APPENDIX 15

Greenhouse Gas and Energy Assessment

ULAN COAL COMPLEX
UNDERGROUND MODIFICATION 6

Greenhouse Gas and Energy Assessment

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Ulan Coal Mines Pty Limited

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Report No.	20020/R06
Date:	October 2022

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	John Merrell	28 October 2022	Kirsty Davies	31 October 2022

Executive Summary

The Ulan Coal Complex (UCC) is located approximately 38 km north-north-east of Mudgee and 19 km north-east of Gulgong in New South Wales (NSW). Ulan Coal Mines Pty Limited (UCMPL) was granted Project Approval (PA) 08_0184 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 15 November 2010 for the Ulan Coal – Continued Operations Project (UCCO Project). Approved operations at the UCC consist of underground mining in the Ulan Underground and Ulan West areas, open cut mining and coal handling, processing and transport through to August 2033.

UCMPL is proposing a modification to PA 08_0184 pursuant to section 4.55(2) of the EP&A Act to maximise resource recovery from the existing underground mining operations within existing mining lease areas. UCMPL has determined that there is a valuable mineable resource within Exploration Lease (EL) 7542 and is seeking to modify PA 08_0184 to enable access to this coal resource by extending currently approved longwall panels. The Proposed Modification will extend the life of the existing operations by two years until 2035, and allow the recovery of an additional approximately 25 million tonnes (Mt) of product coal.

A Modification Report is required to accompany the application to modify PA 08_0184 and this Greenhouse Gas and Energy Assessment (GHGEA), which considers Scope 1, 2 and 3 emissions, will form part of that report.

The GHGEA found that the Proposed Modification will be associated with the following greenhouse gas emissions:

Greenhouse Gas Emissions Associated with the Proposed Modification		
	(t CO_2-e)	(%) of total emissions
Scope 1	130,000	0.2
Scope 2	247,000	0.4
Scope 3	64,590,000	99.4
TOTAL	**64,967,000**	**100**

The Proposed Modification is forecast to produce approximately 130,000 t CO_2-e Scope 1 emissions over its lifetime. The majority of Scope 1 emissions will be generated by the ventilation system releasing coal mine waste gas (fugitive emissions) and diesel consumption. UCMPL has a direct influence over Scope 1 emissions, which will be subject to management and mitigation plans.

The Proposed Modification has a relatively low Scope 1 greenhouse gas emissions intensity due to the relatively low diesel demands of an underground mine, and the relatively non-gassy nature of the UCC coal reserves, characteristic of reserves in the Western Coalfield of NSW which have a very low fugitive gas content (primarily carbon dioxide).

The Proposed Modification is forecast to consume approximately 1,516,000 GJ of electricity, which will generate approximately 247,000 t CO_2-e of Scope 2 emissions. UCMPL is influencing reductions in Scope 2 emissions by driving electricity reduction and mining efficiency initiatives.

The Proposed Modification's forecast energy use intensity is considered to fall below the normal range when compared with other underground coal mining operations across Australia. The Proposed Modification is expected to be very energy efficient, due to ongoing energy efficiency measures being implemented at UCC through equipment selection, optimised scheduling and reject reduction.

Approximately 65,000,000 t CO_2-e of Scope 3 emissions (representing 99.4 % of total emissions) are estimated to be associated with the Proposed Modification. The majority of Scope 3 emissions associated with the Proposed Modification will be generated by third parties who transport and consume coal products. UCMPL has no operational control over Scope 3 emissions, as these emissions are generated by the activities of other organisations.

The Proposed Modification may increase the national effort required to reach Australia's 2030 greenhouse gas mitigation target, however, in isolation it is unlikely to limit Australia achieving its national mitigation targets. As part of implementing the Proposed Modification, UCC will seek to mitigate greenhouse gas emissions through ongoing energy efficiency initiatives and optimising productivity.

The Proposed Modification will contribute to global emissions, however, the extent to which global emissions and atmospheric concentrations of greenhouse gases have a demonstrable impact on climate change will be largely driven by the global response to reducing total global emissions which includes all major emission sources and sinks.

Glencore has stated that it is committed to transitioning to a low-carbon economy, and announced publicly in 2021 that it would continue to responsibly source the commodities that advance everyday life through a unique business model that enables the production, recycling and marketing of the materials needed to decarbonise energy while simultaneously reducing emissions.

During 2021 Glencore strengthened its commitment to reducing its total emissions footprint (Scope 1, 2 and 3) which underpins its ambition to be a net-zero emissions company by 2050. The revised targets are:

- 15 % by 2026 (on 2019 levels)
- 50 % by 2035 (on 2019 levels)
- net zero total emissions by 2050 across Glencore's global mining business.

Glencore's focus remains on reducing its total emissions footprint, including Scope 3 emissions, which is critical to achieve the goals of the Paris Agreement. The Proposed Modification and its direct and indirect emissions have been taken into consideration as part of Glencore's broader climate change commitments, and have been included in Glencore's decarbonisation pathway together with the emissions reduction targets outlined above.

Glencore also participates and supports a range of low emission technology initiatives that seek to reduce greenhouse gas emissions from mining operations and provide a pathway to reduce emissions from the use of its products.

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1.0 Introduction

Ulan Coal Mines Pty Limited (UCMPL) has engaged Umwelt to complete a Greenhouse Gas and Energy Assessment (GHGEA) for the Ulan Coal Complex (UCC). The assessment will form part of the Modification Report being prepared by Umwelt to accompany an application for modification of Project Approval (PA) 08-0184 pursuant to section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Proposed Modification Overview

The UCC is located approximately 38 km north-north-east of Mudgee and 19 km north-east of Gulgong in New South Wales (NSW) (refer to **Figure 1.1**). Operations at the UCC are located approximately 1.5 km east of the village of Ulan and entirely within the Mid-Western Regional Council Local Government Area (LGA). Coal mining has been undertaken in the Ulan area since the 1920s.

UCMPL was granted PA 08_0184 under Part 3A of the EP&A Act on 15 November 2010 for the Ulan Coal – Continued Operations Project (UCCO Project). Approved operations at the UCC consist of underground mining in the Ulan Underground and Ulan West underground areas, open cut mining and associated coal handling, processing and transport through to August 2033. The open cut operations are currently in care and maintenance.

UCMPL is proposing a modification to PA 08_0184 pursuant to section 4.55(2) of the EP&A Act to maximise resource recovery from the existing underground mining operations within existing mining lease areas. UCMPL has determined that there is a valuable mineable resource within Exploration Lease (EL) 7542 and is seeking to modify PA 08_0184 to enable access to this coal resource by extending currently approved longwall panels. The Proposed Modification will extend the life of the existing operations by two years until 2035 and allow the recovery of an additional approximately 25 Mt of product coal. The Proposed Modification (refer to **Figure 1.2**) generally comprises of:

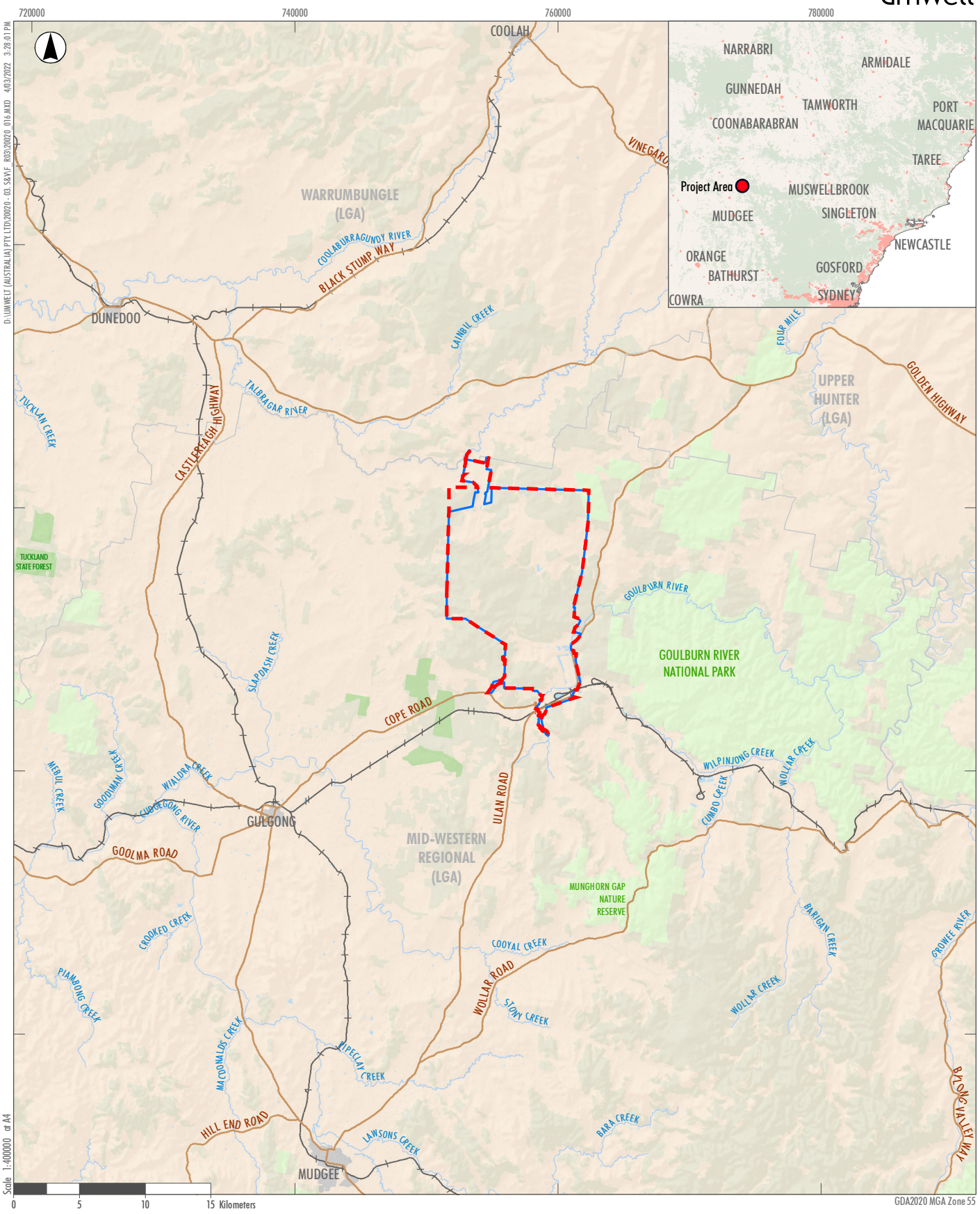
- extending Ulan Underground longwall (LW) panels LWW9 to LWW11 to the west
- widening Ulan Underground LWW11 by approximately 30 metres
- extending Ulan West LW9 to LW12 to the north.

There is an area within exploration lease (EL) 7542 from which the coal may be extracted by either Ulan West Underground or Ulan Underground depending on timing of operations and mining conditions. The area referred to as the 'Longwall Option Area' is shown on **Figure 1.2**. The coal in the Longwall Option Area may be extracted by either a northern extension of Ulan West Underground LW9 or a western extension of Ulan Underground LWW9, 10 and 11 (refer to **Figure 1.2**). In relation to GHGs, extraction of the Longwall Option Area from Ulan West is considered the conservative case and is the subject of this assessment.

UCMPL is also proposing some minor changes to surface infrastructure to support underground mining activities including provision of:

- three ventilation shafts and associated infrastructure corridors
- five dewatering bores and associated infrastructure corridors
- an alternate access track
- an infrastructure corridor and service borehole (to deliver gravel and other construction materials and to provide access and power to the underground mine) to the south-west of Ulan West
- other associated infrastructure required to service the approved and proposed underground mining operations.

The key features of the Proposed Modification that will impact greenhouse gas emissions are the proposed increase to the life of mine by two years and the proposed increase in coal production by 25 Mt.



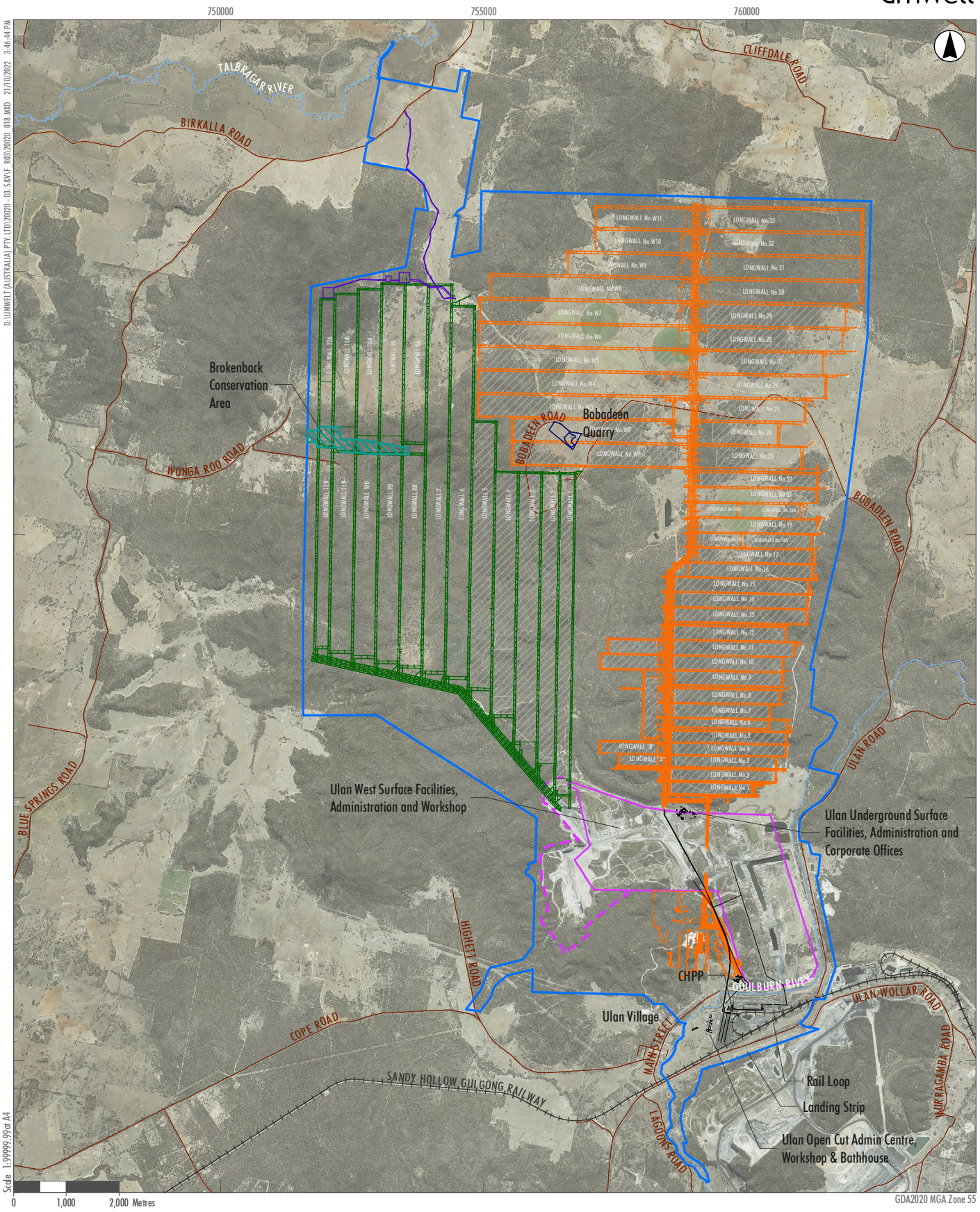
Legend

- Project Approval Boundary
- Proposed Project Approval Boundary
- Local Government Area (LGA)
- Road
- Railway
- Watercourses
- State Forest
- NPWS Estate
- Native Vegetation

FIGURE 1.1

Locality Map

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Ulan (2020)



Legend

- Project Approval Boundary
- Brokenback Conservation Area
- Bobadeen Quarry
- Roads
- Railway
- Major Watercourses
- Approved Infrastructure related to Mod 6
- Approved Ulan Underground Mine Plan
- Approved Ulan West Mine Plan
- Previously Mined
- Previous Ulan Open Cut Area
- Approved Ulan Open Cut Extension

FIGURE 1.2

Approved Operations

Image Source: Glencore (2018) Data source: Glencore (2020); NSW DFSI (2020)

2.0 Assessment Framework

2.1 Objectives

The objective of this assessment is to evaluate the greenhouse gas and energy use implications of the Proposed Modification as part of the environmental assessment process. This GHGEA will form part of the Modification Report and includes greenhouse gas emission projections, energy use calculations and an assessment of climate change impacts.

2.2 Scope

The scope of the GHGEA is limited to:

- estimating direct and indirect (Scope 1, 2 and 3) greenhouse gas emissions associated with the Proposed Modification
- estimating energy use directly associated with the Proposed Modification
- qualifying how the Proposed Modification's greenhouse gas emissions may impact the environment
- estimating the impact of the Proposed Modification's emissions on national and international greenhouse gas emission targets/policies
- assessing reasonable and feasible measures to minimise the greenhouse gas emissions and ensure energy use efficiency.

2.3 Definitions

Table 2.1 contains concepts and a glossary of terms relevant to this GHGEA, sourced from The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (WRI/WBCSD 2004) (the GHG Protocol).

Table 2.1 Glossary of Terms

Concept	Definition
Greenhouse gases	The greenhouse gases referred to in this GHGEA include: • carbon dioxide • methane • nitrous oxide • hydrofluorocarbons • perfluorocarbons • sulphur hexafluoride.
Scope 1 emissions	Direct emissions that occur from sources that are owned or controlled by the Proponent (e.g. fuel use). Scope 1 emissions are emissions over which the Proponent has a high level of control.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the Proposed Modification.

Concept	Definition
Scope 3 emissions	Indirect emissions that are a consequence of the activities of the Proposed Modification, but occur at sources owned or controlled by other entities (e.g. outsourced services). Scope 3 emissions can include emissions generated upstream of the Proposed Modification by providers of energy, materials and transport. Scope 3 emissions can also include emissions generated downstream of the Project by transport providers and product use.

2.4 Impact Assessment Methodology

The GHGEA framework is based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2020 (Commonwealth of Australia, 2020) (the NGA Factors). The assessment framework also incorporates the principles of The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (WRI/WBCSD 2004) (the GHG Protocol).

The GHG Protocol provides an internationally accepted approach to greenhouse gas accounting. The GHG Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors 2020 (Commonwealth of Australia, 2020). Scope 3 emissions associated with product transport were calculated based on emission factors contained in the National GHG Inventory: Analysis of Recent Trends and GHG Indicators (AGO, 2007). Consistent with the National Inventory Report, ventilation fugitive emissions were forecast using an implied emissions factor, which was derived from site specific National Greenhouse and Energy Reporting data.

All methodologies and calculations have been made assuming that all operations will continue as described in **Section 1.0**.

2.5 Data Sources

The calculations in this report are based on activity data provided by UCMPL for coal production, on-site fuel consumption, electricity consumption, fugitive emissions and product haulage distances. A detailed description of activity data and calculations are provided in **Appendix A**.

2.6 Assessment Boundary

The GHGEA boundary was developed to include all significant Scope 1, 2 and 3 emissions, however, there may be some more minor sources of emissions that are not captured within this assessment boundary. **Figure 2.1** demonstrates how the assessment boundary interacts with the potential emission sources under UCMPL's operational control and other emission sources associated with the Proposed Modification.

2.7 Data Exclusions

The GHG Protocol requires inventory data and methodologies to be relevant, consistent, complete, transparent and accurate. The relevance principle states that the greenhouse gas inventory should appropriately reflect greenhouse gas emissions and serve the decision-making needs of users – both internal and external (to the Proposed Modification) (WRI/WBCSD 2004).

The Proposed Modification has a number of potential emission sources, however, the dominant emission sources, often targeted by mitigation measures and of interest to stakeholders, can be summarised as:

- fugitive emissions
- diesel use
- electricity use
- materials use
- product transport
- product use.

The completeness principle states that all relevant emission sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled (WRI/WBCSD 2004).

The emission sources listed in **Table 2.2** have been excluded from the GHGEA as activity data is not readily available, and modelling activity data for these sources is unlikely to generate sufficient emissions to materially change impacts or influence the decision-making outcomes of stakeholders.

Table 2.2 Data Exclusions

Emission Source	Scope	Description
Combustion of fuel for energy	Scope 1	Small quantities of fuels such as petrol and LPG
Industrial processes	Scope 1	Sulphur hexafluoride (high voltage switch gear) Hydrofluorocarbon (commercial and industrial refrigeration)
Wastewater handling (industrial)	Scope 1	Methane emissions from wastewater management
Solid waste	Scope 3	Solid waste to landfill
Business travel	Scope 3	Employees travelling for business purposes
Employee travel	Scope 3	Employees travelling between their place of residence and the UCC

Greenhouse gas emissions resulting from land use, land use change and forestry (LULUCF) were also excluded from the GHGEA. While it is acknowledged that emissions resulting from LULUCF may be an important emission source for decision makers, the Proposed Modification is not likely to generate significant land use change and the assessment made an assumption that emissions generated during land clearing would be sequestered via rehabilitation plantings.

2.8 Materiality

The GHG Protocol states "information is considered to be material if, by its inclusion or exclusion, it can be seen to influence any decisions or actions". This assessment assumes data, results and impacts can be significant and influence decision makers, while also being numerically immaterial (i.e. less than 5 %).

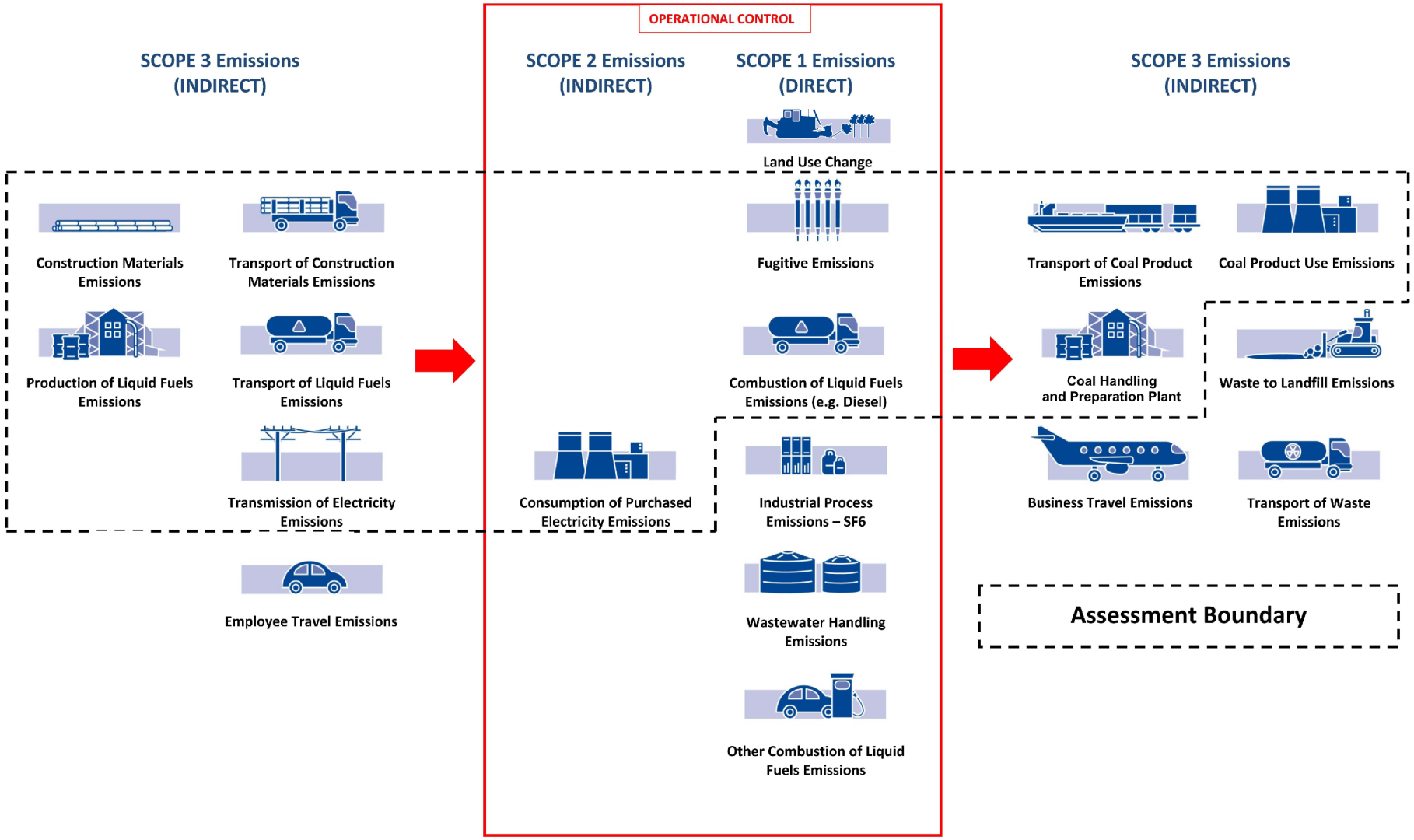


FIGURE 2.1
Greenhouse Gas Assessment Boundary

Image Source: Umwelt

3.0 Emission and Energy Assessment Results

Greenhouse gas and energy use estimates have been calculated for the Proposed Modification. The greenhouse gas estimates referenced in this document only relate to the Proposed Modification. Estimates in this document do not include emissions associated with currently approved operations.

The Proposed Modification is assessed at its upper approval limits. The assessment aims to identify the potential greenhouse gas emissions associated with the Proposed Modification. The assessment is not supposed to represent planned annual activity.

The following information was used to estimate the greenhouse gas emissions associated with the Proposed Modification:

- approximately 27.5 Mt of ROM coal will be extracted, which will produce approximately 25 Mt of product coal
- the UCC operates non-gassy underground mines (i.e. the CH_4 content of ventilation emissions will be less than 0.1 %)
- product coal can be classified as Bituminous coal to align with the NGA Factors
- product coal will be transported approximately 275 km by train
- product coal will be transported approximately 9,507 km by ship
- diesel will be transported approximately 130 km from Dubbo.

The greenhouse gas emissions associated with the Proposed Modification are summarised in **Table 3.1**.

Table 3.1 Summary of Greenhouse Gas Emissions

Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Scope 1 (Direct)	Diesel use	29,483	129,308
	Fugitive emissions	99,825	
Scope 2 (Indirect)	Electricity	246,517	246,517
Scope 3 (Indirect)	Product use	61,501,321	64,590,429
	Product transport	3,061,163	
	Associated with energy extraction and distribution	27,807	
	Materials transport	138	
Total greenhouse gas emissions associated with the Proposed Modification			**64,966,254**

*(Refer to **Appendix A** for further detail).*

3.1 Direct Emissions

The Proposed Modification is forecast to generate approximately 130,000 t CO_2-e of Scope 1 emissions over its lifetime. Scope 1 emissions will be generated by the ventilation system releasing coal mine waste gas (fugitive emissions) and diesel consumption.

Scope 1 emissions are only expected to contribute 0.2 % of total emissions from the Proposed Modification due to the relatively low diesel demands of an underground mine and the non-gassy nature of the UCC coal reserves.

The Western Coalfield in NSW is characterised by a very low fugitive gas content, which is primarily carbon dioxide (Commonwealth of Australia, 2020). The current UCC operations are considered non-gassy, as they produce relatively low levels of carbon dioxide, and methane levels are also below reliable detection limits. The statutory ventilation surveys completed at UCC during 2009/10 state that carbon dioxide levels in the underground ventilation system range between 0–0.04 % CO_2. During 2009/10, the ventilation survey at UCC measured the production of approximately 946,080 m^3 of fugitive gas or 0.2 m^3/tonne. Fugitive gas production rates of 0.2 m^3/tonne are extremely low given that Australian coal seam gas contents range between <1.0 m^3/tonne to 30 m^3/tonne (Australian Coal Association Research Program, 2010).

3.2 Indirect Emissions

The Proposed Modification is forecast to be associated with approximately 247,000 t CO_2-e of Scope 2 emissions from consuming electricity. Scope 2 emissions are produced by electricity generators in NSW.

The Proposed Modification's greenhouse gas inventory is dominated by Scope 3 emissions (99.4 % of the total greenhouse gas emissions associated with the Proposed Modification) which are forecast to be approximately 64,590,000 t CO_2-e. Scope 3 emissions are indirect emissions that are associated with the Proposed Modification, but occur at sources owned or controlled by other entities. Scope 3 emissions acknowledge that products will continue to generate greenhouse gas emissions as they move through a value chain. The primary source of Scope 3 emissions is product transport and product use. Coal produced by the Proposed Modification will be transported to Newcastle by train, and then shipped internationally to thermal coal consumers.

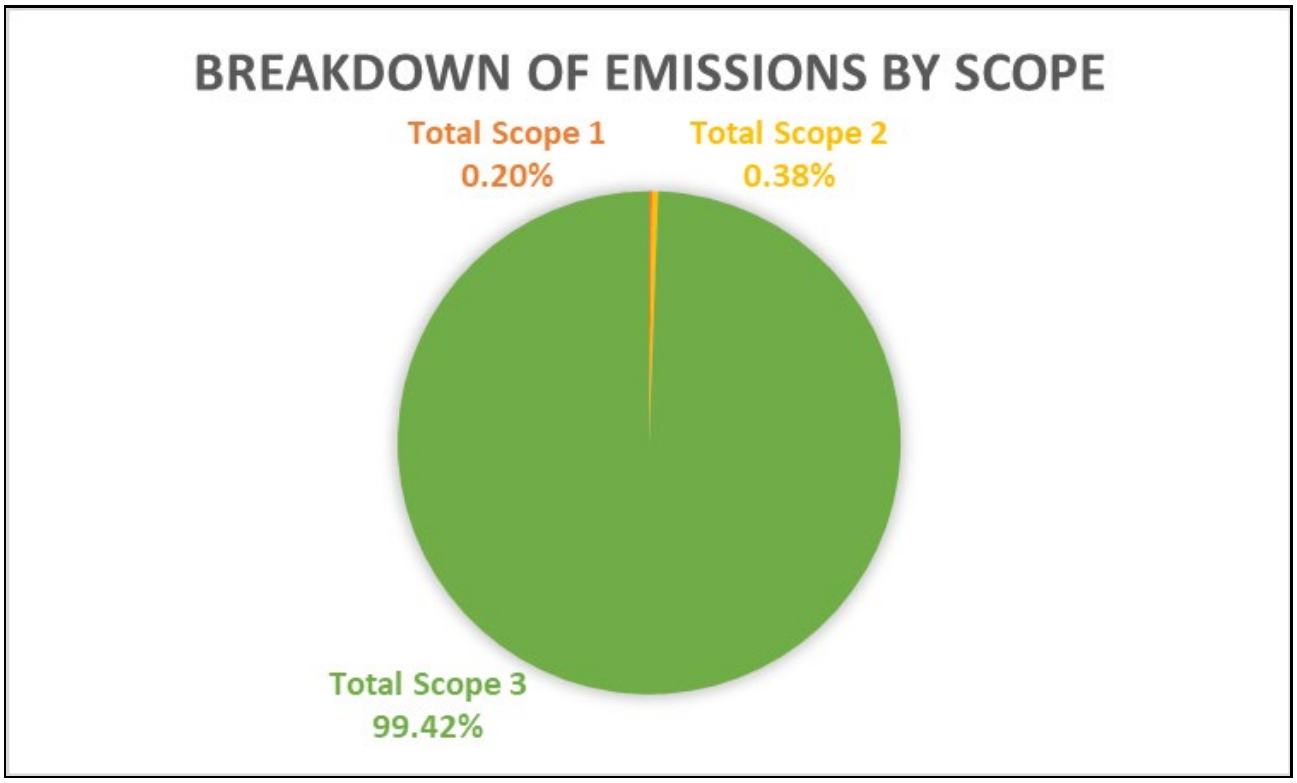


Figure 3.1 Breakdown of Emissions by Scope

Figure 3.1 demonstrates the Proposed Modification's greenhouse gas inventory is dominated by Scope 3 emissions, accounting for approximately 99.4 % of the total greenhouse gas emissions associated with the Proposed Modification.

Scope 2 and 3 emissions have been included in the GHGEA to demonstrate the potential upstream and downstream impacts of the Proposed Modification. All Scope 2 and 3 emissions identified in the GHGEA are attributable to, and may be reported by, other sectors.

3.3 Energy Use

The Proposed Modification is forecast to require approximately 1,516,000 GJ of energy from diesel and grid electricity. Energy use by underground coal mines in Australia averages between 140 and 490 Megajoules (MJ) per product tonne (Energetics 2009). The forecast energy use intensity associated with the Proposed Modification is approximately 60 MJ/product tonne making it lower than the average for underground coal mines in Australia.

The Proposed Modification is expected to operate with a low energy demand, as a large proportion of high-quality ROM coal bypasses the CHPP. The Proposed Modification avoids significant washing, separation and dewatering processes, which reduces the energy demands of the CHPP, and the energy demands associated with emplacing tailings and reject materials.

4.0 Impact Assessment

The greenhouse gas emissions generated by the Proposed Modification have the potential to impact the physical environment and the emission reduction objectives of State, national and international governing bodies. The following assessment makes the distinction between environmental impacts and impacts on policy objectives.

4.1 Impact on the Environment

Greenhouse gas emissions from the Proposed Modification will have a dispersive impact as they are highly mobile and are generated up and down the supply chain. The accumulation of greenhouse gas or carbon in 'carbon sinks' is the primary impact of emissions. Historically, anthropogenic greenhouse gas emissions have accumulated in three major carbon sinks – the ocean (30 %), terrestrial plants (30 %) and the atmosphere (40 %) (BOM and CSIRO 2014).

The accumulation of greenhouse gas in the atmosphere is an important driver of global warming, sea level rise and climate change (IPCC 2013). Sea level rise and climate change may have many ramifications for the natural and built environment. The accumulation of greenhouse gas in the ocean is also an important driver of ocean acidification (IPCC 2013).

The Proposed Modification, in isolation, is unlikely to influence global emission trajectories. Future emission trajectories will largely be influenced by global-scale issues such as technology, population growth and greenhouse gas policy.

4.2 Relative Source of Emissions

The Proposed Modification has the potential to produce approximately 130,000 t CO_2-e Scope 1 emissions over the life of the mine, equating to an average annual emission of approximately 9,286 t CO_2-e.

Most large-scale projects are significant sources of greenhouse gas emissions. **Table 4.1** compares the greenhouse gas emissions intensity of the Proposed Modification with two other underground coal mines located in different coalfields of NSW. The analysis in **Table 4.1** demonstrates that the Proposed Modification has a relatively low greenhouse gas emissions intensity, when compared with mines from other coalfields.

Table 4.1 Comparison of GHG Intensities Produced by NSW Underground Coal Mines

Underground Coal Mine	Coalfield	ROM Coal (tonnes)	Scope 1 Emissions (t CO_2-e)	GHG Intensity (t CO_2-e / ROM t)
Proposed Modification	Western	27.5 M	129,000	0.005
Myuna	Newcastle	14.7 M	3,483,000	0.237
Russell Vale (Revised)	Southern	3.7 M	1,419,000	0.384

4.3 Impact on Policy Objectives

4.3.1 International

The United Nations Framework Convention on Climate Change (UNFCCC) is the leading international forum for setting climate change targets and objectives. The UNFCCC has been responsible for developing internationally accepted greenhouse gas emission reporting methodologies, and has led the development of:

- the Kyoto Protocol
- the Paris Agreement
- specific directives and guidance to improve the implementation of the UNFCCC.

The Kyoto Protocol became international policy in 2005, and it committed the European Union (EU) plus 37 other member states to manage greenhouse gas emissions between 2008 and 2012. A second round of the Kyoto Protocol (the Doha Amendment) committed the EU plus 191 other member states to manage greenhouse gas emissions between 2013 and 2020. Australia was a signatory to both rounds of the Kyoto Protocol and Australia will meet its obligations under the Kyoto Protocol in 2020 (DoEE 2018).

In 2015 the UNFCCC successfully negotiated an international climate change agreement between 195 countries (the Paris Agreement). The Paris Agreement aims to:

- hold the increase in the global average temperature to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels
- increase the ability [of nations] to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production
- make finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilient development.

The Paris Agreement seeks to meet its objectives by developing programs and mechanisms that:

- require participating Parties to prepare and communicate greenhouse gas mitigation contributions (parties are expected to set mitigation targets for 2020, and then develop new targets every five years with each successive target expected to represent a larger mitigation effort than the previous target)
- promote climate change resilience and adaptation
- provide mitigation and adaptation funding to developing countries
- foster mitigation and adaptation technology transfer between Parties
- require participating Parties to report progress towards their mitigation contributions on an annual basis.

Glencore has reviewed the Proposed Modification's greenhouse gas emission inventory and believes the Proposed Modification is unlikely to materially affect the Paris Agreement objectives.

4.3.2 Australia

Australia signed the Paris Agreement on 22 April 2016, and Australia's obligations under the Paris Agreement will drive national greenhouse gas policy between 2020 and 2030. Under the Paris Agreement, Australia is obliged to:

- prepare, communicate and maintain a Nationally Determined Contribution (NDC). An NDC outlines the size and type of mitigation contribution each member state will make to the international effort
- pursue domestic mitigation measures, with the aim of achieving the objectives of its NDC
- communicate an NDC every 5 years
- quantify its NDC in accordance with IPCC methodologies, which promote transparency and avoid double counting.

Australia's commitment to the Paris Agreement was updated in June 2022 to reduce greenhouse gas emissions by 43 % below 2005 levels by 2030 (Commonwealth of Australia, 2022). Australia's NDC prescribes an unconditional economy-wide target to reduce greenhouse gas emissions and states that future policies will target emissions generated from:

- energy use
- industrial processes
- agriculture, land use, land use change and forestry
- waste.

Australia's NDC does not contain sector or state-based targets, nor does it make any reference to the mining sector.

Glencore has reviewed the Proposed Modification's greenhouse gas emission inventory and believes the Proposed Modification is unlikely to materially increase the national effort required to reach Australia's 2030 greenhouse gas mitigation target. Further, the Proposed Modification is unlikely to limit Australia achieving its national mitigation targets.

4.3.3 NSW

The NSW Government has developed its NSW Climate Change Policy Framework (the Framework), which aims to deliver net-zero emissions by 2050, and a State that is more resilient and responsive to climate change (OEH 2016). Under the Framework, NSW has committed to both follow the Paris Agreement and to work to complement national action. The key policy directions under the Framework are summarised in **Table 4.2**.

Table 4.2 NSW Climate Change Policy Framework Summary

Policy Direction	Rationale/Goals
Creating an investment environment that manages the emissions reduction transition	Energy will be transformed and investment/job opportunities will be created in emerging industries of advanced energy, transport, carbon farming and environmental services.
Boost energy productivity and put downward pressure on energy bills	Boosting energy and resource productivity will help reduce prices and the cost of transitions to net-zero emissions.
Grow new industries and capitalise on competitive advantages	Capitalising on the competitive advantage and growth of industries in professional services, advanced energy technology, property management and financial services.
Reduce risks and damage to public and private assets arising from climate change	Embed climate change considerations into asset and risk management as well as support the private sector by providing information and supportive regulatory frameworks for adaptation.
Reduce climate change impacts on health and wellbeing	Recognise the increased demand for health and emergency services due to climate change and identify ways to better support more vulnerable communities to reduce health impacts.
Manage impacts on natural resources and communities	Coordinate efforts to increase resilience of primary industries and rural communities as climate change impacts water availability, water quality, habitats, weeds and air pollution.

The NSW Government is taking a responsible, balanced approach to the effects of the global transition to a low carbon future on the coal mining sector. The government has set a clear and consistent policy framework for coal exploration and mining in NSW that supports investment certainty as the coal mining sector responds to global demand, while helping regional communities to manage the effects of an expected decline in thermal coal mining in the state over the longer term.

The Strategic Statement on Coal Exploration and Mining in NSW (the Strategic Statement) (Department of Regional NSW 2020) sets out the NSW's Government's approach and a four-point action plan built around:

- improving certainty about where coal mining should not occur
- supporting responsible coal production
- reducing the impact of coal mining
- supporting diversification of coal-reliant regional economies to assist with the phase-out of thermal coal mining.

Relevant to the Proposed Modification, the Strategic Statement, under its Plan for Action, states that:

> *The NSW Government will … recognise existing industry investment by continuing to consider responsible applications to extend the life of current coal mines, and by streamlining the process for exploring new areas and areas adjacent to current mining operations to deliver a better economic return to NSW.*

The Proposed Modification is unlikely to materially affect the objectives of the Framework and furthermore it fits within the NSW Government Plan for Action through responsible investment in the extension of an existing coal mine with relatively low fugitive emissions.

4.3.4 Glencore policy

In 2020 Glencore plc released its first three-yearly climate action transition plan, *Climate Report 2020: Pathway to Net Zero*[1] setting out the company's formal position and public commitments in relation to climate change. On 2 December 2021 Glencore published the 2021 Climate Report[2] providing an update on progress against emission reduction targets and incorporating an annual review of its position on climate change.

The 2021 report reiterated Glencore's purpose, to responsibly source the commodities that advance everyday life through a unique business model that enables the production, recycling and marketing of the materials needed to decarbonise energy while simultaneously reducing emissions.

During 2021 Glencore strengthened its commitment to reducing its total emissions footprint (Scope 1, 2 and 3) which underpins its ambition to be a net-zero emissions company by 2050. The revised targets are:

- 15 % by 2026 (on 2019 levels)
- 50 % by 2035 (on 2019 levels)
- net zero total emissions by 2050 across Glencore's global mining business.

Glencore's focus remains on reducing their total emissions footprint, including Scope 3 emissions, which is critical to achieve the goals of the Paris Agreement.

Glencore's approach to coal assets is to continue to operate coal mines until they reach the end of their lives. Through responsible stewardship of these assets and a managed decline of the coal portfolio, Glencore will deliver near- and medium-term energy needs, essential to the advancement of developing economies and the delivery of the United Nations' Sustainability Development Goals.

Due to COVID-19, global economic activity fell significantly during 2020. As a result, global energy demand also declined, reflected by a reduction in Glencore's produced coal volumes. As the world recovers from the impacts of the pandemic and global demand grows, a recovery in coal production is forecast as operations gradually move back towards their normalised steady state. Despite such higher near-term production, Glencore remains on track to deliver a 15 % reduction in total emissions by 2026 (on a baseline of 2019 levels) through progressive rehabilitation and closure of some assets, including, in the near term, Liddell, Integra and Newlands. The pipeline of coal projects and mine life extensions has been factored into Glencore's ability to meet climate change commitments. As such, the Proposed Modification and its direct and indirect emissions have been taken into consideration as part of Glencore's broader climate change commitments and have been included in Glencore's decarbonisation pathway together with the emissions reduction targets outlined above.

[1] https://www.glencore.com/media-and-insights/news/Climate-Report-2020--Pathway-to-Net-Zero

[2] https://www.glencore.com/media-and-insights/news/glencore-publishes-2021-climate-report

5.0 Evaluation of Greenhouse Gas Mitigation Measures

This GHGEA is required to assess reasonable and feasible measures to minimise greenhouse gas emissions from the Proposed Modification. The term reasonable incorporates notions of costs and benefits, whereas the term feasible focuses on the more fundamental practicalities of the mitigation measures, such as engineering considerations and what is practical to build or operate (*Hunter Environment Lobby Inc v Minister for Planning [2011]* NSWLEC 221).

5.1 Energy Efficiency

UCMPL implements all reasonable and feasible management controls to mitigate Scope 1 and 2 greenhouse gas emissions associated with current operations. These are documented in the Air Quality and Greenhouse Gas Management Plan for the Ulan Complex (Glencore 2021a).

UCC has incorporated a range of measures into the Proposed Modification with the aim of minimising potential greenhouse gas emissions and improving energy efficiency. Energy efficiency was a key driver for the design of the extended mine plan, as energy usage is a direct driver of cost as well as greenhouse gas emissions. The Proposed Modification design inherently minimises greenhouse gas emissions generated from the mining operations (Scope 1 emissions) through measures including:

- limiting the number of drive headings, minimising the size of the ventilation system and shortening travel distances
- utilising existing mining equipment that has high energy efficiency and optimised motor sizes
- scheduling activities so that equipment operation is optimised and automatically shutting down equipment when not in use
- reducing reject percentage through monitoring of CHPP density set points to extract highest yields.

As a result of ongoing energy efficiency measures across approved operations, energy and greenhouse gas intensities remain lower than predicted in the 2009 Environmental Assessment (Umwelt, 2009) resulting in lower than predicted Scope 1 and Scope 2 emissions for approved operations (Glencore, 2021b).

5.2 Pre-Draining Coal Mine Waste Gas

Fugitive emissions arise during the coal production/extraction process whereby methane and carbon dioxide gas trapped within the coal (coal mine waste gas) is released to the atmosphere. The volume and concentration of coal mine waste gas varies significantly from mine to mine.

In underground coal mines, mine waste gas is often drained from active coal seams and goaf environments (the fractured rock zone left once the coal has been extracted) to improve safety. Mine waste gas can be destroyed by flaring to reduce its greenhouse gas potential or combusted as a fuel source.

Glencore has found that pre-draining waste gas is only economically viable when waste gas is extracted from an environment which meets critical criteria in relation to gas production, methane percentage and seam permeability.

As described in **Section 3.0**, the UCC is a non-gassy mine which will only produce very low levels of fugitive emissions. Given the predominant carbon dioxide content of fugitive emissions, pre-drainage and combustion are not technically feasible methods for emissions reduction.

5.3 Declining Coal Portfolio

Glencore is committed to transitioning to a low-carbon economy and has recently announced publicly that it will prioritise investment in transition metals while managing the responsible decline of the coal portfolio (refer to **Section 4.3.4**). The Proposed Modification fits within Glencore's commitment as it is focused on sustaining current coal production.

As the Proposed Modification meets an existing demand, and fits within Glencore's climate change commitments, Glencore considers that the Proposed Modification is aligned with the global energy market.

6.0 Scope 3 Emissions

Scope 3 emissions are indirect emissions that are associated with the Proposed Modification but occur at sources owned or controlled by other entities. Scope 3 emissions simply acknowledge that products will continue to generate greenhouse gas emissions as they move through a value chain. The Proposed Modification can be associated with approximately 64,590,000 t CO_2-e of Scope 3 emissions. Products produced by the Proposed Modification will be transported to Newcastle by train, and then shipped internationally to thermal coal consumers. The greenhouse gas emissions from these products make up the majority of greenhouse gas emissions produced by the Proposed Modification.

6.1 Double Counting

In assessing the impacts of Scope 3 emissions, it is important not to double count Scope 1 and Scope 3 emissions. Scope 1 and Scope 3 emissions can be the same emissions once greenhouse gas inventories start to capture multiple facilities and entire value chains. For example, the Scope 1 emissions forecast for the Proposed Modification's consumers are the same emissions as the 'Product Use' Scope 3 emissions forecast for the Proposed Modification Project.

The classification of different emission scopes was deliberately developed to avoid double counting, and all IPCC level greenhouse gas reporting only considers Scope 1 emissions to avoid double counting. The Katowice Climate Change Package (a UNFCCC initiative developed in December 2018) provides NDC guidance on reporting clarity, transparency, and double counting. The importance of avoiding double counting is well recognised under international and Australian greenhouse gas reporting frameworks. The Paris Agreement, and the subsequent Katowice Climate Change Package, requires member states to:

- avoid double counting consistent with the guidance adopted by the UNFCCC
- apply robust accounting to avoid double counting consistent with the guidance adopted by the UNFCCC
- provide information on how their cooperative approach applies robust accounting to ensure the avoidance of double counting
- avoid double counting when accounting for anthropogenic emissions and removals corresponding to their NDCs.

The NGER Act in Australia does not provide for double counting and only regulates Scope 1 and Scope 2 emissions. There is no requirement or obligation under Australian law to report Scope 3 emissions, as Scope 3 emissions will be captured by the controlling corporations directly responsible for generating emissions (i.e., Scope 1 emissions). The exclusion of Scope 3 emissions from the reporting requirements under Australian law effectively avoids double counting of Scope 3 emissions.

6.2 Uncertainty

The Scope 3 emissions calculated as part of this assessment use default emission factors. The actual emissions generated at the emission source will depend on the technologies employed by electricity generators.

Thermal coal electricity generators have started to employ High Efficiency Low Emissions (HELE) technology, which improves the greenhouse gas emissions intensity of coal fuelled electricity generation. Supercritical (SC) and ultra-supercritical (USC) coal-fuelled generators with advanced emissions controls are considered to meet the HELE technology classification. Many coal-importing countries are leaders in the deployment of higher efficiency coal-fuelled generators, as efficiency drives improved economic performance. The International Energy Agency Clean Coal Centre has found that new HELE units can produce up to 40 % lower CO_2 emissions than older generators (Barnes 2018).

Improving the certainty of Scope 3 emissions forecasts requires site-based emission factors for every facility that consumes the Proposed Modification's products.

6.3 Management of Scope 3 Emissions

Glencore manages a significant product stewardship and market development program which aims to mitigate the downstream impacts of its products.

Glencore supports low-emission coal technology projects via the Australian coal industry's Low Emission Technology Australia (LETA) fund. Projects supported by LETA include the Callide Oxyfuel project and the Otway Basin Carbon Capture and Storage project.

Separately, Glencore is involved in the following Projects:

- member of the Callide Oxyfuel project in Queensland
- member of the FutureGen CCS project in the USA
- investigating options for carbon capture and storage in the Wandoan area in Queensland, through the Carbon Transport and Storage Company (CTSCo) Project.

Glencore has also completed a number of research projects related to low emission technologies, including direct injection coal engines, biochar, nanotechnology, chemical looping, and membrane research for power station applications. Glencore is also a Foundation member of the International Energy Centre along with a number of Australian Universities, which offers a Masters of Energy Studies.

Most of the product coal generated by the Proposed Modification will be exported to countries who are parties to the Paris Agreement. These countries have, or are in the process of developing, domestic laws, policies, and measures to mitigate greenhouse gas emissions (to achieve their NDC targets).

The countries that consume the Proposed Modification's coal (i.e., the primary source of the Scope 3 emissions) have, or will have, numerous domestic laws and policies in place to achieve long term greenhouse gas mitigation. It is both appropriate, and consistent with the overarching international climate change framework, for the Proposed Modification's Scope 3 emissions to be regulated and reported by the respective export destinations as Scope 1 emissions generated in those countries.

7.0 Conclusion

The Proposed Modification is forecast to generate approximately 130,000 t CO_2-e of Scope 1 emissions from combusting diesel and releasing fugitive emissions. The Proposed Modification has a relatively low Scope 1 greenhouse gas emissions intensity for an underground coal mine due to the relatively low fugitive gas content of the Western Coalfield.

The Proposed Modification's forecast energy use intensity is considered to fall below the normal range when compared with other underground coal mining operations across Australia. The Proposed Modification is expected to be very energy efficient for a coal mine.

The Proposed Modification is also forecast to be associated with approximately 64,590,000 t CO_2-e of Scope 3 emissions (accounting for 99.4 % of the total emissions). The Proposed Modification's Scope 3 emissions are beyond the operational control of UCMPL, and the majority of Scope 3 emissions will be generated downstream of the Proposed Modification, when coal products are combusted by electricity generators.

The Proposed Modification is consistent with, and has been factored into, Glencore's broader public position and commitments on climate change. This includes emission reduction targets for total emissions (Scope 1, 2 and 3).

UCMPL has incorporated a range of measures into the Proposed Modification's design to minimise potential greenhouse gas emissions and improve energy efficiency. Energy efficiency was a key driver for the design of the mine plan as energy usage is a direct driver of cost as well as greenhouse gas emissions. The Proposed Modification's design inherently minimises greenhouse gas emissions from the mining operations, primarily through energy use reduction initiatives.

UCMPL will continue to monitor and minimise greenhouse gas emissions through the implementation of the Air Quality and Greenhouse Gas Management Plan for the Ulan Complex (Glencore 2021a).

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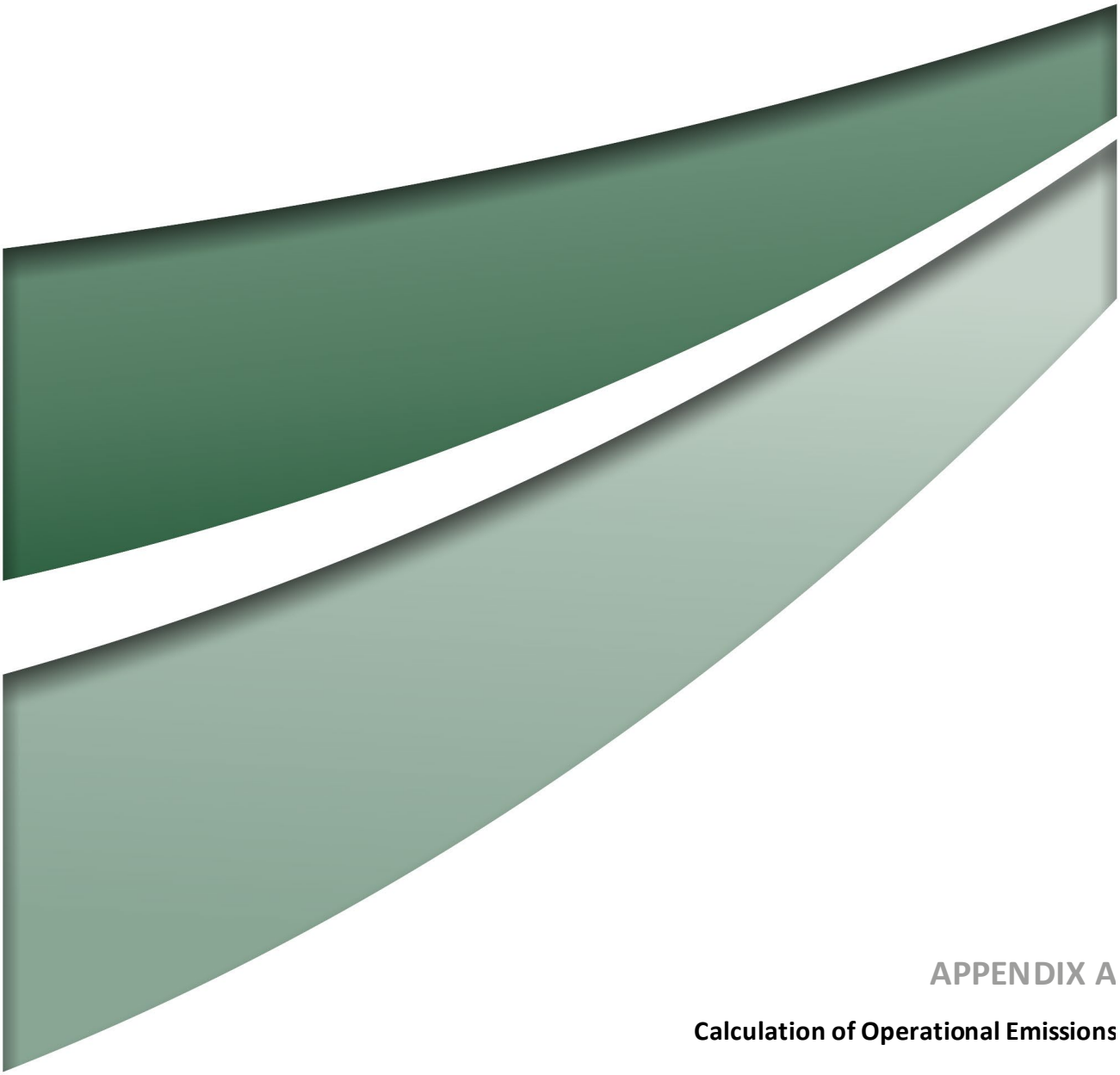

APPENDIX A

Calculation of Operational Emissions

Stationary Diesel Use

Activity Data	Energy Use		Emission Factors		
			CO_2	CH_4	N_20
kL	GJ/kL	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
10,880.57	38.6	419,990	69.9	0.1	0.2
			t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)			29,357	42	84
				Total GHG Emissions (t CO_2-e)	**29,483**

Fugitive Emissions

Domain	Activity Data	Emission Factors
	ROM Coal Tonne	kg CO_2-e/ ROM t
Ulan Underground	17,558,486	4.068
Ulan West	9,901,442	2.868
	Total GHG Emissions (t CO_2-e)	**99,825**

Electricity Use

Activity Data	Energy Use	Emission Factors		
		CO_2	CH_4	N_20
kWh	GJ	kg CO_2-e/kWh	kg CO_2-e/kWh	kg CO_2-e/kWh
304,341,691	1,095,630	0.81	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)		246,517	N/A	N/A
			Total GHG Emissions (t CO_2-e)	**246,517**

Product Use

Activity Data		Energy Production		Emission Factors		
				CO_2	CH_4	N_20
Product	Product (t)	GJ/Product t	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Bituminous coal	25,241,874	27.0	681,530,598	90	0.04	0.2
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				61,337,754	27,261	136,306
					Total GHG Emissions (t CO_2-e)	**61,501,322**

Product Transport

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	Product (t)	Distance (km)	Tonne km (tkm)	kg CO_2-e/tkm	kg CO_2-e/tkm	kg CO_2-e/tkm
Rail – Export	25,241,874	275	6,941,515,350	0.0054	N/A	N/A
Ship – Export	25,241,874	9,507	239,974,496,118	0.0126	N/A	N/A
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				3,061,163	N/A	N/A
					Total GHG Emissions (t CO_2-e)	**3,061,163**

Extraction, Production and Distribution of Energy Purchased

Activity Data		Emission Factors		
		CO_2	CH_4	N_20
Purchased energy	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Diesel	419,990	3.6	N/A	N/A
Electricity	1,095,630	24	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)		27,807	N/A	N/A
			Total GHG Emissions (t CO_2-e)	**27,807**

Materials Transport

Activity Data	Emission Factors			Full Life Cycle
Transport mode	**Usage**	**Units**	**GJ**	**kg CO_2-e/GJ**
Truck – Diesel (260 km)	48.269	kL	1,863	74.01
				t CO_2-e
			Total GHG emissions (t CO_2-e)	**138**

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