

GILGANDRA SHIRE COUNCIL

DA 2021/379 ASSESSMENT REPORT

---

## APPENDIX 7

### Greenhouse Gas Emissions Assessment

---

25 August 2021

Lindsay Mathieson  
Director Planning & Environment  
P.O. Box 23  
Gilgandra NSW, 2827  
E| lmathieson@gilgandra.nsw.gov.au

Dear Lindsay

**Re: Greenhouse Gas Emissions Assessment**

It has been drawn to my attention that the calculations included in the Greenhouse Gas Emissions Assessment, provided in response to Council's request of 15 July for assessment of greenhouse gas emissions, included incorrect formulae to calculate emissions. The following reproduces the calculation of emissions with corrected calculations. **Section 2.0** has been modified to include the equations used in the calculation of greenhouse gas emissions.

As previously reported, the following provides calculations of likely greenhouse gas emissions from the Quarry (under both high and low production stages), an assessment of the associated impacts and commitments with respect to emission minimisation and management.

**1.0 Assessment Methodology**

The World Resources Institute/World Business Council for Sustainable Development Greenhouse Gas Protocol (WRI/WBCSD, 2004) establishes an international standard for accounting and reporting of GHG emissions. The GHG Protocol has been adopted by the International Standard Organisation, endorsed by GHG initiatives (such as the Carbon Disclosure Project).

Three 'scopes' of emissions (Scope 1, Scope 2 and Scope 3) are defined for GHG accounting and reporting purposes. Scope 1, or 'direct emissions', refers to those emissions that occur from sources that are owned or controlled by the reporting entity. Scope 2 refers to indirect emissions associated with purchased electricity consumption. Scope 3 refers to those emissions that are a consequence of the operations, but which arise from sources not owned or controlled by the Applicant. Proposal-related GHG sources included in the assessment are as follows.

- Scope 1: Emissions generated by operations on the Quarry Site and Private Haul Road. The main sources of GHG emissions would be from diesel fuel consumption related to mobile plant, generators for power the mobile crushing plant, and road transport of the Quarry products, and blasting

**Newcastle**  
75 York Street  
Teralba NSW 2284

**Perth**  
Level 1  
12 Prowse Street  
West Perth WA 6005  
PO Box 783  
West Perth WA 6872

**Canberra**  
2/99 Northbourne Avenue  
Turner ACT 2612  
PO Box 6135  
O'Connor ACT 2602

**Sydney**  
Level 3  
50 York Street  
Sydney, NSW, 2000

**Brisbane**  
Level 13  
500 Queen Street  
Brisbane QLD 4000

**Orange**  
Office 1  
3 Hampden Avenue  
Orange NSW 2800

T | 1300 793 267  
E | info@umwelt.com.au  
[www.umwelt.com.au](http://www.umwelt.com.au)

Umwelt (Australia) Pty Limited  
ABN 18 059 519 041

using ANFO explosives. The Proponent has provided the following with respect to the proposed usage of diesel fuel and ANFO.

- Stage 1 (490,000 tpa):
  - Diesel Fuel: 50,000 L
  - ANFO: 20,000 kg
- Stage 2 (100,000 tpa):
  - Diesel Fuel: 10,000 L
  - ANFO: 4,000 kg
- Scope 2: Indirect emissions associated with the purchase of electricity.
- Scope 3: Indirect emissions associated with the production of diesel.

Inventories of GHG emissions were calculated using published emission factors. Different gases have different greenhouse warming effects (referred to as global warming potentials) and emission factors consider the global warming potentials of the gases created during combustion. The estimated emissions are referred to in terms of carbon dioxide equivalent, or CO<sub>2</sub>-e, emissions by applying the relevant global warming potential. The greenhouse gas assessment has been conducted using the National Greenhouse Account Factors (NGA Factors) published by the Department of Industry, Science, Energy and Resources (DISER, 2021).

## 2.0 Method of Calculation

### 2.1 Scope 1 Emissions

Diesel and blasting emissions are calculated based on the following equations provided in the document *National Greenhouse Accounts Factors, Australian National Greenhouse Accounts, August 2021* (DISER, 2021).

#### Diesel Fuel Combustion

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1\,000}$$

Where:

$E_{ij}$  is the emissions of gas type ( $j$ ), (carbon dioxide, methane or nitrous oxide, from fuel type ( $i$ ) (CO<sub>2</sub>-e tonnes).

$Q_i$  is the quantity of fuel type ( $i$ ) (kilolitres) combusted for stationary energy purposes

$EC_i$  is the energy content factor of fuel type ( $i$ ) (gigajoules per kilolitre) for stationary energy purposes.

$EF_{ijoxec}$  is the emission factor for each gas type ( $j$ ) (which includes the effect of an oxidation factor) for fuel type ( $i$ ) (kilograms CO<sub>2</sub>-e per gigajoule).

#### Blasting Emissions

$$E = Q \times EF$$

Where:

$E$  is the emissions of greenhouse gas from combustion of ANFO (CO<sub>2</sub>-e tonnes).

$Q$  is the quantity of ANFO (tonnes) combusted for stationary energy purposes

$EF$  is the combined emission factor for ANFO (t CO<sub>2</sub>-e/t ANFO)

## 2.2 Scope 2 Emissions

There will be no purchased electricity and hence no Scope 2 emissions.

## 2.3 Scope 3 Emissions

Emissions from the production of diesel fuel have been estimated in accordance with the *Greenhouse Gas Protocol - Technical Guidance for Calculating Scope 3 Emissions: Supplement to the Corporate Value Chain (Scope 3) Accounting & Reporting Standard* (World Resources Institute & World Business Council for Sustainable Development, 2013).

$$E_i = \frac{Q_i \times EC_i \times EF_i}{1\,000}$$

Where:

$E_i$  is the greenhouse gas emissions from fuel type ( $i$ ) (CO<sub>2</sub>-e tonnes).

$Q_i$  is the quantity of fuel type ( $i$ ) (kilolitres) combusted for stationary energy purposes

$EC_i$  is the energy content factor of fuel type ( $i$ ) (gigajoules per kilolitre).

$EF_i$  is the Scope 3 emission factor for diesel fuel (kilograms CO<sub>2</sub>-e per gigajoule).

## 3.0 Predicted Emissions

The greenhouse gas emissions of the Project have been estimated by considering anticipated activity levels on the Quarry Site (for Stage 1 and Stage 2 operations), standard heat of combustion figures and default emission factors provided in the NGA Factors document (DISER, 2020).

**Table 3.1** and **Table 3.2** summarise these calculated greenhouse gas emissions.

**Table 3.1 Predicted Greenhouse Gas Emissions – Quarry Stage 1**

Emission Source	Annual Consumption	Energy Content Factor (GJ/kL)	Emission Factor (kg CO <sub>2</sub> -e )			Calculated Emissions (t CO <sub>2</sub> -e/annum)
			CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	
Scope 1						
Diesel Combustion	50 kL	38.6	13.9	0.1	0.2	27.4
Explosive Use (ANFO)	20 t	-	0.17			3.4
Scope 3						
Diesel Production	50 kL	38.6	3.6			6.9
Total						37.7

**Table 3.2 Predicted Greenhouse Gas Emissions – Quarry Stage 2**

Emission Source	Annual Consumption	Energy Content Factor (GJ/kL)	Emission Factor (kg CO <sub>2</sub> -e )			Calculated Emissions (t CO <sub>2</sub> -e/annum)
			CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	
Scope 1						
Diesel Combustion	10 kL	38.6	13.9	0.1	0.2	5.5
Explosive Use (ANFO)	4 t	-	0.17			0.7
Scope 3						
Diesel Production	10 kL	38.6	3.6			1.4
Total						7.6

The total amount of annual greenhouse gas emissions from the Quarry would approximate 38 tonne CO<sub>2</sub>-e per annum at maximum production, reducing to 7.6 tonne CO<sub>2</sub>-e per annum as production reduces following the fulfilment of supply to the Inland Rail construction. Compared against the reported 2019 greenhouse emissions of Australia (518.9 million t CO<sub>2</sub>-e, DISER, 2021), the annual contribution from the Quarry is insignificant (0.0000007 %).

#### 4.0 Impact Assessment

The accumulation of greenhouse gases or carbon in ‘carbon sinks’ is the primary impact of greenhouse gas emissions. Since the industrial revolution, 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 gases 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 gases in the ocean is an important driver of ocean acidification (IPCC 2013).

The Project is forecast to generate <38 t CO<sub>2</sub>-e annually during Stage 1, reducing to <8 t CO<sub>2</sub>-e annually during Stage 2.

The estimated emissions reflect a small increase and total in the context of State and National emissions and no significant greenhouse gas emissions management is warranted.

#### 5.0 Emission Minimisation and Mitigation Measures

There are no obvious alternatives to the proposed methods of extraction, processing and transport which would reduce greenhouse gas emissions. The use of mains electricity to power the crushing and processing equipment would reduce Scope 1 emissions, however, any benefit would be reduced by the emissions associated with the generation of electricity (Scope 2 greenhouse gas emissions), as would the work required to construct and maintain new electricity transmission lines (ETLs). Considering the significant cost and additional environmental impacts of constructing new ETLs, this alternative has been discounted as unreasonable.

Notwithstanding, the Proponent is committed to implementing all reasonable and feasible measures to minimise the generation of greenhouse gas emissions. Commitments include:

- Using larger capacity and more fuel-efficient road trucks to deliver quarry products
- Operating on a campaign basis to minimise inefficient operating practices
- regularly tuning and maintaining mobile and fixed equipment to minimise exhaust and greenhouse gas emissions, and
- reviewing opportunities for improvement in diesel use and energy efficiency when purchasing or replacing equipment at the quarry to reduce greenhouse gas emissions.

## **6.0 References**

Department of Industry, Science, Energy and Resources (DISER) (2021). National Greenhouse Accounts Factors, August 2021.

Bureau of Meteorology and CSIRO (2014). State of the climate 2014.

Intergovernmental Panel on Climate Change (IPCC), 2013. Climate Change 2013: Working Group I: The physical science basis.

World Resources Institute & World Business Council for Sustainable Development (WRI/WBCSD) (2004). The Greenhouse Gas Protocol: The GHG Protocol for Modified RDC Accounting. World Resources Institute and the World Business Council for Sustainable Development, Switzerland.

WRI/WBCSD (2013). Greenhouse Gas Protocol: Technical Guidance for Calculating Scope 3 Emissions: Supplement to the Corporate Value Chain (Scope 3) Accounting & Reporting Standard.

We trust this information meets with your current requirements. Please do not hesitate to contact the undersigned on 1300 793 267 should you require clarification or further information.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'AI', is positioned above the printed name.

Alex Irwin  
Principal Environmental Consultant