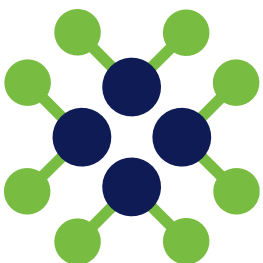




ATLAS-CAMPASPE MINERAL SANDS PROJECT
MODIFICATION 6
APPENDIX E
AIR QUALITY AND GREENHOUSE GAS ASSESSMENT





ATLAS-CAMPASPE MINERAL SANDS PROJECT MODIFICATION 6

Air Quality and Greenhouse Gas Assessment

Final | Revision 1

11 February 2026

Project: 24071

Atlas-Campaspe Minerals Sands Project Modification 6

Project number	24071
Title	Atlas-Campaspe Mineral Sands Project Modification 6
Subject	Air Quality and Greenhouse Gas Assessment
Version	Final
Revision	Revision 1
Date	11 February 2026
Client	Tronox Mining Australia Limited
Project manager	Shane Lakmaker
File name	24071_Atlas-Campaspe MOD 6_AQ & GHG_Final_rev1.docx

Version	Date	Description	Author	Review
D1R1	12/08/25	Draft report	SL	NL
D2R0	16/09/25	Draft report	SL	NL, RS, Tronox
Final	11/12/26	Final report	SL	NL, RS, Tronox

© Copyright 2026 Airen Consulting ABN 44 646 147 579

Limitation: This document has been prepared on behalf of, and for the exclusive use of Airen Consulting's client, and is subject to, and issued in accordance with, the provisions of the contract between Airen Consulting and the client. In preparing this report, Airen Consulting has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Airen Consulting has not attempted to verify the accuracy or completeness of any such information. Airen Consulting has prepared this report in accordance with the usual care and thoroughness of the consulting profession. No other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law. This report should be read in full, and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Airen Consulting for use of any part of this report in any other context.

Contents

Executive Summary	iv
1 Introduction.....	1
1.1 Background.....	1
1.2 Modification Description.....	1
1.3 Report Structure.....	4
2 Air Quality Assessment.....	5
2.1 Air Quality Criteria	5
2.2 Assessment Methodology.....	6
2.3 Existing Environment.....	6
2.3.1 Local Setting	8
2.3.2 Meteorology	8
2.3.3 Air Quality.....	10
2.4 Potential Impacts.....	12
2.5 Air Quality Management	13
3 Greenhouse Gas Assessment.....	15
3.1 Background.....	15
3.2 Federal Policy	15
3.3 State Policy.....	16
3.4 Assessment Boundary and Scenarios.....	17
3.5 Estimated Emissions	18
4 Conclusions	21
5 References.....	22
Appendix A. Greenhouse gas emissions.....	23

List of figures

Figure 1 Regional location	2
Figure 2 Approved and modified general arrangement.....	3
Figure 3 Location of air quality monitors and sensitive receptors	7
Figure 4 Wind speed data collected between 2019 and 2024.....	8
Figure 5 Wind roses from data collected at the Atlas Mine AWS	9
Figure 6 Estimated GHG emissions from the Project	20

List of tables

Table 1 Air quality criteria from Development Consent (SSD_5012)	5
Table 2 Air quality assessment criteria for all relevant air quality indicators.....	6
Table 3 Summary of measured PM ₁₀ concentrations	10
Table 4 Estimated contributions to measured PM ₁₀ concentrations	10
Table 5 Summary of estimated PM _{2.5} concentrations.....	11
Table 6 Summary of estimated TSP concentrations.....	11
Table 7 Summary of measured deposited dust levels	12
Table 8 Estimated particulate matter emissions from the Project.....	13
Table 9 Air quality management measures and controls	14
Table 10 Relevant NSW Government legislation and policy.....	16

Table 11 GHG source inclusions and exclusions	18
Table 12 GHG emission estimation methodologies.....	19
Table 13 Estimated GHG emissions.....	19

Acronyms and definitions

Abbreviation	Definition
CER	Clean Energy Regulator
CO ₂	Carbon dioxide
CO ₂ -e	Carbon dioxide equivalent
COP	Conference of the Parties
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
FY	Financial Year
g/m ² /month	Grams per square metre per month.
GHG	Greenhouse gas
Guide	NSW Guide for Large Emitters
GWP	Global Warming Potential
Measurement Determination	National Greenhouse and Energy Reporting (Measurement) Determination 2008
Kt CO ₂ -e/y	Kilotonnes of CO ₂ equivalent per year
m/s	Metres per second
NDC	Nationally Determined Contribution
Net Zero Future Act	Climate Change (Net Zero Future) Act 2023
NGA	National Greenhouse Accounts
NGER Act	National Greenhouse Gas and Energy Reporting Act 2007
NSW	New South Wales
SSD	State Significant Development
WRI	World Resources Institute
µg/m ³	micrograms per cubic metre.

Executive Summary

Tronox Mining Australia Limited (Tronox) is the proponent of the Atlas-Campaspe Mineral Sands Project (the Project) which includes the development of a mineral sands mining operation (the Atlas-Campaspe Mine), together with the construction and operation of the Ivanhoe Rail Facility (a rail loadout facility) in western New South Wales (NSW).

Development Consent (SSD_5012) was granted for the Project under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2014. Tronox is proposing to modify Development Consent (SSD_5012) under section 4.55(2) of the EP&A Act to improve operational efficiency at the Atlas-Campaspe Mine by developing an optimised services corridor alignment between the Atlas and Campaspe deposits (the Modification). No changes to the Ivanhoe Rail Facility are proposed as part of the Modification.

This report provides an assessment of the potential air quality impacts and greenhouse gas (GHG) emissions associated with the Modification.

The following key conclusions were made in relation to air quality impacts:

- Recent air quality monitoring does not highlight any occasions where the Project caused exceedances of the air quality criteria in the Development Consent (SSD_5012).
- Dust emissions from the modified Atlas-Campaspe Mine site (trucking option) are expected to decrease by 0 to 4% compared to dust emissions from the approved Atlas-Campaspe Mine. This outcome suggests that the air quality impact risk of the Atlas-Campaspe Mine would decrease with the Modification. More significant reductions in dust emissions (up to 9%) would be expected with the option of pumping the concentrates via a pipeline through the optimised services corridor.
- There are no significant gaps in the existing air quality controls that would need to be addressed to manage potential changes in the expected air quality impacts of the Modification.

Based on these conclusions it has been determined that the Modification would not alter the outcomes from previous air quality assessments of the Project (Katestone, 2013 and 2019). Specifically, it can be concluded that the Project would not result in any additional exceedances of the relevant air quality impact assessment criteria at sensitive receptors.

The following key conclusions were made in relation to modified GHG emissions:

- The Atlas-Campaspe Mine is estimated to decrease the direct annual GHG emissions from the Atlas-Campaspe Mine by 1.5 kilotonnes of carbon dioxide equivalent per year on average. This would represent a decrease in Scope 1 emissions of the approved Project (as MOD 5) of approximately 3%. More significant reductions in GHG emissions would be expected with the option of pumping the concentrates via a pipeline through the optimised services corridor.
- The Modification does not meet the NSW Environment Protection Authority (EPA) definition of a “large” emitter, and the “NSW Guide for Large Emitters” (EPA, 2025) is not applicable.
- Tronox would continue to have an obligation to report emissions from the Atlas-Campaspe Mine under the *National Greenhouse and Energy Reporting Act 2007*.
- The Atlas-Campaspe Mine is not a Safeguard facility as it emits less than 100,000 tonnes of carbon dioxide equivalent of Scope 1 emissions (direct emissions produced on-site) in a year.
- The GHG management measures included in the existing Air Quality Management Plan (AQMP) (Tronox, 2018) would continue to be applicable.

1 Introduction

1.1 Background

Tronox Mining Australia Limited (Tronox) is the proponent of the Atlas-Campaspe Mineral Sands Project (the Project) which includes the development of a mineral sands mining operation (the Atlas-Campaspe Mine), together with the construction and operation of the Ivanhoe Rail Facility (a rail loadout facility) in western New South Wales (NSW) (Figure 1).

The Atlas-Campaspe Mine is located approximately 80 kilometres (km) north of Balranald, NSW and 270 km southeast of Broken Hill, NSW (Figure 1). The Ivanhoe Rail Facility (IRF) is located approximately 135 km north-east of the Atlas-Campaspe Mine and is approximately 4.5 km to the south-west of the township of Ivanhoe (Figure 1). The Atlas-Campaspe Mine component of the Project includes the sequential development of the Atlas and Campaspe deposits. Mining at the Atlas deposit is scheduled to be completed in 2025 and mining at the Campaspe deposit is expected to commence in 2026.

Development Consent (SSD_5012) was granted for the Project under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2014. Tronox is proposing to modify Development Consent (SSD_5012) under section 4.55(2) of the EP&A Act to improve operational efficiency at the Atlas-Campaspe Mine by developing an optimised services corridor alignment between the Atlas and Campaspe deposits (the Modification) (Figure 2).

This report provides an assessment of the potential air quality impacts and greenhouse gas (GHG) emissions associated with the Modification.

1.2 Modification Description

Tronox applied to modify Development Consent (SSD_5012) under section 4.55(2) of the EP&A Act in July 2024 to allow for changes to the approved Atlas-Campaspe Mine identified during detailed planning conducted in preparation for the development of the Campaspe deposit, including a revised mineral processing methodology (MOD 5). MOD 5 was approved by the Department of Planning, Housing and Infrastructure (DPHI) on 17 December 2024.

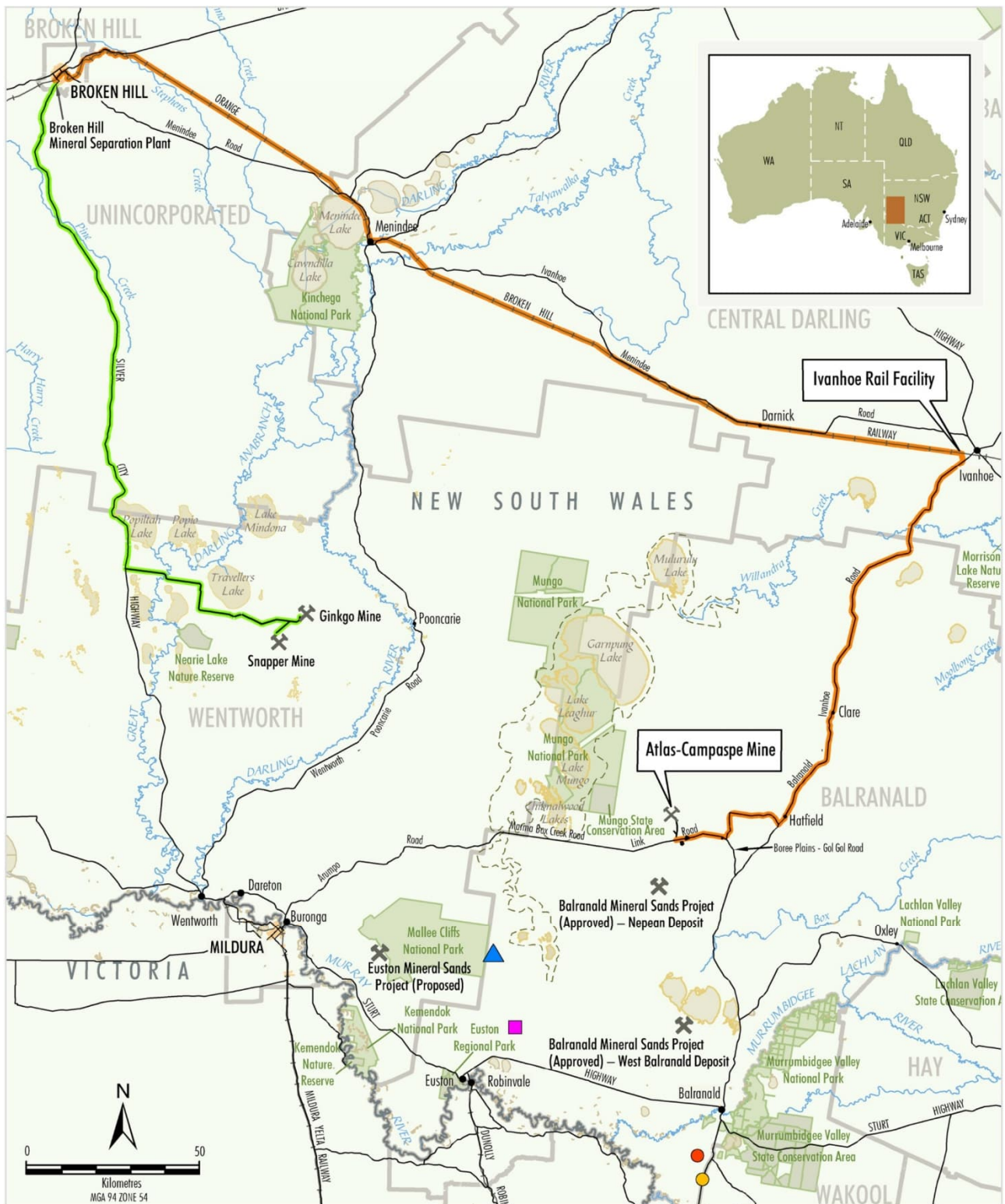
The current Modification would include the following (Figure 2):

- development of an optimised services corridor between the Atlas and Campaspe deposits, including haul road, pipelines, electricity transmission line, soil stockpiles and water management infrastructure;
- transport of pre-mineral concentrate and ore from the pre-concentrator plant (PCP) to the primary gravity concentration unit (PGCU) via a pipeline and/or truck along the optimised transport route;
- a supplementary biodiversity offset area to replace a small section of the approved biodiversity offset area that would be impacted by the optimised services corridor; and
- rehabilitation of the optimised services corridor so that it can be incorporated into the existing biodiversity offset area post-mining.

The existing services corridor would remain to provide an alternative access between the Atlas and Campaspe deposits.

The Modification would not change the following Project components:

- mine path;
- mine life;
- mining methods or rate;
- processing methods or rate;
- product transport (including the Ivanhoe Rail Facility);
- overburden and process waste management;
- annual maximum water supply/demand; and
- workforce.

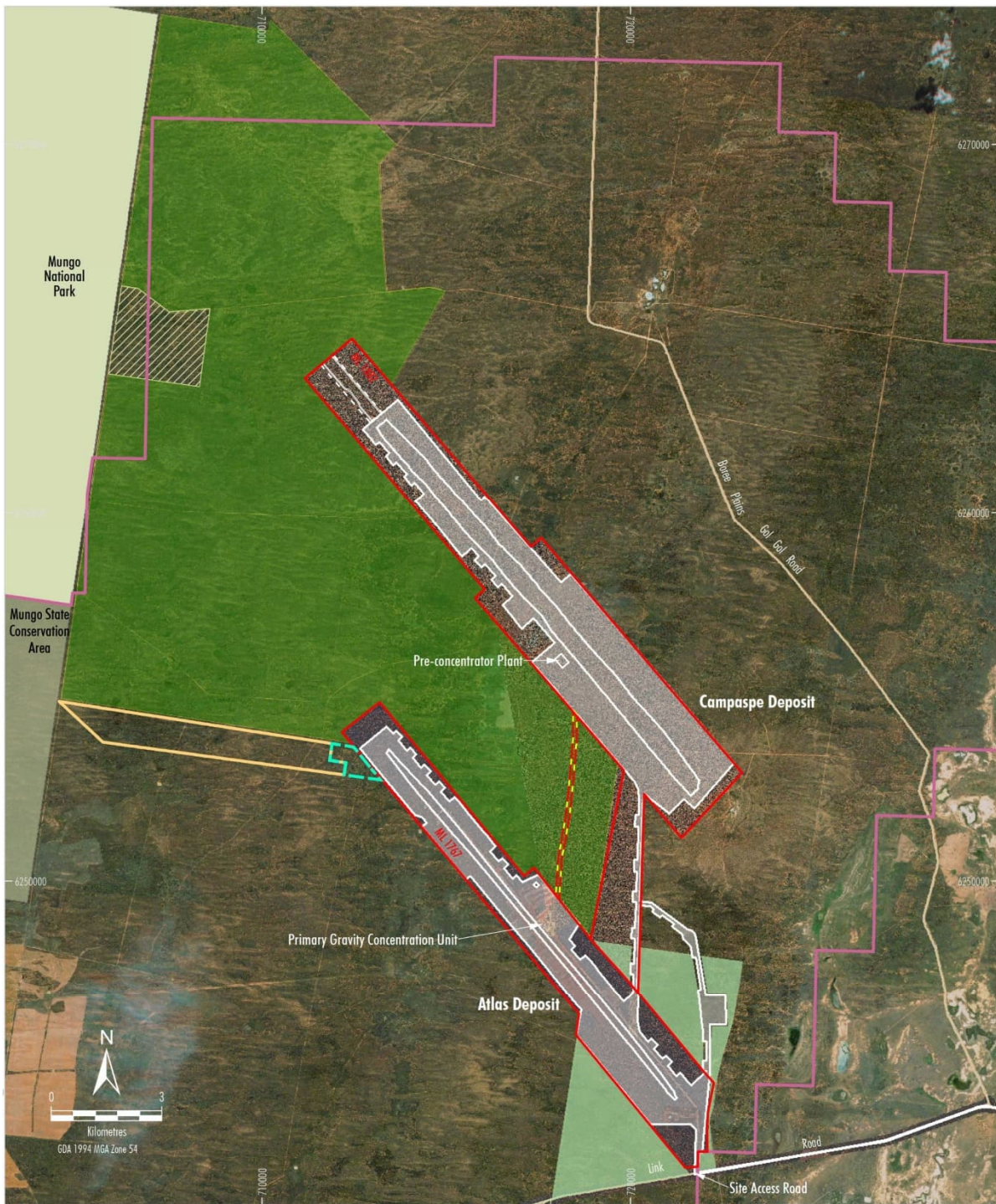


Source: NSW Spatial Services (2021); Cristal Mining Australia (2012)

- | | |
|---|--|
| <p>LEGEND</p> <ul style="list-style-type: none"> National Park, Regional Park or State Conservation Area Willandra Lakes Region World Heritage Area Local Government Area Boundary Snapper and Ginkgo Mines Haulage Route Atlas-Campaspe Mine Mineral Haulage Route | <p>Other Key Projects Potentially Relevant to the Project</p> <ul style="list-style-type: none"> Mine Site Limondale Sun Farm (Approved) Sunraysia Solar Farm (Approved) Euston Wind Farm (Proposed) Koorakee Energy Park Project (Proposed) |
|---|--|



Figure 1 Regional location



Source: NSW Spatial Services (2024); Tronox (2024); Cristal Mining Australia (2012) Orthophoto Mosaic: Tronox (2023); AAM (2011)

LEGEND	
	National Park/State Conservation Area
	Southern Mallee Landuse Agreement Reserve
	Approved Project Components
	Mining Lease Boundaries (ML 1762 & ML 1882)
	Exploration Licence Boundary (EL 5359)
	Surface Development Area
	Groundwater Barefield Study Area [^]
	Mine Path Extent
	Biodiversity Offset Area
	Vegetation Management Area
	Modification Components
	Mining Lease Application (MLA2)
	Surface Development Area
	Supplementary Biodiversity Offset Area
	Potential Biodiversity Stewardship Site



[^] The layout of the groundwater barefield would be confirmed based on the outcomes of ongoing hydrogeological test work/design.

Figure 2 Approved and modified general arrangement

1.3 Report Structure

The report is structured as follows:

- Section 1 provides the background to the Atlas-Campaspe Mineral Sands Project and proposed Modification.
- Section 2 provides an assessment of the potential air quality impacts.
- Section 3 provides an assessment of the greenhouse gas emissions.
- Section 4 provides the conclusions of the assessment.

2 Air Quality Assessment

2.1 Air Quality Criteria

Air quality is typically quantified by the concentrations of substances in the ambient air. Air pollution occurs when the concentration (or some other measure of intensity) of one or more substances known to cause health, nuisance and / or environmental effects, exceeds a certain level. With regard to human health and nuisance effects, the primary air quality issue for the Modification is dust, also referred to as particulate matter.

Key classifications of particulate matter include:

- Total suspended particulates (TSP).
- Particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM₁₀).
- Particulate matter with equivalent aerodynamic diameter of 2.5 microns or less (PM_{2.5}).
- Deposited dust.

Condition 19, Schedule 3 of Development Consent (SSD_5012) requires Tronox to “ensure that all reasonable and feasible avoidance and mitigation measures are employed to ensure particulate matter emissions generated by the development do not exceed the criteria in Tables 5, 6 and 7 at any residence on privately-owned land”. Table 1 shows the air quality criteria from the Development Consent (SSD_5012).

Table 1 Air quality criteria from Development Consent (SSD_5012)

Air quality indicator	Averaging time	^d Air quality criteria from SSD_5012
Particulate matter (PM ₁₀)	24-hour	^a 50 µg/m ³
	Annual	^a 25 µg/m ³
Particulate matter (TSP)	Annual	^a 90 µg/m ³
Deposited dust ^c	Annual (maximum increase)	^b 2 g/m ² /month
	Annual (maximum total)	^a 4 g/m ² /month

^a Total impact (i.e. increase in concentrations due to the development plus background concentrations due to all other sources).

^b Incremental impact (i.e. increase in concentrations due to the development on its own).

^c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

Tronox holds Environment Protection Licence (EPL) 21007 issued under the NSW *Protection of the Environment Operations Act 1997* (POEO Act) for the Project. Although EPL 21007 does not include air quality criteria, Condition M2.2 of EPL 21007 does identify six locations in the vicinity of the Atlas-Campaspe Mine site where dust deposition monitoring must be conducted on a monthly basis, and one location in the vicinity of the Atlas-Campaspe Mine site where a high-volume air sampler is to be operated to monitor PM₁₀ and TSP every six days.

Operating conditions relevant to air quality are provided in Condition O3 of EPL 21007:

O3 Dust

O3.1 All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.

O3.2 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

O3.3 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

The NSW Environment Protection Authority (EPA) has developed assessment criteria for a range of air quality indicators including particulate matter. These criteria are outlined in the “Approved Methods for the Modelling and Assessment of Air Pollutants in NSW” (EPA, 2022), hereafter referred to as the Approved Methods. Most of the EPA criteria referred to in this report have been drawn from national environment protection standards for ambient air quality set by the National Environmental Protection Council of Australia (NEPC) as part of the National Environment Protection Measures (NEPC, 1998 and updates to 2021).

The Approved Methods criteria are outlined in Table 2 and apply to existing and potentially sensitive receptors, where the Approved Methods defines a sensitive receptor as including “a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area”.

Table 2 Air quality assessment criteria for all relevant air quality indicators

Air quality indicator	Averaging time	Criterion	Application
Particulate matter (PM ₁₀)	24-hour	50 µg/m ³	Cumulative, at sensitive receptors
	Annual	25 µg/m ³	Cumulative, at sensitive receptors
Particulate matter (PM _{2.5})	24-hour	25 µg/m ³	Cumulative, at sensitive receptors
	Annual	8 µg/m ³	Cumulative, at sensitive receptors
Particulate matter (TSP)	Annual	90 µg/m ³	Cumulative, at sensitive receptors
Deposited dust (insoluble solids)	Annual (maximum increase)	2 g/m ² /month	Incremental, at sensitive receptors
	Annual (maximum total)	4 g/m ² /month	Cumulative, at sensitive receptors

Source: EPA, 2022.

Many of the EPA air quality assessment criteria relate to the total concentration of pollutants in the air (that is, cumulative) and not just the contribution from project-specific sources. Therefore, some consideration of background levels needs to be undertaken when using these criteria to assess the potential impacts. In situations where background levels are elevated the proponent must “demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical” (EPA, 2022). Section 2.3 provides further discussion on background levels.

2.2 Assessment Methodology

The potential air quality impacts of the Atlas-Campaspe Mine have most recently been assessed by Airen (2024) for MOD 5. The current assessment provides a semi-quantitative review of the Modification in the context of past assessments, proposed activities, contemporary assessment requirements, and recent air quality and meteorological monitoring. This involved:

- Examining recent air quality and meteorological monitoring data and evaluating any assumptions made in past assessments.
- Checking the history of air quality compliance at the Atlas-Campaspe Mine.
- Identifying the key sources of air emissions from approved and modified Atlas-Campaspe Mine activities.
- Developing an air emissions inventory for the modified Atlas-Campaspe Mine and comparing these emissions to those of the approved Atlas-Campaspe Mine.
- Extrapolating the potential air quality impacts of the Modification by using historical projections of impacts (based on modelling) in combination with changes to the location and intensity of emission sources, status of sensitive receptors, and current assessment criteria.
- Examining the existing emission controls for suitability to manage any potential changes in impacts as a result of the Modification.

2.3 Existing Environment

This section provides a description of the environmental characteristics in the Atlas-Campaspe Mine area, including a review of recent and historical meteorological and ambient air quality conditions. The main objectives of this review were to develop an understanding of existing air quality conditions and to evaluate any assumptions made in past assessments.

Figure 3 shows the location the air quality and meteorological monitors, the data from which have been used to inform the existing environment review. This figure also shows the location of the nearest sensitive receptors.

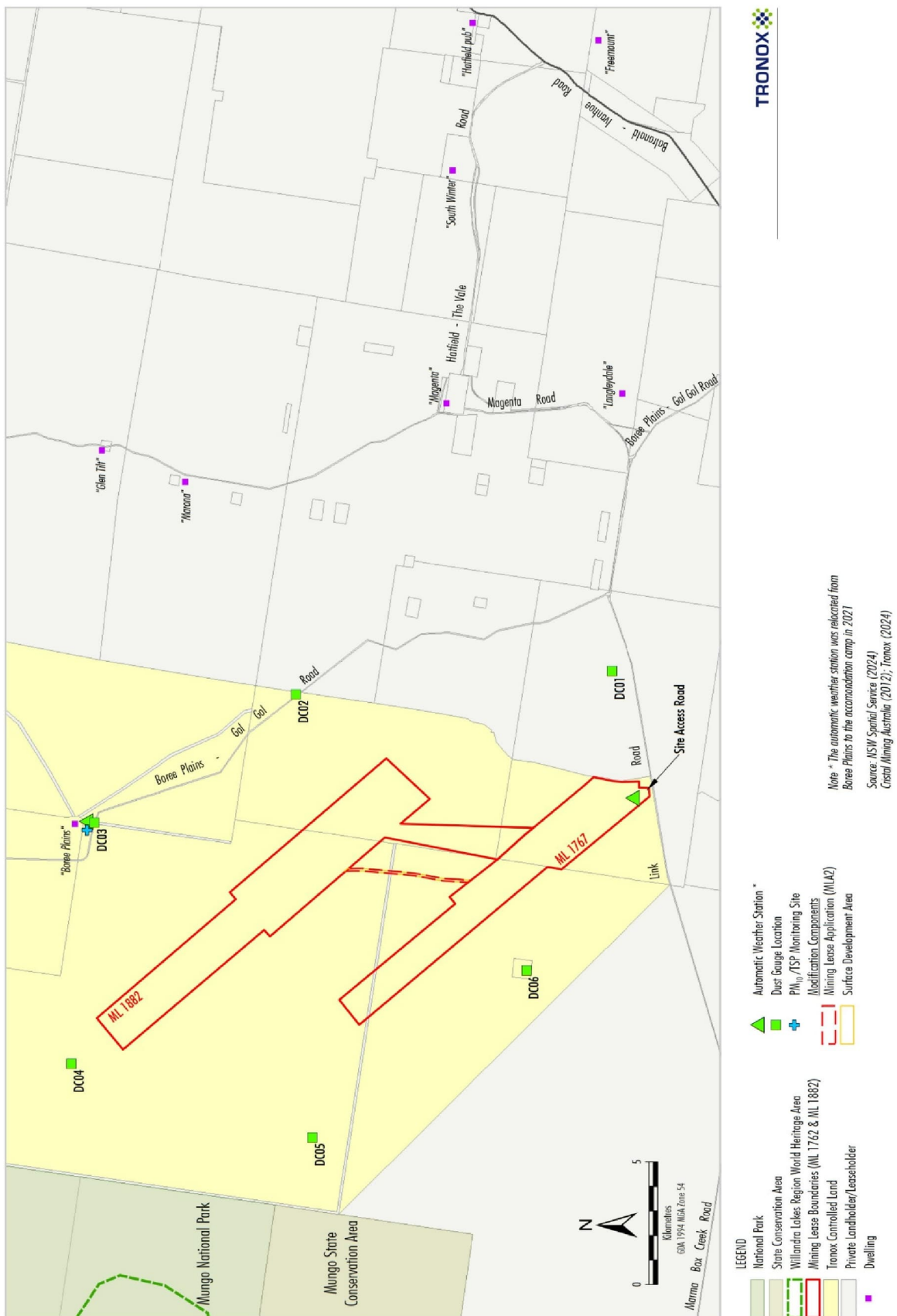


Figure 3 Location of air quality monitors and sensitive receptors

2.3.1 Local Setting

The Atlas-Campaspe Mine is located approximately 80 km north of Balranald and 270 km south-east of Broken Hill, NSW (Figure 1). Construction activities commenced in 2018, and mining operations commenced at the Atlas deposit in 2022. Mining in the Atlas deposit is scheduled to be completed in 2026 and mining in the Campaspe deposit is expected to commence in 2026/2027.

The terrain surrounding the Atlas-Campaspe Mine is relatively flat with transient lakes scattered in various directions. Land use is largely agricultural including both livestock and cropping and natural expanses of semi-arid vegetation. Mungo National Park is located approximately 5 km to the west.

The closest residence is Boree Plains (Tronox-owned) and located approximately 7 km north of the Campaspe deposit (Figure 3). This homestead residence is presently dilapidated and not fit for habitation. It was previously utilized by Tronox before the establishment of the Accommodation Village. Other rural residences include Marona, Glen Tilt, Magenta and Langleydale, all located at least 14 km from mining areas.

2.3.2 Meteorology

Meteorological conditions are important for determining the transport of emissions, and the potential influences on air quality. In addition, meteorological data are often used with concurrent air quality data to determine potential contributions from sources of interest. This section provides an analysis of the local meteorological conditions and identifies the datasets that are representative of the long term, local conditions.

The EPA prescribes the minimum requirements for meteorological data that are to be used for air quality assessments (EPA, 2022). These requirements include data capture rates, siting and operation, and data preparation. Meteorological stations that are used for the purposes of air quality assessments can be classified (EPA, 2022) as either "site specific" or "site representative". Data from site-specific meteorological stations are preferred however site representative data are also acceptable where site-specific meteorological data are not available provided that the data adequately describe the expected meteorological conditions at the site of interest. Air quality assessments that involve modelling are usually carried out using at least one year of site-specific meteorological data that is over 90% complete.

Tronox has been monitoring meteorological conditions around the Atlas-Campaspe Mine since at least 2019. An automatic weather station (AWS) was located near the Boree Plains residence up until 2021 (Figure 3) before being relocated near the Atlas Accommodation Village (on ML1767). This station (referred to as the Atlas Mine AWS) collects continuous records of temperature, wind speed, wind direction, and rainfall, among other parameters.

The Atlas Mine AWS was installed in accordance with the applicable Australian Standard (AS 3580.14) and specifically for collecting data to assist with understanding the local wind conditions on a continuous basis. This station can be considered as "site-specific" for the purposes of air quality assessment and would have collected data that can be classified as specific to conditions at and around the Atlas-Campaspe Mine.

Figure 4 shows the hourly wind speed data from data collected at the Atlas Mine AWS between 2019 and 2024. These data show that maximum hourly wind speeds reached around 10 metres per second (m/s) with the strongest winds generally occurring in the summer. The data from 2019 appeared to exhibit a greater range of wind speeds in 2019 and 2020 than in subsequent years.

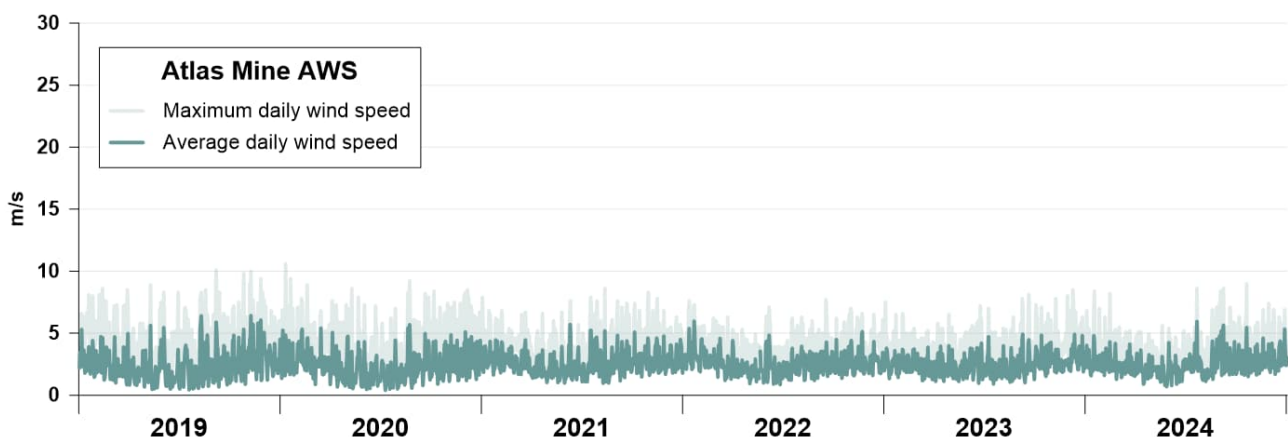


Figure 4 Wind speed data collected between 2019 and 2024

Wind-roses have also been prepared from the available data (Figure 5). The wind-roses show the frequency of wind speeds and wind directions based on hourly records. The circular format of the wind rose shows the direction from which the wind blew and the length of each "spoke" around the circle shows how often the wind blew from that direction. The different colours of each spoke provide details on the speed of the wind from each direction.

Figure 5 shows that there has been some variability in the annual wind patterns at the Atlas Mine AWS. For example, the winds in 2019, 2020 and 2023 were predominantly from the south to southwest but the winds in 2021 and 2022 showed more variability with winds from the north also common. Previous assessments (Katestone, 2013) used model-simulated meteorological data since observational data were not available at the time. The model simulated meteorological data most closely resemble the observational data in 2023 and 2024 which show prevailing winds from the south and a relatively low percentage of calm conditions (1.5%). This suggests that potential issues relating to wind speeds and calm percentages were resolved in recent years.



Figure 5 Wind roses from data collected at the Atlas Mine AWS

2.3.3 Air Quality

Tronox monitors PM₁₀ near the Boree Plains residence and Table 3 provides a summary of the measurement data since 2019. The EPA air quality assessment and Development Consent (SSD_5012) criterion is 50 µg/m³.

The data from Table 3 show that the highest 24-hour average PM₁₀ concentrations, and an exceedance occurred in 2019. This coincided with drought conditions and lower than average rainfall. The DPHI noted these as extraordinary events (DPE, 2020) and not representative of typical air quality conditions. The increases in PM₁₀ concentrations were observed across many locations in NSW and were not unique to the Far West region. In addition, the monitor is located approximately 18 km north of current activities and it is likely that closer sources of dust, such as wind-blown dust, were contributing to the measured levels at PM01. The monitoring stopped in 2020 due to the COVID-19 pandemic and re-commenced in early 2021. Concentrations were much lower in 2021 and 2022, largely due to increased rainfall.

The decrease in annual average PM₁₀ concentrations from 2021 onwards is indicative of the transition from drought to more typical conditions. It is also useful to note that the measured PM₁₀ concentrations (in non-extraordinary years) are much lower than the concentrations assumed in past assessments of the Project. That is, Katestone (2013) assumed an annual average PM₁₀ concentration of 26.2 µg/m³ whereas the monitoring has shown that concentrations typically range between 11 and 15 µg/m³.

Table 3 Summary of measured PM₁₀ concentrations

Year	Boree Plains	EPA assessment criterion / Development Consent (SSD_5012) air quality criteria
Maximum 24-hour average (µg/m³)		
2019	336	50
2020	NA	50
2021	64	50
2022	77	50
2023	79	50
2024	35	50
Annual average (µg/m³)		
2019	42	25
2020	NA	25
2021	14	25
2022	12	25
2023	15	25
2024	11	25

It is not possible to determine if activities at the Atlas-Campaspe Mine caused exceedances of the PM₁₀ air quality criteria from Development Consent (SSD_5012) since there is only one monitor and normally two or more monitors are required to establish background levels. However, an estimate of the contribution can be made by examining the frequency of winds from the Atlas-Campaspe Mine towards the monitor. Table 4 shows the estimated contributions from the direction of the Atlas Campaspe Mine site to measured PM₁₀ concentrations. In the non-extraordinary years (i.e. 2021 to 2024) the measured annual average PM₁₀ concentrations did not exceed the Development Consent (SSD_5012) PM₁₀ criterion (25 µg/m³), and the calculated maximum contributions from the direction of the Atlas-Campaspe Mine ranged from 1.4 to 4.1 µg/m³.

Table 4 Estimated contributions to measured PM₁₀ concentrations

Statistic	2019	2020	2021	2022	2023	2024
Measured annual average due to all sources (µg/m ³)	42	NA	14	12	15	11
Percentage of time that wind was from Atlas-Campaspe Mine towards monitor (%)	26	24	10	18	27	29
Calculated maximum Atlas-Campaspe Mine contribution to annual average PM ₁₀ (µg/m ³)	11.1	NA	1.4	2.2	4.1	3.1

Tronox does not currently monitor PM_{2.5}. Concentrations of PM_{2.5} have been estimated from the PM₁₀ data on the assumption that 50% of the PM₁₀ is PM_{2.5}. Table 5 shows the estimated PM_{2.5} concentrations. These estimates show that maximum 24-hour average PM_{2.5} concentrations may have exceeded the EPA assessment criterion (25 µg/m³), similar to the outcomes for PM₁₀. Annual average PM_{2.5} concentrations were unlikely to have exceeded the EPA assessment criterion (8 µg/m³) in non-extraordinary years. The estimates are similar to the background concentration assumed in past assessments (i.e. 5.2 µg/m³).

Table 5 Summary of estimated PM_{2.5} concentrations

Year	Boree Plains	EPA assessment criterion
Maximum 24-hour average (µg/m ³)		
2019	168	25
2020	NA	25
2021	32	25
2022	38	25
2023	39	25
2024	18	25
Annual average (µg/m ³)		
2019	21	8
2020	NA	8
2021	7	8
2022	6	8
2023	8	8
2024	5	8

Tronox does not currently monitor TSP. Concentrations of TSP have been estimated from the PM₁₀ concentrations assuming that 67% of the TSP is PM₁₀ (as per Katestone, 2019). Table 6 shows the estimated annual average TSP concentrations from data collected in the most recent six-year period. These data suggest that TSP concentrations have not exceeded 90 µg/m³. The estimates are also well below the background concentration assumed in past assessments (i.e. 52.3 µg/m³).

Table 6 Summary of estimated TSP concentrations

Year	Boree Plains	EPA assessment criterion / Development Consent (SSD_5012) air quality criteria
Annual average (µg/m ³)		
2019	63	90
2020	NA	90
2021	21	90
2022	18	90
2023	21	90
2024	16	90

Deposited dust is monitored at 10 locations (Figure 3). Table 7 shows the measured annual average deposited dust levels. The only monitor that is located at a sensitive receptor is DC03 (near the Tronox-owned Boree Plains). The other monitors are located closer to the Atlas Campaspe Mine than the next closest sensitive receptors. The monitored dust levels at DC03 have not exceeded the EPA assessment or Development Consent (SSD_5012) air quality criteria in the most recent six-year period. The measurements are similar to the background level assumed in past assessments (i.e. 1.3 g/m²/month).

Table 7 Summary of measured deposited dust levels

Year	DC01	DC02	DC03	DC04	DC05	DC06	DC07	DC12	DC13	DC14	EPA assessment criterion / Development Consent (SSD_5012) air quality criteria
Annual average (g/m ² /month)											
2019	1.7	1.1	1.1	1.2	1.1	1.4	-	1.7	2.7	1.9	4
2020	0.8	2.5	1.1	1.9	1.7	1.4	0.6	1.6	-	0.9	4
2021	0.7	0.6	0.6	0.5	0.6	0.4	0.6	0.8	-	0.8	4
2022	0.4	0.6	0.4	0.2	0.2	0.3	0.9	2.0	1.4	0.7	4
2023	0.5	1.4	1.0	0.5	0.6	0.4	-	7.6	2.0	1.2	4
2024	0.8	0.9	1.1	0.7	0.6	0.4	-	2.9	0.8	2.4	4

2.4 Potential Impacts

Modelling has historically been used to quantify the potential air quality impacts of the Project. The modelling is detailed in Katestone (2013) and included predictions of TSP, PM₁₀, PM_{2.5} and deposited dust levels at sensitive receptors, in accordance with the EPA's "Approved Methods" (then DEC, 2005). Air quality impacts were determined for the key Project components including the Atlas-Campaspe Mine, the Ivanhoe Rail Facility and mineral concentrate transport route between the Atlas-Campaspe Mine and Ivanhoe Rail Facility. Air emission inventories were developed for a maximum case operational scenario that considered maximum production and overburden extraction rates. For the Atlas-Campaspe Mine, Ivanhoe Rail Facility and mineral concentrate transport components, it was concluded that the Project would not result in any additional exceedances of the relevant air quality impact assessment criteria at sensitive receptors (Katestone, 2013).

Tronox subsequently (2019) proposed a modification to Development Consent (SSD_5012) to allow for changes to optimise the Project (referred to as the Optimisation Modification). Katestone (2019) concluded that the Optimisation Modification would not alter the outcomes of Project as modelled in Katestone (2013). More recently, MOD 5 included a revised mineral processing methodology that was assessed by Airen (2024). This assessment concluded that MOD 5 would not alter the outcomes from previous assessments of the Project (Katestone, 2013 and 2019).

The potential air quality impacts of the current Modification have been assessed, with reference to the key modified Atlas-Campaspe Mine components. The Modification has the potential to change previously calculated emissions of TSP, PM₁₀ and PM_{2.5} from the Atlas Campaspe Mine due primarily to changes in haul distances from development of the optimised services corridor between the Atlas and Campaspe deposits. The potential changes in TSP, PM₁₀ and PM_{2.5} emissions have been quantified.

Table 8 shows the estimated TSP, PM₁₀ and PM_{2.5} emissions from all key activities in the year of maximum production for the approved Project and with the Modification (trucking option).

The most significant change in emissions with the Modification (trucking option) would be due to the optimised services corridor, which decreases the haul distance between the PCP and PGCU from approximately 14 km to 7 km. An additional cleared area of approximately 40 hectares would be associated with the optimised services corridor, which may represent a new source of wind erosion.

If the pumping option is adopted the potential air quality impact would be less than the trucking option as no wheel generated dust associated with haulage would occur.

Table 8 Estimated particulate matter emissions from the Project

Activity	Emissions (g/s)									Notes
	Original Project (Katestone, 2019)			Approved Project (MOD 5)			Project with Modification (MOD 6)			
	TSP	PM ₁₀	PM _{2.5}	TSP	PM ₁₀	PM _{2.5}	TSP	PM ₁₀	PM _{2.5}	
Topsoil removal	1.8	0.4	0.2	2.2	0.5	0.2	2.2	0.5	0.2	No change in production
Overburden removal	18.6	7.4	1.6	22.5	8.9	1.9	22.5	8.9	1.9	No change in overburden volumes
Overburden haulage	20.3	6.5	0.7	24.5	7.8	0.8	24.5	7.8	0.8	No change to overburden haulage
Ore removal	0.7	0.3	0.1	1.0	0.4	0.1	1.0	0.4	0.1	No change in production
Ore processing - screening	2.9	1	0.1	4.0	1.4	0.1	4.0	1.4	0.1	No change in production
Product stacking	0.0022	0.0010	0.0002	0.0031	0.0014	0.0003	0.0031	0.0014	0.0003	No change to stacking
Road train loading	0.0040	0.0020	0.0003	0.0056	0.0028	0.0004	0.0056	0.0028	0.0004	No change to loading
Additional unloading mineral pre-concentrate	0.023	0.011	0.001	0.0230	0.0109	0.0011	0.0230	0.0109	0.0011	No change to unloading
HMC / MSP on-site haulage	7.6	1.9	0.2	7.6	1.9	0.2	3.8	1.0	0.1	Reduced haul to / from HMC / MSP
Grading	0.9	0.3	0.03	0.9	0.3	0.0	0.9	0.3	0.0	No change to grader usage
Wind erosion	7.7	4.3	0.7	7.3	4.1	0.7	8.4	4.7	0.7	Additional stockpiles and cleared areas
Total	60.5	22.1	3.6	70.0	25.4	4.2	67.4	25.0	4.2	-
Change in emissions from MOD 5 to MOD 6							-4%	-1%	0%	-

Overall, emissions from the modified Atlas-Campaspe Mine site are expected to decrease by 0 to 4% compared to emissions from the approved Atlas-Campaspe Mine. This outcome suggests that the air quality impact risk of the Project would decrease with the Modification. However, the magnitude of the decrease is not significant in the context of model results at nearest sensitive receptors which showed, for example, annual average PM₁₀ Project contributions in the order of 1.4 µg/m³ at the most impacted sensitive receptor.

Any changes to the location of Atlas-Campaspe Mine sources of air emissions as a result of the Modification are unlikely to cause significant changes to existing air quality levels at sensitive receivers given the significant distance between the Atlas-Campaspe Mine and the nearest sensitive receptor.

Therefore, from this assessment, the original conclusions that the Atlas Campaspe Mine would not result in any additional exceedances of the relevant air quality impact assessment criteria at sensitive receptors would still be applicable.

2.5 Air Quality Management

The approved Air Quality Management Plan (AQMP) (Tronox, 2018) was prepared in accordance with Condition 21, Schedule 3 of Development Consent (SSD_5012) and includes:

- A description of the key sources of emissions.
- Relevant air quality criteria applicable to the Project.
- Air quality management measures for the Project.
- Air quality monitoring program components.
- A contingency plan to manage any unpredicted impacts and their consequences.

Table 9 shows the air quality management measures and controls from the AQMP. There are no significant gaps in the existing air quality controls that would need to be addressed to manage potential changes in the expected air quality impacts of the Modification.

The review and subsequent emission calculations have shown that the Modification is unlikely to increase air quality risks over those determined for the approved Project. No changes to air quality management measures are proposed as a result of the Modification and it is expected that activities would continue to be carried out in accordance with the approved the AQMP.

Table 9 Air quality management measures and controls

Project phase	Management measures
Construction	<ul style="list-style-type: none"> - Regular watering of roads and exposed areas to reduce wheel-generated dust and restricting vehicle speeds. - Dust-generating activities such as earthworks would not be carried out during high wind conditions (greater than 10 m/s). - Establishment of vegetation on stockpiled material to prevent wind erosion. - Minimisation of haul trips and trip distances, where practicable. - Erecting physical barriers such as bunds and / or wind breaks around stockpiles or areas where earth moving is required, where practicable. - Earth moving activities would be avoided during unfavourable meteorological conditions, where practicable. - Minimising speed (speed limit of 40 km/h) of on-site traffic, where applicable, to minimise wheel generated dust.
Operational (Atlas-Campaspe Mine site)	<ul style="list-style-type: none"> - Watering of exposed haul roads within the active mining area. - Watering during topsoil removal. - Progressive rehabilitation of exposed areas. - Control of truck speeds. - Minimisation of travel speed and distance travelled for bulldozing.
Operational (mineral concentrate transport route)	<ul style="list-style-type: none"> - All vehicles transporting mineral concentrate from the Atlas-Campaspe Mine site would be covered to minimise potential losses. - All rail wagons transporting mineral concentrate along the Orange-Broken Hill Railway would be covered to minimise potential losses. - All MSP process waste transport would be undertaken in sealed containers.

3 Greenhouse Gas Assessment

3.1 Background

GHG is a collective term for a range of gases that are known to trap radiation in the upper atmosphere, where they have the potential to contribute to the greenhouse effect (global warming). GHGs include:

- Carbon dioxide (CO₂); by far the most abundant GHG, primarily released during fuel combustion.
- Methane (CH₄); generated from the anaerobic decomposition of carbon-based material (including enteric fermentation and waste disposal in landfills).
- Nitrous oxide (N₂O); generated from industrial activity, fertiliser use and production.
- Hydrofluorocarbons (HFCs); commonly used as refrigerant gases in cooling systems.
- Perfluorocarbons (PFCs); used in a range of applications including solvents, medical treatments and insulators.
- Sulphur hexafluoride (SF₆); used as a cover gas in magnesium smelting and as an insulator in heavy duty switch gear.

It is common practice to aggregate the emissions of these gases to the equivalent emission of carbon dioxide. This provides a simple figure for comparison of emissions against targets. Aggregation is based on the potential of each gas to contribute to global warming relative to carbon dioxide and is known as the global warming potential (GWP). The resulting number is expressed as carbon dioxide equivalents (or CO₂-e).

GHG emissions that form an inventory can be split into three categories known as “Scopes”. Scopes 1, 2 and 3 are defined by the Greenhouse Gas Protocol (WRI, 2004) and can be summarised as follows:

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include importation of electricity or heat).
- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel, by air or rail, and product usage).

The purpose of differentiating between the scopes of emissions is to avoid the potential for double counting, where two or more organisations assume responsibility for the same emissions.

3.2 Federal Policy

The 21st yearly session of the Conference of Parties (COP), held in Paris in 2015, was pivotal for developing an international treaty on climate change. It resulted in “The Paris Agreement”, an agreement “to achieve a balance between anthropogenic (human induced) emissions by sources and removals by sinks of greenhouse in the second half of this century”. Subsequent COPs have sought to develop policy architecture to deliver on the commitments of COP21. In particular, following COP21, international agreements were made to:

- Keep global warming well below 2.0 degrees Celsius, with an aspirational goal of 1.5 degrees Celsius (based on temperature pre-industrial levels).
- From 2018, countries are to submit revised emission reduction targets every five years, with the first being effective from 2020, and goals set to 2050.
- Define a pathway to improve transparency and disclosure of emissions.
- Make provisions for financing the commitments.

The *Climate Change Act 2022* operates as umbrella legislation to implement Australia’s net-zero commitments. It codifies Australia’s net 2030 and 2050 GHG emissions reductions targets under the Paris Agreement including targets to cut emissions by 43% by 2030 from 2005 levels and achieve net zero emissions by 2050.

The Federal Government uses the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) legislation for the measurement, reporting and verification of GHG emissions in Australia. This legislation is used for a range of purposes, including international GHG reporting. Under the NGER Act, constitutional corporations in Australia which exceed thresholds for GHG emissions or energy production or consumption are required to measure and report data to the Clean Energy Regulator (CER) on an annual basis.

The NGER Act defines facility and corporate group emission thresholds. The facility thresholds are:

- 25,000 t or more CO₂-e (scope 1 and scope 2 emissions);
- production of 100 terajoules (TJ) or more of energy; or
- consumption of 100 TJ or more of energy.

The *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Measurement Determination) identifies several methodologies to account for GHGs from specific sources relevant to the Project. This includes emissions of GHGs from direct fuel combustion (fuels for transport energy purposes), emissions associated with consumption of power from direct combustion of fuel (e.g. diesel generators), and from consumption of electricity from the grid.

The Measurement Determination provides methods, criteria, and measurement standards for calculating and reporting greenhouse gas emissions and energy data under the NGER Act. It covers Scope 1 and Scope 2 emissions and energy production and consumption. The calculation methodologies have been based primarily on the National Greenhouse Accounts (NGA) Factors as these are used for the purposes of project assessment in NSW. The NGA Factors provide methods for the estimation of GHG emissions. Whilst drawing on the Measurement Determination, the NGA factors can be applied to a broader range of emissions estimates.

The Safeguard Mechanism has been in place since 1 July 2016 and is a legislated framework that applies to all facilities that emit more than 100,000 tonnes of CO₂-e of Scope 1 emissions (emissions produced on-site) in a year. The Safeguard Mechanism places a limit on the amount of greenhouse gases Australia's largest industrial facilities can emit by assigning each facility covered by the Mechanism a 'baseline'. Each year, every large facility within the Safeguard Mechanism reports their emissions to the CER. Any facility that emits more greenhouse gases than allowed by their baseline has to take actions to reduce their emissions, for example, through purchasing Australian Carbon Credit Units.

Reforms to the Safeguard Mechanism took effect from 1 July 2023. Under these reforms, new baseline emissions numbers ('baselines') for designated large facilities are set on a declining trajectory aligned with achieving Australia's emissions reduction targets set out in the *Climate Change Act 2022* and its Nationally Determined Contribution (NDC) under the Paris Agreement. The decline rate for Safeguard baselines is currently 4.9% per year to 2030, followed by 3.285% per year thereafter. The Atlas-Campaspe Mine is not a Safeguard facility as it emits less than 100,000 tonnes of CO₂-e of Scope 1 emissions (direct emissions produced on-site) in a year.

3.3 State Policy

Table 10 summarises the relevant NSW Government legislation and policy documents that are relevant to the Modification, including policy documents from the EPA, the primary environmental regulator for NSW.

Table 10 Relevant NSW Government legislation and policy

Title	Description
NSW Guide for Large Emitters	The Guide outlines the EPA's assessment requirements for new projects likely to have large emissions and proposed modifications of existing facilities likely to significantly increase their emissions.
<i>Climate Change (Net Zero Future) Act 2023</i>	Legislates NSW target reductions in GHG emissions of 50% of 2005 levels by 30 June 2030, 70% of 2005 levels by 30 June 2035, and net zero emissions by 2050. The Act does not impose any direct obligations on companies or facilities.
NSW Climate Change Policy Framework	Sets out the NSW Government's long-term goals of achieving net-zero emissions by 2050, and making NSW more resilient and better adapted to a changing climate.
Net Zero Plan Stage1: 2020-2030	Foundation for NSW's action on climate change. It outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions during the 2020s.
Net Zero Plan Stage 1: 2020-2030 Implementation Update Net Zero Plan Implementation Update 2022	These provide updates on the key achievements of NSW Government under the Net Zero Plan and commit NSW to reducing emissions by 50% below 2005 levels by 2030, and 70% below 2005 levels by 2035.
NSW Climate Change Adaptation Strategy	Sets out the NSW Government's strategic approach for managing the impacts of climate change on the State.
NSW Waste and Sustainable Materials Strategy 2041	Sets out how NSW will transition to a circular economy over the next 20 years, including key reforms for reducing GHG emissions from materials (embedded carbon) and the waste sector.

Title	Description
<i>Protection of the Environment Administration Act 1991</i>	<p>Outlines the EPA's statutory objectives and duty to address climate change. Section 6 of the Act outlines the EPA's statutory objectives to protect the environment and human health. The key elements are:</p> <ul style="list-style-type: none"> - to protect, restore and enhance the quality of the environment in NSW, having regard to the need to maintain ecologically sustainable development - to reduce the risks to human health and prevent the degradation of the environment, including by taking action in relation to climate change. <p>Section 9 of the Act imposes a statutory duty on the EPA to develop environmental quality objectives, guidelines and policies to ensure environment protection. This includes protection of the environment from climate change.</p>
<i>Protection of the Environment Operations Act 1997</i>	<p>Sets out EPA's statutory powers and regulatory tools, including environment protection licensing. Schedule 1 of the Act sets out the types of activities that need a licence. The EPA is required to consider its statutory objectives (above) when exercising its licensing functions.</p>
Climate Change Policy	<p>Supports and builds upon NSW Government's climate change policies and initiatives. The main purpose is to address:</p> <ul style="list-style-type: none"> - the EPA's statutory objectives to protect, restore and enhance the quality of the environment in NSW, and to reduce the risks to human health and prevent the degradation of the environment - the EPA's statutory duty to develop environmental quality objectives, guidelines and policies to ensure environment protection from climate change.
Climate Change Action Plan 2023-26	<p>Designed to deliver the Climate Change Policy. The Action Plan sets out:</p> <ul style="list-style-type: none"> - the specific actions the EPA will take over the three years that it covers - the regulatory action the EPA will consider over the medium to longer term, where an increased regulatory response may be required to support the NSW Government's climate change commitments and policies, including achieving net-zero emissions in NSW by 2050.
Strategic Plan 2024–29	<p>Describes how the EPA will deliver stewardship for the environment to protect, restore and enhance the environment and human health. It sets out commitments to effective regulation and a focus on high quality environmental outcomes across all of EPA's work. The plan details objectives and outcomes for three key areas:</p> <ul style="list-style-type: none"> - caring for country - driving action on climate change - enabling a safe circular economy.
Waste Delivery Plan	<p>Outlines the actions the EPA take to reduce the harmful impact of waste and drive behaviours that create a circular economy. The Waste Delivery Plan includes actions to reduce carbon emissions and building the resilience of the waste sector to climate change.</p>

In January 2025, the EPA finalised their GHG assessment requirements in the "NSW Guide for Large Emitters" (EPA, 2025) (the Guide). The Guide outlines the assessment requirements for new projects likely to have large emissions and proposed modifications of existing facilities likely to significantly increase their emissions. There are two main tests to determine the applicability of the Guide. These consider whether the project is a large emitter, and if these emissions will be "significant" based on the development type. The potential applicability and requirements of the Guide has been discussed (see Section 3.4).

3.4 Assessment Boundary and Scenarios

The level of assessment of the Modification has been informed by the "NSW Guide for Large Emitters" (EPA, 2025). The assessment requirements of the Guide are applicable to a project if it meets the following three criteria:

- The project proposal requires development assessment and approval, or a change to an approval, under the *Environmental Planning and Assessment Act 1979*.
- The project involves one or more scheduled activities under Schedule 1 of the *Protection of the Environment Operations Act* (POEO Act) and / or will be carried out at an existing licensed premises.
- The project is likely to emit 25,000 tonnes or more of scope 1 and 2 emissions CO₂-e in any financial year during the operational life of the project (based on planned operational throughput and as designed).

Emissions have been calculated to determine whether the Modification is likely to result in more than 25,000 tonnes of CO₂-e) of scope 1 and 2 emissions in any financial year during the operational life of the project (incremental to the emissions from the existing approved project). Tronox reports both Group and Facility greenhouse gas emissions under the NGER Act, noting that the existing Project triggers the NGER Act reporting threshold for facilities. This would continue to be the case for the Modification.

The assessment boundary was developed to include all significant Scope 1, 2 and 3 emissions. 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, 2004).

Emission sources include the dominant sources at mining operations that are often targeted by mitigation measures and of interest to stakeholders. Table 11 lists the sources that have been included and excluded from the assessment. The source exclusions represent activity data that are not readily available and/or where activity data for these sources is unlikely to generate sufficient emissions to materially change impacts or influence the decision-making outcomes of stakeholders. Emissions for the excluded sources are also not included in the National Greenhouse and Energy Reporting Scheme.

Table 11 GHG source inclusions and exclusions

Activity	Description	Scope
Included sources		
Diesel usage (vehicles)	Combustion of diesel fuel from on-site mobile equipment	1
Diesel usage (generators)	Combustion of diesel fuel from on-site generators	1
Vegetation removal	Loss of carbon sink from vegetation removal	1
Oils and greases	Emissions from oils and greases	1
Electricity	Electricity usage from the IRF and MSP	2
Diesel transport	Combustion of diesel fuel from transporting from IRF to MSP and MSP to Port Pirie	3
Diesel MSP	Combustion of diesel fuel at the MSP	3
LPG MSP	Combustion of liquid petroleum gas (LPG) at the MSP	3
Excluded sources		
Industrial processes	Sulphur hexafluoride (high voltage switch gear) Hydrofluorocarbon (commercial and industrial refrigeration)	1
Wastewater handling (industrial)	Methane emissions from wastewater management	1
Solid waste	Solid waste to landfill	3
Business travel	Employees travelling for business purposes	3
Employee travel	Employees travelling between their place of residence and Atlas-Campaspe mine	3

Emissions have been considered for the operational life of the Modification.

The emission scenarios were as follows:

- The Atlas-Campaspe Mineral Sands Project without the Modification, referred to as “Business as usual”.
- The Atlas-Campaspe Mineral Sands Project with the Modification, referred to as “Modified business”.
- The increment of the Modification only, referred to as “Project Only”

The trucking option for the Modification has been adopted for the “Modified business” and “Project only” as the potential greenhouse gas emissions associated with this option would be greater than the pumping option. This is because the pumping option would result in less diesel usage as the electricity required to pump material via the optimised services corridor would partially be generated from solar farm and battery energy storage system located at the Atlas-Campaspe Mine.

The Modification does not seek to extend the current approved operations.

3.5 Estimated Emissions

The GHG inventory in this document has been calculated in accordance with the principles of the GHG Protocol. The initial actions for a GHG inventory are to determine the sources of GHG emissions, assess their likely significance and set a boundary for the assessment. Creating an inventory of the likely GHG emissions has the benefit of determining the scale of the emissions and providing a baseline from which to assess options that may be reasonable and feasible for GHG reduction. The results of this assessment are presented in terms of the previously mentioned ‘Scopes’ to help understand the direct and indirect impacts of the Modification.

The GHG Protocol (and similar reporting schemes) dictates that reporting Scope 1 and 2 sources is mandatory, whilst reporting Scope 3 sources is optional. Reporting significant Scope 3 sources is recommended. Scope 3 emissions are a consequence of the activities of the company, although occur from sources not owned or controlled by the company. Some examples of Scope 3 activities include the extraction and production of purchased materials, transportation of purchased fuels, and use of sold products and services. The inventory for this assessment includes all significant sources of GHGs (Scopes 1, 2 and 3) associated as per Table 11.

GHG emissions associated with operation of the Atlas-Campaspe Mine are well understood, given that the mine is currently operating. Future projections of production, fuel usage and electricity usage (from Tronox) were used to determine the GHG emissions from the Atlas-Campaspe Mine with and without the Modification. Table 12 shows the emission estimation methodologies for the key emission sources.

Table 12 GHG emission estimation methodologies

Activity	Description	Scope(s)	Emission estimation methodology
Diesel usage (vehicles)	Combustion of diesel fuel from on-site mobile equipment	1, 3	Emission factors from NGA Factors (Department of Climate Change, Energy, the Environment and Water [DCCEEW], 2024a).
Diesel usage (generators)	Combustion of diesel fuel from on-site generators	1, 3	Emission factors from NGA Factors (DCCEEW, 2024a).
Vegetation removal	Loss of carbon sink from vegetation removal	1	Calculated using "Carbon Gauge" developed by the Transport Authorities Greenhouse Group (Transport Authorities Greenhouse Group, 2013). Vegetation of "Class I Grasslands". Biomass class set to "Class 2:50-100 (tonnes of dry matter per hectare [t dry matter/ha])" based on site location.
Oils and greases	Emissions from oils and greases	1, 3	Emission factors from NGA Factors (DCCEEW, 2024a).
Electricity	Electricity usage from the IRF and MSP	2, 3	Emission factor projections from DCCEEW (2024b).
Diesel transport	Combustion of diesel fuel from transporting from IRF to MSP and MSP to Port Pirie	3	Emission factors from NGA Factors (DCCEEW, 2024a).
Diesel MSP	Combustion of diesel fuel at the MSP	3	Emission factors from NGA Factors (DCCEEW, 2024a).
LPG MSP	Combustion of liquid petroleum gas (LPG) at the MSP	3	Emission factors from NGA Factors (DCCEEW, 2024a).

Table 13 shows the estimated emissions due to all identified GHG generating activities associated with the modified Atlas-Campaspe Mine (trucking option). The Modification is estimated to decrease the direct annual GHG emissions from the Atlas-Campaspe Mine by 1.5 kilotonnes of carbon dioxide equivalent per year (kt CO₂-e/y), on average. More significant reductions in GHG emissions would be expected with the option of pumping the concentrates via a pipeline through the optimised services corridor.

Table 13 Estimated GHG emissions

Year	Annual emission (kt CO ₂ -e)								
	Project without the Modification "Business as usual"			Project with the Modification "Modified business"			Change due to the Modification "Project only"		
	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
2025	45.3	1.1	13.2	45.3	1.1	13.2	-	-	-
2026	45.3	1.0	13.5	56.2	1.0	13.5	11.0	-	-
2027	48.2	1.0	15.4	48.2	1.0	15.4	-	-	-
2028	51.5	0.8	15.7	51.5	0.8	15.7	-	-	-
2029	50.1	0.6	17.0	50.1	0.6	17.0	-	-	-
2030	50.1	0.5	21.3	44.1	0.5	21.3	-6.0	-	-
2031	50.1	0.5	21.3	44.1	0.5	21.3	-6.0	-	-
2032	49.9	0.2	9.0	44.0	0.2	9.0	-6.0	-	-
2033	48.4	0.1	9.0	42.8	0.1	9.0	-5.7	-	-
2034	34.3	0.1	9.0	31.4	0.1	9.0	-2.8	-	-
Average	47.3	0.6	14.5	45.8	0.6	14.5	-1.5	-	-
Total	473.3	5.9	144.7	457.8	5.9	144.7	-15.5	-	-

Figure 6 shows the estimated Scope 1 and 2 GHG emissions from the Project (based on the trucking option). The projected annual emissions of the Project with the Modification are likely to exceed the facility emission threshold, so Tronox will continue to have an obligation to report emissions from this facility under the NGER Act.

However, emissions from the Modification would not exceed 25,000 tonnes or more of scope 1 and 2 emissions CO₂-e in any financial year, from the Guide. Therefore, the assessment requirements of the Guide are not applicable, and no further assessment is required. The GHG management measures included in the AQMP (Tronox, 2018) would continue to be applicable.

Full details of the calculations by source and year are provided in Appendix A.

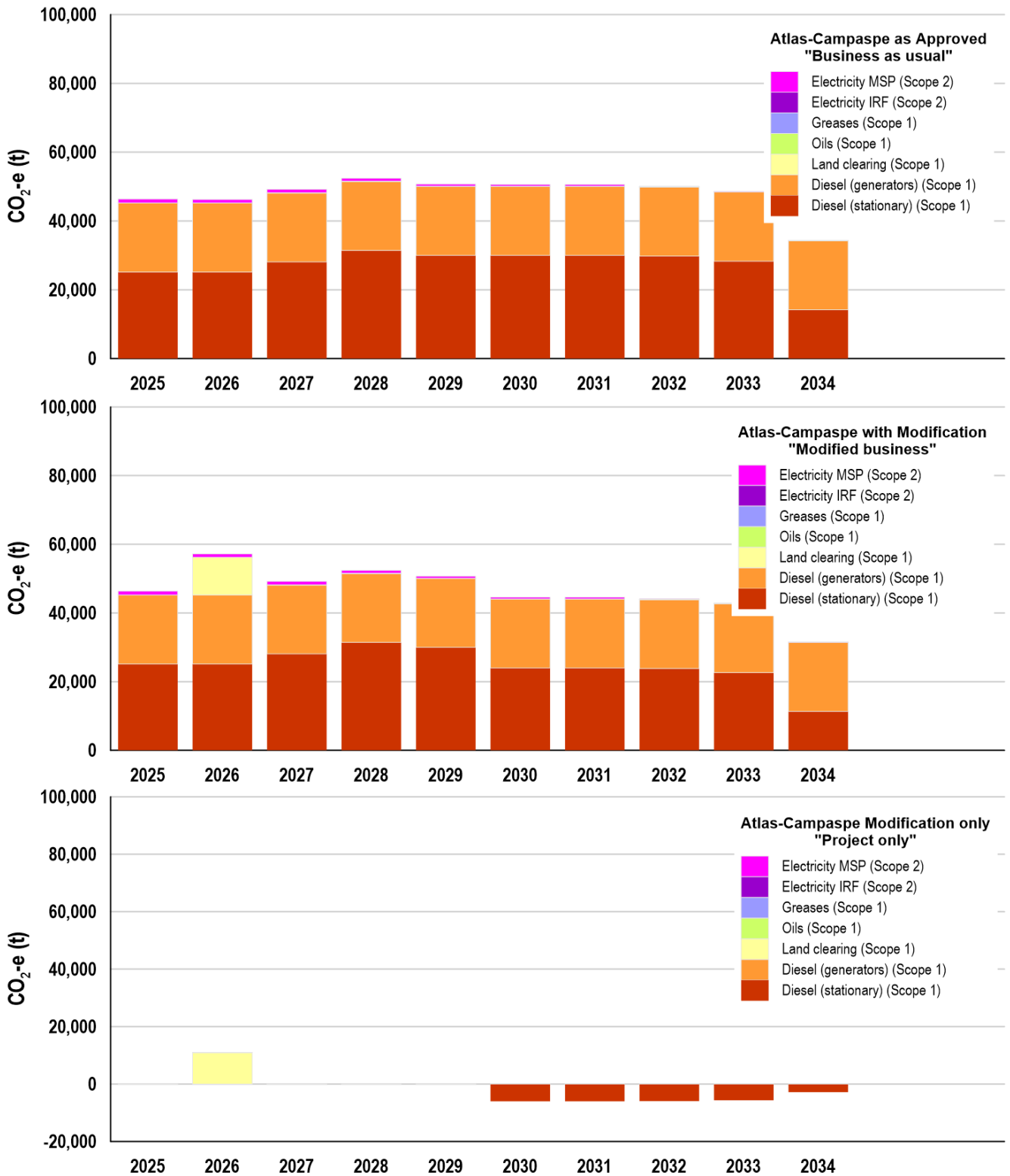


Figure 6 Estimated GHG emissions from the Project

4 Conclusions

This report has provided a review of potential air quality and GHG impacts associated with a proposed modification to the Development Consent (SSD_5012) for the Project. The review considered recent air quality monitoring data and changes proposed as part of the Modification to determine any potential change in air quality impacts of the Approved Project.

The following key conclusions were made in relation to air quality impacts:

- Recent air quality monitoring does not highlight any occasions where the Project caused exceedances of the air quality criteria in the Development Consent (SSD_5012).
- Dust emissions from the modified Atlas-Campaspe Mine site are expected to decrease by 0 to 4% compared to dust emissions from the approved Atlas-Campaspe Mine. This outcome suggests that the air quality impact risk of the Atlas-Campaspe Mine would decrease with the Modification. More significant reductions in dust emissions (up to 9%) would be expected with the option of pumping the concentrates via a pipeline through the optimised services corridor.
- There are no significant gaps in the existing air quality controls that would need to be addressed to manage potential changes in the expected air quality impacts of the Modification.

Based on these conclusions it has been determined that the Modification would not alter the outcomes from previous air quality assessments of the Project (Katestone, 2013 and 2019). Specifically, it can be concluded that the Project would not result in any additional exceedances of the relevant air quality impact assessment criteria at sensitive receptors.

The following key conclusions were made in relation to GHG emissions:

- The Atlas-Campaspe Mine is estimated to decrease the direct annual GHG emissions from the Atlas-Campaspe Mine by 1.5 kt CO₂-e/y on average. This would represent a decrease in Scope 1 emissions of the approved Project (as MOD 5) of approximately 3%. More significant reductions in GHG emissions would be expected with the option of pumping the concentrates via a pipeline through the optimised services corridor.
- The Modification does not meet the EPA definition of a "large" emitter, and the "NSW Guide for Large Emitters" (EPA, 2025) is not applicable.
- Tronox would continue to have an obligation to report emissions from the Atlas-Campaspe Mine under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act).
- The Atlas-Campaspe Mine is not a Safeguard facility as it emits less than 100,000 tonnes of CO₂-e of Scope 1 emissions (direct emissions produced on-site) in a year.
- The GHG management measures included in the existing AQMP (Tronox, 2018) would continue to be applicable.

5 References

- Airen Consulting (2024) "Air Quality Review of Atlas-Campaspe Mineral Sands Project – Modification 5". Letter dated 8 July 2024.
- DCCEEW (2024a) "National Greenhouse Accounts Factors 2024". Department of Climate Change, Energy, the Environment and Water.
- DCCEEW (2024b) "Australia's emissions projections 2024". Department of Climate Change, Energy, the Environment and Water. November 2024.
- DCCEEW (2024c) "Safeguard Mechanism" document July 2021 republished October 2023, April 2024 and September 2024. Last updated 24 September 2024. Department of Climate Change, Energy, the Environment and Water.
- DEC (2005) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW". August 2005. Published by the Department of Environment and Conservation.
- DPE (2020) "Annual Air Quality Statement 2019". Available from <https://www.environment.nsw.gov.au/>. Department of Planning and Environment now known as Department of Planning, Housing and Infrastructure.
- DPIE (2020) "Net Zero Plan Stage 1: 2020–2030". Department of Planning, Industry and the Environment. March 2020.
- EPA (2022) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW". August 2022. Published by the Environment Protection Authority.
- EPA (2025) "NSW Guide for Large Emitters – guidance on how to prepare a greenhouse gas assessment as part of NSW environmental planning processes". January 2025. Environment Protection Authority.
- Katestone (2013) "Atlas-Campaspe Mineral Sands Project – Air Quality and Greenhouse Gas Assessment". Report prepared by Katestone Environmental Pty Ltd, dated May 2013.
- Katestone (2019) "Atlas-Campaspe Mineral Sands Project – Optimisation Modification – Air Quality Review". Report prepared by Katestone Environmental Pty Ltd, dated 16 July 2019.
- NEPC (1998 and updates to 2021) "Ambient Air – National Environment Protection Measure for Ambient Air Quality", National Environment Protection Council, Canberra.
- Tronox (2018) "Atlas-Campaspe Mineral Sands Project – Air Quality Management Plan". July 2018.
- WRI (2004). "Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard - REVISED EDITION". The Greenhouse Gas Protocol is a collaboration between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The Protocol provides guidance on the calculation and reporting of carbon footprints.

Appendix A. Greenhouse gas emissions

Project as Approved ("Business as Usual")

Diesel (stationary)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	9,283	2709.72	0	667.78	25,153	-	6,199	31,352
2026	9,283	2709.72	0	667.78	25,153	-	6,199	31,352
2027	10,368	2709.72	0	667.78	28,096	-	6,924	35,020
2028	11,598	2709.72	0	667.78	31,428	-	7,745	39,173
2029	11,074	2709.72	0	667.78	30,007	-	7,395	37,403
2030	11,070	2709.72	0	667.78	29,996	-	7,392	37,388
2031	11,070	2709.72	0	667.78	29,997	-	7,392	37,390
2032	10,997	2709.72	0	667.78	29,798	-	7,343	37,141
2033	10,449	2709.72	0	667.78	28,313	-	6,977	35,290
2034	5,224	2709.72	0	667.78	14,156	-	3,489	17,645
Total	100,415				272,097	-	67,055	339,153

Project as Approved ("Business as Usual")

Diesel (generators)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2026	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2027	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2028	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2029	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2030	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2031	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2032	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2033	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2034	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
Total	74,104				200,800	-	49,485	250,285

Project as Approved ("Business as Usual")

Land clearing

Year	Clearing (ha)	Emission factor (kg CO2-e/ha)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	0	0	0	-	-	-	-
2026	0.00	112888.20	0	0	-	-	-	-
2027	-	0	0	0	-	-	-	-
2028	-	0	0	0	-	-	-	-
2029	-	0	0	0	-	-	-	-
2030	-	0	0	0	-	-	-	-
2031	-	0	0	0	-	-	-	-
2032	-	0	0	0	-	-	-	-
2033	-	0	0	0	-	-	-	-
2034	-	0	0	0	-	-	-	-
Total	-				-	-	-	-

Project as Approved ("Business as Usual")

Oils

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	71	539.32	0	698.4	39	-	50	88
2026	71	539.32	0	698.4	39	-	50	88
2027	71	539.32	0	698.4	39	-	50	88
2028	71	539.32	0	698.4	39	-	50	88
2029	71	539.32	0	698.4	39	-	50	88
2030	71	539.32	0	698.4	39	-	50	88
2031	71	539.32	0	698.4	39	-	50	88
2032	71	539.32	0	698.4	39	-	50	88
2033	71	539.32	0	698.4	39	-	50	88
2034	71	539.32	0	698.4	39	-	50	88
Total	714				385	-	499	884

Project as Approved ("Business as Usual")

Greases

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	17	135.8	0	698.4	2	-	12	14
2026	17	135.8	0	698.4	2	-	12	14
2027	17	135.8	0	698.4	2	-	12	14
2028	17	135.8	0	698.4	2	-	12	14
2029	17	135.8	0	698.4	2	-	12	14
2030	17	135.8	0	698.4	2	-	12	14
2031	17	135.8	0	698.4	2	-	12	14
2032	17	135.8	0	698.4	2	-	12	14
2033	17	135.8	0	698.4	2	-	12	14
2034	17	135.8	0	698.4	2	-	12	14
Total	174				24	-	121	145

Project as Approved ("Business as Usual")

Electricity usage (Ivanhoe Rail Facility)

Year	Usage (kWh)	Emission factor (kg CO2-e/kWh)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	4,006	0	0.51	0.04	-	2	0	2
2026	3,848	0	0.47	0.03	-	2	0	2
2027	4,074	0	0.4	0.03	-	2	0	2
2028	5,188	0	0.34	0.02	-	2	0	2
2029	5,875	0	0.21	0.02	-	1	0	1
2030	6,002	0	0.15	0.01	-	1	0	1
2031	5,817	0	0.15	0.01	-	1	0	1
2032	5,273	0	0.13	0.01	-	1	0	1
2033	5,283	0	0.09	0.00	-	0	-	0
2034	3,205	0	0.09	0.00	-	0	-	0
Total	48,571				-	12	1	12

Project as Approved ("Business as Usual")

Electricity usage (Mineral Separation Plant)

Year	Usage (kWh)	Emission factor (kg CO2-e/kWh)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	2,070,032	0	0.51	0.04	-	1,056	83	1,139
2026	2,124,100	0	0.47	0.03	-	998	64	1,062
2027	2,425,336	0	0.4	0.03	-	970	73	1,043
2028	2,471,680	0	0.34	0.02	-	840	49	890
2029	2,664,780	0	0.21	0.02	-	560	53	613
2030	3,352,216	0	0.15	0.01	-	503	34	536
2031	3,352,216	0	0.15	0.01	-	503	34	536
2032	1,421,216	0	0.13	0.01	-	185	14	199
2033	1,421,216	0	0.09	0.00	-	128	-	128
2034	1,421,216	0	0.09	0.00	-	128	-	128
Total	22,724,008				-	5,870	403	6,274

Project as Approved ("Business as Usual")

Diesel (IRF to MSP and MSP to Port Pirie)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	4,111	0	0	2717.44	-	-	11,171	11,171
2026	4,219	0	0	2717.44	-	-	11,465	11,465
2027	4,817	0	0	2717.44	-	-	13,090	13,090
2028	4,909	0	0	2717.44	-	-	13,340	13,340
2029	5,292	0	0	2717.44	-	-	14,381	14,381
2030	6,658	0	0	2717.44	-	-	18,093	18,093
2031	6,658	0	0	2717.44	-	-	18,093	18,093
2032	2,822	0	0	2717.44	-	-	7,669	7,669
2033	2,822	0	0	2717.44	-	-	7,669	7,669
2034	2,822	0	0	2717.44	-	-	7,669	7,669
Total	45,130				-	-	122,638	122,638

Project as Approved ("Business as Usual")

Diesel (Mineral Separation Plant)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	105	0	0	2709.72	-	-	285	285
2026	108	0	0	2709.72	-	-	293	293
2027	124	0	0	2709.72	-	-	336	336
2028	126	0	0	2709.72	-	-	341	341
2029	136	0	0	2709.72	-	-	369	369
2030	171	0	0	2709.72	-	-	463	463
2031	171	0	0	2709.72	-	-	463	463
2032	72	0	0	2709.72	-	-	195	195
2033	72	0	0	2709.72	-	-	195	195
2034	72	0	0	2709.72	-	-	195	195
Total	1,157				-	-	3,135	3,135

Project as Approved ("Business as Usual")

LPG (Mineral Separation Plant)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	1,105	0	0	1557.42	-	-	1,721	1,721
2026	1,134	0	0	1557.42	-	-	1,766	1,766
2027	1,295	0	0	1557.42	-	-	2,017	2,017
2028	1,319	0	0	1557.42	-	-	2,054	2,054
2029	1,422	0	0	1557.42	-	-	2,215	2,215
2030	1,789	0	0	1557.42	-	-	2,786	2,786
2031	1,789	0	0	1557.42	-	-	2,786	2,786
2032	759	0	0	1557.42	-	-	1,182	1,182
2033	759	0	0	1557.42	-	-	1,182	1,182
2034	759	0	0	1557.42	-	-	1,182	1,182
Total	12,130				-	-	18,892	18,892

Project with Modification ("Modified Business")

Diesel (stationary)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	9,283	2709.72	0	667.78	25,153	-	6,199	31,352
2026	9,283	2709.72	0	667.78	25,153	-	6,199	31,352
2027	10,368	2709.72	0	667.78	28,096	-	6,924	35,020
2028	11,598	2709.72	0	667.78	31,428	-	7,745	39,173
2029	11,074	2709.72	0	667.78	30,007	-	7,395	37,403
2030	8,856	2709.72	0	667.78	23,997	-	5,914	29,911
2031	8,856	2709.72	0	667.78	23,998	-	5,914	29,912
2032	8,797	2709.72	0	667.78	23,838	-	5,875	29,713
2033	8,359	2709.72	0	667.78	22,650	-	5,582	28,232
2034	4,179	2709.72	0	667.78	11,325	-	2,791	14,116
Total	90,653				245,645	-	60,537	306,182

Project with Modification ("Modified Business")

Diesel (generators)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2026	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2027	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2028	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2029	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2030	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2031	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2032	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2033	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
2034	7,410	2709.72	0	667.78	20,080	-	4,948	25,028
Total	74,104				200,800	-	49,485	250,285

Project with Modification ("Modified Business")

Land clearing

Year	Clearing (ha)	Emission factor (kg CO2-e/ha)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	0	0	0	-	-	-	-
2026	97.03	112888.20	0	0	10,953	-	-	10,953
2027	-	0	0	0	-	-	-	-
2028	-	0	0	0	-	-	-	-
2029	-	0	0	0	-	-	-	-
2030	-	0	0	0	-	-	-	-
2031	-	0	0	0	-	-	-	-
2032	-	0	0	0	-	-	-	-
2033	-	0	0	0	-	-	-	-
2034	-	0	0	0	-	-	-	-
Total	97				10,953	-	-	10,953

Project with Modification ("Modified Business")

Oils

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	71	539.32	0	698.4	39	-	50	88
2026	71	539.32	0	698.4	39	-	50	88
2027	71	539.32	0	698.4	39	-	50	88
2028	71	539.32	0	698.4	39	-	50	88
2029	71	539.32	0	698.4	39	-	50	88
2030	71	539.32	0	698.4	39	-	50	88
2031	71	539.32	0	698.4	39	-	50	88
2032	71	539.32	0	698.4	39	-	50	88
2033	71	539.32	0	698.4	39	-	50	88
2034	71	539.32	0	698.4	39	-	50	88
Total	714				385	-	499	884

Project with Modification ("Modified Business")

Greases

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	17	135.8	0	698.4	2	-	12	14
2026	17	135.8	0	698.4	2	-	12	14
2027	17	135.8	0	698.4	2	-	12	14
2028	17	135.8	0	698.4	2	-	12	14
2029	17	135.8	0	698.4	2	-	12	14
2030	17	135.8	0	698.4	2	-	12	14
2031	17	135.8	0	698.4	2	-	12	14
2032	17	135.8	0	698.4	2	-	12	14
2033	17	135.8	0	698.4	2	-	12	14
2034	17	135.8	0	698.4	2	-	12	14
Total	174				24	-	121	145

Project with Modification ("Modified Business")

Electricity usage (Ivanhoe Rail Facility)

Year	Usage (kWh)	Emission factor (kg CO2-e/kWh)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	4,006	0	0.51	0.04	-	2	0	2
2026	3,848	0	0.47	0.03	-	2	0	2
2027	4,074	0	0.4	0.03	-	2	0	2
2028	5,188	0	0.34	0.02	-	2	0	2
2029	5,875	0	0.21	0.02	-	1	0	1
2030	6,002	0	0.15	0.01	-	1	0	1
2031	5,817	0	0.15	0.01	-	1	0	1
2032	5,273	0	0.13	0.01	-	1	0	1
2033	5,283	0	0.09	0.00	-	0	-	0
2034	3,205	0	0.09	0.00	-	0	-	0
Total	48,571				-	12	1	12

Project with Modification ("Modified Business")

Electricity usage (Mineral Separation Plant)

Year	Usage (kWh)	Emission factor (kg CO2-e/kWh)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	2,070,032	0	0.51	0.04	-	1,056	83	1,139
2026	2,124,100	0	0.47	0.03	-	998	64	1,062
2027	2,425,336	0	0.4	0.03	-	970	73	1,043
2028	2,471,680	0	0.34	0.02	-	840	49	890
2029	2,664,780	0	0.21	0.02	-	560	53	613
2030	3,352,216	0	0.15	0.01	-	503	34	536
2031	3,352,216	0	0.15	0.01	-	503	34	536
2032	1,421,216	0	0.13	0.01	-	185	14	199
2033	1,421,216	0	0.09	0.00	-	128	-	128
2034	1,421,216	0	0.09	0.00	-	128	-	128
Total	22,724,008				-	5,870	403	6,274

Project with Modification ("Modified Business")

Diesel (IRF to MSP and MSP to Port Pirie)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	4,111	0	0	2717.44	-	-	11,171	11,171
2026	4,219	0	0	2717.44	-	-	11,465	11,465
2027	4,817	0	0	2717.44	-	-	13,090	13,090
2028	4,909	0	0	2717.44	-	-	13,340	13,340
2029	5,292	0	0	2717.44	-	-	14,381	14,381
2030	6,658	0	0	2717.44	-	-	18,093	18,093
2031	6,658	0	0	2717.44	-	-	18,093	18,093
2032	2,822	0	0	2717.44	-	-	7,669	7,669
2033	2,822	0	0	2717.44	-	-	7,669	7,669
2034	2,822	0	0	2717.44	-	-	7,669	7,669
Total	45,130				-	-	122,638	122,638

Project with Modification ("Modified Business")

Diesel (Mineral Separation Plant)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	105	0	0	2709.72	-	-	285	285
2026	108	0	0	2709.72	-	-	293	293
2027	124	0	0	2709.72	-	-	336	336
2028	126	0	0	2709.72	-	-	341	341
2029	136	0	0	2709.72	-	-	369	369
2030	171	0	0	2709.72	-	-	463	463
2031	171	0	0	2709.72	-	-	463	463
2032	72	0	0	2709.72	-	-	195	195
2033	72	0	0	2709.72	-	-	195	195
2034	72	0	0	2709.72	-	-	195	195
Total	1,157				-	-	3,135	3,135

Project with Modification ("Modified Business")

LPG (Mineral Separation Plant)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	1,105	0	0	1557.42	-	-	1,721	1,721
2026	1,134	0	0	1557.42	-	-	1,766	1,766
2027	1,295	0	0	1557.42	-	-	2,017	2,017
2028	1,319	0	0	1557.42	-	-	2,054	2,054
2029	1,422	0	0	1557.42	-	-	2,215	2,215
2030	1,789	0	0	1557.42	-	-	2,786	2,786
2031	1,789	0	0	1557.42	-	-	2,786	2,786
2032	759	0	0	1557.42	-	-	1,182	1,182
2033	759	0	0	1557.42	-	-	1,182	1,182
2034	759	0	0	1557.42	-	-	1,182	1,182
Total	12,130				-	-	18,892	18,892

Modification Only ("Project Only")

Diesel (stationary)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	2709.72	0	667.78	-	-	-	-
2026	-	2709.72	0	667.78	-	-	-	-
2027	-	2709.72	0	667.78	-	-	-	-
2028	-	2709.72	0	667.78	-	-	-	-
2029	-	2709.72	0	667.78	-	-	-	-
2030	- 2,214	2709.72	0	667.78	- 5,999	-	- 1,478	- 7,478
2031	- 2,214	2709.72	0	667.78	- 5,999	-	- 1,478	- 7,478
2032	- 2,199	2709.72	0	667.78	- 5,960	-	- 1,469	- 7,428
2033	- 2,090	2709.72	0	667.78	- 5,663	-	- 1,395	- 7,058
2034	- 1,045	2709.72	0	667.78	- 2,831	-	- 698	- 3,529
Total	- 9,762				- 26,452	-	- 6,519	- 32,971

Modification Only ("Project Only")

Diesel (generators)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	2709.72	0	667.78	-	-	-	-
2026	-	2709.72	0	667.78	-	-	-	-
2027	-	2709.72	0	667.78	-	-	-	-
2028	-	2709.72	0	667.78	-	-	-	-
2029	-	2709.72	0	667.78	-	-	-	-
2030	-	2709.72	0	667.78	-	-	-	-
2031	-	2709.72	0	667.78	-	-	-	-
2032	-	2709.72	0	667.78	-	-	-	-
2033	-	2709.72	0	667.78	-	-	-	-
2034	-	2709.72	0	667.78	-	-	-	-
Total	-				-	-	-	-

Modification Only ("Project Only")

Land clearing

Year	Clearing (ha)	Emission factor (kg CO2-e/ha)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	0	0	0	-	-	-	-
2026	97.03	112888.20	0	0	10,953	-	-	10,953
2027	-	0	0	0	-	-	-	-
2028	-	0	0	0	-	-	-	-
2029	-	0	0	0	-	-	-	-
2030	-	0	0	0	-	-	-	-
2031	-	0	0	0	-	-	-	-
2032	-	0	0	0	-	-	-	-
2033	-	0	0	0	-	-	-	-
2034	-	0	0	0	-	-	-	-
Total	97				10,953	-	-	10,953

Modification Only ("Project Only")

Oils

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	539.32	0	698.4	-	-	-	-
2026	-	539.32	0	698.4	-	-	-	-
2027	-	539.32	0	698.4	-	-	-	-
2028	-	539.32	0	698.4	-	-	-	-
2029	-	539.32	0	698.4	-	-	-	-
2030	-	539.32	0	698.4	-	-	-	-
2031	-	539.32	0	698.4	-	-	-	-
2032	-	539.32	0	698.4	-	-	-	-
2033	-	539.32	0	698.4	-	-	-	-
2034	-	539.32	0	698.4	-	-	-	-
Total	-				-	-	-	-

Modification Only ("Project Only")

Greases

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	135.8	0	698.4	-	-	-	-
2026	-	135.8	0	698.4	-	-	-	-
2027	-	135.8	0	698.4	-	-	-	-
2028	-	135.8	0	698.4	-	-	-	-
2029	-	135.8	0	698.4	-	-	-	-
2030	-	135.8	0	698.4	-	-	-	-
2031	-	135.8	0	698.4	-	-	-	-
2032	-	135.8	0	698.4	-	-	-	-
2033	-	135.8	0	698.4	-	-	-	-
2034	-	135.8	0	698.4	-	-	-	-
Total	-				-	-	-	-

Modification Only ("Project Only")

Electricity usage (Ivanhoe Rail Facility)

Year	Usage (kWh)	Emission factor (kg CO2-e/kWh)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	0	0.51	0.04	-	-	-	-
2026	-	0	0.47	0.03	-	-	-	-
2027	-	0	0.4	0.03	-	-	-	-
2028	-	0	0.34	0.02	-	-	-	-
2029	-	0	0.21	0.02	-	-	-	-
2030	-	0	0.15	0.01	-	-	-	-
2031	-	0	0.15	0.01	-	-	-	-
2032	-	0	0.13	0.01	-	-	-	-
2033	-	0	0.09	0.00	-	-	-	-
2034	-	0	0.09	0.00	-	-	-	-
Total	-				-	-	-	-

Modification Only ("Project Only")

Electricity usage (Mineral Separation Plant)

Year	Usage (kWh)	Emission factor (kg CO2-e/kWh)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	0	0.51	0.04	-	-	-	-
2026	-	0	0.47	0.03	-	-	-	-
2027	-	0	0.4	0.03	-	-	-	-
2028	-	0	0.34	0.02	-	-	-	-
2029	-	0	0.21	0.02	-	-	-	-
2030	-	0	0.15	0.01	-	-	-	-
2031	-	0	0.15	0.01	-	-	-	-
2032	-	0	0.13	0.01	-	-	-	-
2033	-	0	0.09	0.00	-	-	-	-
2034	-	0	0.09	0.00	-	-	-	-
Total	-				-	-	-	-

Modification Only ("Project Only")

Diesel (IRF to MSP and MSP to Port Pirie)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	0	0	2717.44	-	-	-	-
2026	-	0	0	2717.44	-	-	-	-
2027	-	0	0	2717.44	-	-	-	-
2028	-	0	0	2717.44	-	-	-	-
2029	-	0	0	2717.44	-	-	-	-
2030	-	0	0	2717.44	-	-	-	-
2031	-	0	0	2717.44	-	-	-	-
2032	-	0	0	2717.44	-	-	-	-
2033	-	0	0	2717.44	-	-	-	-
2034	-	0	0	2717.44	-	-	-	-
Total	-				-	-	-	-

Modification Only ("Project Only")

Diesel (Mineral Separation Plant)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			Total
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	
2025	-	0	0	2709.72	-	-	-	-
2026	-	0	0	2709.72	-	-	-	-
2027	-	0	0	2709.72	-	-	-	-
2028	-	0	0	2709.72	-	-	-	-
2029	-	0	0	2709.72	-	-	-	-
2030	-	0	0	2709.72	-	-	-	-
2031	-	0	0	2709.72	-	-	-	-
2032	-	0	0	2709.72	-	-	-	-
2033	-	0	0	2709.72	-	-	-	-
2034	-	0	0	2709.72	-	-	-	-
Total	-				-	-	-	-

Modification Only ("Project Only")

LPG (Mineral Separation Plant)

Year	Usage (kL)	Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
2025	-	0	0	1557.42	-	-	-	-
2026	-	0	0	1557.42	-	-	-	-
2027	-	0	0	1557.42	-	-	-	-
2028	-	0	0	1557.42	-	-	-	-
2029	-	0	0	1557.42	-	-	-	-
2030	-	0	0	1557.42	-	-	-	-
2031	-	0	0	1557.42	-	-	-	-
2032	-	0	0	1557.42	-	-	-	-
2033	-	0	0	1557.42	-	-	-	-
2034	-	0	0	1557.42	-	-	-	-
Total	-				-	-	-	-