proposed, the existing operations will continue as per the current operations. The only substantial modification to the surface operations is the proposed mining services facility. Coal haulage and coal preparation are covered by existing separate approvals, to which no changes are proposed as a part of the project application.

Approval for the Major Project is being sought under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Umwelt (Australia) Pty Limited (Umwelt) has been engaged by OCAL to complete the Environmental Assessment (EA) of which the GHGEIA is part. The Project will require the approval of the NSW Minister for Planning. The GHGEIA has been prepared to comply with the NSW Department of Planning, Director-General's Requirements (DGRs) for the Project, including a comprehensive assessment of the predicted Scope 1, Scope 2 and Scope 3 GHG emissions.

The estimated GHG emissions that are expected to result from the Project are:

Scope 1 Total direct (Scope 1) GHG emissions from the proposed WWC operations are **4,296,963.55 t CO_2-e**. WWC have direct influence over these emissions and will be the subject of management and mitigation plans. The GHG emissions that occur onsite that are a direct result of project operations account for **only 5.4 per cent of the estimated total** direct and indirect WWC operations.

Scope 2 Total indirect (Scope 2) GHG emissions that are also required to operate the project are **557,524.84 t CO_2-e**. WWC have no direct influence over how efficiently these emissions are generated. Management and mitigation measures however can include energy reduction and energy efficiency measures to reduce this indirect emission.

Scope 3 Total indirect and downstream (Scope 3) GHG emissions over which WWC have no management or mitigation control is **74,501,679 t CO_2-e**. These emissions are generated by the offsite transport (rail and shipping) and

combustion of WWC thermal coal to generate electricity and coking coal in steel manufacture in domestic and international markets.

These emission totals are also expected to be captured by national and global GHG emissions inventories.

Energy — The Project will consume an estimated total of **314,195.40 GJ** per annum and an estimated **2,827,758.53 GJ** of energy from the combustion of diesel oil and the purchase of electricity.

Total — The total GHG emissions from the proposed Project are **79,356,167.39 t CO_2-e. WWC have no direct management or control over the combustion, management efficiency or mitigation measures of 94.6 per cent** of the GHG emissions that result from the Project.

The proposed Project GHG emissions (Scope 1, Scope 2 and Scope 3 emissions) will contribute **0.03 per cent** to current global GHG emissions and **1.479 per cent** to current national GHG emissions.

The Project will seek to provide for maximum resource extraction with maximum efficiency. WWC will also assess and consider implementation, where feasible, of greenhouse gas and energy management and mitigation initiatives during the design, operation and decommissioning of the Project. The current Project GHG end energy mitigation measures are largely focused on energy management, energy efficiency and the potential reduction in automotive diesel oil consumption for mine plant and equipment.

The energy efficiency and GHG reduction targets identified by XC and implemented by WWC are consistent with the GHG emission reduction target adopted by Lake Macquarie City Council. The Lake Macquarie Local Environment Plan states that the Council has adopted a three per cent per annum reduction in GHG emissions (measured on a per capita basis) and a city-wide decrease in GHG emissions of 30 percent by 2018 (LMCC, 2009).

WWC has prepared an Energy Savings Action Plan (ESAP) as part of their requirements under the NSW Government's ESAP legislation (DEUS, 2005). The purpose of the ESAP was to review energy usage, identify energy savings opportunities, and implement on-going energy management activities.

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APPENDICES

1.0 Introduction

This Greenhouse Gas and Energy Impact Assessment (GHGEIA) report provides an analysis and estimate of the greenhouse gas (GHG) and energy impacts associated with the West Wallsend Continued Operations Project (the Project). West Wallsend Colliery (WWC) is an underground coal mine located approximately one kilometre east of Killingworth and approximately 1.25 kilometres south-west of Barnsley within the Newcastle Coalfields of New South Wales (NSW). WWC is located in the Lake Macquarie Local Government Area (LGA). WWC is operated by Oceanic Coal (Australia) Pty Limited (OCAL) on behalf of the Macquarie Coal Joint Venture (MCJV). OCAL, which also owns OCAL Macquarie Pty Ltd, is wholly-owned by Xstrata Coal Pty Limited.

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No significant changes to the existing underground mining or associated surface operations are proposed, the existing operations will continue as per the current operations. The only substantial modification to the surface operations is the proposed mining services facility. Coal haulage and coal preparation are covered by existing separate approvals, to which no changes are proposed as a part of the project application.

1.1 Assessment Requirements

Approval for the Major Project is being sought under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Umwelt (Australia) Pty Limited (Umwelt) has been engaged by OCAL to complete the Environmental Assessment (EA) of which the GHGEIA is part. The Project will require the approval of the NSW Minister for Planning.

The GHGEIA has been prepared to comply with the NSW Department of Planning, Director-General's Requirements (DGRs) for the Project, including a comprehensive assessment of the predicted Scope 1, Scope 2 and Scope 3 GHG emissions. Reference will also be made to the commitments detailed in the West Wallsend Energy Savings Action Plan (ESAP) Action Items (WWC, 2008). Energy Savings Action Plans are developed with reference to the Guidelines for Energy Savings Action Plans (DEUS, 2005).

An address of the Lake Macquarie City Council's Greenhouse Gas Reduction Target Policy Version 01 (LMCC, 2008) is also provided in this GHGEIA. The Lake Macquarie Local Environment Plan states that the Council has adopted a three per cent per annum reduction in GHG emissions (measured on a per capita basis) and a city-wide decrease in GHG emissions of 30 percent by 2018 (LMCC, 2009).

1.2 Description of the Proposed Development

The key features of the Project are outlined below in **Table 1.1**. No modifications to existing coal haulage approval (DA-89-0012) or coal preparation activities (1981 Stockton Borehole Consent), are sought as part of the current application.

Table 1.1 – Key Features of West Wallsend Continued Operations Project

Major Project Components/Aspects	Proposed Operations
Limits on Extraction	Up to 5.5Mtpa Run of Mine (ROM)*
Estimated Mine Life	Approximately 12 to 15 years of mining
Operating Hours	24 hours per day, 7 days per week
Number of Employees	Approximately 390 full time equivalents
Mining Methods	Underground Mining – longwall method
Mining Areas	All existing and proposed mining within CCL 718, 725 and ML 1451
Infrastructure	Existing West Wallsend Pit Top infrastructure Existing No.2, No.3 Vent Shafts and existing ballast borehole Existing Longwall 11 borehole facility Proposed future ventilation infrastructure and minor surface infrastructure Proposed Mining Services Facility

* Allows for variations in production schedule

1.3 Existing Operations

The existing pit top facilities are comprised of infrastructure required to support the operation of the mine. The infrastructure includes the main car park, administration buildings, stores, workshops, main drift and shaft, surface conveyors, 2000 tonne coal storage bin and haul road loop. The No.2 and No.3 fans shafts are both existing fan sites that will continue to be used for the continued operations at WWC, with no modifications to the existing installations.

WWC currently mines the West Borehole coal seams using longwall mining techniques. The majority of the coal from WWC is washed and loaded onto trains at the MCPP to be transported to Newcastle Port for export. A minor percentage of coal mined from WWC has been periodically transported from MCPP to Eraring Power Station via coal haul trucks on a private coal haul road. Continued longwall mining at WWC is proposed to be undertaken in two main areas, referred to as the Western and Southern domains. Mining is currently being undertaken in longwall 38 in the Western domain.

1.3.1 Coal Mining, Handling and Transport

WWC extracts black (bituminous) thermal and coking coal from the Borehole and West Borehole coal seams of the Newcastle Coalfields of NSW using underground longwall retreating method. WWC is classified as a Class A Mine ('gassy') according to the National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2009 (DCC, 2009) (NGER Technical Guidelines).

The estimated mass of run-of-mine (ROM) coal to be mined from WWC has been provided to Umwelt by WWC as part of the EA consultation process. The proposed Project seeks to extract up to 5.5 million tonnes per annum (Mtpa) of ROM over approximately 12 years. The life-of-mine (LOM) ROM estimates an average extraction of 3.96 Mtpa of ROM over a 9 year period. The ROM coal is transported from underground via a conveyor belt to the surface breaker building. The coal is sized and conveyed from the breaker building into a 2000 tonne ROM surface bin where it is loaded into trucks and transported via a 3.5 kilometre private haul road to Macquarie Coal Preparation Plant (MCPP).

Washed coal is carried by conveyor to the rail siding at MCPP for loading onto trains for transport to domestic markets and Port Waratah Coal Service (PWCS). The majority of washed coal is shipped from PWCS at Newcastle Port to Asian markets including Taiwan, Japan and the Republic of Korea. Domestic markets include power stations and steel manufacturers.

2.0 Assessment Framework

2.1 Objectives

The objective if this GHGEIA is to estimate the energy consumed, GHG emitted and energy produced that are expected to be a direct and indirect result from the proposed Project. Placement of the Project at an LGA, a national and global climate change context, according to the principles of ecologically sustainable development (ESD) context is also included (refer to **Section 5.0**). The scope of the GHGEIA is as follows:

- GHG emissions, energy produced and energy consumed from the extraction of (up to) 5.5 Mtpa of ROM thermal and coking coal;
- GHG emissions, energy produced and energy consumed from the extraction of (up to) 35.97 Mt of ROM thermal and coking coal over the LOM;
- GHG emissions produced, energy consumed from the transport of the thermal and coking coal product from WWC to domestic and international markets;
- GHG emissions produced and energy produced from the combustion of the thermal coal product in national and international electricity generation markets;
- GHG emissions produced and energy produced from the combustion of the coking coal product in national and international steel manufacturing markets;
- placement of the estimated GHG emissions from the Project in LGA, national and global GHG reporting accounts and targets, according to the principles of ESD; and
- management and mitigation framework and objectives currently implemented by XC direct WWC in reducing energy and GHG emissions generated from the Project.

2.2 Scope

All methodology and calculations (refer to **Appendix A and B**) are made within the parameters that no significant changes to the existing underground mining or associated surface operations are proposed, the existing operations will continue as per the current operations.

A detailed description of the national, international and industry reports and guidelines used in this GHGEIA is provided in **Appendix A**.

The standard approach to coverage of sources of GHG emissions, energy consumed and energy produced, is set out in the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act) and the National Greenhouse and Energy Determination (the NGER Determination 2009). The National Greenhouse Accounts Factors (NGAF) (DCC, 2009a), as proposed by the Project DGRs, refer to the default methodology (Method 1) of the NGER Determination. The specified Scope 1, Scope 2 and Scope 3 emission categories are assessed as follows (DCC, 2009):

Scope 1 Scope 1 (direct) emissions are the GHG emissions which occur as a direct result of activities at a Project. Direct emissions are emissions over which entities have a high level of control. Point source emissions from the proposed Project are considered as to be occurring within the boundary of WWC.

Scope 2 Scope 2 (energy indirect) emissions cover GHG emissions from the generation of purchased electricity, steam, heating or cooling consumed by a Project. These indirect emissions can be measured easily and can be significantly influenced 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 Project, but occur at sources or facilities not owned or controlled by the entity. Scope 3 emissions or life cycle emissions are an estimate only with a relatively high level of uncertainty, unreliability and variability.

2.2.1 Definitions and Sources

As prescribed by the NGER Act and the NGAF, this report refers to the six Kyoto Protocol GHG (refer to **Appendix A**).

2.2.2 Assumptions and Exclusions

The calculations in this GHGEIA rely directly on data provided by WWC. The report has been written with the assumption that the energy consumption and operational data is complete and accurate. No physical testing or auditing has been conducted by Umwelt to verify the accuracy of the data for this purpose. The activities and emission sources listed in **Table 2.1** are considered variable, immaterial and incidental (IHAP, 2007) for the purposes of this report.

Table 2.1 – West Wallsend Continued Operations Data Exclusions

UNFCCC Category	Emissions Scope	Description
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/contractor activities.
Category 2 Emissions from industrial processes	Scope 1	• Sulphur hexafluoride (high voltage switch gear); • Hydrofluorcarbon (commercial and industrial refrigeration; and • Perfluorocarbon (manufacturing).
Category 6 Emissions from waste disposal	Scope 1	• Disposal of waste generated onsite.

3.0 Assessment Methodology

3.1 Methodology

A detailed description of the national, international and industry methodology used in this GHGEIA to calculate energy produced, energy consumed and GHG emissions, is provided in **Appendix A**.

Xstrata Coal (XC) has also developed a standard methodology and calculator for estimating Scope 3 energy consumption and GHG emissions based on an analysis of all potential Scope 3 emissions from coal mines (XC, 2010). The document is referred to as the XC Scope 3 emissions calculator. This calculator has been verified by SEE Sustainability Pty Limited (SEE Sustainability) and is used in this GHGEIA for the calculation of Scope 3 emissions. The XC analysis determined the only material sources of Scope 3 energy consumption and GHG emissions arise from (XC, 2010):

- Emissions associated with infrastructure development;
- Emissions associated from product transport; and
- Emissions from the end use of the product.

It is understood that the XC Scope 3 Emissions Calculator is based on the methodology outlined in the NGAF (DCC, 2009a). Umwelt has not conducted a review, analysis or assessment of the methodology or formulas used in the XC Scope 3 Emissions Calculator for this purpose.

4.0 Assessment Results

4.1 Project Greenhouse Gas Emissions

Detailed calculations of the Project GHG emissions, energy consumption and energy production, using the methodology detailed in **Appendix A**, are provided in **Appendix B**. A summary of the GHGEIA results are as follows.

The estimated GHG emissions that are expected to result from the Project are as follows:

Scope 1 Total direct (Scope 1) GHG emissions from the proposed WWC operations are **4,296,963.55 t CO_2-e**. WWC have direct influence over these emissions and will be the subject of management and mitigation plans. The GHG emissions that occur onsite that are a direct result of project operations account for **only 5.4 per cent of the estimated total** direct and indirect WWC operations.

Scope 2 Total indirect (Scope 2) GHG emissions that are also required to operate the project are **557,524.84 t CO_2-e**. WWC have no direct influence over how efficiently these emissions are generated. Management and mitigation measures however can include energy reduction and energy efficiency measures to reduce this indirect emission.

Scope 3 Total indirect and downstream (Scope 3) GHG emissions over which WWC have no management or mitigation control is **74,501,679 t CO_2-e**. These emissions can be divided into 'transport of the product', which accounts for **2.9 per cent** of total indirect Scope 3 emissions and 'use of product' which accounts for **97.1 per cent** of total indirect Scope 3 emissions.

These emission totals are also expected to be captured by national and global GHG emissions inventories.

Total The total GHG emissions from the proposed Project are **79,356,167.39 t CO_2-e. WWC have no direct management or control over the combustion, management efficiency or mitigation measures of 94.6 per cent** of the GHG emissions that result from the Project.

The proposed Project GHG emissions (Scope 1, Scope 2 and Scope 3 emissions) will contribute **0.03 per cent** to current global GHG emissions and **1.478 per cent** to current national GHG emissions (refer to **Section 5.0**).

A Summary of the Project GHG emissions is provided in **Table 4.1** below. A summary Project GHG emissions is provided in **Section 4.1** A summary of the Project energy consumption is provided in **Section 4.2** and a summary of the Project energy production is provided in **Section 4.3**

Table 4.1 – Total GHG Emission Summary from Proposed West Wallsend Colliery Project

Scope	UNFCCC Emission Source	Emission Type	Total ($t CO_2.e$)	Onsite Emissions
Scope 1 (Direct)	Onsite Fuel (Fugitive) Combustion (Diesel Oil)	Fuel Combustion	**40,024.88**	**Yes**
	Fugitive Emissions from Coal Mining (Underground)	Fugitive Emissions	**3,753,363.78**	**Yes**
	Fugitive Emissions from Gassy Mines (Post-Mining)	Fugitive Emissions	**503,574.89**	**Yes**
Total Scope 1 (Direct) Emissions tonnes CO_2-e			**4,296,963.55**	**Yes**
Scope 2 (Indirect)	Electricity Consumption Emissions	Purchased Electricity	**557,524.84**	**No**
Total Scope 2 (Indirect) Emissions tonnes CO_2-e			**557,524.84**	**No**
Scope 3 (Indirect)	Indirect Emissions from Domestic (Offsite) Transport	Fuel Combustion	**2,730**	**No**
	Indirect Emissions from Export (Offsite) Transport	Fuel Combustion	**2,146,935**	**No**
	Indirect Emissions from Domestic Product Use - Thermal	Fuel Combustion	**10,316893**	**No**
	Indirect Emissions from Export Product Use - Thermal	Fuel Combustion	**42,854,786**	**No**
	Indirect Emissions from Domestic Product Use - Coking	Fuel Combustion	**3,487,334**	**No**
	Indirect Emissions from Export Product Use - Coking	Fuel Combustion	**15,693,002**	**No**
Total Scope 3 (Indirect) Emissions tonnes CO_2-e			**74,501,679**	**No**
Summary				
Direct Project Emissions - Scope 1			**4,296,963.55**	**Yes**
Indirect Project Emissions – Scope 2 and Scope 3			**75,059,203.84**	**No**
Total Project Emissions (Scope 1 + Scope 2 + Scope 3)			**79,536,167.39**	**Majority No**

4.2 Project Energy Consumption

The Project will consume an estimated total of **314,195.40 GJ** per annum and an estimated LOM total of **2,827,758.53 GJ** of energy content in the combustion of diesel oil and the purchase of offsite electricity (refer to **Appendix B**).

4.3 Project Energy Production

Based on average ROM per year of 3,996,626 tonnes, it is estimated that the proposed Project will produce thermal and coking coal that will have the potential energy production of **107,908,905 GJ** annually and **971, 180, 145 GJ** of energy for the LOM (refer to **Appendix B**).

5.0 Project Impact Summary

Placement of the Project at an LGA level, a national and global climate change context, according to the principles of ecologically sustainable development (ESD) context has been an objective of this report. When considering the principles of intergenerational equity, it is worthwhile noting that as there are no significant changes to the existing operations by the proposed Project, all GHG emissions estimates provided in this report are already a captured and managed as part of existing WWC operations.

The total GHG emissions from the proposed Project are **79,536,167.39** t CO_2-e, including Scope 1, Scope 2 and Scope 3 GHG emissions of the LOM. **WWC have no direct management or control over the combustion, management efficiency or mitigation measures of 94.6 per cent** of the GHG emissions that result from the Project.

Of these indirect and downstream emissions over which XC or WWC has no direct management control, an estimated 2.9 per cent of these emissions are derived from 'transport of the product' and 97.1 per cent are derived from the 'use of product'. Therefore the significant majority of Project emissions cannot be directly managed or mitigated by XC policies and practice. Placement of the proposed Project must be understood in this context.

5.1 Lake Macquarie Council Greenhouse Gas Objectives

As part of the Lake Macquarie LGA, the proposed Project must comply with the objectives of Lake Macquarie Greenhouse Reduction Targets Policy (LMCC, 2008) and the Greenhouse Gas initiatives that are detailed in the Lake Macquarie City Council Local Environment Plan (LMCC, 2009). Existing XC and energy efficiency and GHG reduction initiatives underway at WWC align with the following Lake Macquarie City commitments and objectives (LMCC, 2009):

- By 2018 Council commits to a 30 per cent city-wide decrease in GHG emissions (3 per cent per annum/capita) and a 30 per cent corporate decrease (3 per cent per annum). This is equivalent to annual savings of approximately 150,000 t of CO2–e for the city and 592 t of CO2–e for Council.

The management and mitigation measures initiated by XC and already in place at WWC are detailed in **Section 6.0**.

5.2 Project Placement in National and Global Inventories

No significant changes to the existing underground mining or associated surface operations are proposed, the existing operations will continue as per the current operations. Therefore any attempt at placement of the potential impact from the Project, and potential address of ESD principles and intergenerational equity, must consider that the GHG emissions expected from the Project are already being emitted and will continue to be emitted from existing operations.

However, the proposed total Project GHG emissions (Scope 1, Scope 2 and Scope 3) for the LOM will make a **minor total contribution of 0.03 per cent to the global** GHG inventory, as detailed by the International Energy Outlook, 2009 (EIA, 2009). The contribution to **national GHG inventory of 1.479 per cent is equally minor**, as detailed by the National Greenhouse Inventory: Kyoto Protocol Accounting Framework, 2009 (DCC, 2009b) (refer to **Appendix B**).

6.0 Management and Mitigation

The Project will seek to provide for maximum resource extraction with maximum efficiency. WWC will also assess and consider implementation, where feasible, of greenhouse gas and energy management and mitigation initiatives during the design, operation and decommissioning of the Project. Some of the opportunities for improving energy efficiency and reducing greenhouse gas emissions from the Project are discussed below. The Project mitigation measures are largely focused on energy management, energy efficiency and the potential reduction in automotive diesel oil consumption for mine plant and equipment.

6.1 Energy Management and Energy Efficiency

WWC has prepared an Energy Savings Action Plan (ESAP) as part of their requirements under the NSW Government's ESAP legislation (DEUS, 2005). The purpose of the ESAP was to review energy usage, identify energy savings opportunities, and implement ongoing energy management activities. Actions that have been implemented or identified for further investigation include (WWC, 2008):

- baseline assessment of energy usage across WWC operations, including a change of mine plan and a review of the production cycle;
- identification and tracking of energy use per ROM tonnes of coal as a key performance indicator;
- improved energy metering and data logging capacity on site;
- water management – including an assessment of water reuse underground and a new underground water pump ;
- power factor correction;
- compressor system review and audit;
- conveyor review – including a plan to reduce energy use from conveyor drives;
- hydraulic circuits at the Longwall;
- voltage study and potential regulation on site;
- energy efficiency opportunities in the administration offices; and
- high efficiency motor review and variable speed drive review.

6.2 Xstrata Coal Commitments

As an Xstrata Coal (XC) operation, WWC is subject to the Xstrata Coal Climate Change Position Statement (XC, 2008). Coal has long played a leading role in helping meet global energy needs. Given the ever increasing demand for energy in both the developed and developing world and international concerns about energy security and costs of power, coal will continue to be an integral part of the energy mix well into the future (XC, 2008).

XC believes that access to an affordable, reliable and secure energy supply is fundamental to economic and social development but, at the same time, fully recognises its role and responsibility to help address climate change. The company believes that emission reductions resulting from the production and use of coal are both required and achievable. Increased energy efficiencies within the built environment, industrial and power generation sectors, together with carbon capture and storage and other low emission power generation technologies, will enable the deep cuts in greenhouse emissions to be realised.

XC is committed to the highest standards of health, safety and environmental performance community cooperation and to the principles of sustainable development. Through its approach to climate change, XC:

- is committed to playing its part in the international collaborative effort to implement solutions to the challenge of climate change;
- recognises the future will be a carbon constrained world and is working with governments, researchers and industry around the world to develop a portfolio of options for reducing greenhouse gas emissions for the use of coal in power generation;
- is a major contributor to the A$1 billion COAL 21 Fund, through the imposition of a voluntary levy on its production. The Fund will financially support the research, development and deployment of low emission power generation technologies in Australia;
- collaborates in research and development programs and provides both technical and financial support to dedicated Cooperative Research Centres focused on near zero emission technologies ;
- supports additional research into CO_2 capture and storage to enable this technology to be commercialised worldwide as rapidly as possible;
- works continually for the more efficient use of energy and reduction of greenhouse gas emissions through a dedicated energy efficiency program at all operations;
- looks to collaborate with its customers, both domestic and international, towards the sustainable use of coal through new power generation technologies;
- seeks to effectively reduce fugitive emissions from its operations through the capture and use of methane wherever possible from coal seams to generate electricity, and
- contribute to the development of effective Climate Change Policy (XC, 2008).

As part of Xstrata Coal, WWC will also participate in Xstrata Coal's response to the following programs:

- the National Greenhouse and Energy Reporting System (NGERS);
- the Energy Efficiency Opportunities (EEO) Program; and
- the proposed Carbon Pollution Reduction System (CPRS).

6.3 Xstrata Coal NSW Climate Change and GHG KPI 2009

Specific XCN Energy and Greenhouse KPI are provided in the 2009 XCN Sustainable Development Plan (XC, 2009). The XCN KPI has been developed to address the XC requirements. The Greenhouse and Climate Change KPI for the period 2009 to 2013 include:

- 5 per cent reduction in energy intensity (per ROM tonne) by 2012 over 2007 performance;
- 100 per cent commencement of implementation viable energy efficient projects identified with a payback of 4 years;
- 100 per cent of business units have NGER compliant reporting systems in place; and
- 100 per cent of employees and other relevant stakeholders have received XC Climate Change Information Package.

7.0 References

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APPENDIX A

GHGEIA Calculation Methodology

Appendix A - GHGEIA Calculation Methodology

1. Methodology Framework

1.1 International, National and Industry Reference

Scientific calculation of energy consumed, energy produced and GHG emissions that are expected from the proposed Project is provided by reference to aligned international, national and industry references. The Project DGRs suggest direct reference to the National Greenhouse Accounts Factors (NGAF) (DCC, 2009) (refer to **Section 1.2** for context and limitations). References listed in **Table A** are referred to directly in the GHGEIA and **Appendix B**.

All methodology and calculations are made within the context that no significant changes to the existing underground mining or associated surface operations are proposed, the existing operations will continue as per the current operations.

Table A – 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 4AR), UNFCCC, 2007.
International	The Kyoto Protocol to the United Nations Framework Convention on Climate Change (Kyoto Protocol), UN, 1998.
International	The Greenhouse Gas Protocol: GHG Protocol for Project Accounting (GHG Protocol), WRI/WBCSD, 2004.
National	National Greenhouse and Energy Reporting Streamlining Protocol (NGER Protocol), DCC, 2009b.
National	National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2009 (the NGER Technical Guidelines), DCC, 2009.
National	National Greenhouse Accounts Factors (NGAF), DCC, 2009a.
National	Guidelines for Energy Savings Action Plans (ESAP), DEUS, 2005.
Industry	Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance: Optional Emissions from Commuting, Business Travel, and Product Transport, USA EPA, 2008.
Industry	Independent Hearing and Assessment Panel, Anvil Hill Coal Project: Report to the Director-General, Department of Planning, IHAP, 2007.
Industry	Xstrata Coal (XC) Energy and Greenhouse Plan – Estimation of Scope 3 Emissions - Scope 3 Emissions Calculator, XC, 2008.

1.2 National Greenhouse Accounts Factors

Unless otherwise stated, the methods for calculating emissions listed in the NGAF are 'Method 1' from the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* and the *National Greenhouse and Energy Reporting (Measurement) Technical Guidelines June 2009* (DCC, 2009).

Updated factors and methods in the NGAF document correspond to those detailed in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* and the *National Greenhouse and Energy Reporting (Measurement) Amendment Determination 2009*

(No.1). In particular, however, the NGAF does not current provide methodology for the calculation of:

- Energy consumed (refer to **Section 5**);
- Energy produced (refer to **Section 6**) ;
- Scope 3 emissions from export transport (refer to **Section 3.3**); and
- Scope 3 emissions from domestic transport (refer to **Section 3.3**).

The methodology and formulas used in this report are detailed in the following sections.

2. GHGEIA Greenhouse Gases Assessed

As defined by the *National Greenhouse and Energy Reporting Act (2007)* and the National Greenhouse Accounts Factors (DCC, 2009), this report refers to the six Kyoto Protocol GHG (refer to **Table B**).

Table B – Kyoto Protocol GHG Categories Applied to the Project

Kyoto Protocol GHG Category Applied to the Project	
Kyoto GHG Category	**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

3. Calculation of Project Emissions

3.1 Direct (Scope 1) Fugitive Emissions

Scope 1 Fugitive Emissions are those that are produced from activities within the parameters of West Wallsend Colliery as a result of the current and projected operational activities. These emissions specifically arise from activities that release or combust solid, liquid or gaseous fuels.

Fugitive Emissions from Fuel Combustion

Emission Source 1

UNFCCC Category 1.A

Emission Source Reference: *National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2009. Part 2.4: Emissions Released from the Combustion of Liquid fuels.*

Onsite fuel combustion from the onsite transportation of product and onsite operations (industrial and mining) are included in the aggregate data set provided by WWC. GHG emissions from mobile and operational 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 Gross Calorific Value or GCV (DCC, 2009).

Emissions Formula 1

The following formula estimates GHG emissions from the combustion of liquid fuels. West Wallsend Colliery uses diesel fuel onsite. The formula refers to Table 2.4.2B 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 (for transport energy purposes). 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. West Wallsend Colliery has indicated that no increase in fuel use is predicted. The calculations are provided in **Appendix B**.

The GHG emissions from diesel fuel combustion were estimated using the following equation.

$$E_{ij} = DU_{onsite} \times EC_i \times EF_{ikoxec} / 1000 \qquad \textbf{(Formula 1)}$$

where:

E_{ij} is the emissions of GHG, being carbon dioxide, methane or nitrous oxide, released from the combustion of diesel fuel from the operation of the project, during the year measured in CO_2-e tonnes;

DU_{onsite} is the estimated diesel combusted onsite from the project operation (kilolitres (kL/annum) (West Wallsend Colliery estimate is 554.58kL/annum.

EC_i is the energy content factor for diesel measured as energy content in gigajoules (GJ) per kL (Item 54 in Table 2.4.2B – Transport Energy Purposes, Diesel Oil is 38.6 GJ/kt); and

EF_{ikoxec} is the emission factor for diesel released from the operation of the facility during the year, measured in kilograms CO_2-e per gigajoule of fuel type (Item 54 in Table 2.4.2B – Transport Energy Purposes, Diesel Oil is 69.9 kg CO_2-e/kg).

Fugitive Emissions from Extracting Coal

Emissions Source 2

UNFCCC Category 1.B

Emission Source Reference: *National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2009. Part 3.2, Division 3.2.2: Coal Mining: Underground, Section 3.6 Method 4 – Extraction of Coal*

Fugitive emissions from underground mines involve the release of CH_4 and CO_2 during the mining process due to the fracturing of coal seams, overburden and underburden strata. Emissions also arise from post-mining activities such as the stockpiling of coal from the release of residual gases within the coal not released during the mining process (DCCc, 2008). West Wallsend Colliery is classified as a Class A Mine ('gassy') according to the National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2009 (DCC, 2009).

Emissions Formula 2

Section 3.6 of the NGER Technical Guidelines, provides a Method 4 formula for the estimation of fugitive emissions associated with the extraction of coal at underground mining operations. The calculations are provided in **Appendix B**. The method 4 formula used to calculate fugitive emissions from underground mining is:

$$E_j = CO2\text{-}e_{gen,\,total} - \gamma_j (Q_{ij,\,cap} + Q_{ij,\,flared} + Q_{ijtr}) \qquad \textbf{(Formula 2a)}$$

Where:

E_j is the fugitive emissions of gas type (j) that result from the extraction of coal from the mine during the year, measured in CO2-e tonnes.

$CO2\text{-}e\ j_{gen,\,total}$ is the total mass of gas type (j) generated from the mine during the year before capture and flaring is undertaken at the mine, measured in CO2-e tonnes and estimated using the direct measurement of emissions in accordance with Part 1.3 of the NGER Technical Guidelines.

γ_j is the factor for converting a quantity of gas type (j) from cubic metres at standard conditions of pressure and temperature to CO2-e tonnes, being:
(a) for methane — 6.784 × 10-4 × 21; and
(b) for carbon dioxide — 1.861 × 10-3.

$Q_{ij,cap}$ is the quantity of gas type (j) in coal mine waste gas type (i) captured for combustion from the mine and used during the year, measured in cubic metres and estimated in accordance with Division 2.3.6. (No gas is captured for combustion at WWC)

$Q_{ij, flared}$ is the quantity of gas type (j) in coal mine waste gas type (i) flared from the mine during the year, measured in cubic metres and estimated in accordance with Division 2.3.6. (No gas is flared at WWC)

Q_{ijtr} is the quantity of gas type (j) in coal mine waste gas type (i) transferred out of the mining activities during the year measured in cubic metres. (No gas is transferred out at WWC)

The above formula is specified as reportable under the National Greenhouse and Energy Reporting System (NGERS). To obtain a projection per annum for the project the following calculation was performed:

$$EP_j = Ej / Q_{2008/2009} \times Q_{estimated} \quad \textbf{(Formula 2b)}$$

Where:

EP_j is the projected fugitive emissions of gas type (j) that result from the extraction of coal from the mine during the project period, measured in CO2-e tonnes.

E_j is directly measured fugitive emissions of gas type (j) that result from the extraction of coal from the mine during the 2008/09 NGER reporting year, measured in CO2-e tonnes (WWC recorded an emissions total of 281,970.74 CO2-e tonnes for the 2008/09 reporting period).

$Q_{2008/2009}$ is the recorded production of ROM during the 2008/2009 NGER Reporting Period (WWC recorded a ROM total of 2,702,212 tonnes for the 2008/09 reporting period).

$Q_{estimated}$ is the estimated production of ROM per annum for the duration of the Project (WWC estimates a ROM total of 35.97 million tonnes).

Fugitive Emissions from Gassy Mines (Post-Mining)

Emissions Source 3

UNFCCC Category 1.B

Emission Source Reference: National Greenhouse and Energy Reporting (Measurement) Technical Guidelines v1.1. Part 3.2, Division 3.2.2: Coal Mining: Underground, Section 3.17 Method 1 – Post Mining Activities Related to Gassy Mines

Most fugitive GHG emissions are released from coal during the mining process. However some residual gas remains trapped within the coal after extraction, and is slowly released during handling, transportation and stockpiling of the coal.

Emissions Formula 3

Method 1 for estimating emissions from post-mining activities, with the source as described in the NGER Technical Guidelines is associated with gassy underground mines only. The method is derived from the National Greenhouse Account Factors (DCC, 2009). Emissions are estimated by multiplying a (physical) quantity of ROM coal by an emission factor. The calculations are provided in **Appendix B.**

Method 1 is:

Ej = Q × EFj **(Formula 3)**

Where:

Ej is the fugitive emissions of gas type (j) that result from fugitive emissions from gassy mines (post mining) during the year, measured in CO2-e tonnes.

Q is the estimated production of ROM (WWC estimates ROM total of 35.97 million tonnes for the project).

EFj is the emission factor for methane (j), measured in CO2-e tonnes per tonne of run-of-mine coal extracted from the mine which is equal to 0.014.

3.2 Indirect (Scope 2) Project Emissions

Electricity Consumption Emissions

Emissions Source 4

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.*

WWC has an established modelling and calculation methodology to assess measure and predict its electricity consumption. WWC advises that quantity and activity division is not predicted to increase or decrease with the proposed modification consuming electricity for the following operations:

- Transport of ROM to surface loadings bins by conveyor;
- Sizing of coal; and
- Mining Support Services (for example, administration, lighting, stationary equipment).

Emissions Formula 4

Division 7.2 of the NGER Technical Guidelines (DCC, 2009) provides methodology to estimate GHG emissions from the combustion of thermal coal to produce electricity. WWC 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 interconnections 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. WWC expects that electricity purchase will remain constant throughout the proposed project. The calculations are provided in **Appendix B.**

$E_{CO2\text{-}e} = Q \times EF_{ep} / 1000$ **(Formula 4)**

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 (WWC estimates the quantity to be 69,603,599.54 kWh per annum) during the year and consumed from the operation of the project;

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 New South Wales and Australian Capital Territory has an emission factor of 0.89 kg CO_2-e/kWh.

3.3 West Wallsend Colliery Indirect (Scope 3) Emissions

Emission Sources 5

Xstrata Coal (XC) has also developed a standard methodology and calculator for estimating Scope 3 energy consumption and GHG emissions based on an analysis of all potential Scope 3 emissions from coal mines (XC, 2010). The document is referred to as the XC Scope 3 emissions calculator.

Emission Formulas 5

This calculator has been verified by SEE Sustainability Pty Limited (SEE Sustainability) and is used in this GHGEIA for the calculation of Scope 3 emissions. The XC analysis determined the only material sources of Scope 3 energy consumption and GHG emissions arise from:

- Emissions associated with infrastructure development;
- Emissions associated from product transport; and
- Emissions from the end use of the product.

It is understood that the XC Scope 3 Emissions Calculator is based on the methodology outlined in the NGA (DCC, 2009a). Umwelt has not conducted an analysis, review or assessment of the methodology and formulas used in the XC Scope 3 Emissions Calculator for this purpose.

4. Contribution to National and International Inventories

Emission Inventory Reference: National Greenhouse Gas Inventory: Kyoto Protocol Accounting Framework (DCC, 2009a) and the International Energy Outlook (EIA, 2009)

Emission Source 6

This GHGEIA addresses the principles of Ecologically Sustainable Development (ESD), and in particular, the principle of intergenerational equity and the precautionary principle from the downstream GHG emissions from the project. The precautionary principle requires that the mine's cumulative effects (including downstream emissions) must be assessed, and that the impacts of burning product coal be assessed despite any scientific uncertainty about the extent of impact.

Emission Formula 6

The direct and indirect emissions that are result of the proposed Project operations are expected to be accounted for in national and international total emissions. The Project emissions are therefore represented as a percentage contribution to national and international inventories. The calculations are divided into domestic and international GHG emissions and are provided in **Appendix B.**

$$PC = PE / IT_{ni} \times 100 \qquad \textbf{(Formula 6)}$$

where:

PC is the percentage contribution of the total WWC project GHG emissions (Scope 1 + Scope 2 + Scope 3) to national and international greenhouse gas (GHG) emission inventories;

PE is the total project GHG emissions (Scope 1 + Scope 2 + Scope 3); and

$\mathbf{IT_{ni}}$ is the total national inventory (n) or international inventory (i).

5. Calculation of Project Energy Consumption

Energy Source A

The methodology for the calculation of energy consumption is provided in Part 6.2 of the NGER Technical Guidelines (DCC, 2009). Energy consumption is calculated for the proposed Project in consuming diesel and purchased electricity. The calculations are provided in **Appendix B.**

Energy Formula A

The purpose of this formula is to provide an estimation of the energy content of energy consumed from the Project.

$Z_i = Q_i \times EC_i$ (Formula A)

where:

Z_i is the energy content of fuel type (i) consumed during the year / Project and measured in gigajoules (GJ);

Q_i is the quantity of fuel type (i) consumed during the year / Project in accordance with subsection 2 (electricity) and Division 2.4.6 (liquid fuels); and

EC_i is the energy content factor of fuel type (i). For liquid fuels, it is measured in GJ per kilolitre, and for electricity, it is measured in GJ per kilowatt hours (equal to 0.0036).

6. Calculation of Project Energy Production

Energy Source B

The methodology for the calculation of energy consumption is provided in Part 6.1 of the NGER Technical Guidelines (DCC, 2009). Energy production is calculated for the proposed Project in the extraction of black coal for combustion. The calculations are provided in **Appendix B and does not contribute to the GHG inventory of the Project.** The methodology and calculations are provided for context purposes only.

Energy Formula B

The purpose of this formula is to provide an estimation of energy content of energy produced from black coal as the commodity of the Project. The energy content of a kind of energy (fuel) produced from the operation of the proposed Project during the year / Project duration is calculated with the following formula.

$Z_i = Q_i \times EC_i$ **(Formula B)**

where:

Z_i is the energy content of fuel type (i) produced during the year / Project and measured in gigajoules (GJ);

Q_i is the quantity of fuel type (i) produced during the year / Project in accordance with Division 2.2.4 (solid fuels); and

EC_i is the energy content factor of fuel type (i). For solid fuels, it is measured in GJ per tonne.

APPENDIX B

GHGEIA Calculations

Appendix B - GHGEIA CALCULATIONS

1. Direct Project Emissions

1.1 Direct (Scope 1) Fugitive Emissions

A. Onsite Fuel Combustion (Diesel Oil)

For the assessment period of 9 years, the total fuel emissions from onsite fuel combustion will be an estimated **40,024.88 t CO_2-e/kJ** based on an estimated consumption of **1,648 kL** per annum. The mean yearly onsite emissions are calculated as **4,447.21 t CO_2-e/kJ**.

Table A – Calculation of Fugitive Emissions from Onsite Fuel Combustion

Period	Formula		Calculation
2010	Onsite Fuel Emissions (t CO_2-e)	= DUonsite x EC x EF/1000	= 1,648 kL x 38.6 x 69.9/1000
			= 4,447.21
Per annum	Onsite Fuel Emissions (t CO_2-e)	= DUonsite x EC x EF/1000	= 1,648 kL x 38.6 x 69.9/1000
			= 4,447.21
		Annual Mean	= 4,447.21 t CO2-e/kJ
		Life of Remaining Production (Years)	= 9
		Total for Project (Estimate)	= 4,447.21 x 9
			= 40,024.88 t CO2-e/kJ

B. Fugitive Emissions from Coal Mining (Underground)

As previously discussed, WWC is considered a 'gassy' mine (DCCc, 2008) and the fugitive emissions from underground mining are presented as an estimate only. It is expected the remaining life of mine (LOM) production to be 35,969,635 ROM tonnes, with an average of **3,996,626.11 tonnes** per annum over the 9 year period. The fugitive emission estimate is based on directly measured emissions from the 2008/09 NGERS report to calculate tonnes of CO_2-e per ROM tonne. The yearly mean fugitive emissions from underground mining of coal is estimated as **417,040.42 t CO_2-e,** with emissions estimated from the remaining LOM totalling **3,753,363.78 t CO_2-e.**

Table B – Calculation of Fugitive Emissions from Underground Mining

Period	Formula		Calculation
2008/09 (Base)	t CO_2-e Fugitive Emissions (Directly Measured)	= $CO2\text{-}e_{gen,\ total} - Y_i (Q_{ij,\ cap} + Q_{ij,\ flared} + Q_{ijtr})$	= 281,970.74 - 0
			= 281,970.74 t CO2-e
Per annum	t CO_2-e Fugitive Emissions (Projected from ROM Estimates)	$= E_j / Q_{2008/2009} \times Q_{estimated}$	= 281,970.74 / 2,702,212 x 3,996,626.11
			= 417,040.42
		Annual Mean	= 417,040.42 t CO2-e
		Life of Remaining Production (Years)	= 9
		Total for Project (Estimate)	= 417,040.42 x 9
			= 3,753,363.78 t CO2-e

C. Fugitive Emissions from Post-Mining Activities Related to Gassy Mines

As WWC is considered a 'gassy' mine emissions from post-mining activities has been estimated using Method 1. Emissions are estimated by multiplying the ROM coal extracted by an emission factor. The emission estimate is based on a ROM estimation of 35,969,635 LOM tonnes, with an average of **3,996,626.11 tonnes** per annum over the 9 year period. The yearly mean post mining emissions is estimated as **55,952.77 t CO_2-e,** with emissions estimated from the remaining LOM totalling **503,574.89 t CO_2-e.**

Table C – Fugitive Emissions from Post-Mining Activities Related to Gassy Mines

Period	Formula		Calculation
2010	Fugitive Emissions (t CO_2-e)	= Q x EFj	= 3,996,626.12 x 0.014
			= 55,952.77
Per annum	Fugitive Emissions (t CO_2-e)	= Q x EFj	= 3,996,626.12 x 0.014
			= 55,952.77
		Annual Mean	= 55,952.77 t CO2-e
		Life of Remaining Production (Years)	= 9
		Total for Project (Estimate)	= 55,952.77 x 9
			= 503,574.89 t CO2-e

2. Indirect (Scope 2) Project Emissions

2.1 Stationery Energy

D. Electricity Consumption Emissions

The estimated yearly mean emissions from electricity consumption will be **61,947.21 t $C0_2$-e/kWh.** The estimated annual mean consumption of electricity of **69,603,599.54 kWh** is provided by WWC. The total emissions from electricity consumption for the life of remaining production of 9 years are estimated as **557,524.84 t $C0_2$-e/kWh**.

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

Period	Formula		Calculation
2010	Stationary Source Emissions (t CO_2-e)	= Q x EF/1000	= 69,603,599.54 kWh x 0.89/1000
			= 61,947.21
Per annum	Stationary Source Emissions (t CO_2-e)	= Q x EF/1000	= 69,603,599.54 kWh x 0.89/1000
			= 61,947.21
		Annual Mean	= 61,947.21 t CO2-e/kWh
		Life of Remaining Production (Years)	= 9
		Total for Project (Estimate)	= 61,947.21 x 9
			= 557,524.84 t CO2-e/kWh

3. Indirect (Scope 3) Project Emissions

3.1 XC Scope 3 Emissions Calculator Results

E. Scope 3 Emissions

Table E – Indirect Scope 3 Emission Summary

Total indirect scope 3 emissions resulting from the project are estimated to equal **74,576,456.3 t $C0_2$-e**. These emissions can be divided into 'transport of the product', which accounts for **2.9%** of total indirect scope 3 emissions and 'use of product' which accounts for **97.1%** of total indirect scope 3 emissions.

Emissions Breakdown	%	Tonnes CO2-e (Total Project Life)	Tonnes CO2-e per tonne coal	Tonnes CO2-e (Average Annual)
Transport of Product	**2.9**	**2,149,665**	**0.1**	**238,852**
Domestic transport	0.0	2,730	0.00	303
Export transport	2.9	2,416,935	0.08	238,548
Use of Product	**97.1**	**72,352,015**	**2.7**	**8,039,113**
Thermal - Domestic Use	13.8	10,316,893	0.39	1,146,321
Thermal - Export Use	57.5	42,854,786	1.61	4,761,643
Coking - Domestic Use	4.7	3,487,334	0.13	387,482
Coking - Export Use	21.1	15,693,002	0.59	1,743,667
Total	**100**	**74,501,679**	**2.80**	**8,277,964**

4. Total Project Emissions – Summary

Table F – Total GHG Emission Summary from Proposed WWC Project

Scope	UNFCCC Emission Source	Emission Type	Total (t CO_2-e)	Onsite Emissions
Scope 1 (Direct)	Onsite Fuel (Fugitive) Combustion (Diesel Oil)	Fuel Combustion	**40,024.88**	**Yes**
	Fugitive Emissions from Coal Mining (Underground)	Fugitive Emissions	**3,753,363.78**	**Yes**
	Fugitive Emissions from Gassy Mines (Post-Mining)	Fugitive Emissions	**503,574.89**	**Yes**
Total Scope 1 (Direct) Emissions tonnes CO_2-e			**4,296,963.55**	**Yes**
Scope 2 (Indirect)	Electricity Consumption Emissions	Purchased Electricity	**557,524.84**	**No**
Total Scope 2 (Indirect) Emissions tonnes CO_2-e			**557,524.84**	**No**
Scope 3 (Indirect)	Indirect Emissions from Domestic (Offsite) Transport	Fuel Combustion	**2,730**	**No**
	Indirect Emissions from Export (Offsite) Transport	Fuel Combustion	**2,146,935**	**No**
	Indirect Emissions from Domestic Product Use - Thermal	Fuel Combustion	**10,316,893**	**No**
	Indirect Emissions from Export Product Use - Thermal	Fuel Combustion	**42,854,786**	**No**
	Indirect Emissions from Domestic Product Use - Coking	Fuel Combustion	**3,487,334**	**No**
	Indirect Emissions from Export Product Use - Coking	Fuel Combustion	**15,693,002**	**No**
Total Scope 3 (Indirect) Emissions tonnes CO_2-e			**74,501,679**	**No**
Summary				
Direct Project Emissions - Scope 1			**4,296,963.55**	**Yes**
Indirect Project Emissions – Scope 2 and Scope 3			**75,059,203.84**	**No**
Total Project Emissions (Scope 1 + Scope 2 + Scope 3)			**79,536,167.39**	**Majority No**

5. Placement in National and Global Inventories

5.1 National and Global Greenhouse Gas (GHG) Inventory

The WWC project will contribute approximately **1.478%** per annum to national greenhouse inventories and **0.03%** to international greenhouse inventories.

Table G1 – Comparison of Project to National and International Greenhouse Inventories

Comparison of Project GHG Emissions to National/International Emissions	
Scope/Category	Total t CO_2 -e
Total Scope 3 (Indirect) Emissions tonnes CO_2-e	**74,501,679**
Total Directly Related to the Project Operations	4,296,963.55
Total Indirectly Related to the Project – DOWNSTREAM	**75,059,203.84**
Total Project Emissions (Scope 1 + Scope 2 + Scope 3)	**79,536,167.39**
CURRENT TOTAL GLOBAL EMISSIONS (per annum) ^	29,000,000,000
CURRENT TOTAL NATIONAL EMISSIONS (per annum) **	597,156,550

^ Source: International Energy Outlook, 2009 (Energy Information Administration, U.S. Department of Energy) (EIA, 2009): http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2009).pdf

** Source: National Greenhouse Gas Inventor: Kyoto Protocol Accounting Framework, 2009 (DCC, 2009b): http://ageis.climatechange.gov.au

Table G2 – Contribution of Project to National and International Greenhouse Inventories

Contribution of Project GHG Emissions to National/International Emissions	
Scope/Category	Total t CO_2 -e
Total Project Emissions (Scope 1 + Scope 2 + Scope 3)	**79,536,167.39**
Total Project Emissions (per annum)	8,837,351.93
Current Total Global GHG Emissions Inventory	29,000,000,000
Current Total National GHG Emissions Inventory	597,156,550
Contribution to International Emissions Inventory (%)	**0.03047363**
Contribution to National Emissions Inventory (%)	**1.47990538**

6. Energy Consumption

Based on the data provided by WWC for electricity consumption and Diesel Consumption (refer to **Table H1**), it is estimated that the proposed Project will consume an annual mean of 69,603.599 GJ of energy in electricity consumption (refer to **Table H2**) and an annual mean of 63,622.44 GJ of energy in fuel consumption (refer to **Table H3**). The Project will consume an estimated total of 314,195.40 GJ per annum and an estimated 2,827,758.53 GJ of energy.

Table H1 – Project Electricity Consumption Data

Item	**Value**
Projected Total ROM Mined (tonnes)	35,969,635
Time frame (years)	9
Average ROM per year (tonnes)	3,996,626
Average Electricity Usage (kWh/ROM Tonne)	17.41558945
Annual Electricity Usage	69,603,599.54
Average Diesel Usage (L/ROM Tonne)	0.412410242
Annual Diesel Usage (kL)	1,648.25

Table H2 – Project Energy Consumption from Electricity Purchase

Period	**Formula**		**Calculation**
2010 (Base)	Stationary Source Emissions (t CO_2-e)	= Q x EC	= 69,603,599.54 kWh x 0.0036
			= 250,572.96
Per annum	Stationary Source Emissions (t CO_2-e)	= Q x EC	= 69,603,599.54 kWh x 0.0036
			= 250,572.96
		Annual Mean	= 250,572.96 GJ
		Life of Remaining Production (Years)	= 9
		Total for Project (Estimate)	= 250,572.96 x 9
			= 2,255,156.63 GJ

Table H3 – Project Energy Consumption from Diesel Oil Combustion

Period	**Formula**		**Calculation**
2010 (Base)	Fuel Energy Consumption (GJ)	= DUonsite x EC	= 1,648 kL x 38.6
			= 63,622.44
Per annum	Fuel Energy Consumption (GJ)	= DUonsite x EC	= 1,648 kL x 38.6
			= 63,622.44
		Annual Mean	= 63,622.44 t CO2-e/kWh
		Life of Remaining Production (Years)	= 9
		Total for Project (Estimate)	= 63,622.44 x 9
			= 572,601.9 t CO2-e

7. Energy Production

Based on average ROM per year data of 3,996,626 tonnes (refer to **Table I1**), it is estimated that the proposed Project will produce thermal and coking coal that will have the potential energy production capacity of **107,908,905 GJ** of energy (refer to **Table I2**). Estimated total potential energy production capacity for the Project is **9,711,801.45 GJ** for the LOM.

Table I1 – Project Energy Production (Average / Total ROM Data)

Item	Value
Projected Total ROM Mined (tonnes)	35,969,635
Time frame (years)	9
Average ROM per year (tonnes)	3,996,626.11

Table I2 – Project Energy Production from Mining of Black Coal (ROM Data)

Period	Formula		Calculation
2010 (Base)	Energy Production	= Q x EF	= 3,996,626.11 tonnes x 27
			= 1,079,089.05
Per annum	Energy Production	= Q x EF	= 3,996,626.11 tonnes x 27
			= 107,908,905.
		Annual Mean	= 107,908,905. GJ
		Life of Remaining Production (Years)	= 9
		Total for Project (Estimate)	= 107,908,905. x 9
			= 9,711,801.45 GJ