APPENDIX B

AIR QUALITY AND GREENHOUSE GAS IMPACT ASSESSMENT

Air Quality & Greenhouse Gas Impact Assessment

Cooranbong Entry Site Stockpile Extension Modification

Centennial Northern Coal Services

Gradwells Road
Dora Creek
NSW 2264

Prepared by:

SLR Consulting Australia

SLR Project No.: 610.30979

13 December 2024

Revision: 0.3

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	13 December 2024	F Rahaman	K Lawrence	K Lawrence

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Centennial Northern Coal Services (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Table of Contents

Tables in Text

Figures in Text

Appendices

1.0 Introduction

SLR consulting Australia Pty Ltd (SLR) was engaged by Centennial Northern Coal Services (Centennial) to prepare an air quality and greenhouse gas impact assessment (AQGHGIA) for the proposed extension of the coal stockpile (the Project) at the Cooranbong Entry Site (the Site).

This AQGHGIA has been prepared by SLR to support a Modification to SSD-5145.

2.0 Project Overview

Northern Coal Services (NCS) operations are located on the western side of Lake Macquarie, approximately 25 kilometres (km) south-west of Newcastle and 140 km north of Sydney. NCS comprises surface coal handling and processing facilities at the Newstan Colliery surface site and the Cooranbong Entry Site, as well as private haul roads connecting Newstan Colliery, Awaba Colliery, Cooranbong Entry Site and Eraring Power Station. The NCS facilities are integral to the handling, processing and transport of coal from Newstan Colliery (via conveyor) and Mandalong Mine (via an underground conveyor to Cooranbong Entry Site then NCS private haul roads).

The Site was originally developed as part of the Cooranbong Colliery in 1981. It comprises a Coal Handling Plant (CHP), coal stockpiles, coal conveyors, mine entries for access to Mandalong Mine, workshop and administration buildings, car parking, water management structures and other associated infrastructure. Centennial proposes to apply for the Modification (Modification 4) of SSD-5145 under Section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for:

- Development of the existing coal stockpile at CES to increase capacity from 100,000 tonnes to approximately 400,000 tonnes; and
- Construction of infrastructure associated with the modified stockpile footprint. This will include access tracks, lighting towers, water sprays, fencing and water management infrastructure.

The proposed Project footprint is presented in **Figure 2**.

3.0 Pollutants of Interest

3.1 Identification of Air Emissions Associated with the Project

The key air emissions from the Project would be fugitive emissions of particulate matters associated with construction of the modified stockpile area and coal handling activities. Wind erosion of the coal handling areas and Run of Mine (ROM) stockpile also has the potential to generate dust emissions under dry and windy conditions.

Other air pollutants that have the potential to be generated as a result of the Project include products of fuel combustion from the on-site vehicles and mobile/fixed equipment, the most significant of these being:

- oxides of nitrogen (NO_x);
- particulate matter;
- sulphur oxides (SO_x);
- carbon monoxide (CO); and
- volatile organic compounds (VOCs).

These emissions are predominantly emitted from mobile sources and will be emitted over a large area (as opposed to a single point source emission) and considering the scale of the emissions release from these mobile sources, the proposed activities are not expected to result in any significant change in ground level concentrations of these pollutants at surrounding receptors. Given this, potential air quality impacts associated with these mobile emission sources have not been investigated further in this assessment.

3.2 Particulate Matter

To assess potential health and nuisance impacts of dust emissions, particles are classified primarily by size, as TSP (total suspended particulates), PM_{10} (particulate matter with an aerodynamic diameter up to 10 µm) and $PM_{2.5}$ (particulate matter with an aerodynamic diameter up to 2.5 µm).

Human health effects of dust tend to be associated with particles with an aerodynamic diameter of 10 µm or less ($\leq PM_{10}$). These smaller particles tend to remain suspended in the air for longer periods and can penetrate into the lungs. The $PM_{10-2.5}$ fraction (coarse fraction) is termed “thoracic particles”. These particles are inhaled into the upper part of the airways and lung. $PM_{2.5}$ particles are fine particles that are inhaled more deeply and lodge in the gas exchange region (alveolar region) of the human lung and are termed “respirable dust”.

Emissions of TSP also have the potential to result in nuisance impacts due to increased rates of dust deposition in the surrounding area.

Based on the discussion above, this AQGHGIA focusses on the following key pollutants of interest:

- $PM_{2.5}$;
- PM_{10};
- TSP; and
- dust deposition.

4.0 Regulatory Framework for Air Quality Assessments

Section 7.1 of the NSW Environment Protection Authority document *NSW Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the Approved Methods) (NSW EPA 2022) outlines the impact assessment criteria for the pollutants identified in **Section 3.1**.

The criteria listed in the Approved Methods are the defining ambient air quality criteria for NSW, and are considered to be appropriate for the setting. The criteria adopted for the AQGHGIA are summarised in **Table 1**.

Table 1 Air Quality Assessment Criteria Adopted for this Study

Pollutant	Averaging Period	Assessment Criteria	Source
PM_{10}	24-Hour	50 µg/m^3	Approved Methods, 2022
	Annual	25 µg/m^3	
$PM_{2.5}$	24-Hour	25 µg/m^3	
	Annual	8 µg/m^3	
TSP	Annual	90 µg/m^3	
Dust Deposition	Annual increment	2 g/m^2/month	
	Annual cumulative	4 g/m^2/month	

The regulatory framework relevant to the assessment and management of GHG emissions is discussed in **Section 9.2**.

5.0 Existing Environment

5.1 Topography and Land Use

The land surrounding the Site is rolling rural in nature and includes land used for mining, power generation and townships. These include the Eraring Power Station to the east, Lake Eraring to the southeast, Dora Creek to the south and Cooranbong township to the southwest.

There are a few scattered rural dwellings mainly to the south of the Project.

For the air dispersion modelling study, topographical data was sourced from the Shuttle Radar Topography Mission (SRTM) database, which obtained elevation data on a near-global scale to generate the most complete high-resolution digital topographic database of Earth. There are two resolution outputs available: 1 km and 90 m resolutions. SRTM data with 90 m resolution was input into the CALMET model (see **Section 7.1.3**) to characterise terrain heights within the model domain, as presented in **Figure 1**.

5.2 Sensitive Receptors

A desktop mapping study was conducted to identify potentially sensitive land uses (referred to as “sensitive receptors”) in the surrounding area that may be affected by Project changes in air quality conditions.

The nearest identified potentially sensitive receptors are summarised in **Table 2** and shown graphically in **Figure 2**. These locations have been modelled as discrete receptor locations in addition to the gridded receptor network covering the modelling domain.

Table 2 Details of Identified Potential Sensitive Receptors

Receptor ID *	Easting (m)	Northing (m)
R1 (23)	360,222	6,340,540
R2 (26)	360,201	6,340,471
R3 (22)	360,002	6,340,503
R4 (28)	360,081	6,340,274
R5 (32)	360,190	6,340,241
R6 (31)	359,733	6,340,052
R7 (35)	359,873	6,339,911
R8 (30)	359,383	6,339,664
R9 (33)	359,188	6,339,819
R10	360,196	6,340,325
R11	360,065	6,340,359
* Numbers in brackets correspond to sensitive receptor identifiers from Appendix 4, Figure 2 of SSD-5145		

Figure 1 Local Topography

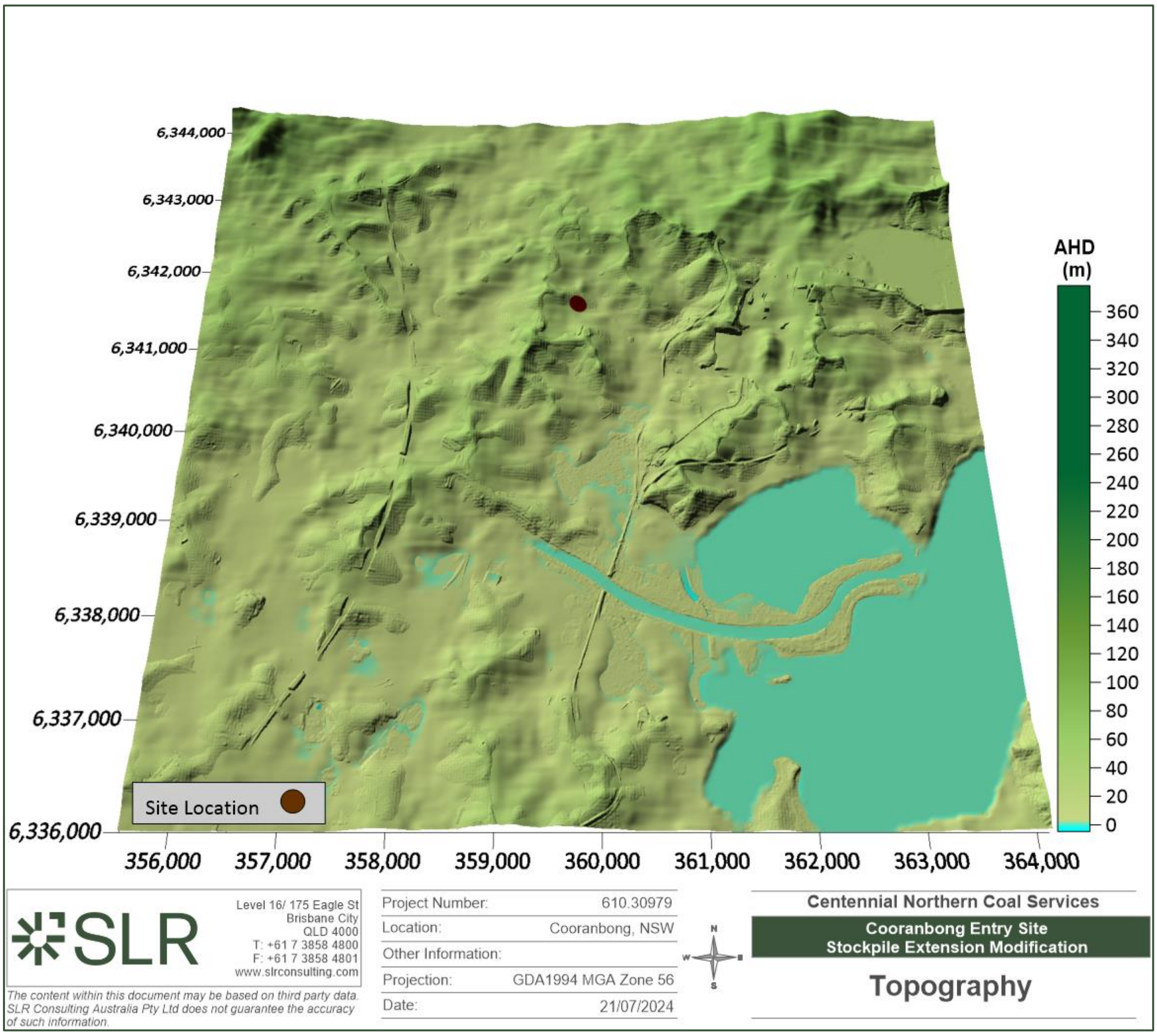
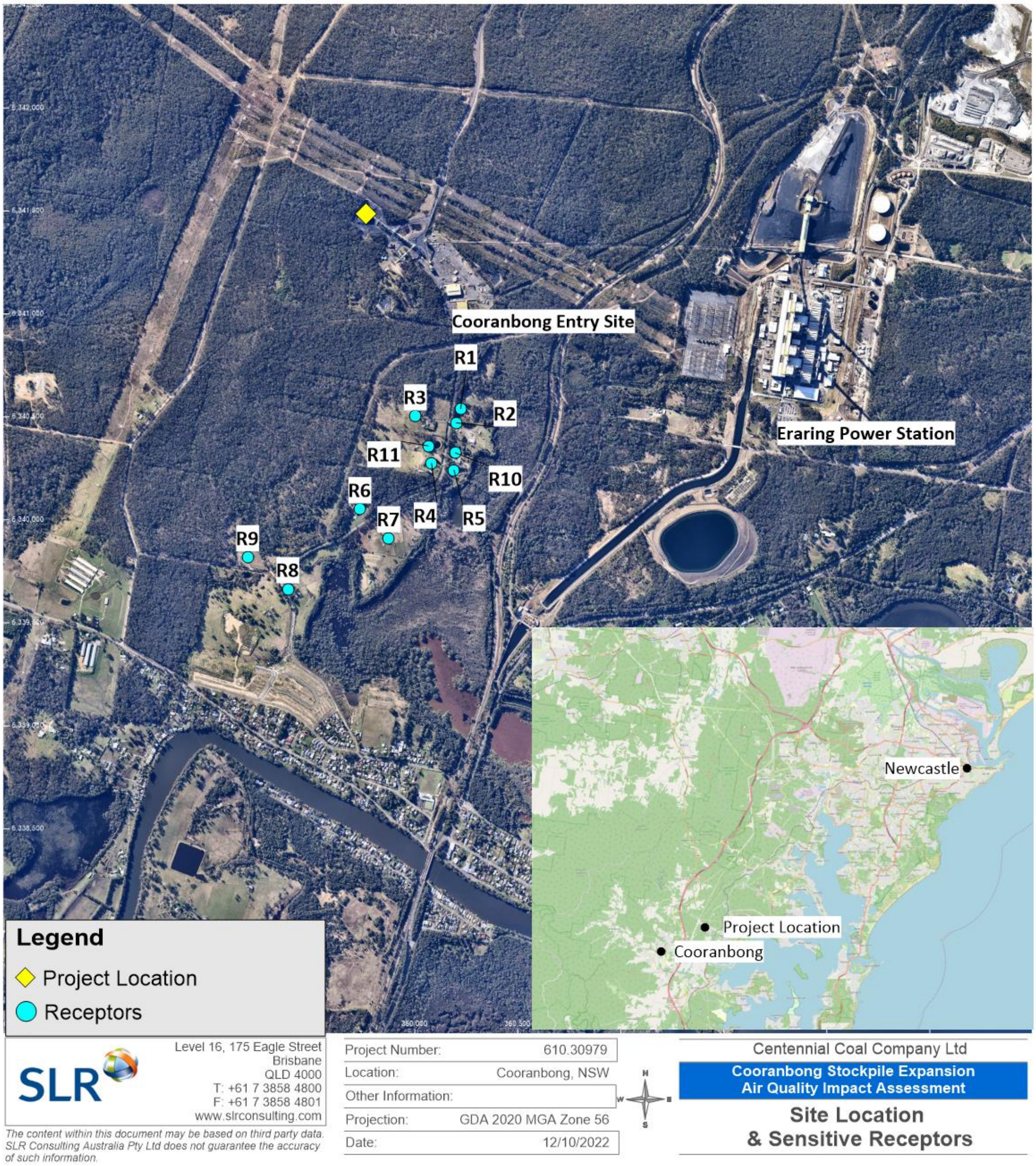


Figure 2 Identified Potential Sensitive Receptors



5.3 Existing Air Quality

5.3.1 Review of Available Air Quality Monitoring Data for the Project Area

Centennial operates an onsite air quality monitoring station (Onsite AQMS) measuring ambient PM_{10} and TSP concentrations located approximately 500 m southeast of the current stockpile, and a dust deposition gauge (DDG) approximately 900 m south southeast of the current stockpile. The relative location of the current stockpile operation, AQMS and dust deposition gauge are presented in **Figure 3**.

A brief summary of the 24-hour average PM_{10} and TSP concentrations and monthly dust deposition data recorded in 2023 is presented in **Table 3**. No exceedances of relevant impact assessment criteria outlined in **Section 4.0** were recorded at these sites in the 2023 calendar year.

Additionally, the NSW Department of Planning, Housing and Infrastructure (DPHI) operate an AQMS at Morisset (Morisset AQMS), located approximately 7.6 km southeast of the Site that monitors PM_{10} and $PM_{2.5}$ concentrations. This station is located within the region in a similar setting of this Project and as such, data recorded at this station were considered to be generally representative of background level in the region. Summary statistics reported for this AQMS for 2023 are reproduced in **Table 3**. No exceedances of relevant impact assessment criteria outlined in **Section 4.0** were recorded at the Morisset AQMS in the 2023 calendar year.

Given the close proximity of the Onsite AQMS to key dust sources of approved Cooranbong Entry Site operations, ambient monitoring data recorded at this station are not considered suitable for establishing the background particulate levels that excludes any significant contribution from the current operation. Thus, the Morisset AQMS was used to establish background air quality concentrations for the Project (see **Section 5.3**).

Table 3 Summary of TSP, PM_{10} and Dust Deposition Monitoring Data (2023)

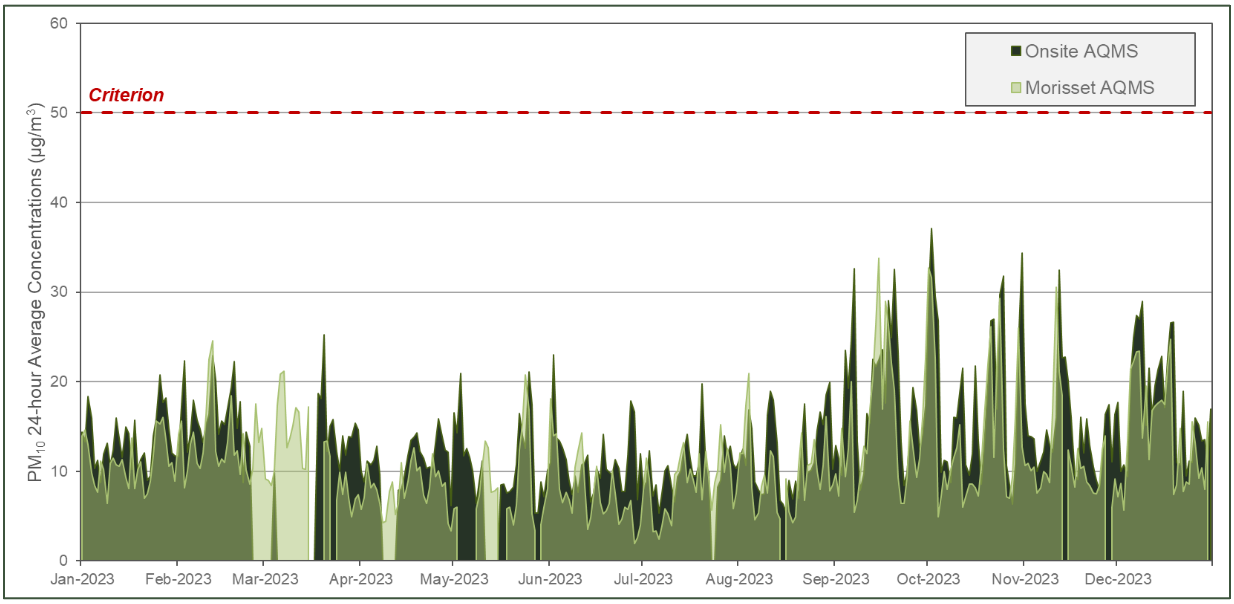
Pollutant	Averaging Period	Units	Criteria	Onsite	Morisset
Particulate Matter as PM_{10}	Maximum 24 Hours	µg/m^3	**50**	37	34
	Annual	µg/m^3	**25**	14	11
Particulate Matter as $PM_{2.5}$	Maximum 24 Hours	µg/m^3	**25**	-	23
	Annual	µg/m^3	**8**	-	5
Total Suspended Particulate (TSP)	Annual	µg/m^3	**90**	14	-
Dust Deposition	Annual	g/m^2/month	**4**	0.64	-

Figure 3 Monitoring Locations

A comparison of the measured 24-hour average PM_{10} concentrations at the Onsite and Morisset AQMS are presented in **Figure 4**. The comparison showed that the measured data recorded at these sites aligns well in general, with measured data at the Onsite AQMS slightly higher than the data recorded at Morisset AQMS on most days.

It is noted that on 15 September 2023, Morisset AQMS recorded significantly higher particulate concentrations than those recorded at the Onsite AQMS. On this day, the Morisset AQMS recorded the highest 24-hour average PM_{10} and $PM_{2.5}$ concentrations of 2023, at 23.2 µg/m³ and 33.8 µg/m³ respectively. The Onsite AQMS recorded a 24-hour average PM_{10} concentration of 22.4 µg/m³ on this day. Based on this, it is likely that particulate concentrations data recorded on this day at the Morisset AQMS were associated with local activities (e.g. hazard reduction burns) and are not representative of regional background levels.

Figure 4 Measured PM_{10} 24-hour average Concentration at Onsite and Morisset AQMS



5.3.2 Adopted Background Levels

As noted earlier, background 24-hour and annual average PM_{10} and $PM_{2.5}$ levels have been estimated for the use in this assessment based on the monitoring data recorded by DPHI at the Morisset AQMS.

Whilst dust deposition data is not collected at the Morisset AQMS, recorded data at the Centennial dust gauge located in the vicinity of the Site (see **Figure 3**) has conservatively been adopted for this assessment.

The background levels adopted for each air quality indicator and averaging period, along with the basis of the estimated values, are presented in **Table 4**.

Table 4 Background Concentrations Adopted for this Assessment

Pollutant	Averaging Period	Background Value	Basis for Revised Background Levels
PM_{10}	24-Hours	Daily-varying	Contemporaneous with Morisset AQMS data (1 Jan 2023 – 31 Dec 2023)
	Annual	11.1 µg/m³	Average of Morisset AQMS data (1 Jan 2023 – 31 Dec 2023)
$PM_{2.5}$	24-Hours	Daily-varying	Contemporaneous with Morisset AQMS data (1 Jan 2023 – 31 Dec 2023)
	Annual	5.0 µg/m³	Average of Morisset AQMS data (1 Jan 2023 – 31 Dec 2023)
TSP	Annual	27.9 µg/m³	Scaled from annual average PM_{10} using a PM_{10}/TSP ratio of 0.4 based on data collected in the vicinity of coal mines (Richardson 2000)
Dust Deposition	Annual	0.6 g/m²/month	Annual average of Site DG4 data (1 Jan 2023 – 31 Dec 2023)

6.0 Construction Impact Assessment

6.1 Methodology

For the assessment of construction phase impacts, the *IAQM Guidance on the Assessment of Dust from Demolition and Construction,* developed in the United Kingdom by the Institute of Air Quality Management (IAQM 2024), was used to provide a qualitative assessment method (see **Appendix A** for the full IAQM methodology). This approach has been adopted for assessing construction impacts in numerous air quality assessments for developments that have been approved by NSW EPA.

The IAQM method uses a four-step process for assessing potential dust impacts from construction activities:

- **Step 1**: Screening based on distance to the nearest sensitive receptor; whereby the sensitivity to dust deposition and human health impacts of the identified sensitive receptors is determined.
- **Step 2**: Assess risk of dust effects from activities based on:
    - the scale and nature of the works, which determines the potential dust emission magnitude; and
    - the sensitivity of the area surrounding dust-generating activities.
- **Step 3**: Determine site-specific mitigation for remaining activities with greater than negligible effects.
- **Step 4**: Assess significance of remaining activities after management measures have been considered.

6.2 Impact Assessment

The key potential air pollution and amenity issues associated with fugitive dust emissions from the proposed construction activities are:

- Annoyance due to dust deposition (soiling of surfaces) and visible dust plumes; and
- Elevated suspended particulate concentrations (PM_{10}).

Modelling of dust from construction activities is generally not considered appropriate, as emission rates can vary significantly depending on a combination of the activity and prevailing meteorological conditions (i.e. rainfall and wind speed), which cannot be reliably predicted. The following sections therefore present a qualitative assessment of the potential risks to air quality associated with dust from Project construction activities. Details of the IAQM methodology used to perform the risk assessment are provided in **Appendix A.**

6.2.1 Step 1 – Screening Based on Separation Distance

The nearest sensitive receptor (residential) is located approximately 1km southeast of the Site as shown in **Section 5.2**.

The IAQM screening criteria for further assessment is the presence of a ‘human receptor’ within:

- 250m of the boundary of the site; or
- 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s).

As no 'human receptor' is located within 250m of the boundary of the Site or site entrances, or within 50m of route(s) used by construction vehicles on the public highway, no further assessment is required.

Based on the above, it can be expected that standard good practice dust mitigation measures can adequately control dust emissions from the Project construction activities, and no adverse off-site air quality impacts are expected.

7.0 Operational Impact Assessment

7.1 Modelling Methodology

7.1.1 Selection of Models

Emissions from the proposed Project were modelled using a combination of the TAPM, CALMET and CALPUFF models. CALPUFF is a transport and dispersion model that ejects “puffs” of material emitted from modelled sources, simulating dispersion and transformation processes along the way. In doing so, it typically uses the fields generated by a meteorological pre-processor CALMET, discussed further below. Temporal and spatial variations in the meteorological fields selected are explicitly incorporated in the resulting distribution of puffs throughout a simulation period.

The primary output files from CALPUFF contain either hourly concentration or hourly deposition fluxes evaluated at selected receptor locations. The CALPOST post-processor is then used to process these files, producing tabulations that summarise results of the simulation for user-selected averaging periods.

7.1.2 Selection of Representative Modelling Year

In order to determine a representative meteorological year, five years of meteorological data (2019-2023) from the nearest BoM station (Cooranbong (Lake Macquarie AWS), Station ID 61412) located approximately 5 km southeast of Site location were reviewed and analysed. Specifically, the following parameters were analysed:

- Frequency and distribution of the predominant wind directions;
- Wind speed;
- Temperature; and
- Relative humidity.

Based on this analysis, 2023 calendar year was selected as a representative year for this study.

7.1.3 Meteorological Modelling

Three-dimensional meteorological data for the site and surrounding areas were generated using a combination of The Air Pollution Model (TAPM) and CALMET models.

TAPM

Prognostic models, such as The Air Pollution Model (TAPM), solve the equations of atmospheric dynamics to produce physically realistic three-dimensional meteorological fields, such as wind, temperature, humidity, surface fluxes and boundary-layer structure. They are the models used in weather forecasting and climate research, and as a basis for dispersion modelling. Data from local climate stations are optional and local flows arise through the dynamic forcing simulated by the computational model. Larger-scale fields (up to global scale) are required for their initialization and ongoing boundary updates.

For this assessment, the TAPM modelling system was used to produce the meteorological field required to provide the ‘initial guess’ field for the CALMET meteorological model. The TAPM modelling was conducted for the 2023 calendar year using a nested approach, where the results from a coarser resolution grid run were used as the inputs into a finer resolution grid run. Parameters used in the TAPM modelling are presented in **Table 5**.

Table 5 Meteorological Parameters – TAPM (2023 Calendar Year)

Parameter	Value
Start and end dates	31 December 2022 – 1 January 2024
Grid Centre (Lat/Long, WGS84)	33° 3.500'S, 151°30.0'E
Grid Centre (UTM Co-ordinates [m])	359962, 6341246
No. of grids	4
No. of horizontal grid points	25 x 25
Horizontal grid spacing	30 km, 10 km, 3 km, 1 km
No. of vertical levels	35
Monthly deep-soil moisture content (12 values)	0.15 m^3/m^3 (model default)
Topography	TAPM datasets
Vegetation and land use	TAPM datasets
Surface vegetation and precipitation processes	Included
Snow processes and non-hydrostatic processes	Excluded
Grid used for extracted profile	4 (1.0 km)
Data assimilation	Lake Macquarie AWS BOM station and Morisset AQMS

CALMET

In the simplest terms, CALMET is a meteorological model that develops hourly wind and other meteorological fields on a three-dimensional gridded modelling domain that are required as inputs to the CALPUFF dispersion model. Associated two dimensional fields such as mixing height, surface characteristics and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, sea breeze (if relevant), as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field. The final hourly varying wind field thus reflects the influences of local topography and land uses.

The CALMET model was run for a 10 km by 10 km domain with a 100 m grid resolution. TAPM-generated three-dimensional meteorological data were used as the 'initial-guess' wind field, and local topography and land use information were used to refine the wind field predetermined by the TAPM output.

Table 6 Meteorological Modellings Parameters – CALMET (2023 Calendar Year)

Parameter	Mine Site
Modelling period	1 January 2023 to 1 January 2024
Meteorological grid	10 km × 10 km
Meteorological grid resolution	100 m
Initial guess field	3D output from TAPM model
Vertical resolution (cell heights)	9 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1200 m, 2000 m, 3000 m)
Data assimilation	None

7.1.4 Meteorological Data Used in the Dispersion Modelling

To provide a summary of the meteorological conditions predicted for the Project area using the methodology described in **Section 7.1.3**, a single-point, ground-level meteorological dataset was extracted from the 3-dimensional dataset near the centre of Project. Key features of the data set relevant to pollutant dispersion are presented and discussed below.

Wind Speed and Direction

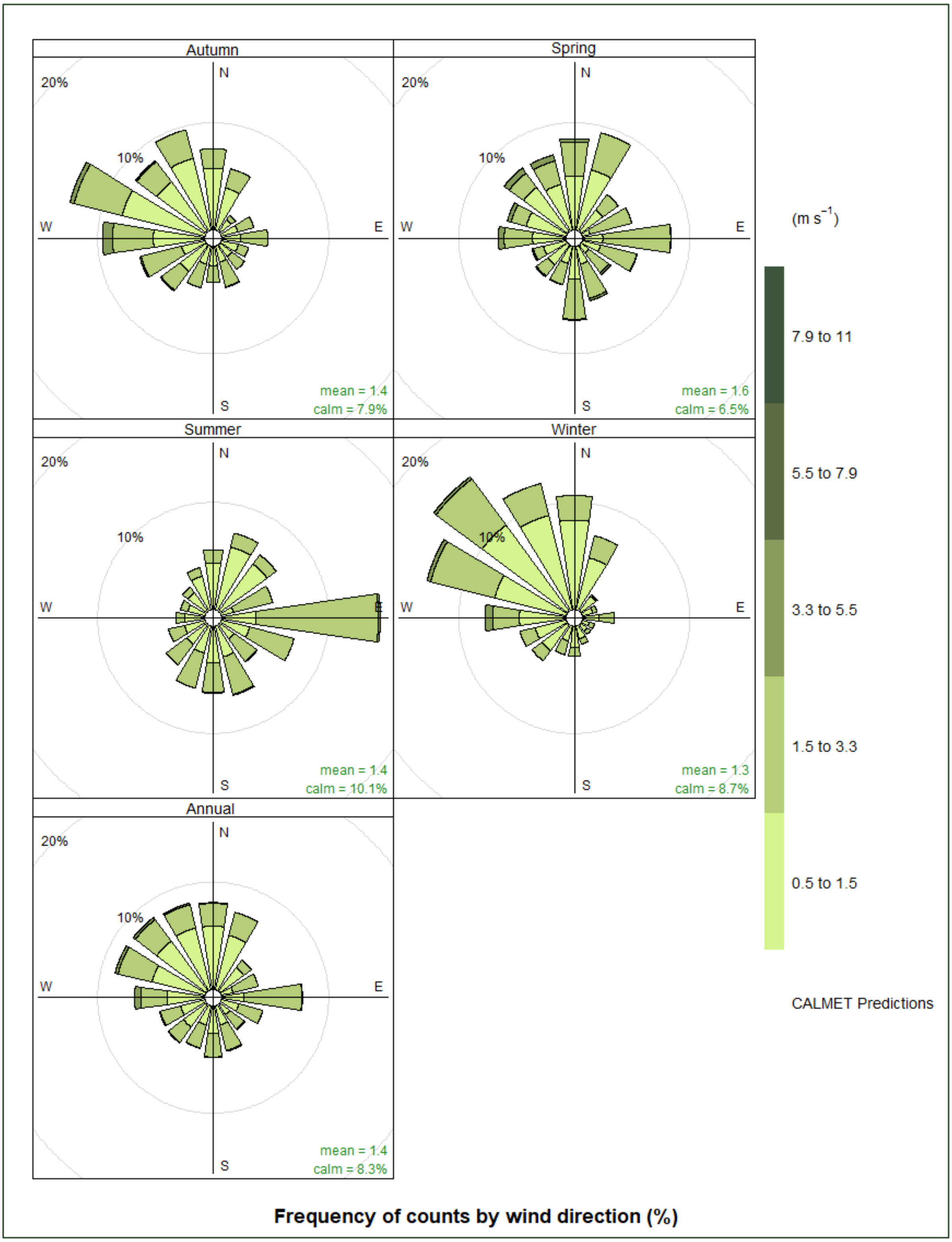
A summary of the annual wind behaviour predicted by CALMET for the Project during 2023 is presented as annual and seasonal wind roses in **Figure 5**.

Figure 5 indicates that during the 2023 calendar year, the site experienced light winds (between 0.5 m/s and 3.3 m/s), predominantly from the north-western quadrant. Calm wind conditions (wind speeds less than 0.5 m/s) were predicted to occur approximately 8% of the time on an annual basis.

The seasonal wind roses indicate the following:

- During autumn and winter months, the northwest was predicted to be the predominant wind direction with very low frequency of winds blowing from the southeast. Winds were predicted to be light for these months, and calm conditions were predicted to occur approximately 8% and 9% of the time respectively.
- In summer, light winds were predicted to be blowing predominantly from the east.
- Light winds were predicted to be blowing from the northern and western directions fairly evenly during spring, with approximately 6% calms predicted over these months.

Figure 5 Seasonal and Annual Wind Roses Predicted for the Project (CALMET, 2023)



Atmospheric Stability

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Gifford-Turner (PGT) assignment scheme identifies six Stability Classes, A to F, to categorise the degree of atmospheric stability as follows:

- A = Extremely unstable conditions
- B = Moderately unstable conditions
- C = Slightly unstable conditions
- D = Neutral conditions
- E = Slightly stable conditions
- F = Moderately stable conditions

The meteorological conditions defining each PGT stability class are shown in **Table 7**.

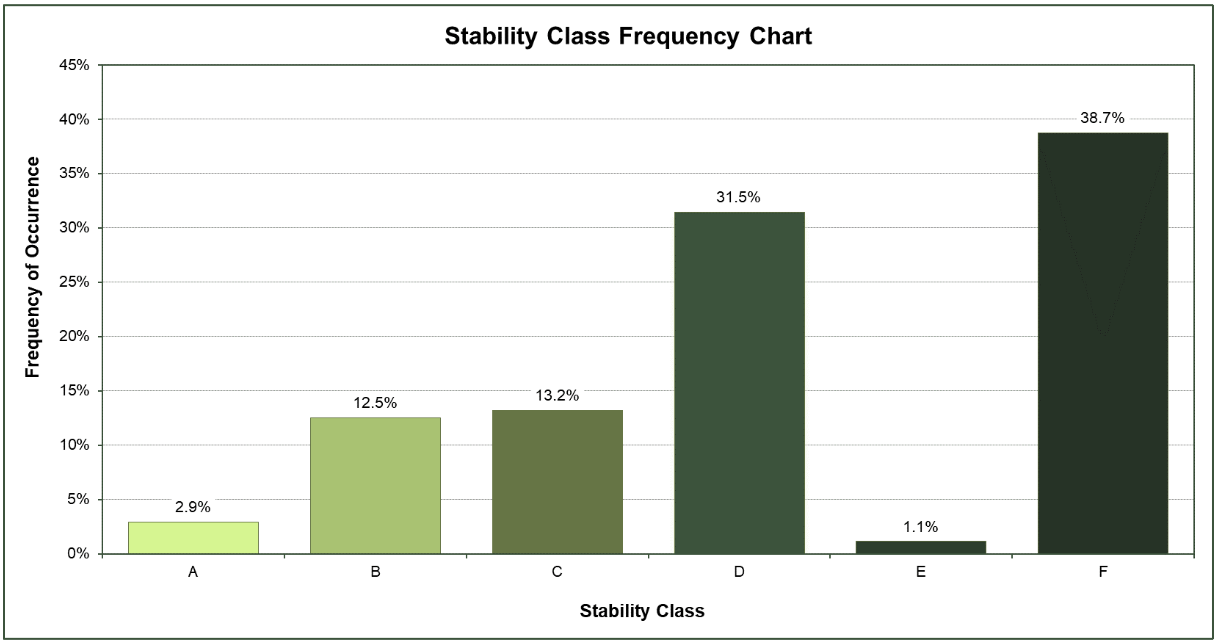
Table 7 Meteorological Conditions Defining PGT Stability Classes

Surface Wind Speed (m/s)	Daytime Insolation			Night-time Conditions	
	Strong	Moderate	Slight	Thin overcast or > 4/8 low cloud	<= 4/8 cloudiness
< 2	A	A - B	B	E	F
2 - 3	A - B	B	C	E	F
3 - 5	B	B - C	C	D	E
5 - 6	C	C - D	D	D	D
> 6	C	D	D	D	D

Notes:
Night refers to the period from 1 hour before sunset to 1 hour after sunrise.
The neutral category D should also be used, regardless of wind speed, for overcast conditions during day or night and for any sky conditions during the hour preceding or following night as defined above.
Source: (NOAA 2019).

Figure 6 shows the frequency distribution of the atmospheric stability classes predicted for the Project during 2023. The results indicate that neutral and moderately stable conditions (Stability Classes D and F, respectively) occurred most frequently. Stable conditions are associated with a low level of pollutant dispersion due to limited mechanical mixing in the atmosphere. Neutral conditions do not significantly limit or facilitate plume dispersion.

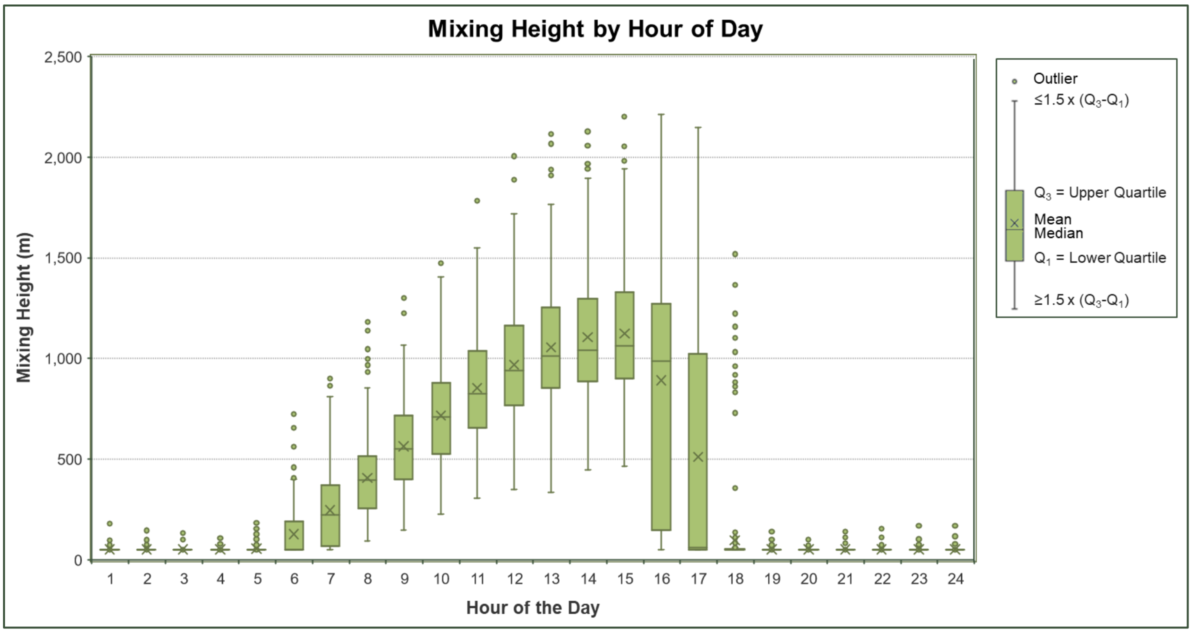
Figure 6 Stability Class Distribution Predicted for Project (CALMET, 2023)



Mixing Heights

Diurnal variations in maximum and average mixing heights predicted by CALMET at the Project during the 2023 calendar year are illustrated in **Figure 7**. As would be expected, an increase in the mixing height during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur mostly in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer.

Figure 7 Mixing Heights Predicted for the Project (CALMET, 2023)



7.1.5 Dispersion Model Configuration

Emissions from the material handling processing were represented within CALPUFF by a series of volume sources, while wind erosion from exposed areas was represented by area sources and emissions from ventilation activities were represented as a point source.

The estimated particulate emissions were modelled as:

- Fine Particulates (**FP** < 2.5 µm)
- Course Matter (2.5 µm<**CM**<10 µm)
- Remainder (**RE**>10 µm).

These parameters were then grouped within the CALPUFF model to predict $PM_{2.5}$, PM_{10} and TSP concentrations (and dust deposition rates) at surrounding receptor locations. This approach provides the most realistic treatment of the differing size fractions, with the lighter, finer particulate matter being dispersed further than the heavier size fraction that settles out of the air more rapidly.

Based on the sensitivity of each activity to wind speed, hourly varying emission files representing hourly FP, CM and RE emissions for each source were generated for each model scenario based on the annual average emission rates estimated for each activity. Details of the algorithm used to generate the variable emission files are presented in **Appendix C**.

7.2 Estimation of Air Emissions

7.2.1 Modelling Scenarios

Based on a review of available Project information, including design plans, the following operational scenarios were modelled to assess potential worst-case impacts for both potential product delivery paths and compliance with air quality impact assessment criteria at the identified sensitive receptors:

- **Scenario 1** – Export option - representing receipt and handling of 6 Mtpa of ROM coal from the Mandalong Mine and the export of 6 Mtpa of ROM to Newstan Colliery Surface Site by trucks.
- **Scenario 2** – Eraring Power Station (EPS) option - representing receipt and handling of 6 Mtpa of ROM from the Mandalong Mine and the export of 6 Mtpa of ROM to EPS by overland conveyors.

7.2.2 Emission Estimation

Fugitive dust emissions for the above scenarios were estimated using relevant emission factors sourced from the USEPA's AP42 Emission Factor Handbook (US EPA 2006) and updates), Australian Coal Association Research Program (ACARP) emission factors (ACARP 2015), and the NPI Emission Estimation Technique Manual for Mining (DSEWPC 2012). The use of emission factors from these databases are common in the industry and have been used for preparing air quality assessments for numerous coal mining projects in NSW.

The emission inventories were developed based on the following assumptions/input data:

- Haul road lengths and areas of disturbance were estimated based on the site layout;
- Stockpiling activities were assumed to operate on a 24/7 basis

- Level 1 watering on haul roads and exposed areas during dry and dusty wind conditions i.e. 50% control per the NPI Emission Estimation Technique Manual for Mining (DSEWPC 2012).
- Transfer points will be fully enclosed (i.e. 70% control).

The activity data used to estimate the potential particulate emissions for each scenario are presented in **Table 8**.

A summary of the total estimated annual TSP, PM_{10} and $PM_{2.5}$ emissions for each assessment scenario is presented in **Table 9**. Details of the emission calculations and the estimated emissions for each activity are presented in **Appendix B**.

In addition to the above, an upcast ventilation shaft is currently operating at the site as part of the operation of Mandalong Mine. Potential air emissions associated with the operation of this upcast ventilation shaft has also been included in the assessment. Ventilation parameters and emission rates for this source were estimated based on historical stack sampling data from Mandalong Mine upcast ventilation shafts and are presented in **Table 10**. It is noted that measured data showed identical concentrations of $PM_{2.5}$ and PM_{10}. Given this, it was assumed that all measured PM_{10} would be of $PM_{2.5}$ fractions as a conservative approach.

Table 8 Activity Data Used in Estimation of Dust Emissions

Parameter	Scenario 1	Scenario 2	Unit
Coal handling - FEL2 - Main stockpile	503,700	-	t/annum
Coal handling - FEL1 - Main stockpile	192,720	-	t/annum
Coal handling - FEL - 3,000 t stockpile	1,000,000	1,000,000	t/annum
Bulldozer on Main stockpile	8,688	8,688	hrs/annum
CES401 Conveyor - Main stockpile	6,000,000	6,000,000	t/annum
Loading/unloading - Main stockpile	4,200,000	-	
Loading/unloading - 3,000 t stockpile	1,000,000	1,000,000	t/annum
CTL401 Conveyor - Deliver to 1200 t bin	1,800,000	-	t/annum
1200t truck loading bin	1,800,000	-	t/annum
Onsite hauling - transport coal from bin	24,528	-	km/annum
Onsite hauling - transport coal from stockpile	102,244	-	km/annum
Final Product bin	-	6,000,000	t/annum
2000t ROM bin	-	6,000,000	t/annum
250t ROM bin	-	6,000,000	t/annum
Screen/rotary breakers	-	6,000,000	t/annum
Crushing Plant	-	6,000,000	t/annum
Moisture content - ROM	7	7	%
Silt content - ROM	6	6	%
Wind erosion - Main stockpile	4.5	4.5	ha
Wind erosion - 3000t stockpile	0.09	0.09	ha
Wind erosion - 1,500 t (emergency) stockpile	0.05	0.05	ha

Table 9 Estimated Total Fugitive Dust Emissions

Scenario	TSP (kg/year)	PM_{10} (kg/year)	$PM_{2.5}$ (kg/year)
Scenario 1 (Export)	49,728	24,864	2,460
Scenario 2 (EPS)	18,061	9,031	877

Table 10 Upcast Ventilation Shaft Parameters

Parameter	Value	Unit
Coordinates in UTM	(359,888, 6,341,332)	M
Exit velocity	5.7	m/s
Exit Temperature	19	°C
Flowrate	101	m^3/s
Equivalent diameter (calculated)	4.8	m
Height	12.7	m
Emission Rates		
TSP	0.73	g/s
PM_{10}	0.12	g/s
$PM_{2.5}$	0.12	g/s

8.0 Modelling Results and Assessment

8.1 Incremental and Cumulative Impacts

The incremental and cumulative impacts predicted by the modelling at each identified sensitive receptor surrounding the Project for each modelled scenario are presented in **Table 11** (maximum 24-hour and annual average $PM_{2.5}$ concentrations), **Table 12** (maximum 24-hour and annual average PM_{10} concentrations) and **Table 13** (annual average TSP concentrations and monthly dust deposition rates).

The estimated annual average background concentrations derived in **Section 5.3.2** were used to calculate the cumulative impacts at each identified surrounding receptor. For the 24-hour average concentrations, the predicted incremental concentrations for each day were added to the measured concentrations at Morisset AQMS on the same day and the maximum of all data is presented.

The modelling results showed that the predicted cumulative annual average $PM_{2.5}$, PM_{10} and TSP concentrations and dust deposition rates are well below and comply with the relevant criteria at each of the identified receptors for both modelled scenarios.

Analysis of predicted cumulative 24-hour average $PM_{2.5}$ and PM_{10} concentrations, with adoption of measured PM_{10} and $PM_{2.5}$ concentrations data from Morisset AQMS as background level, showed potential for one exceedance of the relevant 24-hour average PM_{10} and $PM_{2.5}$ guideline at four receptors (R1, R2, R5 and R10) for Scenario 1 (Export option). No exceedances of the relevant 24-hour average PM_{10} and $PM_{2.5}$ guidelines were predicted for Scenario 2 (EPS option).

8.2 Contemporaneous Analysis

Contemporaneous analysis of predicted $PM_{2.5}$ and PM_{10} concentrations at two worst impacted receptors (R1 and R2) for Scenario 1 are presented in **Table 14** to

Table 17.

The contemporaneous analysis showed that, including the ambient monitoring data recorded at Morisset AQMS in 2023 as the existing background level, exceedances of relevant 24-hour average $PM_{2.5}$ and PM_{10} guidelines were predicted at four receptors on 15 September 2023. As discussed in **Section 5.3**, ambient monitoring data recorded at Morisset AQMS on 15 September is likely to include significant contributions from local events (such as hazard reduction burns) and may not be representative of regional background levels. Recorded 24-hour average PM_{10} concentration data on this day at the Onsite AQMS is much lower than that recorded at Morisset AQMS (indicative of a localised emission event). A comparison of predicted cumulative 24-hour average PM_{10} concentrations on this day at the identified sensitive receptors for Scenario 1 using background data from the Morisset AQMS and Onsite AQMS is presented in **Figure 8.** The comparison showed that no exceedances of 24-hour average PM_{10} guideline at any of the identified sensitive receptors were predicted should PM_{10} concentrations data recorded at the Onsite AQMS be adopted as background concentrations.

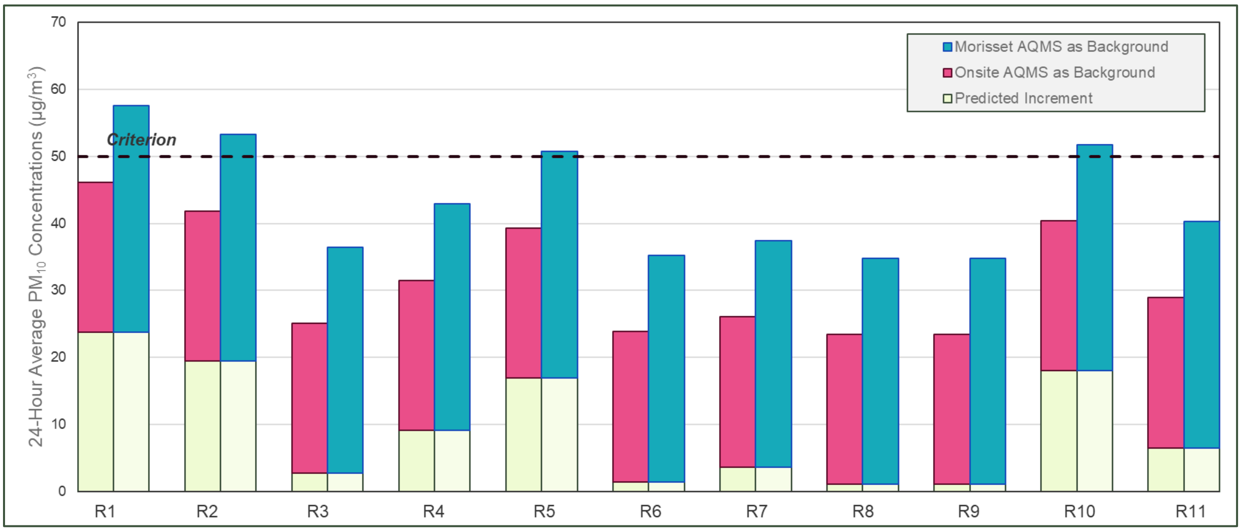
It is noted that $PM_{2.5}$ concentrations are not recorded at the Onsite AQMS. However, given the significant differences in measured PM_{10} concentrations between the Onsite AQMS and Morisset AQMS, it is likely that background $PM_{2.5}$ levels at the Onsite AQMS would be much lower than those recorded at Morisset AQMS on this day.

It is also noted that the Onsite AQMS data includes air quality impacts associated with approved Cooranbong Entry Site coal handling operations (i.e. double counting of the impact associated with onsite material handling for cumulative impacts).

Based on the analysis presented above, the Project is not predicted to cause any significant elevation of particulate levels leading to an exceedance of relevant impact criteria.

Contour plots presenting the spatial distribution of the incremental impact levels for each pollutant and each averaging period for the proposed scenarios are presented in **Appendix D**.

Figure 8 Analysis of Predicted 24-Hour Average PM_{10} Concentration for Scenario 1



Note: Comparison data presented for 15 September 2023 (Scenario 1)

Table 11 Predicted Incremental and Cumulative $PM_{2.5}$ Concentrations - Daily-Varying Background

Receptor ID	Maximum 24-Hour Average $PM_{2.5}$ Concentrations (µg/m^3)				Annual Average $PM_{2.5}$ Concentrations (µg/m^3)			
	Increment		Cumulative		Increment		Cumulative	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
R1	3.3	1.0	25.8	23.8	0.7	0.2	5.8	5.4
R2	2.6	0.9	25.3	23.7	0.5	0.2	5.7	5.4
R3	2.3	0.7	23.5	23.3	0.2	<0.1	5.4	<5.3
R4	1.6	0.5	24.2	23.4	0.3	<0.1	5.4	<5.3
R5	2.0	0.8	25.0	23.7	0.4	0.1	5.5	5.3
R6	1.9	0.5	23.3	23.2	0.1	<0.1	5.3	<5.3
R7	1.2	0.4	23.6	23.3	0.1	<0.1	5.3	<5.3
R8	1.2	0.3	23.3	23.2	<0.1	<0.1	<5.3	<5.3
R9	0.9	0.3	23.3	23.2	<0.1	<0.1	<5.3	<5.3
R10	2.2	0.9	25.2	23.7	0.4	0.1	5.6	5.3
R11	1.8	0.5	23.9	23.4	0.3	<0.1	5.4	<5.3
Criteria	**-**		**25**		**-**		**8**	

Note: Exceedances of 24-hour average criterion are driven by high background level recorded on 15th September 2023 at Morisset AQMS that are likely to be influenced by local activities (e.g. hazard reduction burn) and may not be representative of the background.

Table 12 Predicted Incremental and Cumulative PM_{10} Concentrations - Daily-Varying Background

Receptor ID	Maximum 24-Hour Average PM_{10} Concentrations ($\mu g/m^3$)				Annual Average PM_{10} Concentrations ($\mu g/m^3$)			
	Increment		Cumulative		Increment		Cumulative	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
R1	29.5	7.3	57.5	38.6	5.9	1.5	17.5	13.0
R2	23.5	6.4	53.2	37.8	4.7	1.2	16.2	12.7
R3	21.0	6.4	36.4	34.3	1.9	0.5	13.4	12.0
R4	14.1	4.1	42.9	35.6	2.3	0.6	13.8	12.2
R5	17.8	6.5	50.7	38.3	3.2	1.0	14.7	12.5
R6	16.6	4.4	35.2	34.0	1.0	0.3	12.6	11.8
R7	10.4	3.0	37.4	34.6	1.1	0.3	12.7	11.9
R8	10.3	1.9	34.8	33.9	0.6	0.1	12.1	11.7
R9	8.1	2.4	36.9	33.9	0.7	0.1	12.3	11.7
R10	19.5	6.8	51.8	38.3	3.6	1.1	15.2	12.6
R11	16.0	4.7	40.3	35.0	2.2	0.6	13.7	12.1
Criteria	**-**		**50**		**-**		**25**	

Note: Exceedances of 24-hour average criterion are driven by high background level recorded on 15th September 2023 at Morisset AQMS that are likely to be influenced by local activities (e.g. hazard reduction burn) and may not be representative of the background.

Table 13 Predicted Incremental and Cumulative Annual Average TSP Concentrations and Deposition Rates

Receptor ID	Annual Average TSP Concentrations (µg/m^3)				Annual Average Dust Deposition (g/m^2/month)			
	Increment		Cumulative		Increment		Cumulative	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
R1	9.0	2.4	36.9	30.3	<0.1	<0.1	<0.7	<0.7
R2	7.1	1.9	35.0	29.8	<0.1	<0.1	<0.7	<0.7
R3	3.0	0.8	30.9	28.7	<0.1	<0.1	<0.7	<0.7
R4	3.4	1.0	31.3	28.9	<0.1	<0.1	<0.7	<0.7
R5	4.7	1.5	32.6	29.4	<0.1	<0.1	<0.7	<0.7
R6	1.5	0.4	29.4	28.3	<0.1	<0.1	<0.7	<0.7
R7	1.6	0.5	29.5	28.4	<0.1	<0.1	<0.7	<0.7
R8	0.8	0.2	28.7	28.1	<0.1	<0.1	<0.7	<0.7
R9	1.1	0.3	29.0	28.2	<0.1	<0.1	<0.7	<0.7
R10	5.4	1.7	33.3	29.6	<0.1	<0.1	<0.7	<0.7
R11	3.3	0.9	31.2	28.8	<0.1	<0.1	<0.7	<0.7
Criteria	**-**		**90**		**2**		**4**	

Table 14 Contemporaneous $PM_{2.5}$ Analysis of Days with Highest Predicted Increment – Scenario 1 (Export Option)

Date	Receptor R1			Date	Receptor R2		
	Highest Predicted Increment	Background	Cumulative		Highest Predicted Increment	Background	Cumulative
13-07-2023	3.2	6.9	10.1	13-07-2023	2.6	6.9	9.5
14-07-2023	2.9	7.2	10.1	22-08-2023	2.5	3.7	6.1
26-02-2023	2.8	4.8	7.6	26-02-2023	2.4	4.8	7.2
22-08-2023	2.7	3.7	6.3	04-07-2023	2.4	7.2	9.6
15-09-2023	2.6	23.2	25.8	14-08-2023	2.3	16.6	18.9

Table 15 Contemporaneous $PM_{2.5}$ Analysis of Days with Highest Background – Scenario 1 (Export Option)

Date	Receptor R1			Date	Receptor R2		
	Increment	Highest Background	Cumulative		Increment	Highest Background	Cumulative
15-09-2023	2.7	23.2	25.8	15-09-2023	2.7	23.2	25.8
14-09-2023	1.3	18.1	19.3	14-09-2023	1.3	18.1	19.3
17-09-2023	0.5	16.7	17.2	17-09-2023	0.5	16.7	17.2
18-09-2023	1.6	16.7	18.3	18-09-2023	1.6	16.7	18.3
04-08-2023	2.6	16.6	19.1	04-08-2023	2.6	16.6	19.1

Table 16 Contemporaneous PM_{10} Analysis of Days with Highest Predicted Increment – Scenario 1 (Export Option)

Date	Receptor R1			Date	Receptor R2		
	Highest Predicted Increment	Background	Cumulative		Highest Predicted Increment	Background	Cumulative
13-07-2023	29.5	11.8	41.2	13-07-2023	23.5	11.8	35.3
14-07-2023	27.5	13.3	40.7	14-07-2023	22.4	13.3	35.7
26-02-2023	26.2	17.5	43.8	26-02-2023	21.6	17.5	39.1
24-06-2023	24.8	4.7	29.5	04-08-2023	19.6	20.9	40.6
31-05-2023	24.8	8.1	32.9	15-09-2023	19.5	33.8	53.2

Table 17 Contemporaneous PM_{10} Analysis of Days with Highest Background – Scenario 1 (Export Option)

Date	Receptor R1			Date	Receptor R2		
	Increment	Highest Background	Cumulative		Increment	Highest Background	Cumulative
15-09-2023	23.8	33.8	57.5	15-09-2023	19.5	33.8	53.2
1-10-2023	16.6	32.7	49.3	01-10-2023	12.8	32.7	45.4
2-10-2023	6.4	31.6	38.0	02-10-2023	5.6	31.6	37.2
11-11-2023	7.3	30.5	37.9	11-11-2023	5.5	30.5	36.0
24-10-2023	7.8	29.3	37.1	24-10-2023	6.1	29.3	35.4

9.0 Greenhouse Gas Assessment

9.1 Background

The term ‘greenhouse gas’ (GHG) comes from the ‘greenhouse effect’, which refers to the natural process that warms the Earth’s surface. GHGs in the atmosphere absorb the solar radiation released by the Earth’s surface and then radiate some heat back towards the ground, increasing the surface temperature.

Human activity, especially burning fossil fuels and deforestation, is increasing the concentration of GHGs in the atmosphere and hence increasing the absorption of outgoing heat energy. Even a small increase in long-term average surface temperatures has numerous direct and indirect consequences for climate.

The National Greenhouse and Energy Reporting (NGER) Scheme is a single national framework for reporting company information about:

- Greenhouse gas emissions;
- Energy production; and
- Energy consumption.

9.1.1 Scope 1, 2 and 3 Emissions

The internationally accepted method of reporting GHG emissions is to separate the emission sources into three categories, referred to as ‘scopes’. The three scopes of GHG emissions that are regulated under the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (DCCEEW 2023) are described below and summarised in **Figure 9**.

Scope 1 emissions

- Direct emissions where the point of emission release is owned/controlled by the organisation or development owner, such as:
  - emissions resulting from fuel combustion, e.g. from petrol fuelled vehicles, gas-fired boilers or diesel generators;
  - fugitive emissions during the extraction, production, processing and distribution of fossil fuels (e.g. methane emissions from coal mines, leakage from coal seam gas or natural gas extraction and processing);
  - industrial process emissions, e.g. the use of fuels as feedstocks, leakage of insulating or refrigerant GHGs from switchgear and cooling systems; and
  - waste emissions, which result from the decomposition of organic material in an on-site landfill or on-site wastewater treatment plant.

Scope 2 emissions

- Indirect GHG emissions that occur inside the development footprint or within the control of the reporting organisation.
  - The main Scope 2 emission relates to electricity usage, where the emissions arise principally at an electricity generator, or through the loss of electricity from the electricity transmission or distribution network.

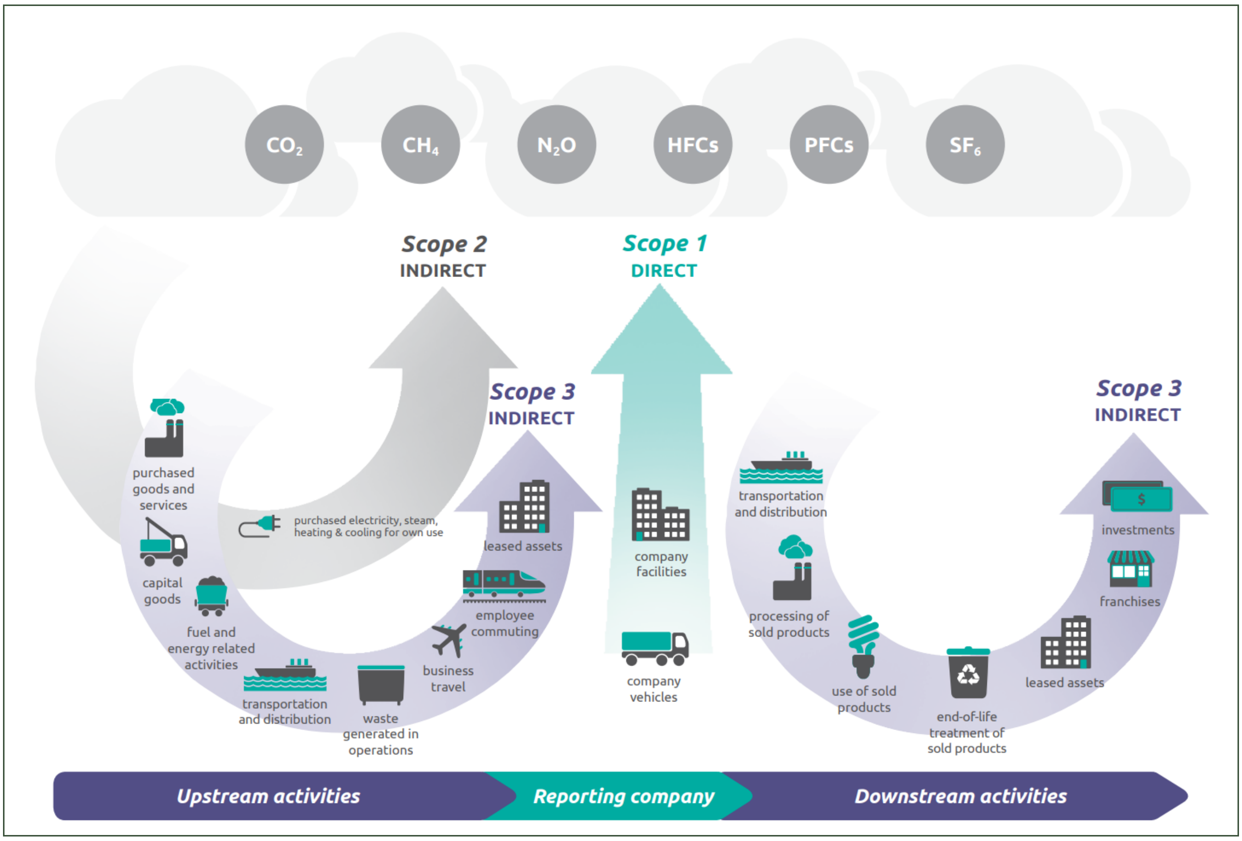
Scope 3 emissions

- Other indirect GHG emissions that occur outside the development footprint or control of the reporting organisation. For example:
  - emissions associated with the extraction, production, processing and distribution of fuels used by the development / organisation;
  - embodied CO_2-e emissions associated with material of construction and raw materials used by the development /organisation; and
  - emissions associated with the transport, distribution and end use of sold products.

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

Reporting under the Commonwealth *National Greenhous and Energy Reporting Act 2007* (NGER Act) requires that organisations report Scope 1 and Scope 2 emissions, but not Scope 3 emissions. Scope 3 emissions may be reported voluntarily.

Figure 9 Overview of GHG Scopes and Emissions



Source: (WRI 2011)

9.1.2 Global Warming Potentials

GHG emissions are generally reported in terms of carbon dioxide equivalent (CO_2-e). This is to provide a standardised unit for reporting due to different gases having varying effects of global warming impacts or Global Warming Potential (GWP). The GWP refers to the GHG potential to trap heat in the atmosphere for a certain period (generally 100 years), relative to carbon dioxide (with a GWP of one).

At the time of writing, the most recent available *National Greenhouse Accounts Factors* published by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) equates methane (as an example) with a GWP of 28, which means for every tonne of methane emitted, it has the same global warming effect of 28 tonnes of carbon dioxide (DCCEEW 2024). As such, gases such as methane or nitrous oxide are relatively potent GHGs.

Table 18 presents the GWPs of the key GHGs that are associated with the Project.

Table 18 GHG Global Warming Potentials

Gas	Chemical Formula	GWP
Carbon dioxide	CO_2	1
Methane	CH_4	28
Nitrous oxide	N_2O	265
Source: (DCCEEW 2024)		

9.2 Policy and Legislation

9.2.1 Commonwealth Policy and Legislation

The Australian Federal Government has a range of programs, policies, and tools in place to act on climate change. The key aspects of the federal action on climate change are summarised below.

National Greenhouse and Energy Reporting Act 2007

The NGER Act introduces a single national framework for reporting and disseminating company information about GHG emissions, energy production, and energy consumption. Under the NGER Act, companies that meet threshold levels for GHG emissions, energy consumption or energy production are required to report their GHG emissions annually. The six GHGs that are reported under the NGER Act include the following compounds and groups of compounds:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Specified hydrofluorocarbons (HFCs);
- Specified perfluorocarbons (PFCs), and
- Sulphur hexafluoride (SF_6).

The current GHG reporting thresholds for individual facilities are as follows:

- Emission of more than 25,000 tonnes of carbon dioxide equivalent (t CO_2-e);

- Production of 100 terajoules (TJ) or more of energy; or
- Consumption of more than 100 TJ of energy per year.

Emissions Reduction Fund

To meet its targets set under the Kyoto Protocol and Paris Agreement, DCCEEW commissioned the Emissions Reduction Fund (ERF). The ERF was developed to provide incentives for Australian businesses, farmers, land holders and citizens to reduce their GHG emissions by adoption of more efficient practices and technologies.

Key elements of the ERF were as follows:

- Crediting emissions reductions that go beyond business-as-usual standards;
- Selling emission reductions in the form of Australian Carbon Credit Units (ACCUs); and
- A Safeguard Mechanism that provides a framework for Australia's largest emitters to measure, report and manage emissions.

As part of the Safeguard Mechanism reforms, ERF projects that solely reduce covered emissions (i.e. those reportable under the Safeguard Mechanism) at Safeguard facilities are no longer able to be registered. Developments that are already registered will continue to generate and sell credits for their existing crediting period, however, are not able to enter into new contracts for Government purchase of ACCUs or extend their crediting period.

Safeguard Mechanism

The Safeguard Mechanism commenced in 2016. It was reformed in 2023 to ensure that covered facilities contribute to meeting Australia's reduction targets, while strengthening their competitiveness as the world moves to net zero. The reforms apply a decline rate to facilities' baselines so that they are reduced predictably and gradually over time on a trajectory consistent with achieving Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050 (see below).

The Safeguard Mechanism applies to industrial facilities emitting Scope 1 covered emissions (including direct emissions from fugitive emissions and emissions from fuel combustion, waste disposal and industrial process such as cement and steel making) of more than 100,000 t CO_2-e per year, including:

- Mining;
- Oil and gas production;
- Manufacturing;
- Transport; and
- Waste facilities.

9.2.2 State Policy and Legislation

In May 2024, the NSW Environment Protection Authority (EPA) recently released for public comment its draft *Climate Change Assessment Requirements* (CCARs) and draft *Guide for Large Emitters* (NSW EPA 2024).

The CCARs and draft *Guide for Large Emitters* propose to establish requirements for proponents of developments in NSW that are anticipated to have significant GHG emissions to assess those emissions and mitigation opportunities as part of the environmental impact assessment process to obtain planning approval under the EP&A Act. It is likely that the

CCARs and draft *Guide for Large Emitters* will apply to coal development s and other large-scale mining, conventional energy production, landfills and waste management facilities, and chemical production facilities.

The draft *Guide for Large Emitters* indicates that CCARs are likely to be recommended for both new development likely to produce large amounts of GHG emissions, and for modifications to existing developments (the effect of which is that the development will likely produce large amounts of GHG emissions). When a proposal involves a modification to an existing approved operation, such as in the case of this Project, a 25,000 tonne CO_2-e threshold applies specifically to the activities falling within the GHG assessment boundary and not to the whole operation. The assessment boundary must be defined to account for the impact of the development on emissions elsewhere in the facility.

A development will be considered a large emitter, and therefore subject to the CCARs and *Guide for Large Emitters*, if it meets the following three criteria:

1. The development requires a development assessment and approval (including for modifications) under the EP&A Act;
2. The development involves one or more scheduled activities under Schedule 1 of the *Protection of the Environment Operations Act 1997* (NSW) and/or will be carried out at a premises with an existing Environment Protection Licence (EPL); and
3. The development is likely to emit above a NGER Act threshold of 25,000 tonnes or more of Scope 1 and 2 GHG emissions (calculated as CO_2-e) in any financial year during the operational life of the development (based on planned operational throughput and as designed).

In assessing whether development emissions may exceed the NGER facility threshold, the draft *Guide for Large Emitters* specifies that:

- Proponents must use the latest version of the Clean Energy Regulator (CER) *Emissions and Energy Threshold Calculator and user guide* or apply appropriate NGER methods.
- Proponents must consider the CER's *Supplementary Guide: Operational Control*. However, the Guide notes that whilst the obligations under the NGER Act apply to controlling corporations only, the requirements outlined apply to all developments that exceed the NGERS threshold, whether or not the proponent is considered a controlling corporation.
- Only development emissions within NSW are to be considered when assessing whether to apply the CCARs.

Where the CCARs apply, a proponent is required to carry out a GHG Assessment. The purpose of this assessment is to provide detailed information about potential GHG emissions associated with the Project. The draft *Guide for Large Emitters* provides detailed guidance on the steps required when preparing a GHG Assessment Report. A proponent is also required to develop a GHG Mitigation Plan to reflect the analysis and findings of the GHG Assessment.

9.2.3 Greenhouse Gas Emissions Estimation Guidelines

GHG emissions associated with the Project have been estimated based on emission factors and reporting guidelines available in the *National Greenhouse Accounts* (NGA) *Factors*, which is published annually by DCCEEW and provides methods to help companies and individuals estimate GHG emissions. The NGA Factors draw on the *National Greenhouse and Energy Reporting (Measurement) Determination* 2008. However, they are not published for the purposes of reporting under the NGER Act; instead they have a more general application to the estimation of a broader range of GHG emissions.

The default emission factors listed in the NGA Factors are estimated by DCCEEW using the Australian Greenhouse Emissions Information System and are determined simultaneously with the production of Australia's National Greenhouse Accounts. This promotes consistency between inventories at company or facility level and the emission estimates presented in the National Greenhouse Accounts.

The 2024 NGA Factors (DCCEEW 2024) have been referred to in this assessment.

9.3 GHG Inventory Methodology

9.3.1 Overview of Approach

The calculation of GHG emissions from the Project has been performed in a five-stage process:

1. Definition of the Project boundary;
2. Identification of GHG emission sources within the Project boundary during construction and operation;
3. Identification of emission calculation methods and emission factors for each source;
4. Identification of the activity data for each emission source required for the calculations; and
5. Calculation of estimated GHG emissions.

The GHG emissions estimated for the Project were compared against the most recent publicly available state and national GHG emissions to assess their potential contribution to state and national emissions inventories and thus their potential impact on Australia's and NSW's ability to meet GHG reduction targets and policies.

Recommendations were then provided for the mitigation and monitoring of key GHG emission sources associated with the Project.

A number of assumptions have been relied upon in compiling the GHG emission inventory for the Project. GHG emissions from the key sources identified for the construction and operation of the Project have been estimated based on the most current available NGA factors published for use in reporting GHG emissions, which rely on estimates of the level of intensity of each activity (referred to as activity data). This includes parameters such as projected fuel consumption rates. The activity data used in the calculations has been compiled based on the current available Project design information and in consultation with the design team. The basis of the emission estimates and activity data are detailed in the relevant subsections in **Section 9.3.5**.

9.3.2 Boundary Definition

This section defines the boundaries adopted for the GHG emission inventory compiled for the Project as part of this GHG assessment.

The assessment has considered Scope 1, Scope 2 and Scope 3 emissions associated with the construction and operation of the Project.

The geographical boundary set for the emissions considered in the GHG assessment covers the modified SSD-5145 Project Boundary, including the proposed modified stockpile area and associated on-site haulage route. Scope 1 and Scope 2 GHG emissions associated with the construction and operation (considering incremental increases in potential operational GHG emissions only, compared to current operations) of the Project are considered to be within the geographical boundary of this assessment. In line with the draft *Guide for Large Emitters* (NSW EPA 2024), see **Section 9.2.2**) this assessment is limited to potential changes in emissions associated with the Project only. Given there is no change proposed to the approved NCS coal throughput, existing GHG emissions associated with current on-site operations will be unaffected by the Project, and off-site upstream emissions associated with the coal mining activities, as well as the downstream emissions associated with product coal handing, transport or end use have not been considered as part of assessment.

GHG emissions would also occur during decommissioning of Project infrastructure at the end of its approved life. Future options for the Project infrastructure would vary between life extension, upgrading or decommissioning/revegetation. Due to the uncertainty regarding the end use of NCS infrastructure, the GHG emissions associated with the end-of-life phase of the Project have not been estimated as part of this GHG assessment.

9.3.3 Identification of GHG Emission Sources

The potential emissions associated with the Project that were considered in preparing this GHG assessment are listed below.

- Scope 1:
  - Land clearing during construction;
  - Diesel combustion in mobile and fixed plant during construction;
  - Diesel combustion associated with additional dozer activity on the larger stockpile; and
  - Diesel combustion in haul trucks associated with longer haulage distance around the larger stockpile.
- Scope 3:
  - Emissions associated with the production and supply of fuels consumed during construction and operation.

Table 19 GHG Emission Sources Included in the Inventory for the Project

Project Activity	Scope 1	Scope 3
Construction		
Vegetation removal	• Loss of carbon stock in areas that will be cleared for construction of the modified stockpile	-
Fuel combustion for construction activities	• Emissions from diesel combustion in mobile and fixed equipment, including dozers, excavators, haul trucks etc	• Emissions associated with production and supply of diesel consumed
Operation		
Fuel combustion for transport purposes	• Emissions from diesel combustion in haul trucks travelling a longer on-site distance	• Emissions associated with extraction and production of diesel consumed
Fuel combustion for stationary energy purposes	• Emissions from additional diesel combustion in dozers for coal handing on the modified stockpile	• Emissions associated with extraction and production of diesel consumed

9.3.4 Calculation Methods and Emission Factors Used

9.3.4.1 Vegetation Clearing

Whilst the clearing of vegetation (excluding diesel used in the equipment used during clearing) is not a true GHG emission, the net impact of removing the vegetation (which is a carbon sink) is that the removal of CO_2 from the atmosphere by those plants will no longer occur, and the resulting effect is that an equivalent amount of CO_2 will remain in the atmosphere as a result. Hence, clearing of vegetation is categorised as a Scope 1 emission.

GHG emissions associated with land clearing by a facility are not reportable under the NGER Scheme and no emission calculation methodologies or emission factors are given for GHG emission estimation for land clearing in the *Measurement Determination 2008* or the NGA Factors Workbook. The IPCC's *Guidelines for National Greenhouse Gas Inventories* (IPCC 2019) provide methodologies for the estimation of carbon loss associated with land use change and the associated loss of CO_2 sequestration due to vegetation removal. However, the methodology involves a number of very high level assumptions and relatively limited default values for broad vegetation classes across the globe. The resulting estimates therefore have a very high level of uncertainty when applied to specific, localised construction projects in Australia.

To provide an indicative estimate of GHG emissions associated with the carbon sink loss due to land clearing proposed as part of the Project, the Carbon Gauge Tool (the TAGG Tool) developed by the Transport Authorities Greenhouse Group (TAGG 2013) was used. The TAGG Tool provides a simplified method to estimate the carbon sink losses utilising maps showing the maximum potential biomass (or maxbio) class for all areas of Australia. The maxbio class is an estimate of the maximum tonnes of dry vegetation matter per hectare (t dry matter/ha) for a specific location, sourced by TAGG from the Australian Greenhouse Office. The proposed clearance areas for each relevant vegetation class (e.g. open forest, open woodlands, etc as per the Australian Natural Resources Atlas) are then entered by the user, and the TAGG Tool provides the GHG estimates in CO_2-e, taking into account the carbon that exists in the vegetation at the time of clearing and carbon that could have been sequestered in the future if the vegetation was not cleared. For this assessment, maxbio class 4 (150-250 t dry matter/ha) was used.

The TAGG Tool estimation approach assumes that:

- All carbon pools (i.e. woody, non-woody, debris and soil) are removed;
- All carbon removed is converted to carbon dioxide and released to the atmosphere; and
- Sequestration from revegetation of the Project site is not included.

This is a conservative approach for estimating GHG emissions from vegetation removal.

The TAGG Tool also provides an estimate of GHG emissions associated with the fuel consumption in equipment used during vegetation clearing, which has been adopted in this GHG assessment.

9.3.4.2 Diesel Combustion

Estimates of GHG emissions from the combustion of diesel were calculated by multiplying the estimated quantities of diesel to be combusted by a fuel-specific energy content factor and fuel-specific CO_2-e Scope 1 emission factors. The emission factors used in the calculations are summarised in **Table 20**.

The emission factors used for the combustion of diesel fuel in the heavy construction equipment are those given for stationary energy use, as the NGA Factors Workbook

(DCCEEW 2024) states "*No transport factors are provided for vehicles not registered for road use. Stationary energy factors for individual fuel types should be used in these cases*".

Table 20 GHG Emission Factors Used in this Assessment

Emission Source	Energy Content Factor (GJ/kL)	Scope 1 Emission Factors (kg CO_2-e/GJ)				Scope 3 Emission Factor (kg CO_2-e/GJ)
		CO_2	CH_4	N_2O	Total	
Fuel Use – Stationary (power generation and off-road equipment) [1]						
Diesel	38.6	69.9	0.1	0.2	70.2	17.3
Fuel Use - Transport [2]						
Diesel – Heavy duty vehicles	38.6	69.9	0.01	0.4	70.4	17.3

[1] NGA Factors Workbook 2024, Table 8 (DCCEEW 2024)
[2] NGA Factors Workbook 2024, Table 9 (DCCEEW 2024), Euro III factors

9.3.4.3 Production and Supply of Diesel

The Scope 3 emission factors used to estimate the CO_2-e emissions associated with the production and supply of diesel, oils and greases used by the Project are shown in **Table 20**.

9.3.5 Activity Data

The activity data used in the GHG emission calculations are shown in **Table 21**.

Table 21 Activity Data

Parameter	Units	Approved	Proposed
Vegetation clearance			
Vegetation clearance area	ha	-	2.97
Truck haulage			
Travel Distance - Coal loaded out directly to haul trucks	km/annum	73,584	24,528
Travel Distance - Coal loaded to CES stockpile	km/annum	31,536	104,244
Haul truck fuel consumption rate [1]	L/km	1.2	1.2
Diesel consumption - Coal loaded directly to haul trucks	kL/annum	88.3	29.4
Diesel consumption - Coal loaded to CES stockpile	kL/annum	37.8	125.1
Coal handling			
Dozer operation [2]	hours/annum	208	8,688
Dozer fuel consumption rate [3]	L/hr	73.3	73.3
Dozer operation	kL/annum	15.2	637

1. From *Northern Coal Logistics Project: Greenhouse Gas Report for EIS* (BDM 2014)
2. Estimated activity rate for current operations of 4 hours/week 52 weeks/year from 2014 AQIA (SLR 2014)
3. CAT D10T dozer, medium duty, from https://www.wph.net.au/wp-content/uploads/2017/06/D10T-Dozer.pdf

9.4 Estimated GHG Emissions

The estimated Scope 1 and 3 GHG emissions for the Project construction are presented in **Table 22**. As there is not expected to be any significant change in electricity usage as a result of the Project, Scope 2 emissions have not been considered.

Table 22 shows the following:

- The main source (99%) of estimated Scope 1 emissions associated with the construction phase of the Project is vegetation clearance, which were calculated using the TAGG Tool (TAGG, 2013) based on a total clearance area of 2.97 ha.
- The main source (96%) of estimated Scope 1 emissions associated with the operational phase of the Project is associated with the additional fuel requirement in the dozer(s) used to manage the stockpile.

Table 22 Estimated Scope 1 and 3 GHG Emissions for the Project

Construction	Estimated Emissions (t CO_2-e)			
	CO_2	CH_4	N_2O	Total
SCOPE 1				
Land clearance *^	1,547	-	-	1,547
Diesel – construction equipment ^	18	0.03	0.05	18
Total Scope 1	***1,565***	***0.03***	***0.05***	***1,565***
SCOPE 3				
Production and supply of diesel consumed				4.4
Operation	**Estimated Annual Emissions (t CO_2-e/annum)**			
	CO_2	**CH_4**	**N_2O**	**Total**
SCOPE 1				
Diesel – additional truck haulage	77	0.2	0.4	77
Diesel – additional dozer activity	1,677	2.4	4.8	1,684
Total Scope 1	***1,754***	***2.6***	***5.2***	***1,762***
SCOPE 3				
Production and supply of diesel consumed *				434

* Emission calculations/factors do not provide breakdown by gas; all emissions allocated as CO_2.
^ Estimate provided by the TAGG Tool based on 2.97 ha clearance of maxbio class 4 (150-250 t dry matter/ha) open forest.

9.5 Risk Assessment

The annual GHG emissions estimated for the operational phase of the Project are negligible when compared to the estimated emissions for the Northern Coal Logistics Project as a whole, as well as Centennial's total NSW emissions:

- The annual Scope 1 emissions estimated for the Northern Coal Logistics Project was 141,306 t CO_2-e (BDM 2014). The estimated emissions from the Project represent 1.2% of those emissions.

- The Scope 1 emissions reported under the NGER Scheme for Centennial's NSW operations for the 2022-23 reporting year was 1,367,736 t CO_2-e. The estimated emissions from the Project represent less than 0.2% of those emissions.

The Project emissions are also estimated to be significantly below the 25,000 tonne CO_2-e/annum threshold under the draft *Guide for Large Emitters* (NSW EPA 2024).

Given the above, the Project is considered to have a low risk in relation to potential GHG emissions and its associated contribution to climate change impacts.

9.6 Mitigation Measures

As identified in **Section 9.3.3**, the main sources of direct GHG emissions associated with the Project are anticipated to be associated with vegetation clearing and diesel combustion. The following emissions reduction initiatives have been identified to minimise the GHG footprint of the Project and will be explored further during detailed design:

- Minimising clearing, where possible;
- Regular maintenance of mobile plant and equipment;
- Consideration of energy efficiency in plant and equipment selection;
- Switching off plant and equipment when not in constant use and not left idling;
- Planning construction works to minimise the movement of plant and equipment; and
- Exploring opportunities for the beneficial reuse of the carbon removed in Project vegetation clearing in other areas within NCS, such as mulching and composting, where feasible.

10.0 Conclusions

SLR Consulting Australia Pty Ltd was engaged by Centennial to prepare an air quality impact assessment report for the proposed increase in capacity of the Cooranbong Entry Site coal stockpile from 100,000 tonnes to approximately 400,000 tonnes.

Potential air quality risks associated with the construction phase of the Project were assessed qualitatively using IAQM method. As no 'human receptor' is located within 250m of the boundary of the Site or site entrances, or within 50m of route(s) used by construction vehicles on the public highway, no significant risks of air quality or dust soiling were identified at the surrounding sensitive receptors and no adverse off-site air quality impacts are expected. It is recommended best practice mitigation measures (e.g. watering, speed reduction etc.) should be adopted for the construction activities to minimise release of any significant dust during the construction phase of the Project.

To assess potential air quality impacts associated with the operational phase of the Project, a detailed assessment using CALPUFF dispersion model has been carried out to predict potential cumulative air quality impacts at surrounding sensitive receptors for the following two operational scenarios:

- **Scenario 1** – Export option - representing receipt and handling of 6 Mtpa of ROM from the Mandalong Mine and the export of 6 Mtpa of ROM to Newstan Colliery Surface Site by trucks.
- **Scenario 2 –** EPS option - representing receipt and handling of 6 Mtpa of ROM from the Mandalong Mine and the export of 6 Mtpa of ROM to EPS by overland conveyors

The fugitive particulate emissions for the above scenarios were estimated using relevant emission factors sourced from the USEPA's AP42 Emission Factor Handbook (US EPA 2006) and updates), Australian Coal Association Research Program (ACARP) emission factors (ACARP 2015), and the NPI Emission Estimation Technique Manual for Mining (DSEWPC 2012).

Air dispersion modelling was conducted for TSP, PM_{10}, $PM_{2.5}$ and deposited dust, and incremental ground level concentrations and deposition rates were predicted at sensitive receptors identified in the surrounding area. Modelling was performed using the CALPUFF dispersion model, and a site-representative 3-dimensional meteorological file compiled for the 2023 calendar year using the TAPM and CALMET meteorological models. Cumulative impacts were then calculated by including background TSP, PM_{10} and $PM_{2.5}$ concentrations and dust deposition rates, estimated based on a review of ambient air quality monitoring data for the local area.

Based on the analysis of ambient monitoring data and model predictions, the following were identified:

- No exceedances of the cumulative annual average $PM_{2.5}$, PM_{10} and TSP or deposited dust criteria were predicted at the identified receptors for both modelled scenarios;
- No exceedances of the cumulative 24-hour average $PM_{2.5}$ and PM_{10} criteria were predicted for Scenario 2 (EPS option);
- One day of exceedance of the cumulative 24-hour average $PM_{2.5}$ and PM_{10} criteria was predicted for Scenario 1 (Export option) on 15 September 2023 at R1 and R2 (both $PM_{2.5}$ and PM_{10}) and R5 and R10 (PM_{10} only). Further analysis of the modelled exceedance on this day found that the Project would not result in exceedances of air quality criteria at receiver locations, due to:

- The use of ambient monitoring data recorded at Morisset AQMS in 2023 as the existing background level, which leads to the modelled exceedances of relevant 24-hour average $PM_{2.5}$ and PM_{10} criteria on 15 September 2023;
- Ambient monitoring data recorded at Morisset AQMS on 15 September being likely to include significant contributions from local events (such as hazard reduction burns) and may not be representative of ambient background levels;
- Recorded 24-hour average PM_{10} concentration data on 15 September 2023 at the Onsite AQMS being much lower than that recorded at Morisset AQMS. No exceedances of 24-hour average PM_{10} criteria were recorded at the Onsite AQMS in 2023 (see **Table 3**) and no model exceedances at sensitive receptor locations were predicted should Onsite AQMS data be adopted as background;
- Incremental 24-hour PM_{10} contributions from the Project (including the Modification) were predicted to range up to 29.5 $\mu g/m^3$. These contributions will continue to be minimised through the implementation of the measures described in the Centennial (2022) *Northern Region Air Quality and Greenhouse Gas Management Plan*.
- It is noted that $PM_{2.5}$ concentrations are not recorded at the Onsite AQMS. However, given the significant differences in measured PM_{10} concentrations between the Onsite AQMS and Morisset AQMS on 15 September 2023, background $PM_{2.5}$ level at the Onsite AQMS would likely be much lower than that recorded at Morisset AQMS.

Based on the analysis above and considering that recorded Onsite AQMS data includes air quality impacts associated with approved Cooranbong Entry Site coal handling operations (i.e. double counting of the impact associated with onsite material handling for cumulative impacts), it is considered that operation of the proposed stockpile extension will not result in ambient particulate levels above the relevant criteria.

Thus, it is concluded that the Project is not likely to pose a risk of air quality impacts to neighbouring receptors.

11.0 References

ACARP. 2015. *Development of Australia-Specific PM10 Emission Factors for Coal Mines.* Australian Coal Association Research Program.

BDM. 2014. *Northern Coal Logistics Project - Greenhouse Gas Report for EIS.* Prepared by BDM Resources for Centennial Coal.

Centennial. 2022. *Northern Region Air Quality and Greenhouse Gas Management Plan*.

DCCEEW. 2024. *Australian National Greenhouse Accounts Factors.* Canberra: Department of Climate Change, Energy, the Environemnt and Water.

DCCEEW. 2023. *National Greenhouse and Energy Reporting (Measurement) Determination 2008 - Compilation No.16.* Canberra: Department of Climate Change, Energy, the Environment and Water.

DSEWPC. 2012. "NPI Emission Estimation Technique Manual for Mining." *Version 3.1.* Department of Sustainability, Environment, Water, Population and Communities.

IAQM. 2024. *Guidance on the assessment of dust from demolition and construction.* London: Institutre of Air Quality Management.

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.* Task Force on National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change.

NOAA. 2019. *National Oceanic and Atmospheric Administration.* https://www.ready.noaa.gov/READYpgclass.php.

NSW EPA. 2022. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.* NSW Environment Protection Authority.

NSW EPA. 2024. *NSW EPA Guide for Large Emitters (draft).* Sydney: New South Wales Environment Protection Authority.

Richardson. 2000. "Fine Dust: Implications for the Coal Industry." *The Australian Coal Review*, April.

SLR. 2014. *Northern Coal Logistics Project - Air Quality Impact Assessment.* SLR Consulting (Australia) Pty Ltd.

TAGG. 2013. "Greenhouse Gas Assessment Workbook for Road Projects." *Transport Authorities Greenhouse Group .* February.

US EPA. 2006. "Compilation of Air Pollutant Emission Factors AP-42." *Section 13.2.4 Aggregate Handling and Storage Piles; Section 11.24 Metallic Minerals Processing;.* United States Environmental Protection Agency.

WRI. 2011. *The GHG Protocol Corporate Value Chain (Scope 3) Standard.* WRI/WBCSD.

Appendix A IAQM Risk Assessment Methodology

Air Quality & Greenhouse Gas Impact Assessment

Cooranbong Entry Site Stockpile Extension Modification

Centennial Northern Coal Services

SLR Project No.: 610.30979

13 December 2024

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM Guidance (IAQM 2024) suggests an assessment may be required where:

- a 'human receptor' is located within:
  - 250 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on public roads, up to 250 m from the site entrance.
- an 'ecological receptor' is located within:
  - 50 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on public roads, up to 250 m from the site entrance.

This step is noted as having deliberately been chosen to be conservative and will require assessments for most projects.

Step 2a – Assessment of Scale and Nature of the Works

Step 2a of the assessment provides "dust emissions magnitudes" for each of four dust generating activities; demolition, earthworks, construction, and track-out (the movement of site material onto public roads by vehicles). The magnitudes are: Large; Medium; or Small, with suggested definitions for each category. The definitions given in the IAQM guidance for demolition, earthworks, construction activities and track-out, are as follows:

- Demolition *(Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time)*:
  - **Large**: Total building volume greater than 75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities higher than 12 m above ground level.
  - **Medium**: Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12 m above ground level.
  - **Small**: Total building volume less than12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities less than 6 m above ground, demolition during wetter months.
- Earthworks *(Covers the processes of soil-stripping, ground-levelling, excavation and landscaping)*:
  - **Large**: Total site area greater than 110,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 6 m in height.
  - **Medium**: Total site area 18,000 m^2 to 110,000 m^2, moderately dusty soil type (e.g. silt), 5 to 10 heavy earth moving vehicles active at any one time, formation of bunds 3 m to 6 m in height.
  - **Small**: Total site area less than 18,000 m^2, soil type with large grain size (e.g. sand), less than 5 heavy earth moving vehicles active at any one time, formation of bunds less than 4 m in height.

- Construction (*Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc.)*:
  - **Large**: Total building volume greater than 75,000 m^3, on site concrete batching; sandblasting.
  - **Medium**: Total building volume 12,000 m^3 to 75,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching.
  - **Small**: Total building volume less than 12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
- Track-out *(The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network)*:
  - **Large**: More than 50 heavy vehicle (>3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), greater than 100 m of unpaved road length.
  - **Medium**: Between 20 and 50 heavy vehicle (>3.5 t) outward movements in any one day, moderately dusty surface materials (e.g. high clay content), between 50 m and 100 m of unpaved road length.
  - **Small**: Less than 20 heavy vehicle (>3.5 t) outward movements in any one day, surface materials with a low potential for dust release, less than 50 m of unpaved road length.

In order to provide a conservative assessment of potential impacts, it has been assumed that if at least one of the parameters specified in the 'large' definition is satisfied, the works are classified as large, and so on.

Step 2b – Assessment of the Sensitivity of the Area

Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:

- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts
- The proximity and number of those receptors
- In the case of PM_{10}, the local background concentration
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Individual human receptors are classified as having high, medium or low sensitivity to either dust deposition or human health impacts. The IAQM method provides guidance on the sensitivity of different human receptor types to dust soiling and health effects as summarised in **Table A-1**. The definitions and examples given in the IAQM Guidance for ecological receptors have been modified in **Table A-1** to be relevant to the Australian context based on advice from SLR's ecological specialist team.

It is noted in the IAQM Guidance that people's expectations of amenity levels (dust soiling) is also dependent on existing deposition levels.

Table A-1 IAQM - Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	• Users can reasonably expect a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	• The enjoyment of amenity would not reasonably be expected; or • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	Examples: Dwellings, museums other culturally important collections, medium and long term car parks and car showrooms.	*Examples: Parks and places of work.*	*Examples: Playing fields, farmland (unless commercially sensitive horticultural), footpaths, short term car parks and roads.*
Health effects	• Locations where the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	• Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	• Locations where human exposure is transient.
	Examples: Residential properties, hospitals, schools and residential care homes.	*Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM_{10}.*	*Examples: Public footpaths, playing fields, parks and shopping streets.*
Ecological	• Locations that support International or National (EPBC) level species or ecological communities of conservation significance that may be affected by dust soiling; or	• Locations that support National or State level species or ecological communities of conservation significance, where its dust sensitivity is uncertain or unknown; or • Locations that are protected under the EPBC Act or State	• Locations that support State or Local Government level species of conservational significance where the features may be affected by dust deposition.

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
	• Locations that are protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), that will require approval from the Commonwealth Government Minister for the Environment (the minister) if the action has, will have, or is likely to have, a significant impact on Matters of National Environmental Significance (MNES).	legislation (e.g. Biodiversity Conservation Act), that will require approval from the Commonwealth or State Government Minister for the Environment (the minister) if the action has, will have, or is likely to have, a significant impact on MNES or State listed conservation significant species or communities.	• Locations that are protected under State legislation (e.g. Biodiversity Conservation Act) or Local Government Environmental Management Plans, that will require approval from the State Government Minister for the Environment (the minister) if the action has, will have, or is likely to have, a significant impact on State listed conservation significant species or communities.
	Examples: Threatened avifauna that are impacted from air pollution through the ingestion of fine dust particles into the liver and lungs due to their high metabolic rate and special respiratory systems.	*Examples: Threatened or Priority Ecological Communities that are sensitive to dust by inhibiting photosynthesis and respiration of species.*	*Examples: a local Nature Reserve with dust sensitive vegetation communities.*

According to the IAQM methods, the sensitivity of the identified individual receptors (as described above) is then used to assess the *sensitivity of the area* surrounding the active construction area, taking into account the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors. Additional factors to consider when determining the sensitivity of the area include:

- Any history of dust generating activities in the area
- The likelihood of concurrent dust generating activity on nearby sites
- Any pre-existing screening between the source and the receptors
- Any conclusions drawn from analysing local meteorological data which accurately represent the area and if relevant
- The season during which the works will take place
- Any conclusions drawn from local topography
- The duration of the potential impact (as a receptor may become more sensitive over time)
- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

The IAQM guidance for assessing the sensitivity of an area to dust soiling is shown in **Table A-2**. The sensitivity of the area should be derived for each of activity relevant to the Proposal (i.e. construction and earthworks).

Table A-2 IAQM - Categorising the Sensitivity of an Area to Dust Soiling Impacts

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Note: Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

A modified version of the IAQM guidance for assessing the *sensitivity of an area* to health impacts is shown in **Table A-3**. For high sensitivity receptors, the IAQM methods takes the existing background concentrations of PM_{10} (as an annual average) experienced in the area of interest into account and is based on the air quality objectives for PM_{10} in the UK. As these objectives differ from the ambient air quality criteria adopted for use in this assessment (i.e. an annual average of 25 µg/m^3 for PM_{10}) the IAQM method has been modified slightly.

This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine alternative sensitivity categories, taking into account the following factors:

- any history of dust generating activities in the area
- the likelihood of concurrent dust generating activity on nearby sites
- any pre-existing screening between the source and the receptors
- any conclusions drawn from analysing local meteorological data which accurately represent the area, and if relevant the season during which the works will take place
- any conclusions drawn from local topography
- duration of the potential impact
- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

Table A-3 IAQM - Categorising the Sensitivity of an Area to Dust Health Impacts

Receptor sensitivity	Annual Mean PM_{10}	Number of receptors [a,b]	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-25 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	17-21 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<17 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	21-25 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	17-21 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<17 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Notes: (a) Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m); noting that only the highest level of area sensitivity from the table needs to be considered.
(b) In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

The IAQM Guidance matrix used to categorise the sensitivity of the area to ecological impacts from dust is presented in **Table A-4**.

Table A-4 IAQM - Categorising the Sensitivity of an Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Notes: (a) The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout and for each designated site.
(b) Only the highest level of area sensitivity from the table needs to be considered.
(c) For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site.

Step 2c - Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table A-5** (demolition), **Table A-6** (earthworks and construction) and **Table A-7** (track-out) to determine the risk category with no mitigation applied.

Table A-5 Risk Category from Demolition Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A-6 Risk Category from Earthworks and Construction Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A-7 Risk Category from Track-out Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3 - Site-Specific Mitigation

Once the risk categories are determined for each of the relevant activities, site-specific management measures can be identified based on whether the Site is a low, medium or high risk site.

Step 4 – Residual Impacts

Following Step 3, the residual impact is then determined after management measures have been considered.

Appendix B Emission Estimation for Fugitive Dust Emissions

Air Quality & Greenhouse Gas Impact Assessment

Cooranbong Entry Site Stockpile Extension Modification

Centennial Northern Coal Services

SLR Project No.: 610.30979

13 December 2024

Activity	Emission Rate (kg/y)			Emission Factor				Emission Control	
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	Units	Technology	% control
Scenario 1 (Export Option)									
Loading ROM to main stockpile	1,560	780	78	0.0005	0.0003	0.00003	kg/t	Water spray	50
Loading ROM to 3000 t stockpile	260	130	13	0.0005	0.0003	0.00003	kg/t	Water spray	50
Loading ROM to 1,200 t bin	1,108	554	55	0.0005	0.0003	0.00003	kg/t	Water spray	50
Loading ROM to trucks - 1,200 t bin	1,108	554	55	0.0005	0.0003	0.00003	kg/t	Water spray	50
Transfer point	936	468	47	0.0005	0.0003	0.00003	kg/t	Water spray	70
Loading to trucks - main stockpile	1,560	780	78	0.0005	0.0003	0.00003	kg/t	Water spray	50
Loading to trucks - 3,000 t stockpile	260	130	13	0.0005	0.0003	0.00003	kg/t	Water spray	50
Hauling ROM from bin	19,132	9,566	957	0.520	0.260	0.026	kg/VKT	Level 1 watering	50
Hauling ROM from stockpile	12,755	6,377	638	0.520	0.260	0.026	kg/VKT	Level 1 watering	50
Dozers	2,606	1,303	130	0.6	0.3	0.03	kg/h	Water spray	50
Wind erosion - main stockpile	7,884	3,942	369	0.40	0.20	0.02	kg/ha/hour	Level 1 watering	50
Wind erosion - 3,000 t stockpile	158	79	7	0.40	0.20	0.02	kg/ha/hour	Level 1 watering	50
Wind erosion - 1,500 t (emergency) stockpile	88	44	4	0.40	0.20	0.02	kg/ha/hour	Level 1 watering	50
Scenario 2 (EPS Option)									
Loading ROM to main stockpile	1,560	780	78	0.0005	0.0003	0.0000	kg/t	Water spray	50
Loading ROM to 3,000 t stockpile	260	130	13	0.0005	0.0003	0.0000	kg/t	Water spray	50
Loading ROM to 2,000 t bin	1,560	780	78	0.0005	0.0003	0.0000	kg/t	Water spray	50
Loading ROM to 250 t bin	1,560	780	78	0.0005	0.0003	0.0000	kg/t	Water spray	50
Transfer points	1,872	936	94	0.0005	0.0003	0.0000	kg/t	Water spray	70
Loading to crusher	1,560	780	78	0.0005	0.0003	0.0000	kg/t	Water spray	50
Loading ROM to final product bin	1,560	780	78	0.0005	0.0003	0.0000	kg/VKT	Level 1 watering	50
Wind erosion - Main stockpile	7,884	3,942	369	0.40	0.20	0.02	kg/ha/hour	Level 1 watering	50
Wind erosion – 3,000t stockpile	158	79	7	0.40	0.20	0.02	kg/ha/hour	Level 1 watering	50
Wind erosion - 1,500 t (emergency) stockpile	88	44	4	0.40	0.20	0.02	kg/ha/hour	Level 1 watering	50
Loading ROM to main stockpile	1,560	780	78	0.0005	0.0003	0.0000	kg/t	Water spray	50
Loading ROM to 3000 t stockpile	260	130	13	0.0005	0.0003	0.0000	kg/t	Water spray	50

Activity	Emission Rate (kg/y)			Emission Factor				Emission Control	
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	Units	Technology	% control
Loading ROM to 2000 t bin	1,560	780	78	0.0005	0.0003	0.0000	kg/t	Water spray	50

Appendix C Variable Emission Compilation

Air Quality & Greenhouse Gas Impact Assessment

Cooranbong Entry Site Stockpile Extension Modification

Centennial Northern Coal Services

SLR Project No.: 610.30979

13 December 2024

A brief summary of the steps used in calculating the hourly varying emission rates for each source are presented below.

Step 1: Calculate annual average emission rate (kg/year) for FP, CM and RE

$FP_{ANNUAL} = PM_{2.5, ANNUAL}$	(FP) FINE PARTICULATE – PARTICULATE OF SIZE LESS THAN 2.5 µM
$CM_{annual} = PM_{10,annual} – PM_{2.5, annual}$	(CM) Coarse Particulate – particulate of size between 10 µm and 2.5 µm
$RE_{annual} = TSP_{annual} - PM_{10,annual}$	(RE) Remaining Particulate – particulate of size greater than 10 µm

Step 2: Identify the operating hours for each activity

Step 3: Classify the sensitivity of each type of activity to wind speed

Wind insensitive: activities with emission factor that is independent of wind speed (e.g. blasting).

Wind sensitive: activities with emission factor that is a function of $(\text{wind speed}/2.2)^{1.3}$ (e.g. loading).

Wind erosion: emission from exposed areas/stockpiles.

Step 4: Identify the number of sources associated with each activity

Note that each wind erosion source is modelled as an independent source.

Step 5: Calculate the hourly average emission rate for each activity per source

$FP_{AC,i,h} = \frac{FP_{annual,i} \times 1000}{N_{days} \times OH_i \times 3600 \times N_{s,i} \times WSFactor_{i,h}}$	**WHERE:**
$CM_{AC,i,h} = \frac{CM_{annual,i} \times 1000}{N_{days} \times OH_i \times 3600 \times N_{s,i} \times WSFactor_{i,h}}$	***$FP_{AC,I,H}$- FINE PARTICULATES EMISSION RATE FOR ACTIVITY I (G/S) AT HOUR H***
$RE_{AC,i,h} = \frac{RE_{annual,i} \times 1000}{N_{days} \times OH_i \times 3600 \times N_{s,i}} \times WSFactor_{i,h}$	***$CM_{AC,I,H}$- FINE PARTICULATES EMISSION RATE FOR ACTIVITY I (G/S) AT HOUR H***
FOR WIND INSENSITIVE ACTIVITIES	***$CM_{AC,I,H}$- FINE PARTICULATES EMISSION RATE FOR ACTIVITY I (G/S) AT HOUR H***
$WSFactor_{i,h} = 1$	***OH_I-DAILY OPERATING HOURS (1- 24) FOR ACTIVITY I***
FOR WIND SENSITIVE ACTIVITIES	***N_{DAYS} -NUMBER OF DAYS IN THE METEOROLOGICAL DATA FILE***
$WSFactor_{i,h} = \frac{\left(\frac{WS_h}{2.2}\right)^{1.3}}{\frac{\sum_{j=1}^{n}\left(\frac{WS_j}{2.2}\right)^{1.3}}{n}}$	***$N_{S,I}$ -NUMBER OF SOURCES ASSOCIATED WITH ACTIVITY I***
FOR WIND EROSION ACTIVITIES	***WS_H-WIND SPEED AT THE HOUR***
$WSFactor_{i,h} = \frac{(WS_h)^3}{\frac{\sum_{j=1}^{n}(WS_j)^3}{n}}$	***N -NUMBER OF HOURS IN THE METEOROLOGICAL DATA FILE***

Note: If the activity was modelled as area source, the equation on the left column of the table needs to be divided by the area of that activity.

Step 5: Calculate hourly average emission rate for each source

To calculate the emission rate for a particular source for a particular hour, add up the calculated emission rate for each activity associated with that source. For example, if Source 1 is associated with Activity 1, Activity 2 and Activity 3, then:

- $ER_{S1,h,FP} = FP_{AC,1,h} + FP_{AC,2,h} + FP_{AC,3,h}$
- $ER_{S1,h,CM} = CM_{AC,1,h} + CM_{AC,2,h} + CM_{AC,3,h}$
- $ER_{S1,h,RE} = RE_{AC,1,h} + RE_{AC,2,h} + RE_{AC,3,h}$

Appendix D Contour Plots

Air Quality & Greenhouse Gas Impact Assessment

Cooranbong Entry Site Stockpile Extension Modification

Centennial Northern Coal Services

SLR Project No.: 610.30979

13 December 2024

SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

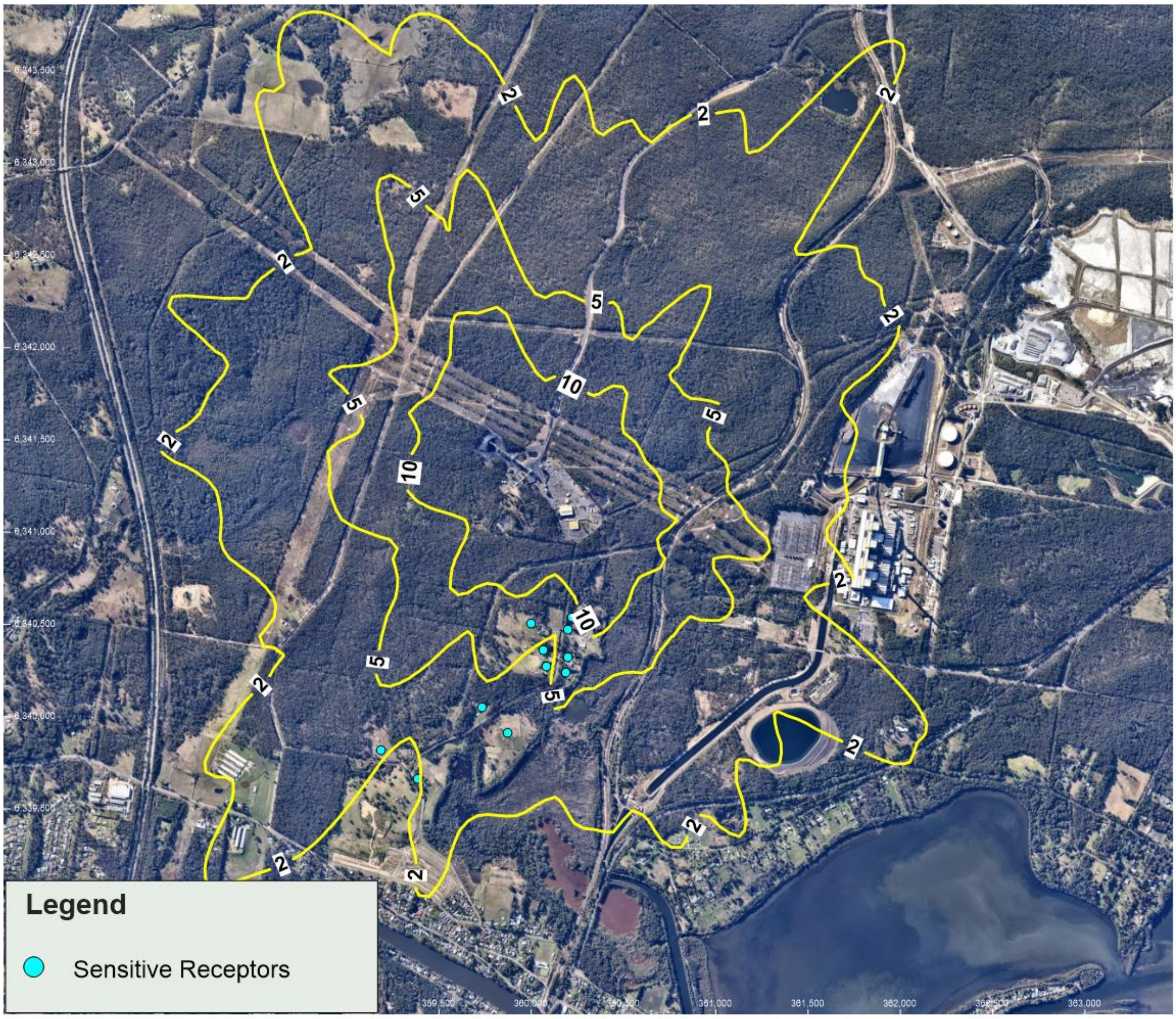
Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 1 (Export Option)

Pollutant	PM_{10}	Avg Period	24-Hour	Unit	µg/m³



SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

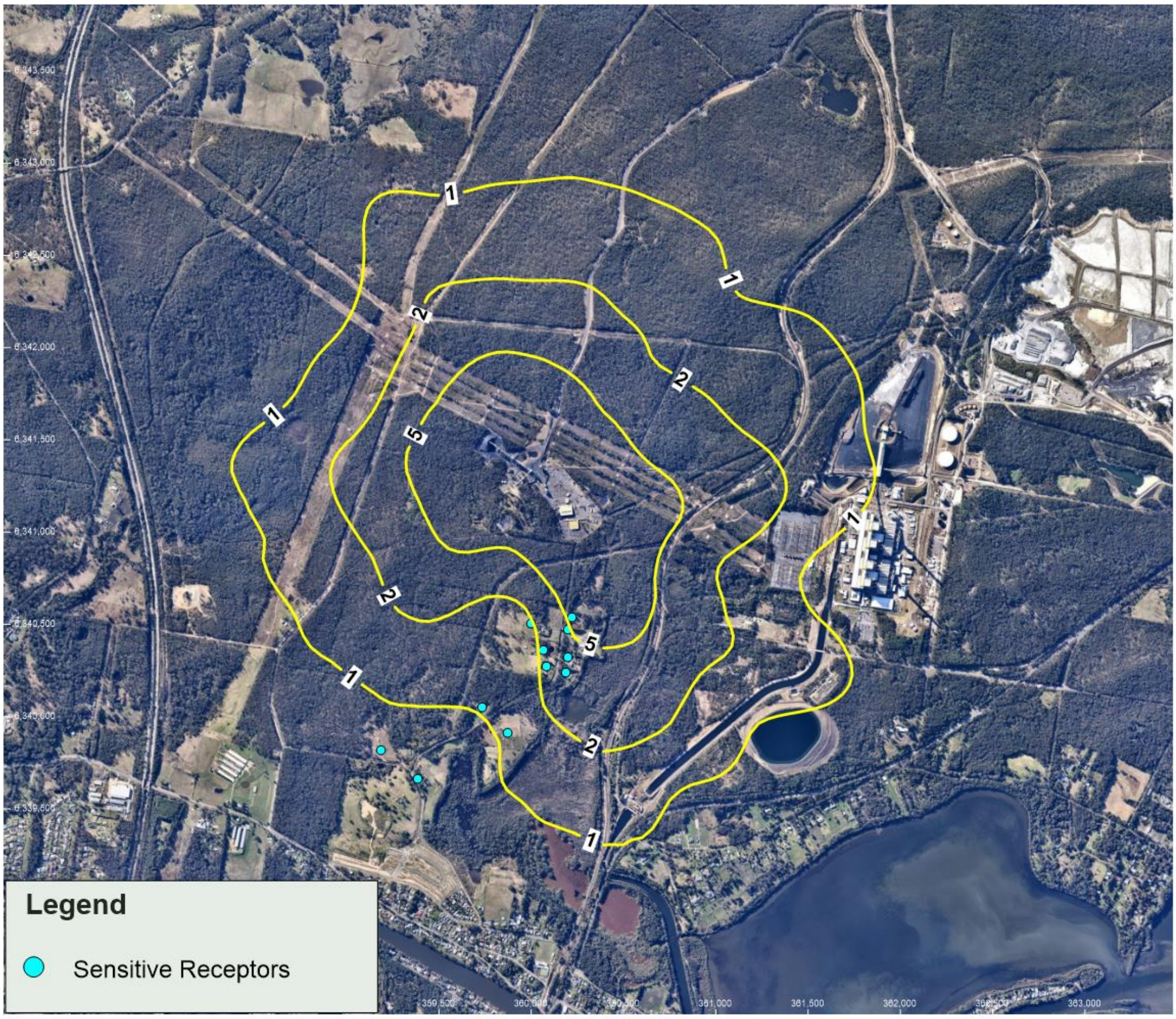
Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 2 (EPS Option)

Pollutant	PM_{10}	Avg Period	24-Hour	Unit	$\mu g/m^3$



SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

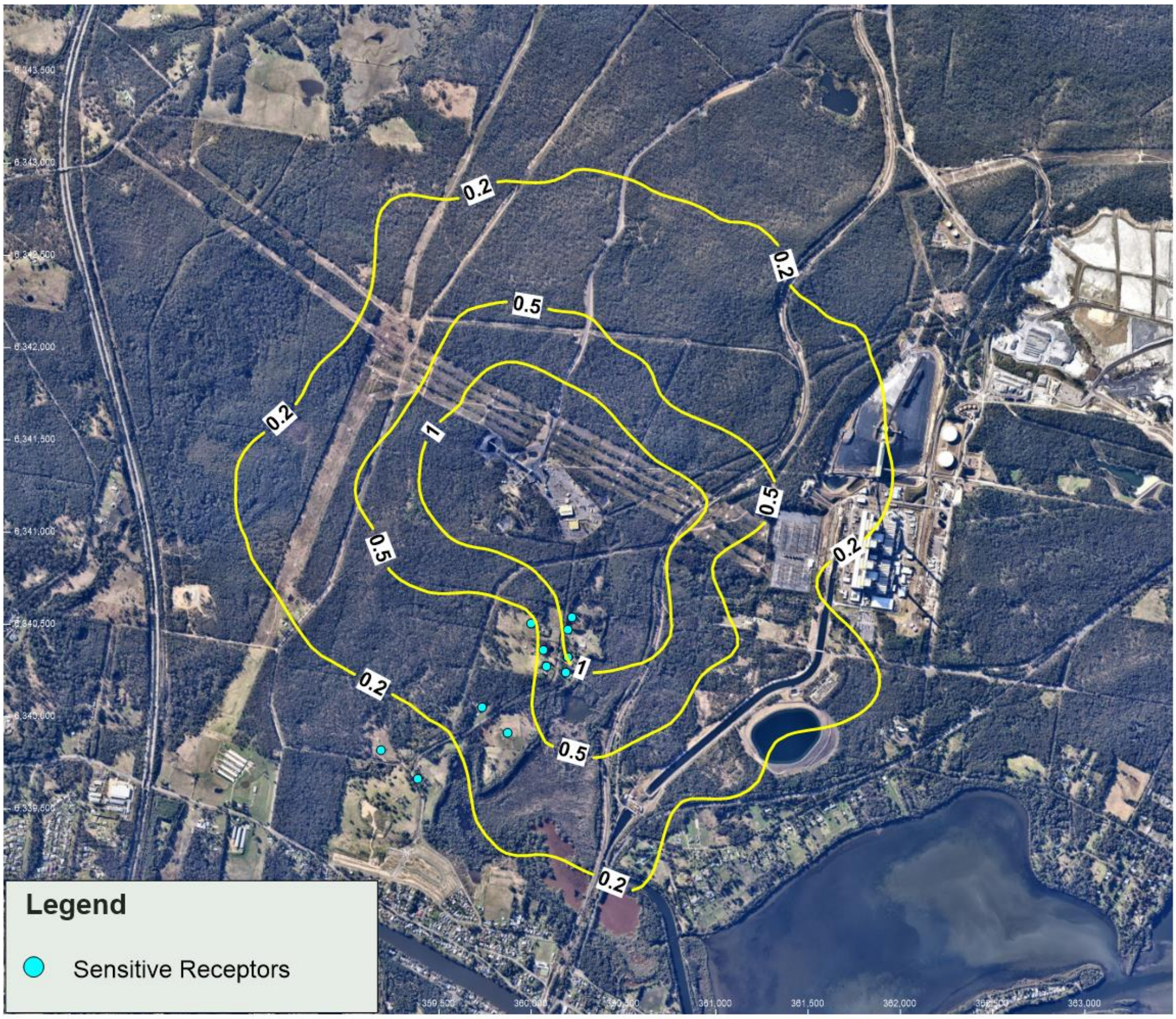
Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 1 (Export Option)

Pollutant	PM_{10}	Avg Period	Annual	Unit	$\mu g/m^3$



SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 2 (EPS Option)

Pollutant	PM_{10}	Avg Period	Annual	Unit	$\mu g/m^3$

Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

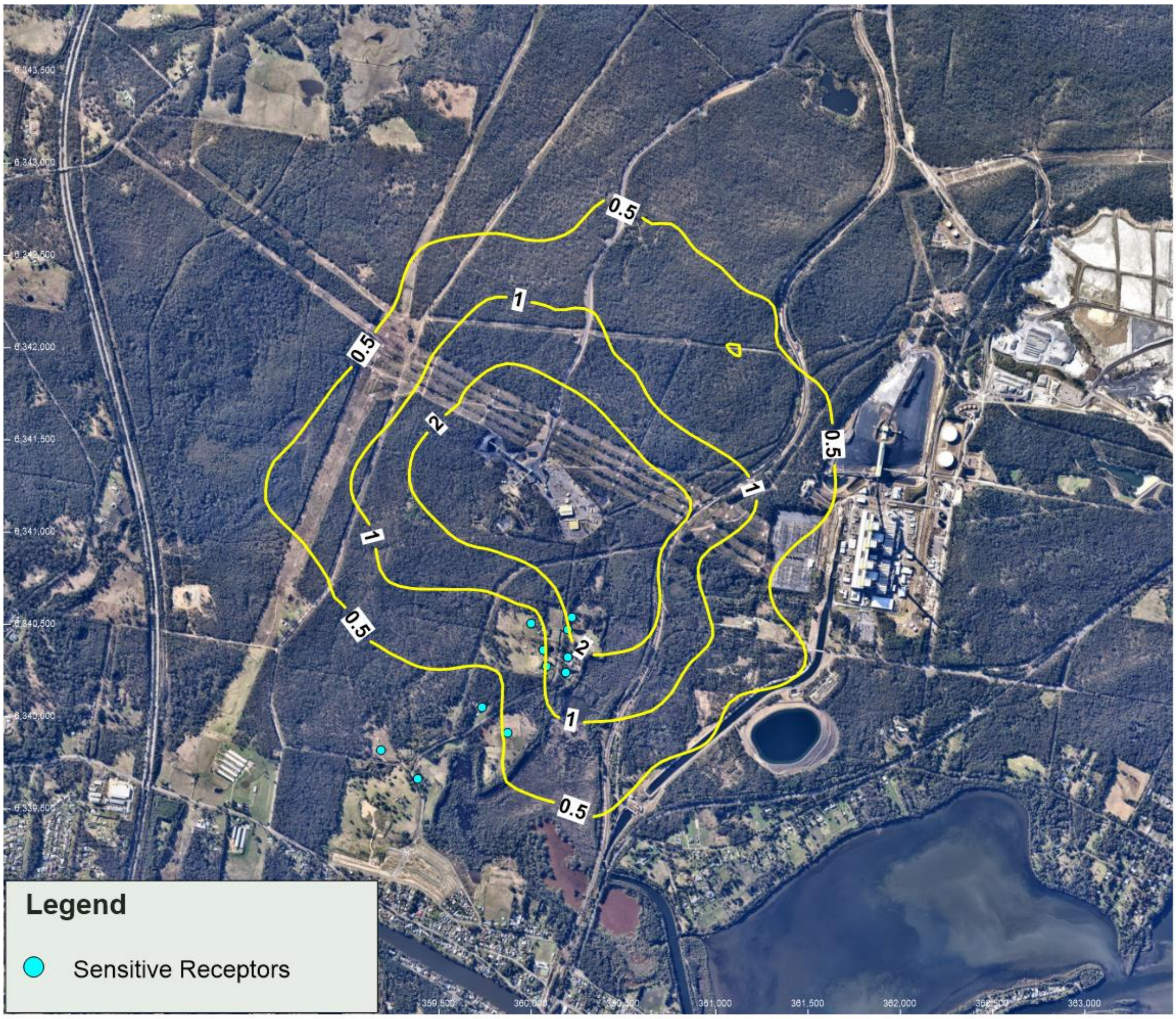
Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 1 (Export Option)

Pollutant	TSP	Avg Period	Annual	Unit	µg/m³



SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

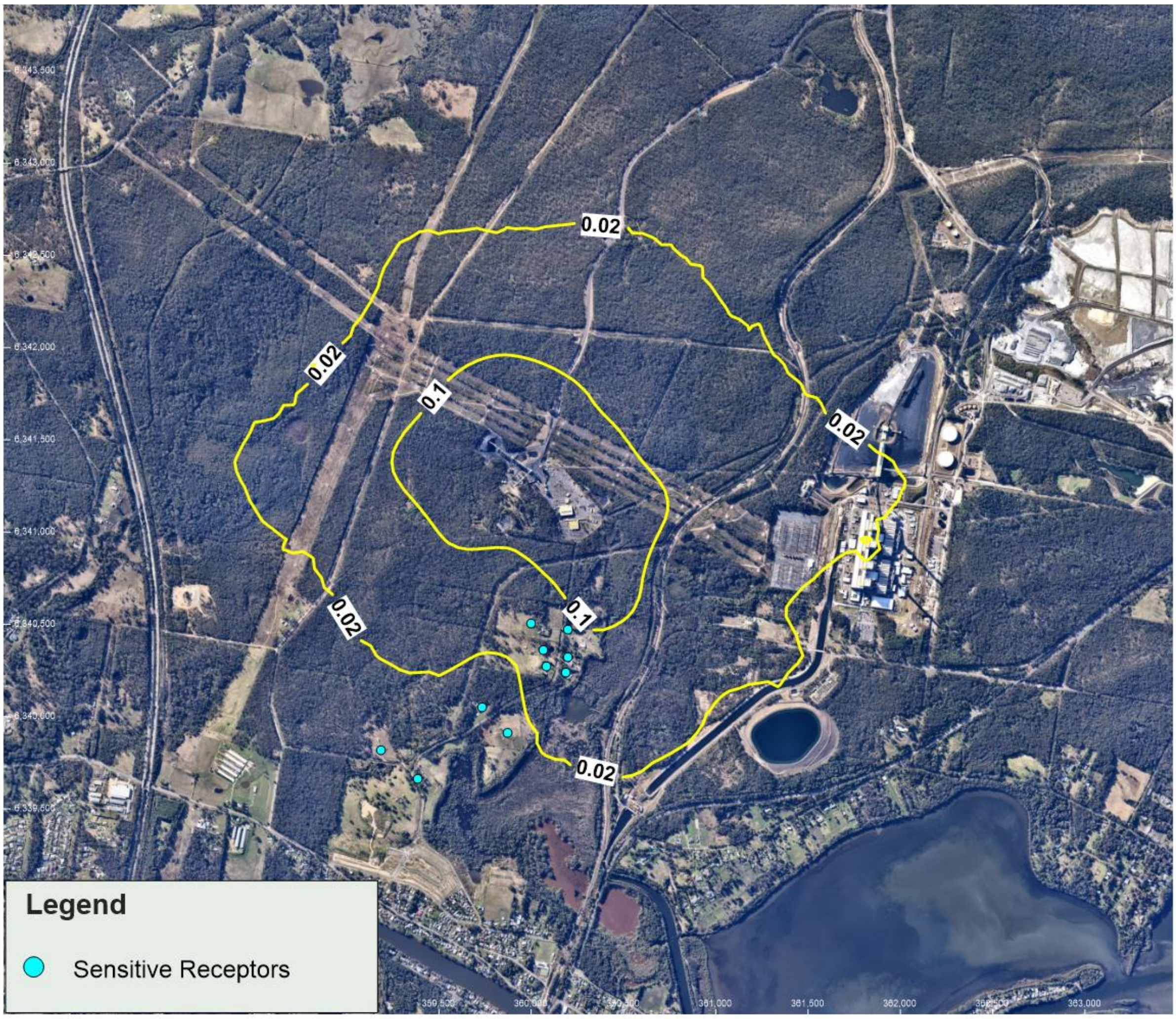
Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 2 (EPS Option)

Pollutant	TSP	Avg Period	Annual	Unit	µg/m³



SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 1 (Export Option)

Pollutant **Dust Deposition** | Avg Period **Annual** | Unit **g/m²/month**

SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

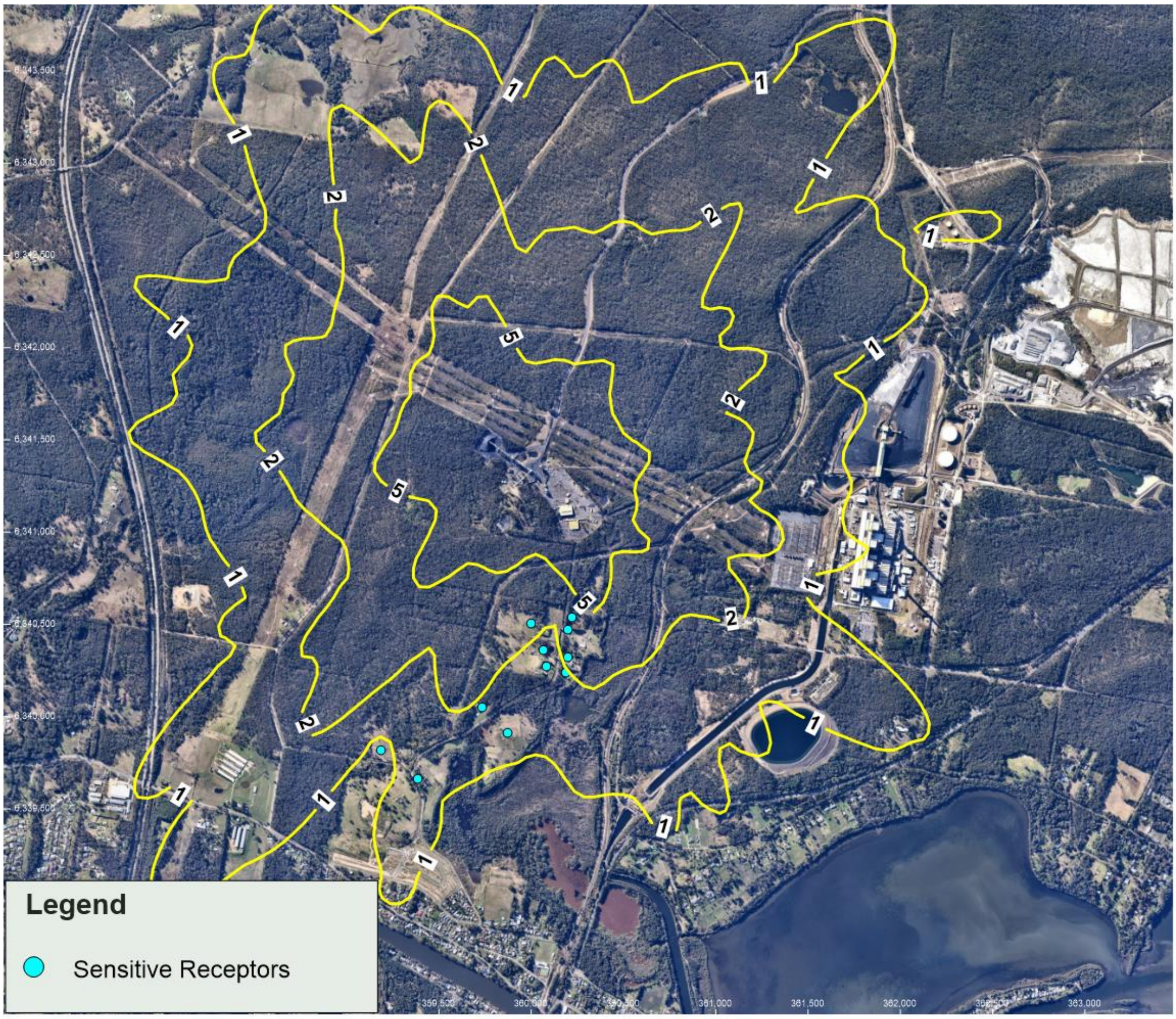
Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 2 (EPS Option)

Pollutant	Avg Period	Unit
Dust Deposition	Annual	g/m²/month



Project Number:	610.30979	Centennial Northern Coal Services			
Dispersion Model:	CALPUFF	Cooranbong Entry Site Stockpile Extension Modification			
Modelling Period:	2023				
Projection:	GDA 1994 MGA Zone 56	Incremental Impact - Scenario 1 (Export Option)			
Date:	01/10/2024	Pollutant	$PM_{2.5}$	Avg Period 24-Hour	Unit µg/m³

SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Project Number:	610.30979						
Dispersion Model:	CALPUFF	**Centennial Northern Coal Services**					
Modelling Period:	2023	**Cooranbong Entry Site Stockpile Extension Modification**					
Projection:	GDA 1994 MGA Zone 56	Incremental Impact - Scenario 2 (EPS Option)					
Date:	01/10/2024	Pollutant	$PM_{2.5}$	Avg Period	**24-Hour**	Unit	**µg/m³**

SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 1 (Export Option)

Pollutant	Avg Period	Unit
$PM_{2.5}$	Annual	$\mu g/m^3$

SLR
Level 16, 175 Eagle Street
Brisbane
QLD 4000
T: +61 7 3858 4800
F: +61 7 3858 4801
www.slrconsulting.com

Project Number:	610.30979
Dispersion Model:	CALPUFF
Modelling Period:	2023
Projection:	GDA 1994 MGA Zone 56
Date:	01/10/2024

Centennial Northern Coal Services

Cooranbong Entry Site Stockpile Extension Modification

Incremental Impact - Scenario 2 (EPS Option)

Pollutant	$PM_{2.5}$	Avg Period	Annual	Unit	$\mu g/m^3$

Making Sustainability Happen