





# West Musgrave Copper and Nickel Project

October 2021

## Greenhouse Gas Management Plan

## VERSION CONTROL

Revision	Version	Authorisation	Position	Signature	Date
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## SUMMARY

A summary of the key Environmental Management Plan (EMP) information is presented in Table 1.

**Table 1: Summary of Key EMP Information**

Project Information	Description
Proposal Name	West Musgrave Copper and Nickel Project
Proponent Name	OZ Minerals
Ministerial Statement No/s and Condition/Clauses	<p>The Proposal is currently being assessed by the Government of Western Australia's Environmental Protection Authority (EPA). The EPA has proposed that a Greenhouse Gas Management Plan (GHGMP) will be a condition of approval of the proposed project.</p> <p>A Ministerial Statement and associated conditions are yet to be issued.</p>
Purpose of the EMP	<ul style="list-style-type: none"> <li>To support the assessment, approval and implementation of the Proposal under Part IV of the <i>Environmental Protection Act, 1986</i> (WA) (EP Act)</li> <li>The Proposal is being assessed by the EPA under Part IV of the EP Act, through Assessment of Referral Information (ARI)</li> <li>This GHGMP has been developed in accordance with the Instructions on how to prepare <i>Environmental Protection Act 1986</i> Part IV Environmental Management Plans (EPA, 2020a) and Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2020b)</li> <li>This GHGMP has also been prepared to demonstrate the commitment of OZ Minerals to a pathway to zero greenhouse gas emissions for the West Musgrave Project (WMP).</li> </ul>
Key Environmental Factor	Greenhouse Gas
Objective	<p>Reduce net greenhouse gas emissions to minimise the risk of environmental harm associated with climate change.</p> <p>Contribute to Western Australian GHG policy commitment to adapting to climate change and working with all sectors of the economy to achieve net zero greenhouse gas emissions by 2050.</p>
Key Provisions of the EMP	<ul style="list-style-type: none"> <li>Continuous progression towards net zero emissions by 2050</li> <li>Development of Decarbonisation Roadmap to support a trajectory towards zero emissions</li> <li>Establish WMP baseline emissions in accordance with National Greenhouse and Energy Reporting (NGERs) and maintain emissions no greater than baseline</li> <li>Implement GHG monitoring and reporting programs</li> <li>Achieve emissions reduction trajectory as defined in the Decarbonisation Roadmap</li> <li>Review Decarbonisation Roadmap.</li> </ul>
Proposed Construction Timing	Commencing 2022 following Final Investment Decision, progressing to 2024
EMP Required Pre-construction?	Yes, prior to issuing of Ministerial Statement
Proposed Operations Timing	26 years from date of commissioning

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## 1 CONTEXT, SCOPE AND RATIONALE

This Greenhouse Gas Management Plan (GHGMP) has been prepared by OZ Minerals to support the assessment, approval and implementation of the Proposal under Part IV of the *Environmental Protection Act, 1986* (WA) (EP Act). GHG emissions are addressed under State legislation, primarily governed by the EP Act. In addition to State legislation, the following policy and guidance statements were considered in the development of this GHGMP:

- EPA Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2020b)
- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2020c)
- Greenhouse Gas Emissions Policy for Major Projects (Government of Western Australia, 2019a).

This GHGMP addresses the Notice Requiring Information for Assessment, received from the EPA (the Notice). The Notice requires OZ Minerals to:

*Provide a Greenhouse Gas Management Plan detailing credible estimates of scope 1, scope 2 and scope 3 Greenhouse Gas (GHG) emissions (annual and total) over the life of a proposal, a breakdown of GHG emissions by source inclusive of, but not limited to, stationary energy, fugitives, transport, and emissions associated with changes to land use, and projected emissions intensity (emissions per unit of production) for the proposal and benchmarking against other comparable projects. The Plan should demonstrate a commitment to achieving net zero emissions by 2050, or clearly articulate why this is not possible. The Plan should also outline how revisions of targets and strategies would be made publicly available. The Plan should be prepared in accordance with the Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2020).*

The EPA Guidance for GHG emissions provides several items for consideration during the environmental impact assessment and management process, specifically:

- Application of the mitigation hierarchy to avoid, reduce and offset emissions
- The interim and long-term emissions reduction targets the proponent proposes to achieve
- Adoption of best practice design, technology and management appropriate to mitigate GHG emissions
- Whether proposed mitigation is plausible, timely, achievable and is all that is reasonable and practicable.

Following initial review by the Strategy and Guidance Branch (SGB) of the EPA during the public comment phase (July 2021), further requirements for inclusion in the GHGMP beyond those prescribed in EPA's Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2020b) were requested, including:

- Commitment to an emissions reduction trajectory broken down into five-year intervals
- Presentation of identified emissions reduction opportunities, whether committed to or otherwise
- Additional reporting requirements, specifically related to the development of a five-year "GHG Summary Plan and Progress Statement" document for public release.

These additional requirements have been incorporated into this GHGMP.

## **1.1 Proposal**

### **1.1.1 Project Overview**

The West Musgrave Copper and Nickel Project (WMP) is located in the West Musgrave Ranges of Western Australia. The WMP is located approximately 1,300 km north-east of Perth near to the border of South Australia and the Northern Territory. The WMP is within the Ngaanyatjarra Native Title determination, and Class A Reserve No. 17614 (for the Use and Benefit of Aboriginal Inhabitants). The nearest towns include the Indigenous Communities of Jameson (Mantamaru) 26 km north, Blackstone (Papulankutja) 50 km east, and Warburton (Milyirrtjarra) 110 km west of the project (Figure 1).

The project, with a current expected life of approximately 26 years, will consist of:

- Mining of copper and nickel ore from two open cut mine pits using conventional blast, load and haul methods
- Placement of mine waste into permanent waste rock dumps (WRDs) and dedicated tailings storage facility (TSF) adjacent to mine pit voids
- Milling and processing of ore using floatation to produce two separate copper and nickel concentrates
- On-site power supply using a combination of renewable power infrastructure (photovoltaic solar panels, wind turbines and battery storage) supported by backup thermal power generation
- Development of a process/potable water supply borefield that may include a combination of overland and/or underground pipelines for use during construction and operations
- Miscellaneous infrastructure, including stormwater management infrastructure (bunds and drains), internal roads and service tracks, a dedicated site access road, accommodation village (approximately 450 beds during operations and 1,200 during construction), airstrip, wastewater treatment, landfill and other supporting infrastructure including offices, warehouses and workshops.



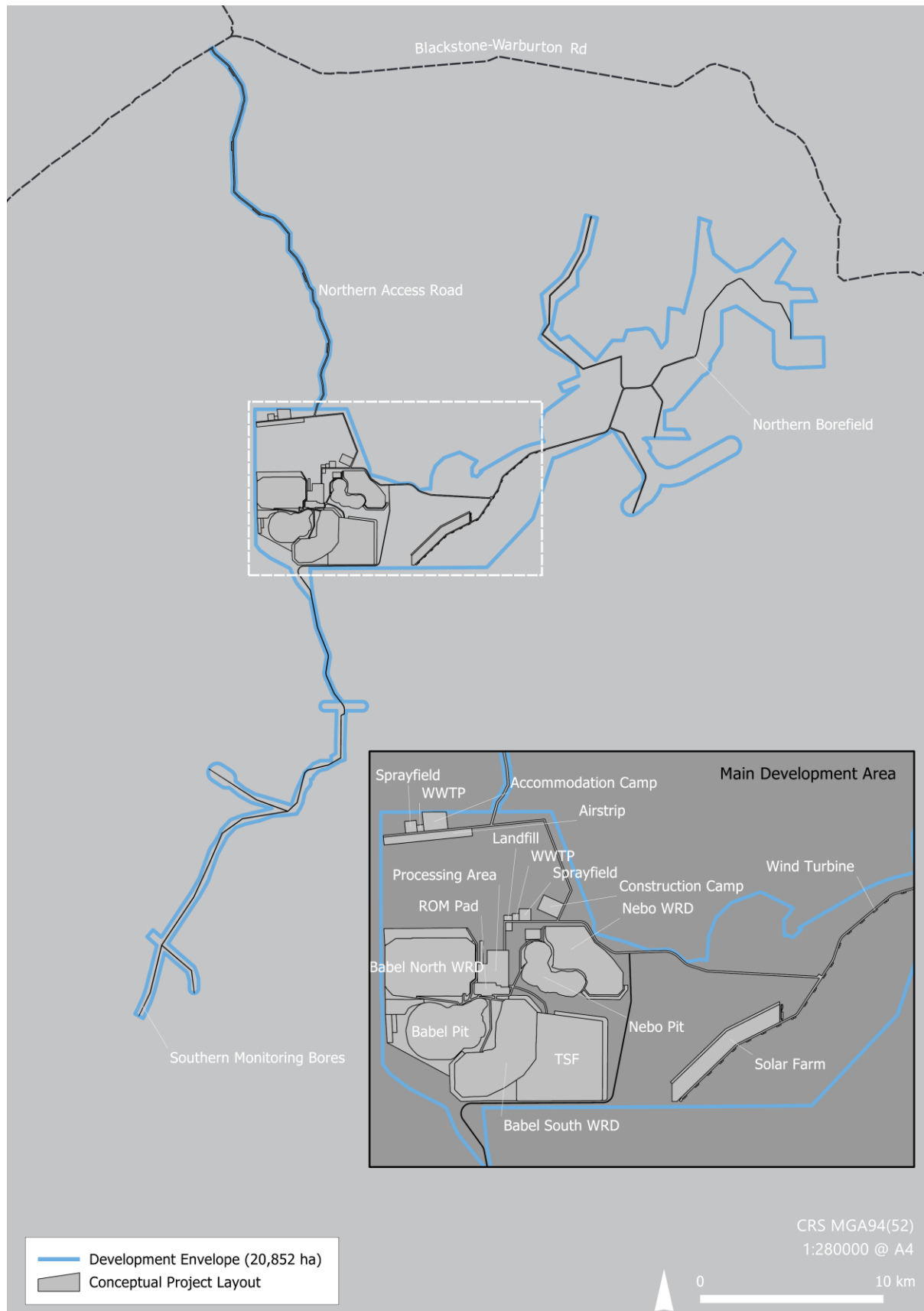
- Concentrate will be transported via existing roads and rail networks.

A summary of the key project characteristics is presented in Table 2.

**Table 2: Key Project Characteristics**

Elements	Location	Proposed Extent Authorised
<b>Physical Element</b>		
Mine and associated infrastructure	Figure 2	Clearing of up to 3,830 ha of native vegetation within a Development Envelope of 20,852 ha
<b>Operational Element</b>		
Mining voids	Figure 2	Below water table mining Nebo pit void to be backfilled above water table post-closure Babel pit void to be a permanent and episodic pit lake post-closure
Mining waste (waste rock)	Figure 2	Placement of waste rock into permanent WRDs
Ore processing waste (tailings)	Figure 2	Disposal of tailings into a TSF and/or Nebo pit void
Power supply	Figure 2	Up to 60 MW (instantaneous load requirement) of fossil fuel electricity generation Up to 100 MW of photovoltaic solar electricity generation Up to 100 MW of wind electricity generation
Water supply	Figure 2	Abstraction of up to 7.5 GL/a of groundwater from the Borefield and through mine pit dewatering





**Figure 2: Location of Key Physical and Operational Elements**

## 1.2 Key Environmental Factor

This GHGMP specifically relates to the Greenhouse Gas Emissions factor guidelines within the EPA Air environmental factor. The EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020c) lists the following as their objective for greenhouse gas emissions:

*To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change*

The objective recognises the fundamental link between GHG emissions and other Environmental Factors through effects on climate. For example, climate change has already caused a significant drying of the State's south-west, which in-turn places significant additional pressures on water resources, flora and fauna, marine environmental quality, and social surroundings.

### 1.2.1 Proposal Activities that May Affect the Key Environmental Factor

#### 1.2.1.1 Scope 1 Emissions

The most significant sources of GHG emissions expected to be emitted by the project include:

- Combustion product emissions associated with the use of diesel electricity generation
- Combustion product emissions associated with use of diesel-powered mining and earth moving vehicles.

Emissions associated with the mining fleet are considered scope 1 emissions. The contractual arrangements regarding electricity supply for the WMP have yet to be finalised. The electricity supply solution may be owned and operated by OZ Minerals (in which case the emissions would be scope 1) or electricity may be subject to a Build-Own-Operate-Maintain (BOOM) contract or similar, with OZ Minerals purchasing electricity "over the fence", in which case, emissions may be classified as scope 2. To present a conservative assessment and ensure that this GHGMP reflects all major sources of GHG emissions, this GHGMP assumes that the electricity supply at WMP is under the operational control of OZ Minerals and emissions associated with this supply are therefore scope 1, where operational control is defined as follows:

*A person will have operational control over a facility if they have the authority to introduce and implement any or all the following for the facility:*

- *operating policies*
- *health and safety policies*
- *environmental policies*

*Where more than one corporation has the authority to introduce and implement any or all of these policies, the corporation that has the greatest authority to introduce and implement operating policies and environmental policies has operational control over the facility. (National Greenhouse Gas and Energy Reporting Act, 2007 (Cth))*

Estimates of GHG emissions from the project have been prepared by third-party GHG consultants and environmental accountants, Greenbase Pty Ltd, using methods and emissions factors from the *National Greenhouse and Energy Reporting [NGER] (Measurement) Determination, 2008 (Cth)* for four operational scenarios. For each scenario, the diesel combusted for the mining fleet and LPG combusted over the life of the mine, remain the same at 997,139 kL (223,381 kL transport and 773,758 kL non-transport) and 214 kL, respectively. The key difference between each scenario is the fuel combustion for power generation:

- Scenario 1: 100 percent diesel/0 percent renewable (i.e., a typical 'business as usual' case)
- Scenario 2: 20 percent diesel/80 percent renewable (base case)
- Scenario 3: 40 percent diesel/60 percent renewable
- Scenario 4: 100 percent pipeline natural gas.

Scenario 2 represents the current proposed project target, and approximates the current base case for WMP, against which other scenarios were compared. However, OZ Minerals recognises that some uncertainty exists relating to the availability and consistency of renewable energy sources such as wind and sun, and as such greenhouse gas emissions at WMP have been considered for a range between Scenario 3 and Scenario 2 (e.g. a base case between 70 and 80% renewable power generation). A summary of these projected emissions is presented in Table 3 and the lifetime emissions profile for Scenario 2 is shown in Figure 5.

The total predicted scope 1 emissions generation over the life of the mine is 4,060,280 t CO<sub>2</sub>-e with an emission intensity of 0.01560 t CO<sub>2</sub>-e/tonne ore mined for Scenario 2, and 5,415,555 t CO<sub>2</sub>-e and 0.02091 t CO<sub>2</sub>-e/tonne ore mined for Scenario 3, respectively (Figure 3). Even under Scenario 3, this emissions intensity represents a significant improvement over business-as-usual emissions.

**Table 3: Projected Scope 1 Greenhouse Gas Emissions under Scenario 2 and Scenario 3**

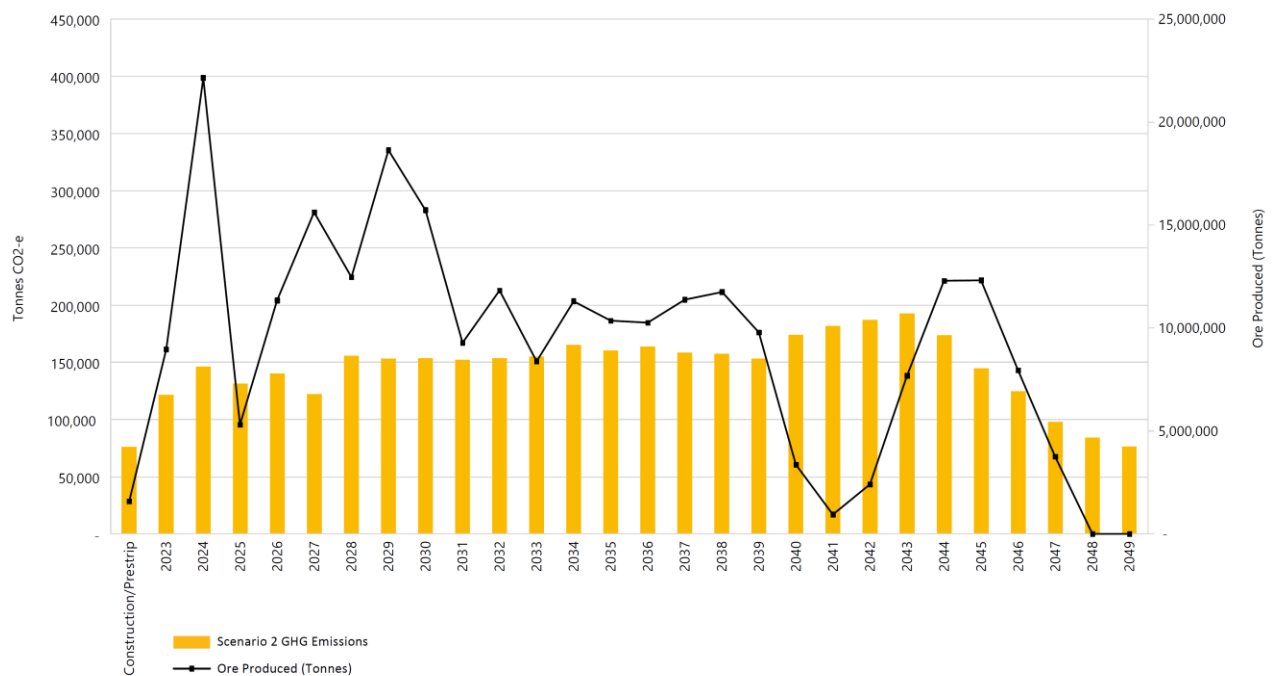
Scenario	Scope 1 Greenhouse Gas Emissions (average t CO <sub>2</sub> -e/annum)	Life-of-Mine Emissions (t CO <sub>2</sub> -e)
Scenario 3 (60% renewable penetration)	178,070 – 215,970	5,415,600
Scenario 2 (80% renewable penetration)	127,870 – 165,770	4,060,280

A breakdown of Scenario 2; scope 1 emissions by source over the life-of-mine is presented in Table 4 and illustrated in Figure 4.



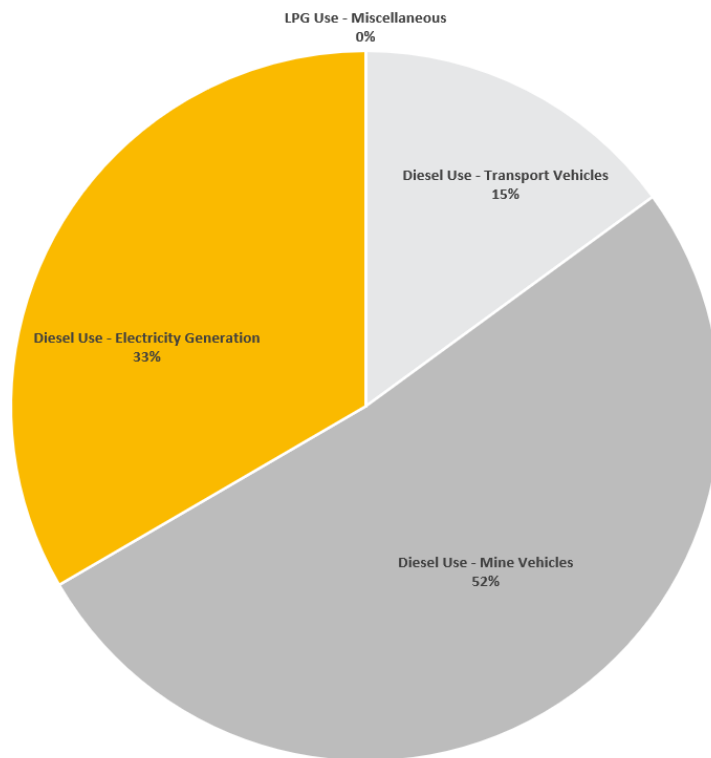
**Table 4: Projected Scope 1 Greenhouse Gas Emissions by Source under Scenario 2**

Emissions Source	Scope 1 Greenhouse Gas Emissions (average t CO <sub>2</sub> -e/annum)	Life-of-Mine Emissions (t CO <sub>2</sub> -e)
Diesel consumption – mining fleet	23,380	607,900
Diesel consumption – materials transport	80,640	2,096,700
Diesel consumption – electricity generation	50,200	1,355,340
Diesel consumption – grinding mill heaters	13	340



**Figure 3: Projected Annual Life-of-Mine Scope 1 Emissions Profile<sup>1</sup>**

<sup>1</sup> Note: Initial rise in GHG emissions (2023–2024) is associated with production ramp-up to steady state operations following construction and commissioning, as reflected in the ore production rate.



**Figure 4: Breakdown of Life-of-Mine Scenario 2 Scope 1 Emissions by Source**

### 1.2.1.2 Scope 3 Emissions

Initial estimates of scope 3 emissions for the life of the project have also been estimated, however are subject to significant uncertainty given the current phase of the supporting engineering studies. Scope 3 emissions estimated to date including emissions associated with:

- Fuel and energy use
- Upstream transportation and distribution
- Processing of sold products
- Downstream transportation and distribution
- Use of sold products
- End of life of sold products
- Waste generation during concentrate production.

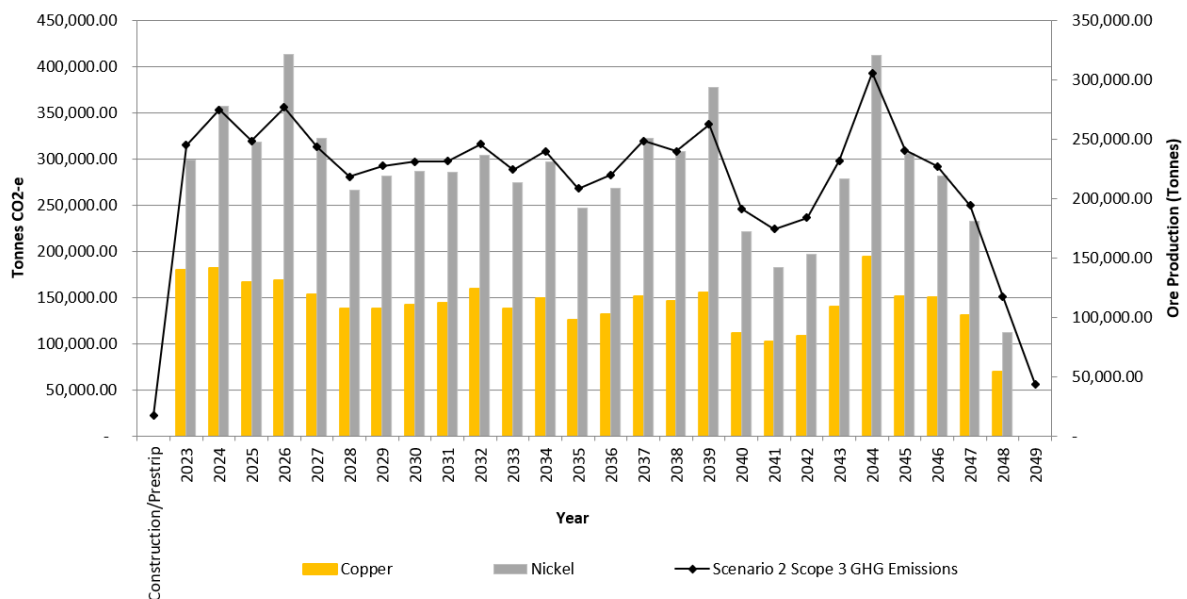
Scope 3 emissions not currently included in the assessment include:

- Purchased goods and services (reagents, spares etc.)
- Some capital goods (specifically the mined rock haulage fleet)
- Employee commuting-related emissions.

The total predicted scope 3 emissions generation over the life of the mine is 7,722,260 t CO<sub>2</sub>-e with an emission intensity of 0.03016 t CO<sub>2</sub>-e/tonne ore mined for Scenario 2 (Figure 5), and 7,413,607 t CO<sub>2</sub>-e and 0.02895 t CO<sub>2</sub>-e/tonne ore mined for Scenario 3, respectively (Table 5).

**Table 5: Projected Scope 3 Greenhouse Gas Emissions under Scenario 2 and Scenario 3**

Scenario	Scope 3 Greenhouse Gas Emissions (average t CO <sub>2</sub> -e/annum)	Life-of-Mine Emissions (t CO <sub>2</sub> -e)
Scenario 3 (60% renewable penetration)	21,800 – 380,000	7,413,607
Scenario 2 (80% renewable penetration)	21,800 – 395,000	7,722,260



**Figure 5: Projected Annual Life-of-Mine Scope 3 Emissions Profile**

### 1.2.1.3 Land Use Change

No local studies into the potential carbon stocks of the environment in the West Musgrave region have been undertaken. An extensive study was undertaken by the Government of Western Australia's Department of Agriculture and Food in 2010 (Alchin, Tierney and Chilcott, 2010) into the potential for carbon offset enterprises within the Pilbara and Kimberley. This report quantified the carbon stocks on a range of vegetation associations within the Kimberley and Pilbara region, including within the Cheela Plains pastoral lease. Although this lease is a significant distance from the project, the area is subject to similar rainfall and has extensive spinifex grasslands (identified as the Capricorn land system) common around the project area.

The average carbon stocks measured for the Cheela Plains are summarised in Table 6.

**Table 6: Land Use Change-related Greenhouse Gas Emissions Estimate**

Carbon Pool	Carbon Mass (t C per ha)	Greenhouse Gas Emission (t CO <sub>2</sub> -e per ha)
Soil	45.29	166.21
Woody vegetation	27.23	99.93
Herbaceous vegetation	14.37	52.74
Coarse woody debris	71.41	262.07
<b>Total</b>	<b>158.30</b>	<b>580.95</b>

Assuming a maximum area of native vegetation clearance associated with the project of 3,830 ha, the total land use-related change in carbon stocks would be up to 2,225,040 t CO<sub>2</sub>-e, noting that the topsoil, incorporating coarse woody debris, would be stockpiled during operations and subsequently used in rehabilitation activities across the project area upon closure, and thus the carbon stock will not be removed from the environment.

## 1.2.2 Site Specific Environmental Values

The project is situated in remote Western Australia within the Shire of Ngaanyatjaraku. The nearest towns/settlements that have the potential for air quality related impacts from the project are Jameson (Mantamaru, approximate population of 160 people), Blackstone (Papulankutja, approximate population of 153 people) and Warburton (approximate population of 580 people) located approximately 26 km north, 50 km east and 110 km west of the project respectively.

As there are few anthropogenic influences in the area, the existing contributors to GHG emissions include power generation for remote settlements, vehicle use by community members and users of the Great Central Road and bushfires.

## 1.3 Condition Requirements

A Ministerial Statement and associated conditions are yet to be issued.

## 1.4 Rationale and Approach

This GHGMP outlines how GHG emissions for the project will be monitored and managed to minimise the Company's contributions to global GHG emissions. This recognises the Company's significant focus during project design to minimise overall emissions through use of renewable energy technologies. It is recognised however that with fast changing technology, additional opportunities to minimise GHG emissions may become available over the life of the project.

## 1.4.1 Survey and Study Findings

### 1.4.1.1 Emissions Intensity

Emissions intensity for the WMP was estimated using the total life-of-mine scope 1 emissions (excluding construction-related emissions) measured against the total mass of ore proposed to be mined (though not necessarily processed) over the same life-of-mine period. This provides a worst-case emissions intensity, given the significant contribution that the consumption of diesel by the mining fleet makes to overall GHG emissions.

### 1.4.1.2 Benchmarking

A GHG benchmarking exercise was undertaken to compare the project's scope 1 and scope 2 emissions with other comparable Australian base-metal projects. In Western Australia, this included operating copper and nickel projects that produce concentrates for sale locally or for export. These projects included the Nova, Jaguar and Tropicana Projects (Independence Group) and the DeGrussa Project (Sandfire Resources). Emissions from OZ Minerals' Prominent Hill Mine in South Australia were also included.

A comparison of emissions intensity against other similar operating projects is presented in Table 7 and illustrated in Figure 6, demonstrating that the WMP base case (Scenario 2) is significantly less emissions intensive than comparable projects, and will emit only 26–35% of the average emissions associated with operations benchmarked for this GHGMP.

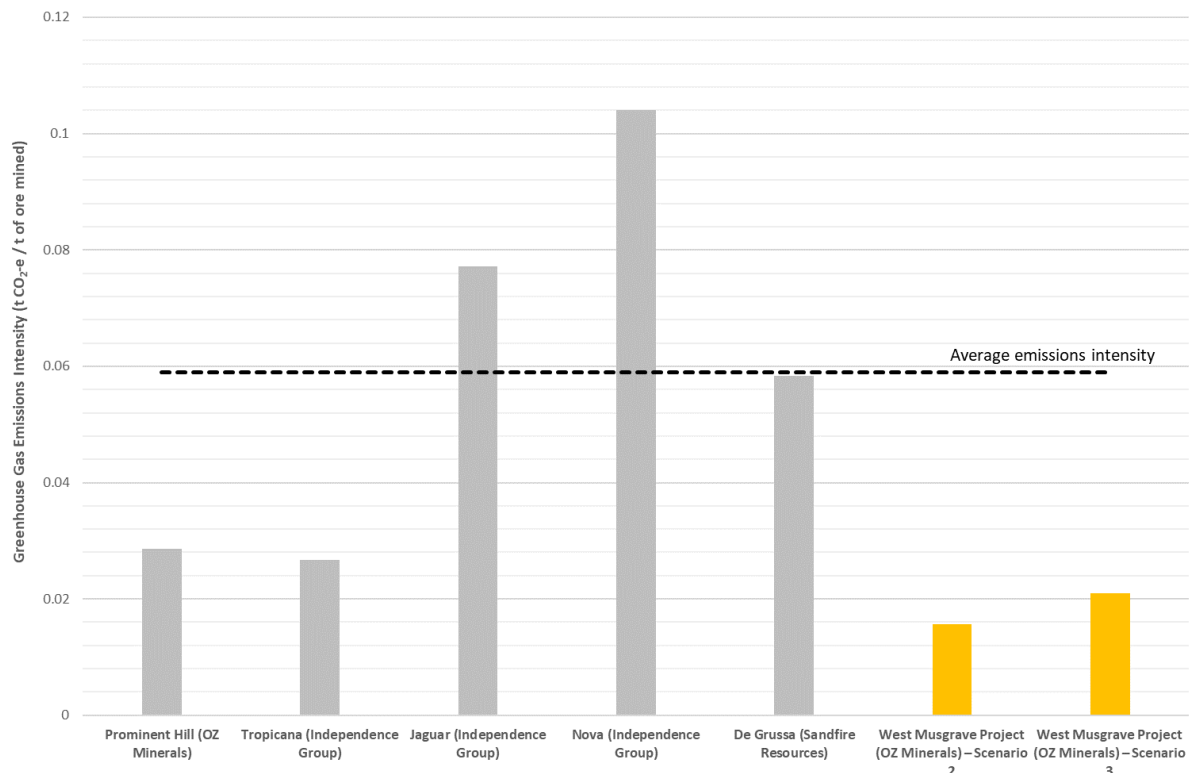
**Table 7: Scope 1 and Scope 2 Greenhouse Gas Intensity of Selected Australian Base-Metals Projects**

Operation	Emissions Intensity (t CO <sub>2</sub> -e / t Ore Mined)
Prominent Hill (OZ Minerals) <sup>1</sup>	0.02863
Tropicana (Independence Group) <sup>2</sup>	0.02665
Jaguar (Independence Group) <sup>2</sup>	0.07710
Nova (Independence Group) <sup>2</sup>	0.10399
De Grussa (Sandfire Resources) <sup>3</sup>	0.05840
<b>West Musgrave Project (OZ Minerals) – Scenario 2</b>	<b>0.01560</b>
<b>West Musgrave Project (OZ Minerals) – Scenario 3</b>	<b>0.02091</b>

<sup>1</sup> Internal data

<sup>2</sup> Independence Group NL, 2017

<sup>3</sup> Sandfire Resources, 2020



**Figure 6: Emissions Intensity of Comparable Base Metals Mining Operations**

### 1.4.1.3 State and National Context

At the peak, the WMP emissions levels would represent approximately 0.2% of Western Australia's total GHG emissions, and 0.03% of Australia's total annual GHG emissions under the base case.

### 1.4.2 Key Assumptions and Uncertainties

This GHGMP has been developed using all relevant and available information at the time of preparation. As the understanding of GHG management improves over time, this GHGMP may require updating. The key assumptions and uncertainties associated with this current GHGMP are described in Table 8.



**Table 8: Key Assumptions and Uncertainties Associated with WMP GHG Management**

ID	Assumption/ Uncertainty	Description
A1	Data accuracy	Whilst there is uncertainty around the exact volumes of diesel required, and the amount of renewable electricity that may be generated year-to-year, it is assumed that the GHG emissions estimates presented in this GHGMP reasonably reflect the likely GHG footprint of the project. These numbers have been prepared by a suitably qualified third party using standard NGERs methodologies.
A2	Power generation conservatively assumed scope 1	The contractual arrangements regarding electricity supply for the WMP have yet to be finalised. The electricity supply solution at WMP may be owned and operated by OZ Minerals (in which case the emissions would be scope 1) or electricity may be subject to a Build-Own-Operate-Maintain (BOOM) contract or similar, with OZ Minerals purchasing electricity “over the fence”, in which, case emissions may be classified as scope 2. To present a conservative assessment and ensure that this GHGMP reflects all major sources of GHG emissions, this GHGMP assumes that the electricity supply is under the operational control of OZ Minerals and emissions associated with this supply are therefore scope 1.
U1	WA and Commonwealth GHG Policy	<p>The Western Australian EPA released a draft GHG Factor Guideline in December 2019. The guideline was finalised in April 2020 (EPA, 2020b). Further, the State introduced the Western Australian Climate Policy (Government of Western Australia, 2020) in November 2020, detailing plans to achieve the aspiration of having net zero emissions by 2050. This policy provides that, in mining, the State initiate projects which target lowering overall energy costs and reducing the carbon footprint from mining and mineral processing, through adoption of alternative energy sources and energy-efficient processes.</p> <p>State and Commonwealth Government policies continue to evolve, which introduces uncertainties. Some of these include:</p> <ul style="list-style-type: none"> <li>• The introduction of the intensity-based Benchmark Baseline process for the estimation of baseline emissions under the Safeguard Mechanism</li> <li>• The State’s contribution to Commonwealth targets</li> <li>• The specific inclusions, exclusions and scope of State and Commonwealth emissions reduction targets to 2050 and any interim targets</li> <li>• State and Commonwealth policy on low emissions technologies, such as the Commonwealth Technology Investment Roadmap</li> </ul>
U2	Carbon price	At the current time, there is no uniformly applied carbon price for carbon emissions in Australia, nor a uniform (Australia-wide) policy for the application of carbon credits, beyond the provisions of the Safeguard Mechanism (see Section 2.2.2). The previous carbon pricing scheme was repealed in 2014 following a change of Government. OZ Minerals maintains an internal carbon price, used to inform decision making and understand exposure.
U3	Carbon emissions	<p>The project is proposing to generate on-site renewable electricity via installed wind turbines and solar photovoltaic systems, to be backed up by diesel-powered electric generators. Modelling has demonstrated that circa 70–80% renewables penetration can be achieved for the site, however climatic variables (wind speed and duration, and solar irradiation) mean that this value is likely to vary over time, and thus the carbon emissions are expected to vary year-to-year.</p> <p>The Decarbonisation Roadmap seeks, amongst other things, to eliminate these emissions, however until the details of this are finalised, carbon emissions from WMP remain subject to some uncertainty.</p>

ID	Assumption/ Uncertainty	Description
U4	Carbon emissions targets and abatement technologies	During the public consultation process of this GHGMP the Strategic Assessment Branch (SAB) of the EPA requested a commitment to an emissions reduction trajectory broken down into five-year intervals. While the WMP has an aggressive approach to emissions reduction in the projects base case, including approximately 70 to 80% off-grid renewable energy penetration, forecasts of emissions reduction beyond five years and the availability of abatement technologies have high levels of uncertainty. The WMP has developed an emissions reduction roadmap identifying multiple pathways to zero emissions optimised under different variables. The adoption of these scenarios is still under review and adoption will be subject to a final investment decision. As further definition on the WMP roadmap come available updates to this GHGMP may be required.
U5	Alternative Fuels and Fleet electrification	At the present time there exists uncertainty about the efficiency, life-cycle emissions and timing associated with the availability of renewable solutions for the replacement of diesel for the mining fleet, representing around 52% of the total scope 1 emissions for the project. The cost-effective availability of alternative fuels is likely to be the single largest impediment to achieving net zero emissions by 2050.

### 1.4.3 Management Approach

The management approaches discussed in this document are based and developed around the mitigation hierarchy of avoid, minimise, rehabilitate and off-set to ensure impacts to the environment have been avoided or reduced to as low as reasonably practicable, and to identify and assess opportunities for improvement, and progress their implementation.

Management actions detailed in this GHGMP have been specifically designed to ensure the project meets the EPA's objective for Greenhouse Gases (see Section 1.2). As such, the management actions focus on the minimisation of GHG emissions from sources within the project's Development Envelope i.e., scope 1 emissions.

Until such time as the project is implemented, and contracts have been let for the supply and transport of materials into and from the project, and for the sale of concentrates, OZ Minerals has limited ability to influence indirect (scope 3) emissions associated with the project. As such, commitments to the minimisation of scope 3 emissions are not included in this GHGMP but, consistent with OZ Minerals' aspirations of systemically reducing scope 3 emissions across our value chain (e.g. current discussions with third party providers related to concentrate logistics management), may be incorporated in future revisions.

### 1.4.4 Rationale for Choice of Management Targets

The provisions included in this GHGMP are management-based as they relate to specific management actions.

## 2 INTERNAL AND REGULATORY FRAMEWORK

### 2.1 OZ Minerals' Approach to Climate Change

OZ Minerals accepts the international scientific consensus of the Intergovernmental Panel on Climate Change (IPCC), recognise the 2015 Paris Agreement and support its commitment to limit global average temperature rise to below 2 degrees Celsius and pursue 1.5 degrees Celsius. To this end, the project would be managed in accordance with the OZ Minerals Climate Change Statement, described in the following section. This climate challenge statement has been integral to the thinking when designing the WMP.

#### 2.1.1 Climate Change Statement

OZ Minerals is committed to building our business sustainably — operating ethically, safely, minimising our environmental footprint, ensuring we are well-governed and are socially responsible. We deliver our aspirations by focusing on value creation for our stakeholders and we report how we have created value under the elements of Safety, Environment, Community, Health and Wellbeing ([www.ozminerals.com/media/reports/annual](http://www.ozminerals.com/media/reports/annual)).

A key focus of our commitment to sustainability relates to the threat of climate change. In our published Statement on Climate Change:

*"OZ Minerals recognises that climate change is a shared global challenge that requires business, government and society to work together. We are committed to playing our part in reducing greenhouse gas emissions and preparing for the physical impacts of climate change and the transition to a net-zero emissions by 2050.*

*OZ Minerals recognises there is a need for large reductions in global greenhouse gas emissions to reduce the scale of climate change and avoid the most severe impacts. This, coupled with the world's increasing requirement for secure, affordable energy, creates significant challenges which are best met by companies, governments and society working together."*

The OZ Minerals Annual and Sustainability Report (OZ Minerals, 2020) details our Strategic Aspirations and Acceleration Priorities, which help the Company to focus on high impact activities. With respect to greenhouse gas emissions, the following Strategic Aspiration has been developed:

*We will emit zero scope 1 emissions and strive to systematically reduce scope 2 and scope 3 emissions across our value chain.*

To facilitate this, OZ Minerals' Acceleration Priorities related to greenhouse gas include:

- Reduce high-emissions energy use
- Investigate baseline scope 3 emissions.

## **2.1.2 Taskforce on Climate-Related Financial Disclosures**

OZ Minerals is implementing our Action Plan for reporting our integrated climate change risks and climate-related financial disclosures in-line with the Task Force on Climate-related Financial Disclosures (TCFD) framework. The TCFD framework, together with our Action Plan, will provide a process to gain a better understanding of climate-related threats and opportunities, which can then be further integrated into our Company governance, strategy, risk management, standards and policies.

OZ Minerals' TCFD Action Plan has been aligned with our OZWay of working to support integration into our business. Integration through our strategy, governance framework, including risk and other process standards, policies and performance standards, ensures climate change risk management can be implemented and systematised across the Company and our devolved operating assets. As the Action Plan outlines, we aim to leverage and modify our Risk Management Specifications to comprehensively accommodate opportunities and threats arising from climate-related risk. Identifying risks, both opportunities and threats, for our business is key to delivering our strategy. We would continue to assure our responses to our identified climate risks are occurring and we would disclose progress in our Company's annual report and as part of our Stakeholder Value Creation Metrics.

## **2.1.3 Climate Change Risk Management**

Climate change has been identified as a strategic risk (both opportunities and threats) by OZ Minerals since 2017. In 2020, a series of dedicated workshops with operational teams and senior management were conducted with OZ Minerals' Australian assets and projects to assess climate-related opportunities and threats in-line with OZ Minerals' Risk Management Specification. In 2021, this work will be undertaken across all OZ Minerals' global assets and projects.

The risk assessment workshops provided a platform to build understanding of climate-related risk in the context of the individual assets. Threat workshops utilised scenario analysis based on the Intergovernmental Panel on Climate Change's (IPCC's) Fifth Assessment Report (AR5) (IPCC, 2014), while opportunity workshops focused on identifying greenhouse gas reduction initiatives to support OZ Minerals' Strategic Aspirations.

Consistent with OZ Minerals' Risk Management Specification, climate-related risks are captured in asset and project risk registers. Controls and actions are captured against each risk, with regular review of progress. Risks are also reviewed regularly.

As part of a review of OZ Minerals' suite of Global Performance Standards in 2020, several Environment Performance Standards were updated to include considerations relating to assessment and management of climate-related threats and opportunities. Our Global Performance Standards enable us to effectively manage the material threats and opportunities that are common across OZ Minerals. The Performance Standards apply to our employees, directors, officers, contractors, consultants, and any other party when undertaking work for, or on behalf of, OZ Minerals.

Table 9 describes the OZ Minerals' general approach to climate change risk management.

**Table 9: Climate Change Risk Management**

Aspect	Description
Risk Trend Analysis	Increasing risk as community, investor and regulatory standards and expectations in relation to climate change continued to increase during 2020 and are expected to continue through 2021 and beyond
Threat	Climate change can cause disruption to mine production, logistics, and water supply as a result of extreme weather events. As regulatory agencies respond to climate change over the medium term, costs of inputs may rise and restrictions may be placed on how certain resources are provided, transported, and used. This may adversely impact the execution of the strategy and the ability of assets to operate efficiently
Opportunity	Climate change, combined with regulatory change, also has the potential to be a catalyst for growth in industries that require copper and could result in upward pressure on copper prices. Ability to proactively use lower-emission sources of energy, efficient production and distribution processes, new technologies, water and energy efficiency, and proactive participation in the carbon market can result in reduced operating costs, increased production capacity, an improved revenue and liquidity position. This can also increase reputational benefits and create value for our key stakeholders
Mitigation	<p>OZ Minerals is committed to reducing the energy and water intensity of its operations, developing innovative practices in relation to chemical processing, and being more efficient in its transportation and processing activities. OZ Minerals' power strategy is focussed on the four key elements for all its operations: distribution, generation, procurement and demand management.</p> <p>Initiatives are underway across operations to reduce OZ Minerals' environmental footprint, including energy intensity, water use, waste management, and transport and logistics. We are focused on reducing carbon emissions, investing in low emissions technologies, managing climate-related threats and opportunities, and working collaboratively with others to contribute to identify improvements and transformational change.</p> <p>OZ Minerals has published a Climate Change Statement on its website which commits to playing its part in achieving net-zero carbon emissions by 2050</p>

Specific threats and opportunities associated with GHG emissions identified by OZ Minerals' assets and projects that are considered relevant to the WMP are detailed in Table 10.

**Table 10: Climate Change Risk Identification Relevant to the WMP**

Risk	Description
Opportunities	<ul style="list-style-type: none"> <li>• Examining options to increasingly electrify vehicle fleet over time, particularly diesel-powered haulage (scope 1)</li> <li>• Engaging with logistics partners to reduce transport emissions (scope 3)</li> <li>• Considering shifting demand peaks for energy-intensive plant and equipment to times of high renewable penetration (scope 2)</li> <li>• Implementing new and different processing techniques to reduce mill energy consumption (scope 1)</li> <li>• Considering greater renewable energy procurement (scope 2)</li> <li>• Evaluating onsite renewable energy options, particularly for site villages (scope 2)</li> <li>• Improving data collection processes and analytics to monitor and identify opportunities for improvement</li> </ul>
Threats	<b>Extreme Heat</b>
	<ul style="list-style-type: none"> <li>• Potential impacts: Employee safety (heat exposure), plant and equipment operation, power supply reliability, potential flight payload restrictions</li> <li>• Mitigating controls: Working in thermal conditions health and safety protocols, Trigger-Action Response Plans (TARPs) and design specifications and standards to include predicted temperature increases</li> </ul>
	<b>Intense Rainfall Events</b>
	<ul style="list-style-type: none"> <li>• Potential impacts: Reduced site access for supplies and shipment of product, direct impacts to infrastructure and operations, increased infrastructure maintenance requirements</li> <li>• Mitigating controls: Reviewing road design specifications and maintenance arrangements to consider future extreme rainfall predictions, review of site drainage infrastructure, review supply chain inventory management considering potential for disruptions, consideration of potential extreme rainfall events in TARPs</li> </ul>

## 2.1.4 Emissions Reduction and Decarbonisation

### 2.1.4.1 Committed Emissions Avoidance and Reduction

OZ Minerals has made significant commitments to reduce GHG emissions associated with the WMP in-line with our broader Strategic Aspirations and Acceleration Priorities (see Section 2.1.1). The implementation of these measures has resulted in emissions that are up to 136% less (equivalent to 5.42 Mt CO<sub>2</sub>-e over the life-of-mine) than a standard 'business-as-usual' approach to electricity supply.

Measures to avoid and to reduce emissions for the WMP are summarised in Table 11. These measures have been (and continued to be) developed during the detailed design phase of the project.



**Table 11: Mitigation Measures for Greenhouse Gas Environmental Factor**

Mitigation Measures
<b>Measures to Avoid</b> <ul style="list-style-type: none"> <li>As a base case, the project is targeting 70–80% of its power supply from renewable sources that would offset significant GHG generation. To this end, the following actions have been undertaken to date: <ul style="list-style-type: none"> <li>Collection of solar and wind data from a 100 m tower on site, 24+ months of data</li> <li>Expression of Interest (EOI) process conducted to obtain proposals from invited parties, based on 60 MW load. EOI respondents are Australian and international, and include proposals for a wide range of technologies (renewable and non-renewable) to achieve low cost and high reliability — includes, wind, solar, battery, hydrogen, gas, diesel, trucked LNG</li> </ul> </li> <li>Implementation of an Energy Strategy, the focus of which is to increase load flexibility and energy efficiency to align with variable renewable energy, focused on investigations covering three areas: <ul style="list-style-type: none"> <li>Energy Reduction and Efficiency (energy demand reductions via innovative comminution and flotation solutions)</li> <li>Energy Management and Load Flexibility (active energy management via load scheduling matched to renewable energy generation forecasting)</li> <li>Fuel Substitution (substitution of fossil fuel energy with renewable energy and long-term energy storage)</li> </ul> </li> <li>The project would continue to pursue lower energy generation machinery such as vertical roller mills to minimise the overall project electricity requirements as part of ongoing value optimisation</li> <li>The project would continue to investigate mechanisms to decarbonise the project, particularly the mobile fleet</li> </ul>
<b>Measures to Minimise</b> <ul style="list-style-type: none"> <li>Energy efficiency and GHG emissions would be considered as part of equipment selection and purchase</li> <li>The project would integrate and disclose the vulnerability of the project to climate change risks as per the requirements for the TCFD</li> <li>Appropriate emission control mechanisms would be selected to ensure that emissions comply with statutory requirements and acceptable standards</li> <li>Develop a roadmap to net zero emissions by 2050 in-line with OZ Minerals' climate change statement and Western Australia's Greenhouse Gas Emissions Policy for Major Projects (Govt. of Western Australia, 2019)</li> </ul>

## 2.1.4.2 Decarbonisation Roadmap

The WMP provides an excellent opportunity for OZ Minerals to showcase innovation in modern mining by demonstrating progress towards zero emissions mining for the project.

The WMP faces several decarbonisation challenges including heavy fleet. As part of the feasibility study-level of assessment for the copper-nickel mine, OZ Minerals is seeking support to develop four decarbonisation scenarios, in which the proposed mining operations at West Musgrave could achieve zero emissions. The business aims to understand the technology options, technical carbon abatement potential, associated capital and operating costs, interdependencies, as well as the threats and opportunities for each scenario. These scenarios will be developed into implementable Decarbonisation Roadmaps for the project.

The outputs of the decarbonisation study for the WMP will be used as inputs into the feasibility study-level of assessment to help OZ Minerals better understand what would be needed to develop and run the WMP as a net zero emissions mine and how this would create additional value for our five key stakeholder groups; communities, employees, shareholders, suppliers and governments.

The Decarbonisation Roadmap will be developed over three stages:

Stage 1: Scenario definitions and data collection.

The first stage will involve the following steps:

- Review and mapping of the value chain at WMP
- Calculate emissions baseline
- Define decarbonisation scenarios, which will include the lowest cost pathway and the fastest decarbonisation pathway
- Identify and prioritise decarbonisation technologies and the appropriate commercial and technical time for inclusion
- Identify options in consideration of most effective capital expenditure
- Assess scenario threats and opportunities.

Stage 2: Scenario modelling and marginal abatement cost curve development.

The second stage will involve the optimisation of the identified scenarios, following by the development of marginal abatement cost curves for each scenario.

Stage 3: Decarbonisation Roadmap and business case.

The final stage will be the development of business cases for each of the optimised scenarios (covering aspects such as capital and operational expenditure) over the project timeframe. Followed by the development of a roadmap for each scenario, which identifies points in time where OZ Minerals will be required to make key decisions about investment and technology selection.

To support the Decarbonisation Roadmap, OZ Minerals has partnered with research company State of Play and 13 other leading mining companies, plus numerous suppliers to the mining industry, to form the Electric Mine Consortium which aims to help reduce scope 1 and scope 2 carbon emissions.

### **2.1.4.3 Offsets**

A requirement of the EPA Environmental Factor Guideline: Greenhouse Gas Emissions (EPA, 2020b) is to consider potential offsets for some or all of the project residual direct (scope 1) emissions as required to meet emissions reduction objectives. Previous sections of this GHGMP have detailed OZ Minerals' approach to decarbonisation above those mitigation measures already committed to. These will seek to reduce emissions to net zero by 2050.

Should OZ Minerals pursue offsets to mitigate some or all of its residual scope 1 emissions to meet its aspirations and/or commitments, this would most likely be through the purchase or generation of Australian Carbon Credit Units (ACCU) via the Climate Solutions Fund (CSF). An ACCU represents 1 t of CO<sub>2</sub>-e abated or avoided.

Alternatively, or in addition to purchased ACCUs, the WMP may seek to generate ACCUs through emissions reduction or avoidance projects. To generate ACCUs, an individual or organisation must undertake an 'eligible emissions reduction' activity. These are defined in 'methodology determinations' which set out the rules for estimating emissions reductions from different activities. These methods ensure that emissions reductions are genuine (i.e. that they are both real and additional to business-as-usual operations). Methods potentially relevant to the WMP are:

- Industrial Electricity and Fuel Efficiency – which applies to an offset project that includes one or more of the following:
  - Modifying, removing or replacing existing energy consuming equipment
  - Installing energy consuming equipment as part of replacing, modifying or augmenting existing energy consuming equipment
  - Changing the way existing energy consuming equipment is controlled or operated
  - Changing the energy sources or mix of energy sources used by existing energy consuming equipment
  - Modifying, installing, removing or replacing equipment that affects the energy consumption of existing energy consuming equipment
- Industrial Equipment Upgrades – which applies to an offset project which includes one or more of the following:
  - Modifying, removing or replacing equipment
  - Installing additional equipment (e.g., waste heat recovery, pre-heating/cooling)
  - Changing the way existing equipment is controlled or operated (e.g., installing/upgrading control systems, sub-metering, refining control algorithms, or introducing additional feedback controls)
  - Changing the energy sources or mix of energy sources used.

There are other emissions reduction or avoidance projects that may be relevant to WMP (e.g., alternative waste treatment and landfill gas) however these are, in the WMP context, likely to deliver less significant outcomes.

## 2.2 Legislative Requirements

### 2.2.1 National Greenhouse and Energy Reporting Scheme

The National Greenhouse and Energy Reporting (NGER) scheme, established by the *National Greenhouse and Energy Reporting Act, 2007* (Cth) (NGER Act), is a single national framework for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER legislation. The objectives of the NGER scheme are to:

- Inform government policy
- Inform the Australian public
- Help meet Australia's international reporting obligations
- Assist Commonwealth, State and Territory government programs and activities, and
- Avoid duplication of similar reporting requirements in the states and territories.

The Clean Energy Regulator (CER) administers the NGER Act, its legislative instruments, and related policies and processes. This includes:

- Registering and deregistering corporations for reporting
- Receiving reports via the Emissions and Energy Reporting System (EERS)
- Monitoring and enforcing compliance
- Applying the audit framework
- Administering the National Greenhouse and Energy Register
- Administering the safeguard mechanism, and
- Publishing data.

Under the NGER Act, the WMP will be required to report scope 1 and scope 2 emissions data as it is projected to exceed the reporting threshold of 25,000 t of CO<sub>2</sub>-e emitted per annum.

### 2.2.2 Emissions Safeguard Mechanism

The emissions safeguard mechanism was established as part of the Emissions Reduction Fund (ERF). The ERF provides an incentive for activities that count towards meeting Australia's international climate commitments. The emissions safeguard mechanism complements the emissions reduction elements of the ERF by compelling businesses to avoid increases in emissions beyond business-as-usual levels. It achieves this by placing a legislated obligation on Australia's largest greenhouse gas emitters to keep net emissions below their emissions limit (or baseline).

The safeguard mechanism operates under the framework of the NGER Act and applies to facilities with direct scope 1 emissions of more than 100,000 t CO<sub>2</sub>-e per year. The Safeguard Mechanism came into effect on 1 July 2016.

Prior to the implementation of mitigation, the WMP may exceed the threshold for scope 1 emissions, in which case it would be required to:

- Calculate an emissions baseline based on either an independently audited forecast of production and either forecast emissions intensity provided by the responsible emitter or use of benchmark baseline based on benchmarked emissions intensities. This may be followed by a production-adjusted baseline after the commencement of operational activities at WMP
- Keep the facility's net emissions at or below its emissions baseline
- Report emissions in accordance with the NGER scheme.

## 3 REDUCTION TARGETS AND TRAJECTORIES

### 3.1 Emissions Reduction Target

OZ Minerals is committed to playing our part in reducing greenhouse gas emissions and preparing for the physical impacts of climate change and the transition to achieve net-zero emissions by 2050. The company has Strategic Aspirations to emit zero scope 1 emissions and systematically reduce scope 2 and scope 3 emissions and supporting acceleration priorities to reduce high emissions energy use and baseline scope 3 emissions, to which the WMP has aligned itself.

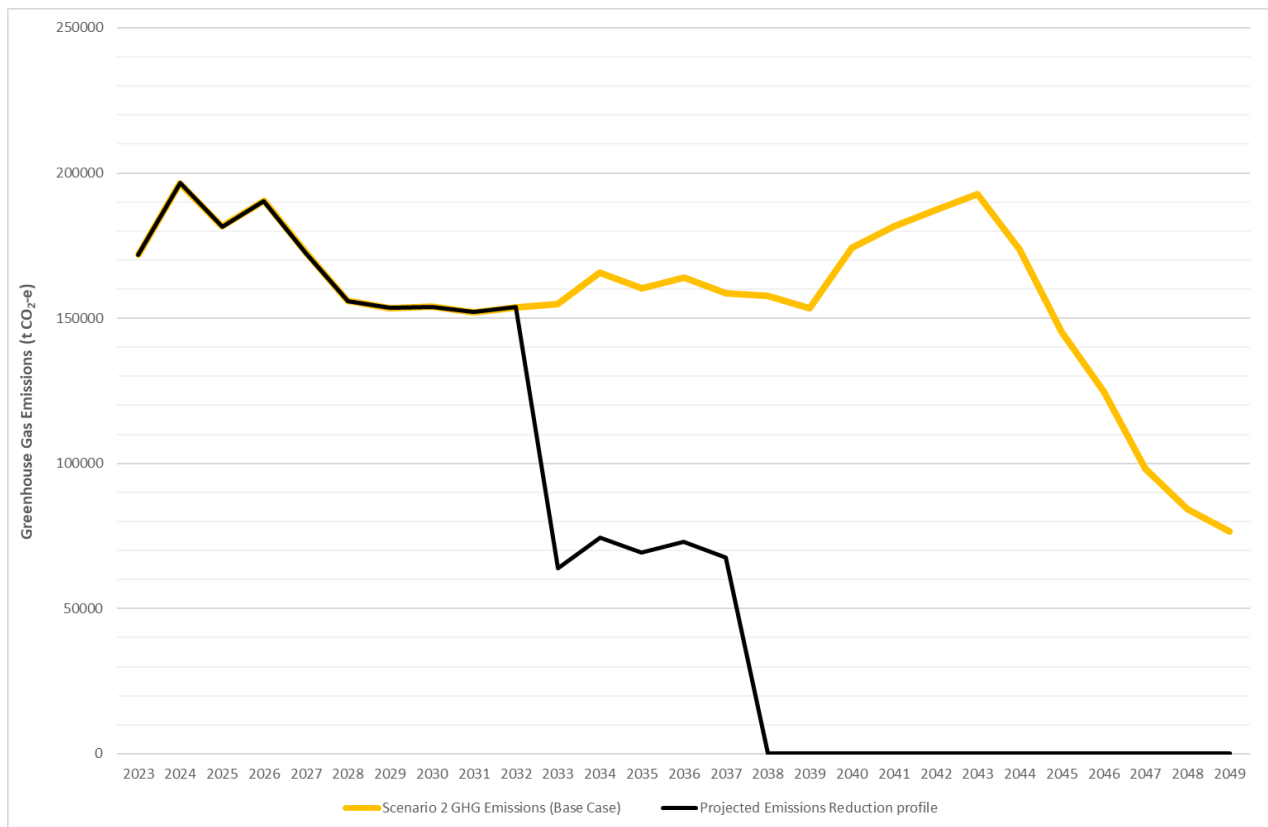
The decarbonisation study currently underway at WMP (Section 2.1.4) supports this objective, demonstrating that, with the implementation of several emissions reduction initiatives, the WMP could potentially achieve net zero scope 1 emissions by 2040.

### 3.2 Emissions Reduction Trajectory

Figure 7 represents the proposed emissions profile under the WMP decarbonisation roadmap to potentially achieve net zero scope 1 emissions by 2040. The emissions reduction profile is based on the milestones and infrastructure detailed in Table 12. While the WMP could potentially achieve net zero scope 1 emissions by 2040 (including power generation) OZ Minerals will continue to explore opportunities to accelerate this timeframe.

**Table 12: Emissions Reduction Profile**

Year	Rationale	Required Infrastructure	Emissions Reduction
0–5	Emissions will likely track similarly to Scenario 3 (at least 70% renewable electricity generation) during project commencement, and as the renewable electricity supply system and the minerals processing plant, are understood and optimised	<ul style="list-style-type: none"> <li>• Solar PV</li> <li>• Wind</li> <li>• Battery storage</li> <li>• Diesel for back-up electricity supply</li> <li>• Diesel for mining fleet</li> </ul>	Reduction of 120,000 t CO <sub>2</sub> -e/annum (compared with 100% diesel scenario) (Average GHG emission over this five-year period is 183,000 t CO <sub>2</sub> -e/annum)
5–10	Emissions will be tracking in line with Scenario 2 (approximately 80% renewable electricity generation)	<ul style="list-style-type: none"> <li>• As above, but optimised operating methodology</li> </ul>	Reduction of ~28,000 t CO <sub>2</sub> -e/annum (Average GHG emission over this five-year period is 155,000 t CO <sub>2</sub> -e/annum)
10–15	<ul style="list-style-type: none"> <li>• Additional renewable infrastructure will be commissioned on site to support increase demand</li> <li>• Electrification of the on-site mobile fleet would be implemented.</li> <li>• Increase in renewable electricity and battery storage capacity would be installed</li> </ul>	<ul style="list-style-type: none"> <li>• Tripling PV capacity</li> <li>• Increasing wind energy capacity by 30%</li> <li>• Significant increase in battery capacity to enable meaningful arbitrage</li> <li>• Diesel for back-up power and off-site transport</li> <li>• Electrification of mining fleet</li> </ul>	Reduction of ~85,000 t CO <sub>2</sub> -e/annum (Average GHG emission over this five-year period is 70,000 t CO <sub>2</sub> -e/annum)
15–20	<ul style="list-style-type: none"> <li>• Fuel switch for back-up power generation to ammonia (NH<sub>3</sub>)</li> <li>• Increase in on-site renewables and battery storage capacities</li> <li>• Installation of seasonal energy storage assets (hydrogen)</li> </ul>	<ul style="list-style-type: none"> <li>• Slight increase of PV, wind and battery capacity</li> <li>• Ammonia for back-up power generation and onsite H<sub>2</sub> production for seasonal storage</li> </ul>	Reduction of ~70,000 t CO <sub>2</sub> -e/annum (Average GHG emission over this five-year period is zero)



**Figure 7: Estimated Emissions Reduction Profile<sup>2</sup>**

Interim emissions reduction targets along the estimated trajectory are summarised in Table 13, and consider the likely range of emissions during the periods described in Table 12.

**Table 13: Scope 1 Emissions Reduction Interim Targets**

Year	Emissions Target
0	Scope 1 emissions not to exceed 196,500 t CO <sub>2</sub> -e
After 5	Scope 1 emissions not to exceed 156,000 t CO <sub>2</sub> -e
After 10	Scope 1 emissions not to exceed 75,600 t CO <sub>2</sub> -e
After 15	Scope 1 emissions to be net zero

### 3.3 Additional Abatement Measures

The emissions reduction trajectory described in Table 12 relies on the implementation of a number of abatement opportunities additional to those already committed to in Table 11. The following sections provide more detail regarding these measures.

<sup>2</sup> Note: Initial rise in GHG emissions (2023–2024) is associated with production ramp-up to steady state operations following construction and commissioning, as reflected by the increase in ore production (see Figure 3 for corresponding ore production rate).



### 3.3.1 Additional Renewable Electricity infrastructure

The current configuration for the WMP electricity supply consists of:

- Wind turbine generators with a total installed capacity of approximately 70 to 80 MW
- Bifacial solar PV arrays with a total installed capacity of 40 to 50 MW
- Battery Energy Storage System inverter/converter nominally rated at 20 to 30 MW (power) and 25 to 35 MWh (energy)
- Diesel gensets (total installed capacity of 45 to 55 MW)

Throughout the WMP, additions to the renewable electricity infrastructure would be required to meet the increasing electricity demand that corresponds to reductions in fossil fuel consumption. This would take the form of additional solar arrays, additional wind turbines and additional battery modules as required.

### 3.3.2 Electrification of the Mining Fleet

OZ Minerals is a founding member of the Electric Mine Consortium, which comprises a dozen mining and service companies with the ambition to accelerate progress towards the fully electrified zero CO<sub>2</sub> and zero particulates mine. The WMP aims to move to battery electric vehicles in year 10, when the first batch of the mine fleet are due for replacement, and necessitating the installation of charging infrastructure design to be powered from the site renewable electricity supply solution.

### 3.3.3 Use of Ammonia as Fuel, Including Hydrogen Storage Infrastructure

Ammonia has had a long history of use as a fuel, with an energy density almost double that of hydrogen alone, but about a third that of diesel. As a fuel, it's high octane rating (120) and low flame temperature allows the use of high compression ratios without a penalty of high NO<sub>x</sub> production, however ammonia cannot be easily used in existing Otto-cycle engines (of the type most often used in gensets) because of its very narrow flammability range, and modifications to combustion engines would likely be required. Since ammonia contains no carbon, its combustion cannot produce carbon dioxide, carbon monoxide, hydrocarbons, or soot, and as a fuel, it is easier to store and distribute as it does not need to be kept at cryogenic temperatures like hydrogen.

Although it is the second most produced chemical (after sulfuric acid), the scale of ammonia production is a small fraction of world petroleum usage. Most of the world's ammonia is synthesized using the Haber-Bosch process, a century-old process that is fast and relatively efficient, but energy (and carbon) intensive if not powered by renewable sources, with current ammonia production consuming about 2% of the world's energy and generating around 1% of its CO<sub>2</sub> emissions. Other production methods exist such as the reverse fuel cell. A reverse fuel cell uses renewable electricity to drive a chemical reaction

that makes ammonia. Water reacts at the anode to make hydrogen ions ( $H^+$ ), which migrate to the cathode where they react with nitrogen ( $N_2$ ) to form ammonia. The reaction is efficient, but slow.

To support the move to ammonia as a fuel for back-up thermal power generation, the WMP could install an electrolyser, which will split water into  $H_2$  and  $O_2$ . The facility will still rely on the Haber-Bosch reaction to combine the hydrogen with nitrogen to make ammonia. But the availability of on-site renewable electricity will eliminate greenhouse gas emissions from the process.

### **3.4 Contingency**

It is expected that emissions reduction technological improvements will rapidly advance over the coming 5 to 10 years displacing hydrocarbon fuel sources. As such the above detailed abatement measures will be constantly reviewed, updated and employed as appropriate.

If OZ Minerals emissions reduction interim aspirational targets at WMP cannot be achieved via the nominated (or equivalent) emissions reduction projects by the nominated date, OZ Minerals commits to providing offsets as required to reduce residual scope 1 emissions (i.e. scope 1 emissions in excess of the target) to a level equal to the trajectory. Offsets would be provided each year until the residual scope 1 emissions were reduced below the trajectory value through the successful implementation of emissions reduction projects.

## 4 MANAGEMENT ACTIONS AND MONITORING

To support OZ Minerals' objectives for GHG management at the WMP (outlined across the previous sections of this document), management actions have been developed as described in Table 14.

**Table 14: Management Actions**

ID	Management Action	Description
MA1	Continuously work towards achieving net zero emissions by 2050	In accordance with OZ Minerals' Climate Change Statement and Strategic Aspirations (see Section 2.1), the WMP aspires to net zero carbon emissions by the year 2040
MA2	Development of Decarbonisation Roadmap	Identification of mitigation opportunities and trajectories for the life of the WMP via the Decarbonisation Roadmap project, as described in Section 3
MA3	Establish WMP baseline emissions in accordance with NGERs and maintain emissions no greater than baseline	Using an appropriate methodology in accordance with the NGERs Safeguard Mechanism, the WMP will establish an emissions baseline that will form the basis for future reporting. Emissions from the WMP will be maintained at, or below, the developed baseline value, or offsets (ACCU) will be purchased as necessary to offset emissions above the baseline
MA4	Implement GHG monitoring and reporting	Monitoring and reporting will be undertaken in accordance with the Commonwealth <i>National Greenhouse and Energy Reporting Act, 2007</i> (Cth)
MA5	Achieve emissions reduction trajectory as defined in the Decarbonisation Roadmap	WMP Management will ensure that appropriate resources are made available to implement the developed (and subsequently, the as-revised) emissions reduction trajectory to ensure progressive emissions reductions over the life of the project

The Objective-based EMP for GHG, based on the above Management Actions, is presented in Table 15.

**Table 15: Objective-Based EMP for Greenhouse Gas Emissions**

Objective-Based EMP	EPA Factor: Greenhouse Gas Emissions			
	Objective: To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change			
	Key Impacts and Risks: Emission of GHG emissions and subsequent contribution to climate change			
Management Action	Management Target(s)	Monitoring	Timing/Frequency of actions	Reporting
MA1 Net zero emissions by 2040	Implementation of the committed emissions avoidance and reduction measures described in Section 2.1.4 of this GHGMP	Monitoring of the implementation progress of the committed measures via an audit of the WMP Obligations Register	Annually	<ul style="list-style-type: none"> <li>Internally reported</li> <li>WMP Compliance Assessment Report (publicly available)</li> </ul>
MA2 Development of Decarbonisation Roadmap describing how emissions reduction targets are to be achieved	Interim emissions reduction targets as defined below: <ul style="list-style-type: none"> <li>Year 0 Scope 1 emissions not to exceed 196,500 t CO<sub>2</sub>-e</li> <li>After year 5 Scope 1 emissions not to exceed 156,000 t CO<sub>2</sub>-e</li> <li>After year 10 Scope 1 emissions not to exceed 75,600 t CO<sub>2</sub>-e</li> <li>After year 15 Scope 1 emissions to be net zero</li> </ul>	Decarbonisation Roadmap to be uploaded to Aconex (document management system)	End 2021	<ul style="list-style-type: none"> <li>Internally reported</li> <li>WMP Compliance Assessment Report (publicly available)</li> </ul>
MA3 Establish WMP baseline emissions in accordance with NGERs and maintain emissions no greater than baseline	Establish baseline emissions for the WMP prior to commencement of production	Baseline to be established using either: <ul style="list-style-type: none"> <li>Calculated baselines—determined based on an independently audited forecast of production and either forecast emissions intensity provided by the responsible emitter or the default emissions intensity value.</li> <li>Benchmark baselines—based on benchmark emissions intensities (that is, the best, least emissions intensive standard for production) and an independently audited forecast of production. A landfill-benchmark baseline will be based on a benchmark capture efficiency rate for non-legacy emissions.</li> </ul> Both calculated baselines and benchmark baselines are determined using forecasts of production and can be replaced with a production-adjusted baseline that reflects actual production from the facility following commencement of production.	Prior to commencement of production	<ul style="list-style-type: none"> <li>Internally reported, included in WMP Obligations Register</li> <li>WMP Compliance Assessment Report (publicly available)</li> <li>Emissions baseline will be reported to the Clear Energy Regulator (CER), and subsequently published as a part of the Safeguard Mechanism data tables by the CER (publicly available)</li> </ul>
	Maintain emissions below determined Safeguard Mechanism baseline over the life of the project	Monitoring in accordance with NGERs scheme methodology ( <i>National Greenhouse and Energy Reporting (Measurement) Determination, 2008</i> (Cth))	Annually	<ul style="list-style-type: none"> <li>WMP Compliance Assessment Report (publicly available)</li> <li>Annual OZ Minerals Sustainability Report</li> <li>Reporting in accordance with NGERs scheme requirements (<i>National Greenhouse and Energy Reporting Regulations, 2008</i> (Cth)) (publicly available)</li> </ul>
MA4 Implement GHG monitoring and reporting	Monitor and report all scope 1 and scope 2 (if applicable) emissions	Monitoring in accordance with NGERs scheme methodology ( <i>National Greenhouse and Energy Reporting (Measurement) Determination, 2008</i> (Cth))	Annually	<ul style="list-style-type: none"> <li>WMP Compliance Assessment Report (publicly available)</li> <li>Annual OZ Minerals Sustainability Report</li> <li>Reporting in accordance with NGERs scheme requirements (<i>National Greenhouse and Energy Reporting Regulations, 2008</i> (Cth)) (publicly available)</li> </ul>
MA5 Achieve emissions reduction trajectory as defined in MA2	Implementation of the emissions reduction projects as required to achieve interim targets	Monitoring of overall emissions and quantification of realised emissions reductions in accordance with NGERs scheme methodology ( <i>National Greenhouse and Energy Reporting (Measurement) Determination, 2008</i> (Cth))	Five-yearly	<ul style="list-style-type: none"> <li>WMP Compliance Assessment Report (publicly available)</li> <li>Reporting in accordance with NGERs scheme requirements (<i>National Greenhouse and Energy Reporting Regulations, 2008</i> (Cth)) (publicly available)</li> </ul>

## 5 ADAPTIVE MANAGEMENT

### 5.1 Greenhouse Gas Management

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of management actions, specifically, adaptive management in relation to this GHGMP includes:

- Defining the issue and objectives, and developing the GHGMP to address these (i.e., this document)

Implementing the management actions described in this GHGMP (see Table 11 and Table 14)

- Monitoring and evaluating the applied management and mitigation against the outcomes and objectives (as per the monitoring program outlined in Table 15)
- Adjusting the management actions and monitoring (if required) to meet the outcome or objective, based on what is learnt from:
  - evaluation of emissions monitoring data
  - evaluation of the effectiveness of applied GHG mitigation measures
  - review of assumptions and uncertainties
  - review of risk assessment
  - external changes during the life of the project (e.g., technical advances or innovation, changes to Government policy).

### 5.2 Greenhouse Gas Management Plan

This GHGMP will nominally be reviewed at least every five years from the date of endorsement to ensure that it reflects the current situation with regards to WMP GHG management and monitoring. The GHGMP may also be reviewed should any of the following occur:

- A significant change in State or Commonwealth climate change policy (e.g., the introduction of revised emissions reduction targets and/or the introduction of a carbon price)
- The addition or change of infrastructure within WMP that has the potential to significantly change the emissions profile of the operation, and that was not forecast as a part of the Decarbonisation Roadmap

- Any change in operational practices on site that has the potential to significantly change the emissions profile of the operation and that was not forecast as a part of the Decarbonisation Roadmap
- Material change is risk (threats and opportunities) associated with climate change identified by the West Musgrave Project.
- Any change to the proposal which means there is a material risk that emissions reduction trajectory will not be achieved.

Audits and peer reviews of this GHGMP may be undertaken as required by OZ Minerals internal processes and/or as directed by the regulators. OZ Minerals will report the outcomes of any audits and/or peer reviews in the WA EPA Compliance Assessment Report.

Any changes to this GHGMP may require approval from Government of Western Australia and may involve consultation with relevant stakeholders.

## 6 STAKEHOLDER CONSULTATION

### 6.1 Consultation

Extensive consultation was undertaken, associated with the EPA Section 38 Referral under Part IV of the EP Act and thereafter. This included discussion of all the EPA Environmental Factors, including Greenhouse Gases. Details of the consultation, stakeholders and outcomes are presented in Section 3 of the EPA Section 38 Referral (OZ Minerals, 2021).

Consultation specific to this GHGMP includes internal peer review with subject-matter experts (MBS Environmental and OZ Minerals Corporate) and meetings with the Government of Western Australia's Department of Water and Environmental Regulation (DWER) and EPA. A program of consultation on all Part IV-related Management Plans was undertaken with the Ngaanyatjarra Council and Traditional Owners, which indicated a low level of interest in greenhouse gas-related matters. All relevant feedback has been incorporated into this management plan.

### 6.2 Reporting

OZ Minerals has committed to a range of public reporting associated with its GHG performance, specifically:

- NGERs emission and safeguard reporting
- National Pollutant Inventory reporting
- OZ Minerals Annual and Sustainability Report
- WA EPA Compliance Assessment Report (which specifically requires details relating to the commitments in this GHGMP).

In addition, OZ Minerals will produce a five-yearly (or otherwise when this GHGMP is updated, whichever is the sooner) brief "GHG Summary Plan and Progress Statement". This document will outline key information from the GHGMP (and reports to that time), in an accessible form which can be easily reviewed by third parties for transparency, for example to compare the proposal against other proposals, and against relative contributions to the achievement of EPA objectives for the State.

The summary report would include:

- A graphical comparison of emission reduction commitments in the GHGMP with 'actual' emissions for compliance periods,
- Proposal performance against benchmarking for comparable facilities,
- Emissions intensity,
- A summary of emission reduction measures undertaken by the proponent, and
- A clear statement as to whether interim targets have been achieved.

A template for the GHG Summary Plan and Progress Statement is attached to this GHGMP as Appendix A.



## 7 UPDATES TO THE EMP

This section is not applicable to the first version of the GHGMP but will be updated in future revisions.

## 8 REFERENCES

Alchin, M., Tierney, E., and Chilcott, C. 2010. *Carbon Capture Project, Final Report: An evaluation of the opportunity and risks of carbon offset based enterprises in the Kimberley-Pilbara region of Western Australia*. Department of Agriculture and Food, Western Australia, Perth. March 2010. Bulletin 4801.

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## Appendix A. Greenhouse Gas Summary Plan and Progress Statement

## A1. CONTEXT AND PURPOSE

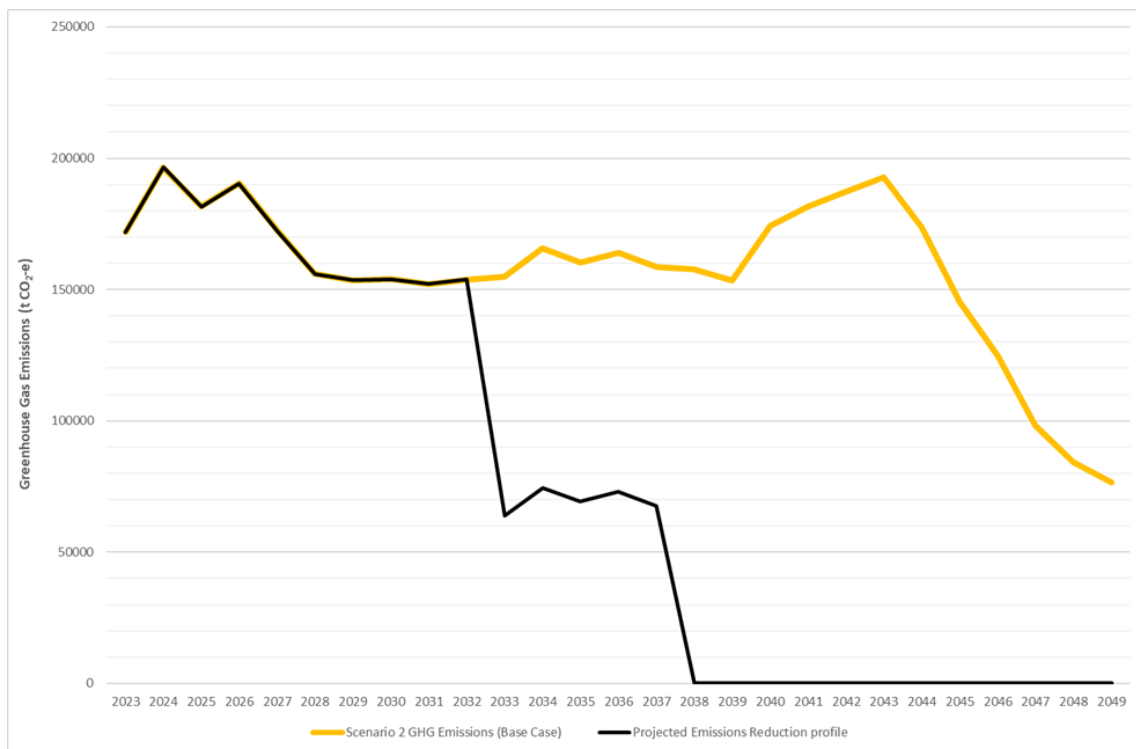
The West Musgrave Project (WMP) emits greenhouse gases, primary associated with:

- The use of mobile mining fleet for the extraction of ore from two open pit mines
- The use of diesel gensets for the generation of electricity

The WMP operates in accordance with an approved Greenhouse Gas Management Plan (GHGMP) which requires OZ Minerals to continuously reduce the emissions associated with the WMP to zero by 2050. This GHG Summary Plan and Progress Statement summarises the performance of OZ Minerals to date in reducing emissions and meeting its emissions reduction trajectories and outlines the projects and initiatives that will be undertaken over the next five years to further reduce emissions and achieve further emissions reduction at WMP.

## A2. EMISSION REDUCTION TARGETS

The GHGMP commits WMP to the emissions reduction trajectory shown below, with the objective of emitting net zero emissions by 2040 (emissions being those scope 1 emissions that OZ Minerals is directly responsible for or has operational control over).



**Figure A1: WMP Emissions Reduction Trajectory**

OZ Minerals has developed five yearly aspirational targets for WMP from the trajectory, described in Table A1.

**Table A1: OZ Minerals Five-Yearly Targets**

Year	Emissions Target
0	Scope 1 emissions not to exceed 196,500 t CO <sub>2</sub> -e
5	Scope 1 emissions not to exceed 156,000 t CO <sub>2</sub> -e
10	Scope 1 emissions not to exceed 75,600 t CO <sub>2</sub> -e
15	Scope 1 emissions to be net zero

## A3. EMISSION REDUCTION MEASURES

OZ Minerals have made several commitments with respect to measures to be implemented to reduce emissions from the WMP. These are described in detail in the GHGMP, but include:

- Establishing renewable energy infrastructure (solar PV farm, wind turbines and battery energy storage) to deliver initially between 70–80% of the electricity required for the WMP
- Designing, constructing and operating a minerals processing plant that has systems and capacities to allow energy intensive operation (such as crushing and grinding of ores) to be scheduled for periods when renewable electricity is available
- Identifying further abatement opportunities, such as electrification of the mining fleet and the use of ammonia-based fuels, to reduce emissions to zero
- Committing to the use of GHG offsets (carbon credits) to offset emissions if we can't achieve the reductions that we have targeted in the timeframes nominated.

## A4. EMISSION REDUCTION PERFORMANCE

As the WMP remains under detailed design at this time, no specific GHG measures have been implemented as of the date of this report, and no greenhouse gases have been emitted. Emissions reduction performance will be detailed in future revisions of this report, and will include:

- A graphical comparison of emission reduction commitments in the GHGMP with 'actual' emissions for compliance periods,
- Proposal performance against benchmarking for comparable facilities,
- Emissions intensity,
- A summary of emission reduction measures undertaken by the proponent,
- A clear statement as to whether the interim trajectory has been achieved.
- Contributions to the achievement of EPA objectives for the State.

### A5. EMISSION REDUCTION PLANNING

During the initial five-year period following the commencement of operations, the focus for the WMP will be constructing and commissioning the project to ensure stable metallurgical performance, after which optimisation of the process, including the performance of the electricity supply system, will be undertaken.

During this time, the objectives will include:

- To achieve a renewable electricity penetration of greater than 70% of all electricity needs, and work towards the base case of 80% renewable penetration
- To maintain emissions to less than a peak of 196,500 t of CO<sub>2</sub>-e per annum over the period
- To optimise the operation of the electricity supply system during the period to achieve the year five trajectory of no greater than 156,000 t CO<sub>2</sub>-e
- To finalise the development of the decarbonisation roadmap which will provide further clarity on the areas of investigation required to deliver the longer-term aspiration of net zero emissions by 2040.

