Jellinbah Group

LAKE VERMONT MEADOWBROOK PROJECT ENVIRONMENTAL IMPACT STATEMENT

CHAPTER 13 AIR QUALITY

aarc ENVIRONMENTAL SOLUTIONS

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13.1 Environmental objectives and performance outcomes

This chapter has been prepared to assist the DES in carrying out their environmental objective assessment in respect of the following environmental objective prescribed in the Project ToR:

The activity will be operated in a way that protects the environmental values of air.

The Project seeks to achieve the environmental objective by operating in a way that achieves all of the following:

- fugitive emissions of contaminants from storage, handling and processing of materials and transporting materials within the site are prevented or minimised;
- contingency measures will prevent or minimise adverse effects on the environment from unplanned emissions and shutdown and start up emissions of contaminants to air; and.
- releases of contaminants to the atmosphere for dispersion will be managed to prevent or minimise adverse effects on environmental values.

The environmental objective will be met through implementation of updated mitigation and management activities to address air quality. These will be detailed in section 13.5.

An air quality and greenhouse gas (GHG) assessment has been conducted for the Project by Katestone Environmental Pty Ltd (2022) and is presented as Appendix L, Air and GHG Assessment (Section 3). The Air and GHG Assessment has been prepared in consideration of the:

- *Environmental Protection Act 1994* (Qld);
- EP Regulation 2019 (Qld);
- Environmental Protection (Air) Policy 2019;
- EIS Guideline–Air (DES 2020i); and
- Guideline: Application requirements for activities with impacts to air (DES 2021f).

13.1.1 Air quality assessment terminology

The Environmental Protection (Air) Policy 2019 (Qld) (EPP Air) and the 'EIS Guideline–Air (DES 2020i)' provide definitions of key terms relating to air quality and GHG assessments. An overview of the terms essential to the technical interpretation of this chapter is provided below, including the indicators used to measure, model and assess the impacts of air.

TSP	total suspended particles means particles in the air environment with an equivalent aerodynamic diameter of less than 100 microns.
PM_{10}	means particles in the air environment with an equivalent aerodynamic diameter of not more than 10 microns.
$PM_{2.5}$	means particles in the air environment with an equivalent aerodynamic diameter of not more than 2.5 microns.
$\mu g/m^3$	means micrograms per cubic metre at zero degrees Celsius and an atmospheric pressure of 1.
Scope 1	emissions from sources that are owned or directly controlled by the organisation. Scope 1 emissions for coal projects will include fugitive coal seam methane vented or released during

mining, as well as emissions directly resulting from the project's activities, such as transportation of product and consumables.

Scope 2 emissions from the consumption of purchased electricity, steam or other sources of energy (e.g. chilled water) generated upstream from the organisation. Scope 2 emissions for any type of project will include energy (e.g. electricity) used by the project but generated by other entities.

Scope 3 emissions that are a consequence of the operations of an organisation but are not directly owned or controlled by the organisation. Scope 3 emissions will include indirect sources such as employee commuting, business travel, third-party distribution and logistics and the production of purchased goods.

CO_2-e carbon dioxide equivalent is a measure used to compare the emissions of a particular greenhouse gas to carbon dioxide based on its global warming potential over a specified timeframe. For example, the global warming potential for methane compared to carbon dioxide over 100 years is 21, so the carbon dioxide equivalent of one tonne of methane is 21 tCO_2-e.

13.1.2 Air quality criteria

Schedule 1 of the EPP (Air) sets out air quality objectives for Queensland. The relevant air quality objectives for the Project are summarised in Table 13.1.

Table 13.1: Project objectives

Pollutant	Environmental value (Appendix L)	Averaging period	Air quality objectives	Source
TSP	Health and wellbeing	Annual	90 ($\mu g/m^3$)	EPP (Air)
PM_{10}	Health and wellbeing	24-hour	50 ($\mu g/m^3$)	EPP (Air)
		Annual	25 ($\mu g/m^3$)	EPP (Air)
$PM_{2.5}$	Health and wellbeing	24-hour	25 ($\mu g/m^3$)	EPP (Air)
		Annual	8 ($\mu g/m^3$)	EPP (Air)
Dust Deposition	Amenity	1-month	120 ($\mu g/m^3$)	DES (2017b)

13.1.2.1 Suspended dust particulates

During the life of the Project, mining activities will have the potential to generate particulate matter (e.g. dust) emissions through mining operations, transportation and processing. Generated particulate matter can occur in the form of the following:

- total suspended particulate (TSP) matter;
- particulate matter with an equivalent aerodynamic diameter of 10 µm or less (PM_{10}) (a subset of TSP); and
- particulate matter with an equivalent aerodynamic diameter of 2.5 µm or less ($PM_{2.5}$) (a subset of TSP and PM_{10}).

13.1.2.2 Dust deposition

There are no air quality objectives prescribed in the EPP (Air) for deposited dust. However, the DES guideline, 'Application requirements for activities with impacts to air' (DES 2021f) indicates that when monitored in accordance with 'AS 3580.10.1—Methods for sampling and analysis of ambient air—Determination of

Particulates—Deposited Matter—Gravimetric method of 2016' (Standards Australia 2016), a dust deposition limit of 120 mg/m^2/day averaged over one month is commonly used in Queensland.

Dust deposition is mostly associated with dust nuisance or amenity impacts in residential areas. Elevated dust deposition rates can reduce public amenity by soiling of clothes, buildings and other surfaces in the area (Appendix L, Air Quality and GHG Assessment, Section 3.1).

13.1.2.3 Other pollutants

The main air pollutant from mining activities is particulates (dust). Emissions of other air pollutants will also arise from mining operations associated with diesel-powered equipment and blasting and include carbon monoxide (CO), oxides of nitrogen (NO_x) and other pollutants, such as sulphur dioxide (SO_2). However, in mining operations that apply standard control measures the emission of other pollutants will be transient in nature and likely to have negligible impact outside of the active working areas of the Project site. Other pollutants will have substantially less air quality impact than particulates and therefore the impacts of particulates were assessed as the critical air pollutant and for determining compliance conditions, cognisant that compliance for particulates is expected to also achieve compliance with air quality standards for other pollutants (Appendix L, Air Quality and GHG Assessment, Section 3.1).

13.1.2.4 Spontaneous combustion

Coal and coal waste materials can potentially present risk of spontaneous combustion and cause resultant impacts to air quality. The risks of spontaneous combustion will be managed within waste management and hazards and safety management frameworks, which will also achieve outcomes for the benefit of prevention of air quality impacts. The Project will operate a ROM coal stockpile within the MIA and transport coal to the existing Lake Vermont Mine for processing and handling. The ROM coal stockpile will be managed through the on-site communication systems and according to hazards and safety procedures which will include measures to monitor for and minimise risk of spontaneous combustion. Once transported to the existing Lake Vermont Mine, coal will be processed and handled through existing Lake Vermont Mine systems with protocols designed for safe handling including the prevention of spontaneous combustion. The management of coal waste material, which includes measures to reduce risk attributes of undesirable outcomes including spontaneous combustion, are described in Chapter 15, Waste Management and Chapter 6, Rehabilitation. The key elements of an emergency response to spontaneous combustion are described in Chapter 16, Hazards and Safety.

These management measures are considered sufficient to adequately manage potential impacts to air quality from spontaneous combustion.

13.1.2.5 Odour

The Lake Vermont Mine has not recorded odour impacts in the past. A spontaneous combustion event could contribute to odour emissions, however management measures for risk of spontaneous combustion are considered sufficient to avoid combustion events resulting in odour impacts (section 13.1.2.4).

Odour impacts from ventilation of underground air was assessed within the Air Quality and GHG Assessment, Appendix L, Section 3.1. The Project will ventilate air from the underground workings and ventilated air can have potential for odour impacts however the odour impact assessment concluded that underground air ventilation from the Project is unlikely to cause elevated odour levels and no management measures are considered necessary for odours.

13.2 Existing air environment

Environmental values to be enhanced or protected under EPP (Air) are those that are conducive to protecting:

- the health and biodiversity of ecosystems;
- human health and wellbeing;

- the aesthetics of the environment, including the appearance of buildings, structures and other property; and
- agricultural use of the environment.

Impacts on these values have been considered within the assessment of impacts to air, resultant of the proposed Project.

13.2.1 Local topography and climate

The Project is approximately 25 km north-east of Dysart, in a rural area surrounded by grazing and cropping land use. Several coal mines operate in the vicinity of the Project, including the Saraji Mine directly to the west and Peak Downs Coal Mine to the north-west.

The local topography of the Project site is relatively flat and approximately 155 mAHD above sea level. Elevation gradually decreases to the east, while to the west (beyond the Saraji Mine), hills reach peak elevations of 470 mAHD (Figure 13.1).

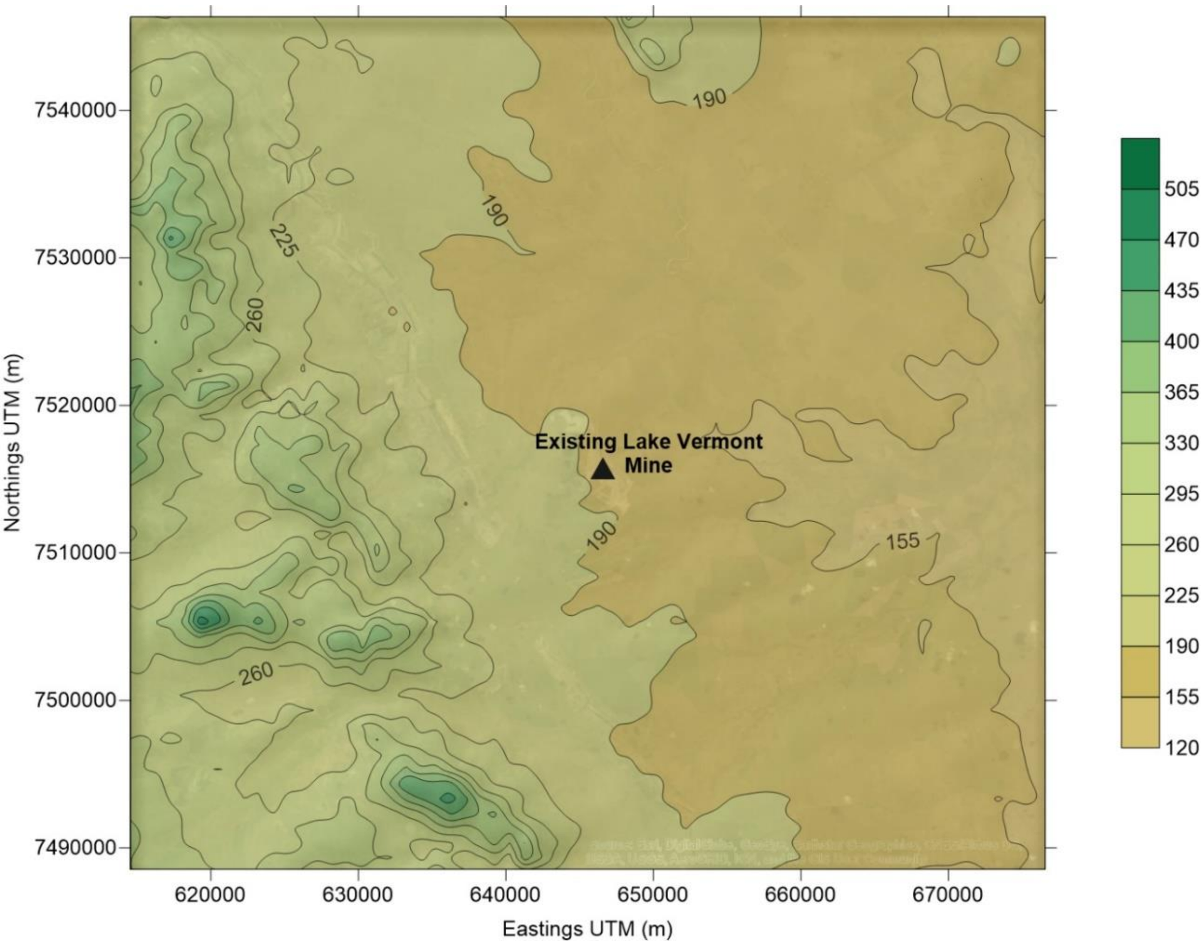

Figure 13.1: Surrounding terrain in the Project area

Climate and local topography can influence dispersion of air pollutants in the surrounding environment. Parameters that are important for the generation and dispersion of air pollutants, such as dust, include:

- wind speed and wind direction;
- atmospheric stability; and
- mixing height.

Climate for the Project region is further described in Chapter 4, Climate.

13.2.2 Atmospheric conditions

13.2.2.1 Wind speed and direction

Wind is a critical influencer of dust emissions in terms of wind speed and wind direction. The closest BoM weather station with continuous monitoring of wind is Moranbah Airport (Figure 13.2). Annual observational data from the Moranbah BoM weather station has been compared to meteorological data from the TAPM/CALMET model at a location indicative of the Project. Predicted wind characteristics are representative of conditions in the region, as outlined in the validation comparison (Appendix L, Air Quality and GHG Assessment, Section 3.3).

Modelled analysis of annual, seasonal, and diurnal wind speed and wind direction has been completed in Appendix L (Air Quality and GHG Assessment, Section 3.3). Seasonal wind roses show that during spring and summer, winds are predominantly from the east and shift towards predominant south-east to south winds during autumn and winter. Wind speed is consistent seasonally with little variation remaining between 2 m/s and 3 m/s. Diurnal wind roses show that late evening and night-time winds (6 pm to 6 am) are predominantly light to moderate and from the north-east to south-east, reducing in strength during the early hours of the morning. Winds during the day (6 am to 6 pm) are predominantly from the east to south-east and between 2 m/s and 7 m/s, with the strongest winds occurring during the afternoon (Appendix L, Air Quality and GHG Assessment, Section 3.3).

Overall, wind direction is predominately from the south-east and occurs minimally from the north-west and south-west. Analysis of the wind speed and wind direction at the site shows that winds are predominantly light to moderate, between 1 m/s and 7 m/s. Annual predicted mean wind speed is 2.81 m/s (Figure 13.3).

13.2.2.2 Atmospheric stability

Atmospheric stability refers to the vertical movement of the atmosphere and is an important factor in the dispersion and transport of a plume within a boundary layer (Appendix L, Air Quality and GHG Assessment, Section 3.3). Day-time conditions range from neutral to unstable as a result of solar heating of the ground inducing turbulent mixing in the atmosphere. Six classes of atmospheric stability are commonly identified using the Pasquil-Gifford scheme:

1) Class A: Extremely unstable conditions, typically on a sunny day (clear skies and warmer temperatures);
2) Class B: Unstable conditions, clear skies, day-time temperatures;
3) Class C: Slightly unstable conditions, moderate winds, slightly overcast and day-time temperatures;
4) Class D: Neutral conditions, cloudy overcast, moderate winds during either day-time or night-time;
5) Class E: Slightly stable conditions, cloudy overcast at night-time; and
6) Class F: Stable conditions, typically occurring during light wind conditions at night.

Stability class is calculated for the Project site (Appendix L, Air Quality and GHG Assessment, Section 3.3), as shown in Table 13.2, which indicates the distribution of stability classes. Figure 13.4 shows the distribution of stability classes predicted at the site by hour of the day.

Table 13.2: Frequency distribution of surface atmospheric stability conditions

Pasquil-Gifford Stability Class	Frequency %
A	1.4
B	6.5
C	12.5
D	41.2
E	9.8
F	28.6

13.2.2.3 Mixing height

Appendix L (Air Quality and GHG Assessment, Section 3.3) describes mixing height as the height of the mixed atmosphere above the ground (mixed layer), which varies diurnally. Air pollutants released at or near the ground will become dispersed within the mixed layer. During stable atmospheric conditions, the mixing height is often quite low and particulate dispersion is limited to within this layer. During the day, solar radiation heats the ground and causes the air above it to warm, resulting in convection and an increase in the mixing height. The growth of the mixing height is dependent on how well the warmer air from the ground can mix with the cooler upper-level air and, therefore, depends on meteorological factors, such as the intensity of solar radiation and wind speed. During strong winds, the air will be well mixed, resulting in an elevated mixing height (Appendix L, Air Quality and GHG Assessment, Section 3.3).

Mixing height information for the Project is presented in Figure 13.5. The data shows that the mixing height develops at around 6 am and increases to a peak around 2 pm to 3 pm before descending rapidly between 4 pm and 5 pm (Appendix L, Air Quality and GHG Assessment, Section 3.3).

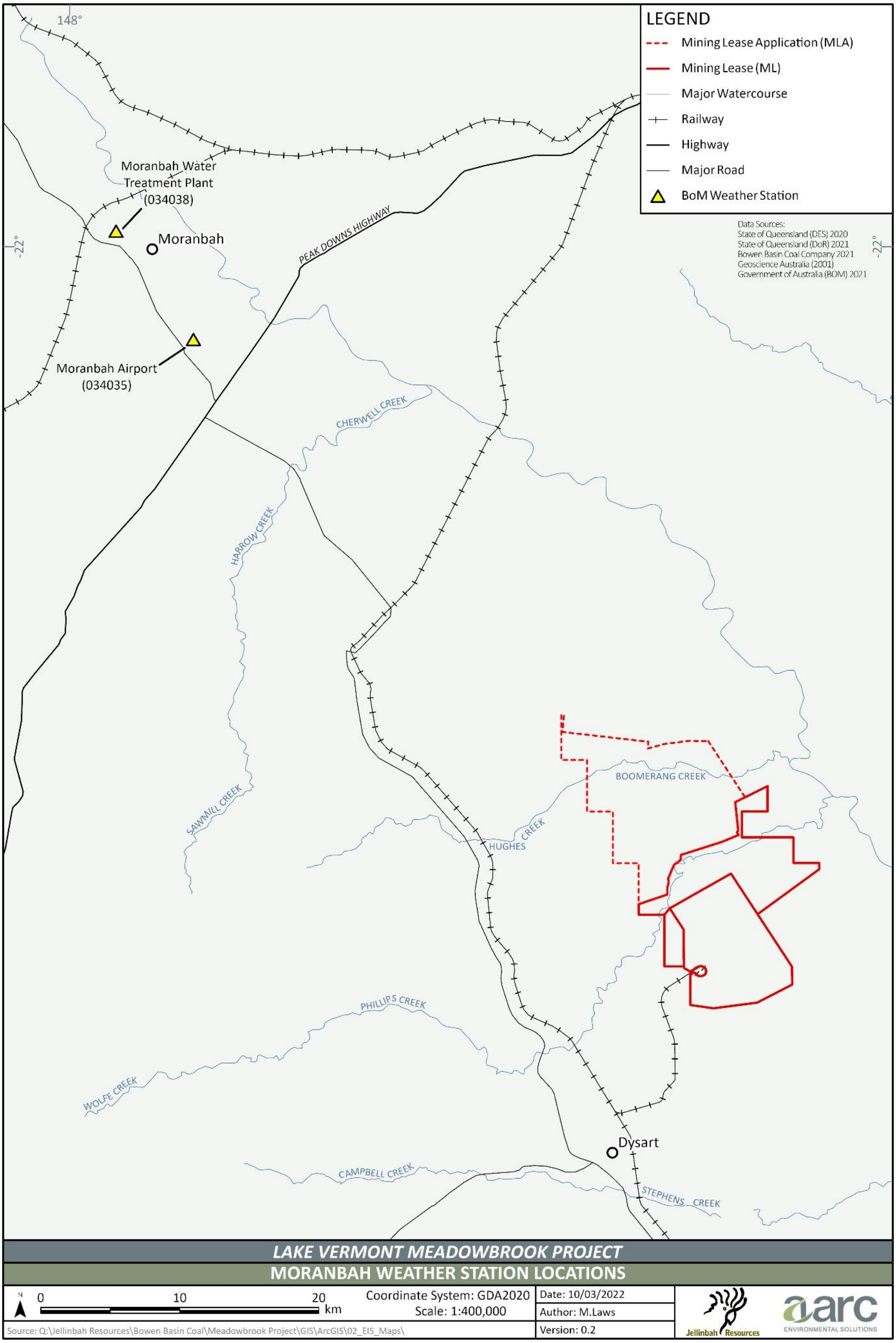

Figure 13.2: Moranbah weather stations

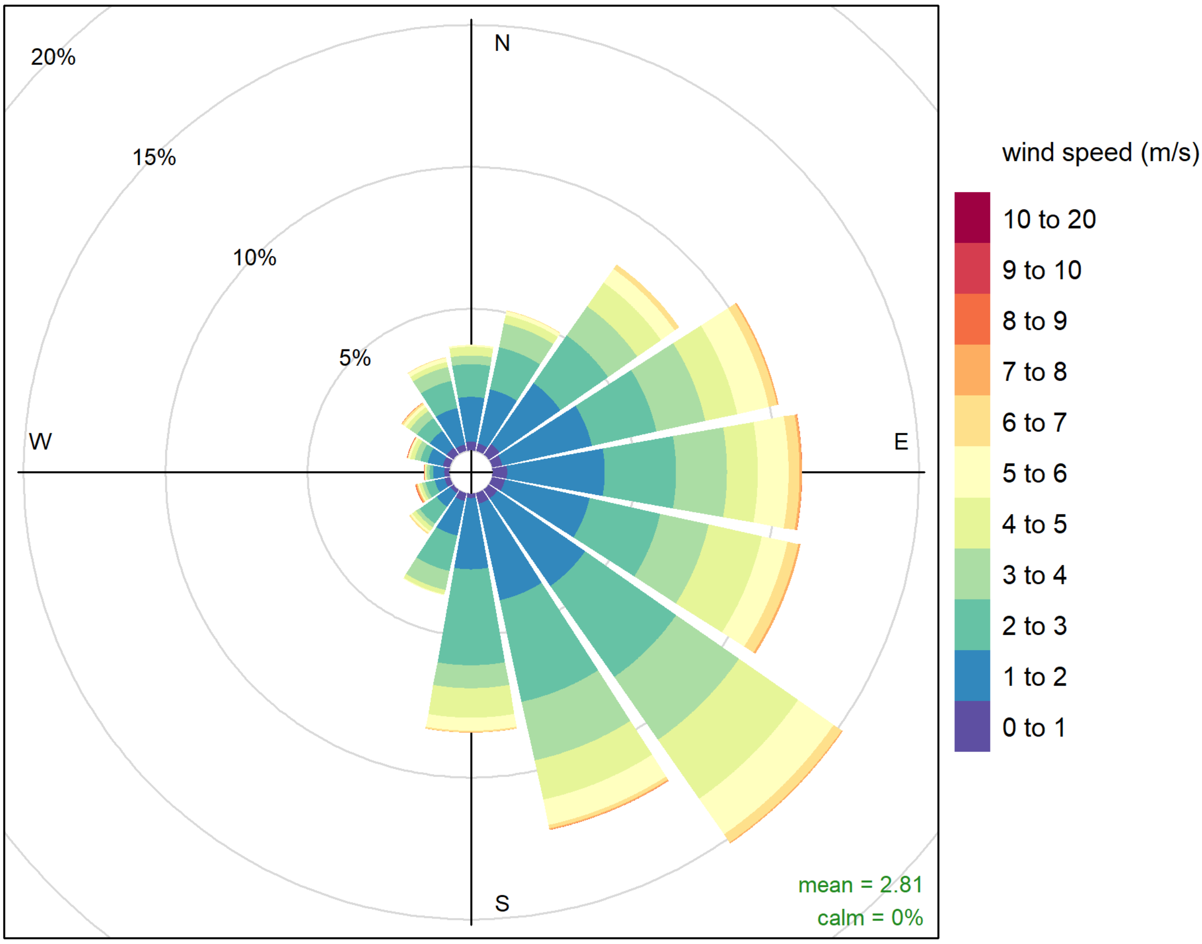

Figure 13.3: Annual distribution of the TAPM/CALMET generated winds for the Project site

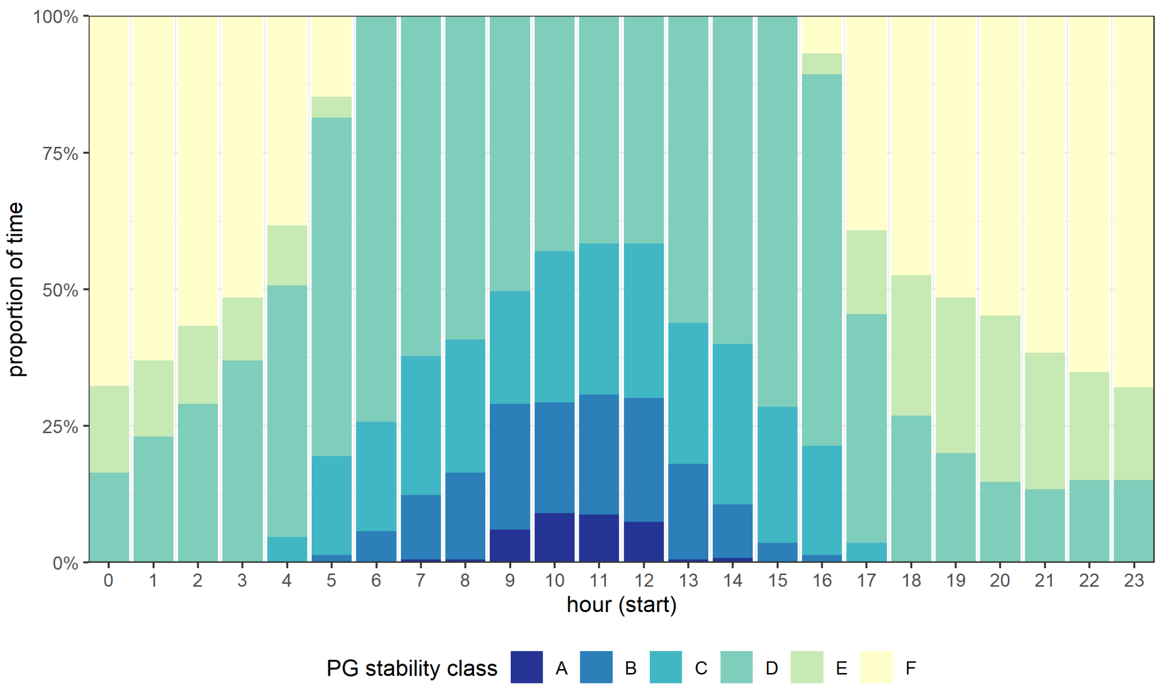

Figure 13.4: Proportion of stability class by hour of day

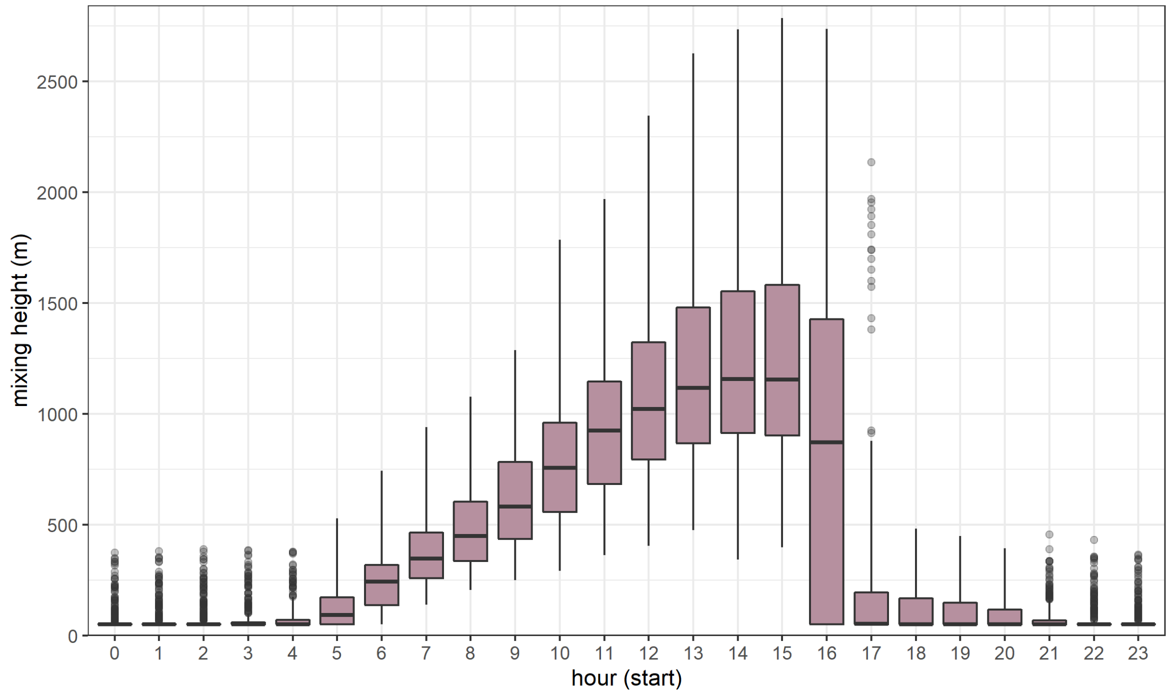

Figure 13.5: Box and whisker plot of mixing height data at the Project by hour of day

13.2.3 Sensitive receptors

Potential sensitive Receptors (SRs) identified in the vicinity of the Project are provided in Table 13.3, with locations shown in Figure 13.6. The SRs comprise rural dwellings and a commercial (mining) operation.

Of the potential SRs identified for the Project (as shown in Table 13.3) the potential receptors R5 (Meadowbrook Homestead), R6 (Lake Vermont Homestead), and the proposed Saraji East construction village (all owned by BMA) are subject to special conditions which limit their applicability for consideration as sensitive receptors. The Project Proponent has entered into a 'Co-existence Agreement' with BMA that, among other things, provides for the following:

- BMA and Bowen Basin Coal agree as to how the Saraji East Project and the Project may co-exist and how each party may assist, or at least not hinder, the development of the other party's project.
- BMA acknowledges and agrees that the Saraji East Project is adjacent to the Project and Bowen Basin Coal will be engaging in mining operations and/or associated activities in relation to the Project.
- BMA further expressly acknowledges and agrees that BMA shall make no objection or claim for compensation in relation to any nuisance to BMA's Saraji East Project (including, without limiting the generality of the foregoing, any accommodation, villages or camps for BMA's workers) caused by Bowen Basin Coal's mining operations and/or associated activities in relation to the Project (including, without limiting the generality of the foregoing, any noise, vibration, dust or light).
- BMA and Bowen Basin Coal acknowledge and agree that they will each use their reasonable endeavours and negotiate in good faith to resolve any disputes which may arise between the parties in relation to the Saraji East Project and the Project.
- The co-existence agreement has no completion date and will endure for the life of the Projects.

As a result of the above, BMA has confirmed its position that no specific regulator assessment and/or conditioning is required in relation to the LVM Project Environmental Authority application and any LVM Project interaction with the potential future Saraji East Project BMA village.

Table 13.3: Sensitive receptors

Receptor ID	Receptor type	Description	Easting (m)	Northing (m)	Distance and direction from the Project[1]
R1	Residential	Pownalls	653025.00	7512686.00	18.11 km north-west
R2	Residential	Seloh Nolem 1	652696.00	7532404.00	15.2 km south-west
R3	Residential	Old Kyewong	646743.00	7509949.00	16.49 km north-west
R4	Residential	Mockingbird Downs	652135.00	7513934.00	16.62 km west
R5	Residential	Meadowbrook Homestead[2]	638086.00	7520400.00	4.62 km north-east
R6	Residential	Lake Vermont Homestead[2]	640116.00	7516958.00	7.85 km north-east
R7	Residential	Willunga	666958.00	7529954.00	27.89 km west
R8	Residential	Leichardt	656328.00	7515670.00	19.09 km west
R9	Residential	Seloh Nolem 2	652770.00	7533482.00	15.83 km south-west
R10	Residential	Old Bombandy	657506.00	7516682.00	29.11 km west
R11	Residential	Vermont Park	647231.00	7537824.00	15.14 km south
R12	Residential	Saraji Homestead 1	629573.71	7519126.55	11.47 km east
R13	Residential	Saraji Homestead 3	630689.29	7522987.44	9.04 km east
R14	Commercial	BMA Saraji	631499.99	7520239.06	9.25 km east
R15	Residential	Iffley	647326.04	7539855.65	16.96 km south
R16	Residential	Tay Glen	635321.52	7509100.99	16.25 km north-east
R17	Residential	Semple Residence	649876.37	7506696.69	20.83 km north-west
R18	Residential	Saraji Homestead 2	630424.00	7523432.00	9.23 km east
n/a	Commercial	Proposed Saraji East Construction Village	636968.00	7526588.00	3.15 km east

[1] Distance and directions provided are from the centre point of the Project MIA.
[2] Meadowbrook and Lake Vermont homesteads are owned by BMA, with Meadowbrook unoccupied.

Meadowbrook Homestead is currently uninhabited, and BMA has confirmed it will not be used as a residence in the future. The Lake Vermont homestead is currently occupied by a tenant of BMA, with appropriate agreements in place with the residents to acknowledge adjacent mining impacts.

13.2.4 Regional air quality

The existing Lake Vermont Mine and the existing Saraji Mine represent the main sources of anthropogenic dust in the local region. Several other surrounding coal mines have also been identified as potential contributors to ambient dust concentrations. PM_{10} and $PM_{2.5}$ dust emissions from surrounding coal mines that have been reported to the National Pollutant Inventory (NPI) database for 2019/20 are included in Table 13.4 (Appendix L, Air Quality and GHG Assessment, Section 3.3).

Existing ambient air quality has been derived from publicly available data. Long-term, continuous monitoring data for dust deposition, PM_{10} and $PM_{2.5}$ is available from two DES monitoring stations in the township of Moranbah (approximately 58 km north-west of the Project site). These monitoring stations include Moranbah East in Utah Drive and Moranbah West in Cunningham Way. Due to the Moranbah West Station only commencing in July 2020, data available from this station has not been utilised for the assessments for PM_{10} and $PM_{2.5}$.

The Moranbah East weather station was the closest accessible monitoring station to the Project with long term (10 year) monitoring data. The Moranbah East station is situated within 10 km of the Isaac Plains coal mine, and within 18 km of the Peak Downs Coal Mine. Due to the location of the monitoring station and proximity to other similar mining projects, it was considered a suitable reference monitoring point. This monitoring station is near several established mines (Figure 13.7) and therefore the data provides a conservative reference baseline considering the location Project area is comparatively unimpacted by potential cumulative dust impacts.

Moranbah East PM_{10} data shows (particularly in the years 2012, 2018, and 2019) many concentrations greater than 50 µg/m (being the EPP Air objective, as shown in Table 13.1). Monthly monitoring reports issued by DES indicate this is resultant of several influences, including nearby housing construction, bushfires and dust storms. The highest 70th percentile value over the range of years monitored has been adopted for ambient background concentrations for cumulative air quality assessments on the basis that it is an appropriate criterion against which the results of the air quality monitoring could be compared. It was used to reduce the incidence of extreme isolated events on otherwise typical days that may contribute to biased or inaccurate results.

The Moranbah East Station also recorded $PM_{2.5}$ concentrations greater than the 24-hour and annual averaging objectives (Table 13.1) in 2019 and 2020, again influenced by nearby housing construction, bushfires and dust storms (Appendix L, Air Quality and GHG Assessment, Section 3.3).

Ambient background concentrations of TSP, PM_{10}, $PM_{2.5}$ and dust deposition are summarised in Table 13.5:. Background levels of PM_{10} and $PM_{2.5}$ are calculated based on publicly available information from Moranbah East Station (Appendix L, Air Quality and GHG Assessment, Section 3.3). Dust deposition is calculated using 18 months of validated data from Moranbah East Station. The maximum rolling annual average is calculated at 79.4 mg/m^2/day against a relevant objective of 120 µg/m^3 (Table 13.1).

Monitoring for TSP is not conducted at the DES Moranbah sites. TSP was, therefore, calculated from DES Moranbah PM_{10} data, using TSP/ PM_{10} ratios found in the NPI EET Manual (DCCEEW 2012), using emission factors for fugitive dust that range from 25% to 52%. An annual TSP concentration was calculated at 44.2 µg/m^3, against the relevant objective of 90 µg/m^3 (Table 13.5).

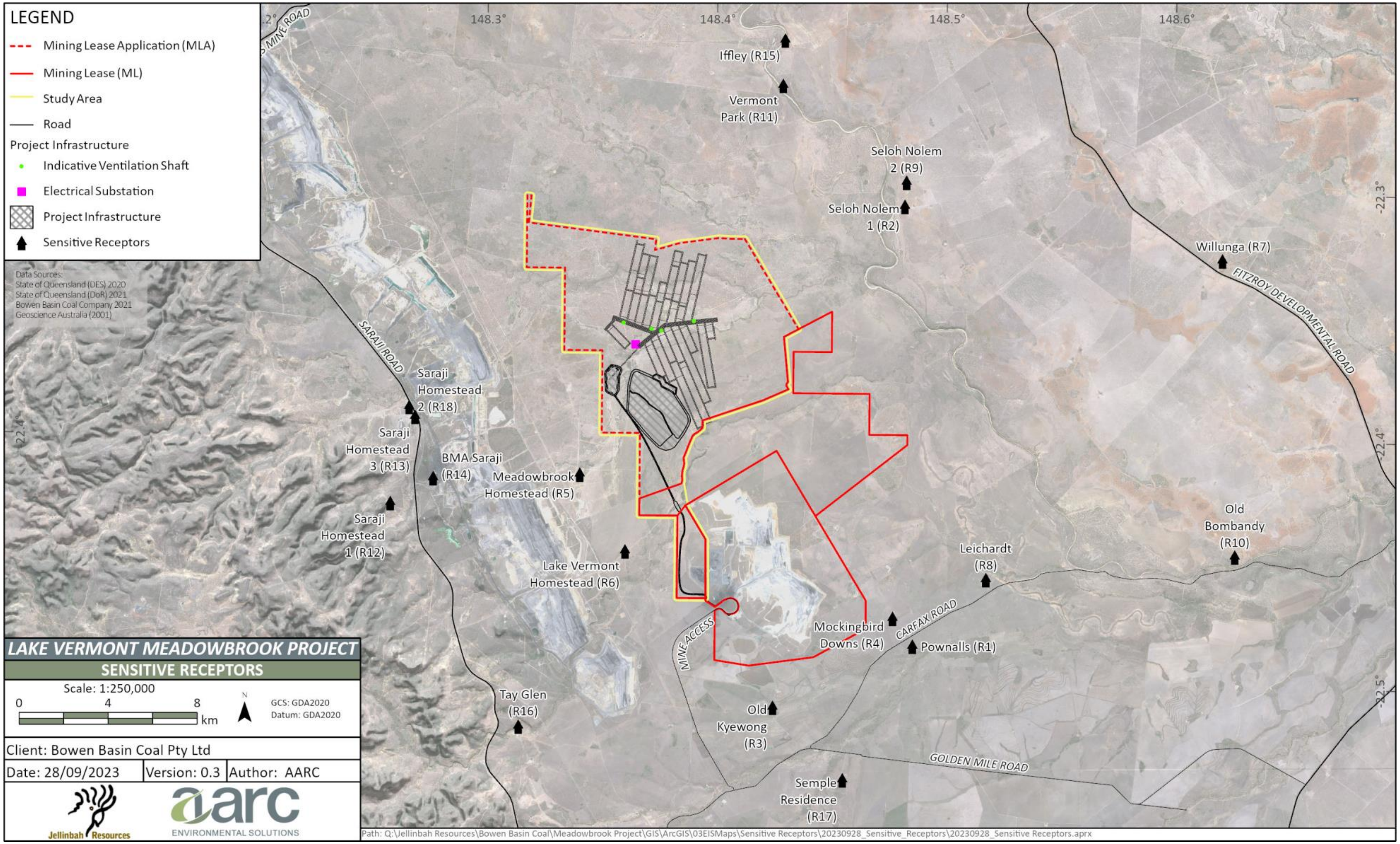

Figure 13.6: Sensitive receptors

Table 13.4: Dust emissions reported to NPI for 2019/2020

Mine sites	Approximate location from the Project boundary	PM_{10} (tonnes/year)	$PM_{2.5}$ (tonnes/year)
Lake Vermont Mine	6 km south	9,921	663
Saraji Mine	13 km west	8,218	167
South Walker Creek Mine	20 km north-west	3,458	57
Peak Downs Mine	27 km north-west	14,600	191
Poitrel Coal Mine	42 km north	2,340	76
Daunia Mine	42 km north	1,934	69
Caval Ridge Mine	44 km north-west	7,588	109
Millennium Coal Mine	45 km north-west	1,834	9
Carborough Downs Coal Mine	45 km north-west	1,552	6
Moorvale Mine	52.3 km north	4,693	72
Isaac Plains Coal Mine	63.6 km north-west	2,982	48
Coppabella Coal Mine	65.3 km north-east	7,351	3
Grosvenor	68.2 km north-west	955	23

Table 13.5: Ambient background concentrations

Air quality indicator	Period	Concentration
TSP	Annual	44.2 µg/m^3
PM_{10}	24-hour, 70th percentile	27.2 µg/m^3
	Annual	22.1 µg/m^3
$PM_{2.5}$	24-hour, 70th percentile	6.6 µg/m^3
	Annual	6.4 µg/m^3
Dust deposition	Annual average	79.4 mg/m^2/day

13.3 Potential impacts

13.3.1 Air quality modelling methodology

To assess air quality impacts resultant of the proposed Project, potential dust emissions from individual mining activities have been explicitly modelled.

Dust emission rates have been estimated using the base equation:

$$ER = A \times EF \times (1 - CF)$$

where:

ER = emission rate

A = activity/operations data

EF = emission factor

CF = reduction in emissions due to the implementation of control measures.

Emissions of TSP, PM_{10} and $PM_{2.5}$ from mining activities have been estimated using recognised and accepted methods of dust emissions estimation. These include approximation of emission rates from NPI emissions estimation technique handbooks and the United States Environmental Protection Agency (US EPA) AP-42 emission handbooks (USEPA, 1998, USEPA, 2006a, USEPA, 2006b, USEPA, 2006c, USEPA, 2011) (Appendix L, Air Quality and GHG Assessment, Section 3.4).

The emissions estimation techniques applied for this assessment has been based on standard methods applied throughout Australia and the United States. These methods are consistent with those adopted for other air quality assessments conducted for other coal mines in Australia. The size distribution of dust particles is derived from the emission rates estimated for TSP, PM_{10} and $PM_{2.5}$ (Appendix L, Air Quality and GHG Assessment, Section 3.4).

13.3.1.1 Modelling scenarios

Potential air quality impacts have been assessed for the mining operations during Project Year 7 (indicatively 2032) and Project Year 22 (indicatively 2047). Project Year 7 is representative of a high production year for the proposed underground mine, while Project Year 22 represents a period of overlap between the proposed underground mine and the proposed open-cut pit mining operations. These years have been selected as indicative of worst-case impacts on air quality.

Project activities that will generate emissions to air have been considered across a number of Project phases. These phases include construction, operations and closure of the proposed Project. Upset conditions (being periods of excessive dust emissions) have also been considered in modelling undertaken for the Project (Appendix L, Air Quality and GHG Assessment, Section 3.5).

In respect of dust emissions, it is acknowledged that Bowen Basin Coal has mitigation measures in place at the existing Lake Vermont Mine that will remain in place for the Project. Mitigation measures are discussed further in section 13.4. It is conservatively estimated that Bowen Basin Coal apply dust mitigation measures a minimum of 24 days per year. As such, this level of mitigation has been built into modelling scenarios.

Construction

Dust emissions (point source and diffuse source emissions) from construction activities are predicted to be minimal compared to the existing Lake Vermont Mine operations. The bulk of the construction activity will be associated with the development of the proposed mine infrastructure area and the development of the proposed infrastructure corridor. Best practices with regard to emission controls are already in place at the existing Lake Vermont Mine, with these proposed to be continued during construction activities to further reduce dust emissions (Appendix L, Air Quality and GHG Assessment, Section 3.5).

Operations

Project activities that are associated with emissions of particulate matter include the following point source emissions:

- transfers and handling of material; and
- emissions from stockpiles.

Diffuse emission sources will include:

- extraction of material;
- haulage; and
- wind erosion of exposed areas.

Emissions of oxides of nitrogen, sulphur dioxide and carbon monoxide would occur due to blasting activities and vehicle movements on-site which are diffuse sources of emission. However, these emissions are transient (contained within the haul road infrastructure corridor and open-cut pits) and low in magnitude; thus, their impact is likely to be negligible. Flaring of gas, a point source emission, as part of gas drainage of the underground coal seam, will occur where practicable. However, this is not expected to contribute adversely to the air quality of the area (Appendix L, Air Quality and GHG Assessment, Section 3.5).

For the majority of activities, the emission rate of particulate matter is dependent on wind speed, with little or no emissions occurring for some activities (e.g. stockpiles) below a wind speed threshold (Appendix L, Air Quality and GHG Assessment, Section 3.5).

Closure and rehabilitation

As the Project nears the end of its life, BBC will engage relevant stakeholders to undertake a decommissioning and rehabilitation process. Infrastructure assets will be either retained, sold, recycled, relocated or disposed of as either general or regulated waste. Progressive rehabilitation will be undertaken at the existing Lake Vermont Mine as soon as practicable and will be underway during this Project.

The Progressive Rehabilitation and Closure Plan will detail the milestones and schedule for the Project decommissioning, but it is expected that decommissioning of the proposed Project will proceed in a similar way to the process implemented at the existing Lake Vermont Mine. Emissions from rehabilitated areas are expected to be less than operational emissions.

13.3.1.2 Cumulative air quality assessment

The Project is close to several existing and proposed mining projects, as shown in Figure 13.7.

Due to its proximity to the Project, dust emissions from the existing Lake Vermont Mine have been included in the dispersion modelling of the proposed underground and open-cut mines. It would also be expected that ambient concentrations of dust would be elevated due to the other existing and proposed mining operations in the vicinity of the Project. Hence, representative background levels of TSP, PM_{10}, $PM_{2.5}$ and dust deposition have been acquired from monitoring in the area and have been added to the results of the dispersion modelling to determine the complete potential impact of the Project (Appendix L, Air Quality and GHG Assessment, Section 3.4). The inclusion of these background particulate levels in the modelling are considered to represent conditions inclusive of all existing and proposed Projects contributing to air quality, including proposed operations adjacent to the Project.

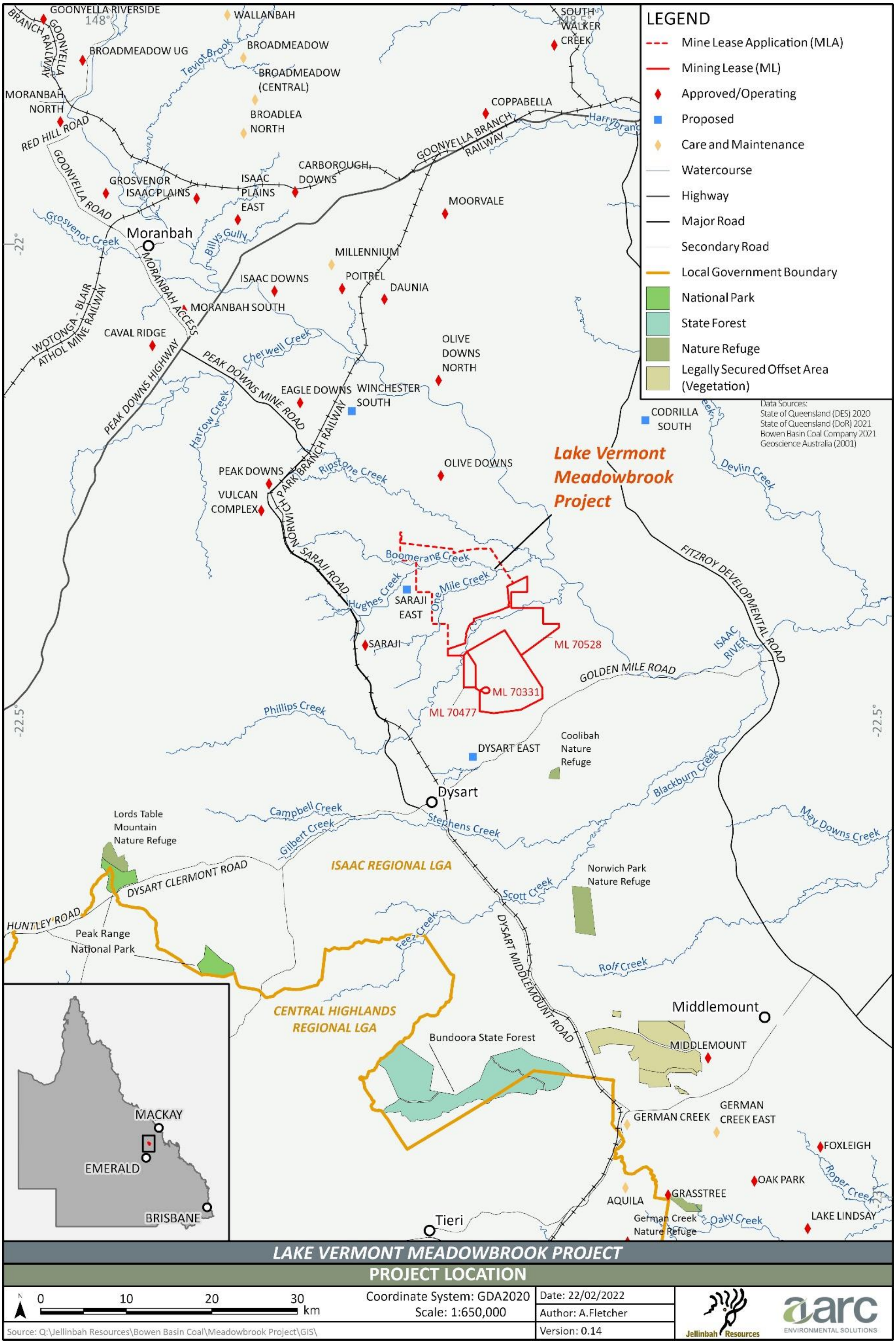

Figure 13.7: Project location in respect of existing and proposed mining projects

13.3.2 Air quality emissions results

A summary of emissions has been developed for the two modelled Project years (Year 7 and Year 22). Results have been determined for each modelled year.

13.3.2.1 Project Year 7

Predicted ground-level concentrations of TSP and dust deposition rates for Project Year 7 are presented in Table 13.6. Predicted ground-level concentrations of $PM_{2.5}$ and PM_{10} are presented in Table 13.7. The results of the cumulative assessment are presented as contour plots in Figure 13.8 to Figure 13.14. Results are sourced from Appendix L (Air Quality and GHG Assessment, Section 3.6) and have been presented as:

- Proposed emissions—the Project underground mine operations in isolation;
- Combined emissions—the Project underground mine operations and Lake Vermont Mine operations in isolation; and
- Cumulative emissions—the combined emissions with the ambient backgrounds representative of impacts from existing and proposed operations included.

Results from Year 7 modelling illustrate that:

- Predicted annual average concentrations of TSP comply with the Air EPP objective at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.
- Predicted maximum monthly dust deposition rates comply with the EA limit at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.
- Predicted 24-hour average concentrations of $PM_{2.5}$ comply with the Air EPP objective at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.
- Predicted annual average concentrations of $PM_{2.5}$ comply with the Air EPP objective at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.
- Predicted 24-hour average concentrations of PM_{10} comply with the EA limit at all sensitive receptors in Project in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations. Additional dust mitigation measures have been applied that reflect current proactive management practices (Appendix L, Air Quality and GHG Assessment, Section 3.6).
- Predicted annual average concentrations of PM_{10} comply with the Air EPP objective at all assessed Project sensitive receptors in isolation, using standard mitigation measures for the Project and the existing operations.

Table 13.6: Predicted annual average TSP and dust deposition rates for Project Year 7

Receptors		TSP (µg/m3)			Dust deposition (mg/m2/day)		
		Annual			Max monthly		
		Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG
R1	Pownalls	0.1	0.7	44.9	0.2	3.0	82.4
R2	Seloh Nolem 1	0.1	0.5	44.7	0.1	0.6	80.0
R3	Old Kyewong	0.2	3.0	47.2	0.5	5.2	84.6
R4	Mockingbird Downs	0.1	1.5	45.7	0.2	7.6	87.0
R7	Willunga	0.01	0.1	44.3	0.04	0.5	79.9
R8	Leichardt	0.03	0.3	44.5	0.1	2.0	81.4
R9	Seloh Nolem 2	0.1	0.4	44.6	0.1	0.6	80.0
R10	Old Bombandy	0.02	0.2	44.4	0.1	1.8	81.2
R11	Vermont Park	0.1	0.8	45.0	0.1	0.9	80.3
R12	Saraji Homestead 1	0.4	1.0	45.2	0.8	3.9	83.3
R13	Saraji Homestead 3	0.5	1.3	45.5	1.2	4.7	84.1
R14	BMA Saraji	0.6	1.5	45.7	1.3	5.1	84.5
R15	Iffley	0.1	0.6	44.8	0.1	0.7	80.1
R16	Tay Glen	0.4	1.4	45.6	1.2	6.1	85.5
R17	Semple Residence	0.1	1.0	45.2	0.3	1.2	80.6
R18	Saraji Homestead 2	0.5	1.2	45.4	1.1	4.3	83.7
Objective		**90 µg/m³ (EPP, Air)**			**120 µg/m³ (DES 2017b)**		

Table 13.7: Predicted 24 hour and annual average $PM_{2.5}$ and PM_{10} for Project Year 7

Receptors		$PM_{2.5}$ (µg/m³)						PM_{10} (µg/m³)								
		24-hour			Annual			24-hour Maximum [a]			24-hour 6th Highest [a]			Annual		
		Proposed	Combined	Combined +BG	Proposed	Combined	Combined +BG	Proposed	Combined	Combined +BG	Proposed	Combined	Combined +BG	Proposed	Combined	Combined+BG
R1	Pownalls	0.9	4.1	10.7	0.02	0.1	6.5	2.1	15.3	42.5	0.6	6.1	33.3	0.04	0.5	22.6
R2	Seloh Nolem 1	0.7	2.0	8.6	0.03	0.1	6.5	1.6	8.6	35.8	1.3	6.6	33.8	0.1	0.4	22.5
R3	Old Kyewong	1.6	4.9	11.5	0.1	0.6	7.0	3.5	17.8	45.0	2.2	13.3	40.5	0.2	2.5	24.6
R4	Mockingbird Downs	1.5	5.3	11.9	0.03	0.2	6.6	3.5	18.7	45.9	1.1	14.1	41.3	0.1	1.1	23.2
R7	Willunga	0.2	0.6	7.2	0.004	0.02	6.4	0.5	2.8	30.0	0.2	1.4	28.6	0.01	0.1	22.2
R8	Leichardt	1.0	3.1	9.7	0.01	0.05	6.4	2.4	9.3	36.5	0.3	3.6	30.8	0.02	0.2	22.3
R9	Seloh Nolem 2	0.7	1.8	8.4	0.03	0.1	6.5	1.7	8.6	35.8	1.1	6.6	33.8	0.1	0.4	22.5
R10	Old Bombandy	0.7	2.2	8.8	0.01	0.04	6.4	1.45	7.7	34.9	0.4	3.2	30.4	0.02	0.2	22.3
R11	Vermont Park	1.1	2.5	9.1	0.04	0.2	6.6	3.0	10.4	37.6	1.7	8.0	35.2	0.1	0.7	22.8
R12	Saraji Homestead 1	1.0	2.1	8.7	0.1	0.3	6.7	2.0	4.5	31.7	1.6	3.7	30.9	0.3	0.8	22.9
R13	Saraji Homestead 3	1.4	2.4	9.0	0.2	0.4	6.8	2.9	5.8	33.0	2.2	5.2	32.4	0.5	1.1	23.2
R14	BMA Saraji	1.4	2.5	9.1	0.2	0.4	6.8	3.0	7.0	34.2	2.5	5.5	32.7	0.5	1.3	23.4
R15	Iffley	0.9	2.3	8.9	0.04	0.1	6.5	2.4	9.5	36.7	1.4	5.8	33.0	0.1	0.5	22.6
R16	Tay Glen	1.6	3.4	10.0	0.1	0.4	6.8	3.6	9.0	36.2	2.0	5.7	32.9	0.3	1.2	23.3
R17	Semple Residence	1.1	5.1	11.7	0.03	0.2	6.6	2.6	13.9	41.1	1.4	9.5	36.7	0.1	0.9	23.0
R18	Saraji Homestead 2	1.4	2.4	9.0	0.20	0.4	6.8	2.8	5.8	33.0	2.1	5.1	32.3	0.4	1.0	23.1
Objective		**25 µg/m³**			**8 µg/m³**			**50 µg/m³**						**25 µg/m³**		

[a] An additional 50% control factor has been applied to existing overburden haul roads for 24 days of the year to reflect proactive dust controls

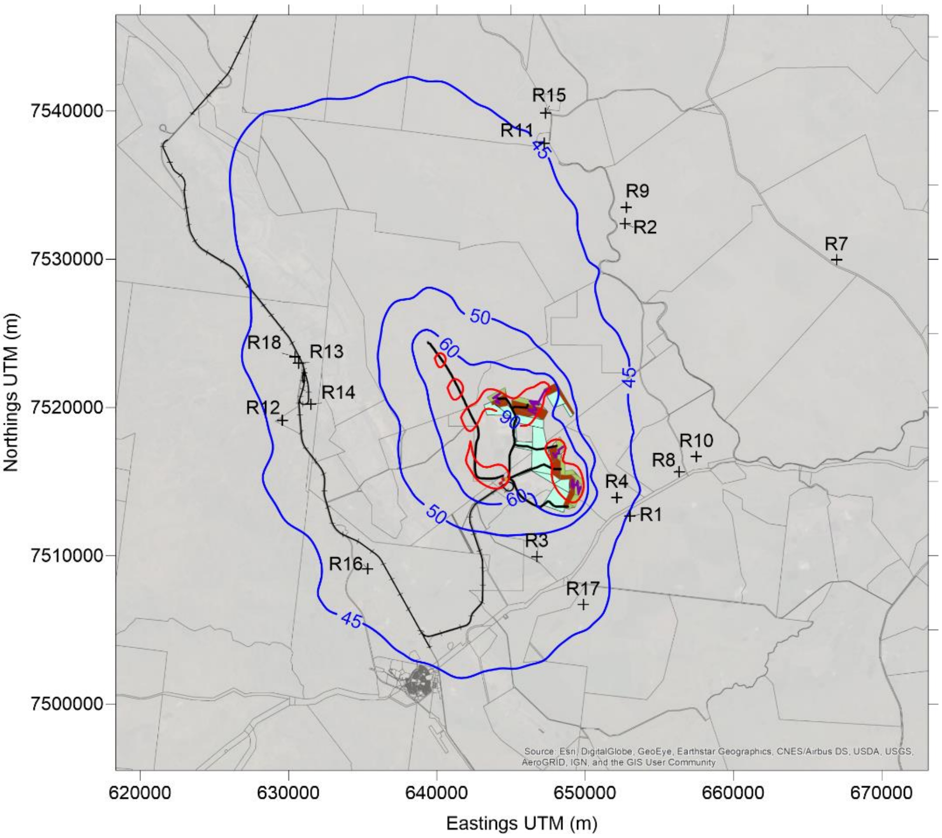

Figure 13.8: Predicted annual average TSP (µg/m^3) cumulative emissions Year 7

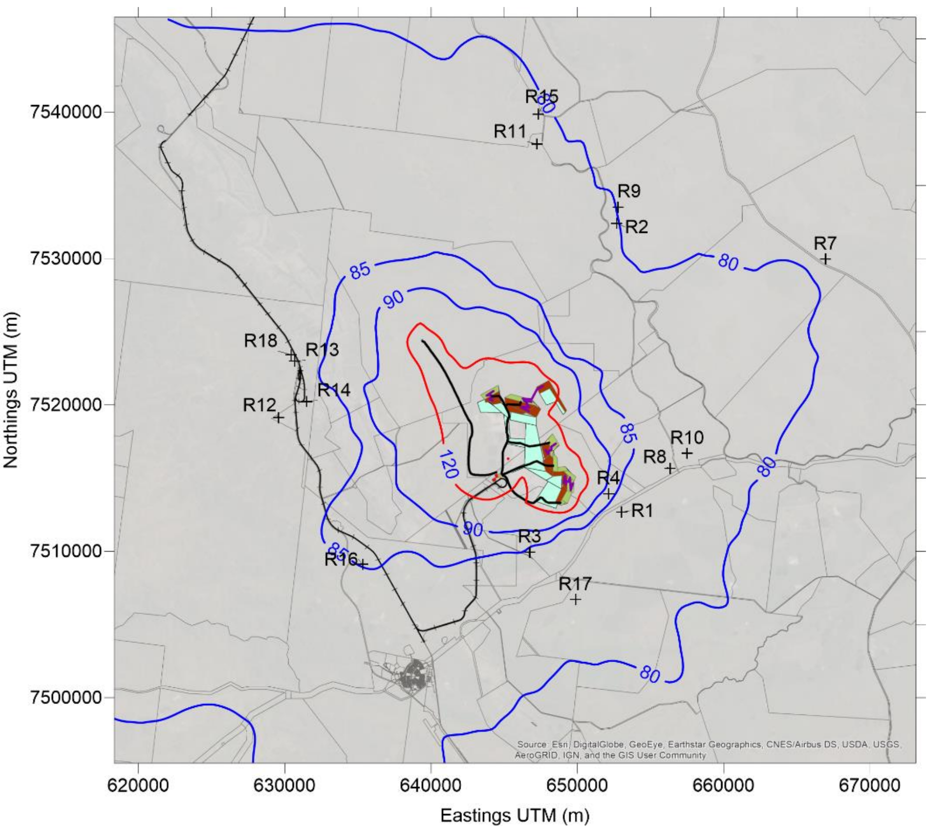

Figure 13.9: Predicted maximum monthly dust deposition (mg/m^2/day) cumulative emissions Year 7

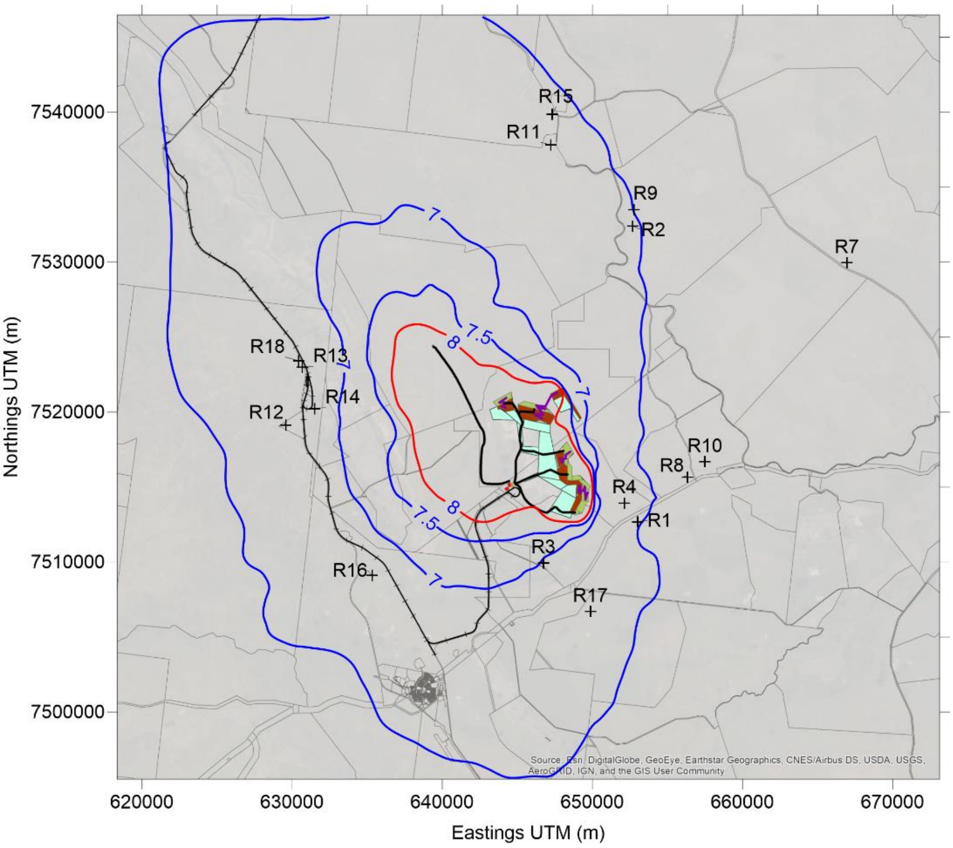

Figure 13.10: Predicted annual average $PM_{2.5}$ (µg/m^3) cumulative emissions Year 7

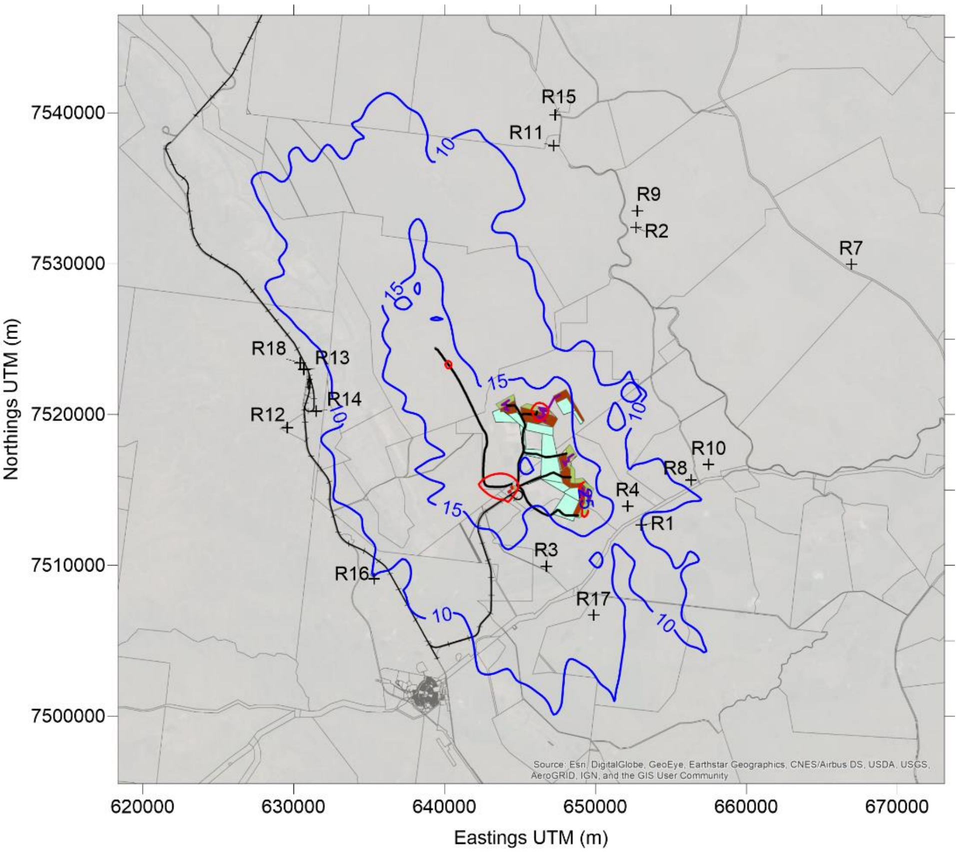

Figure 13.11: Predicted 24-hour maximum $PM_{2.5}$ (µg/m^3) cumulative emissions Year 7

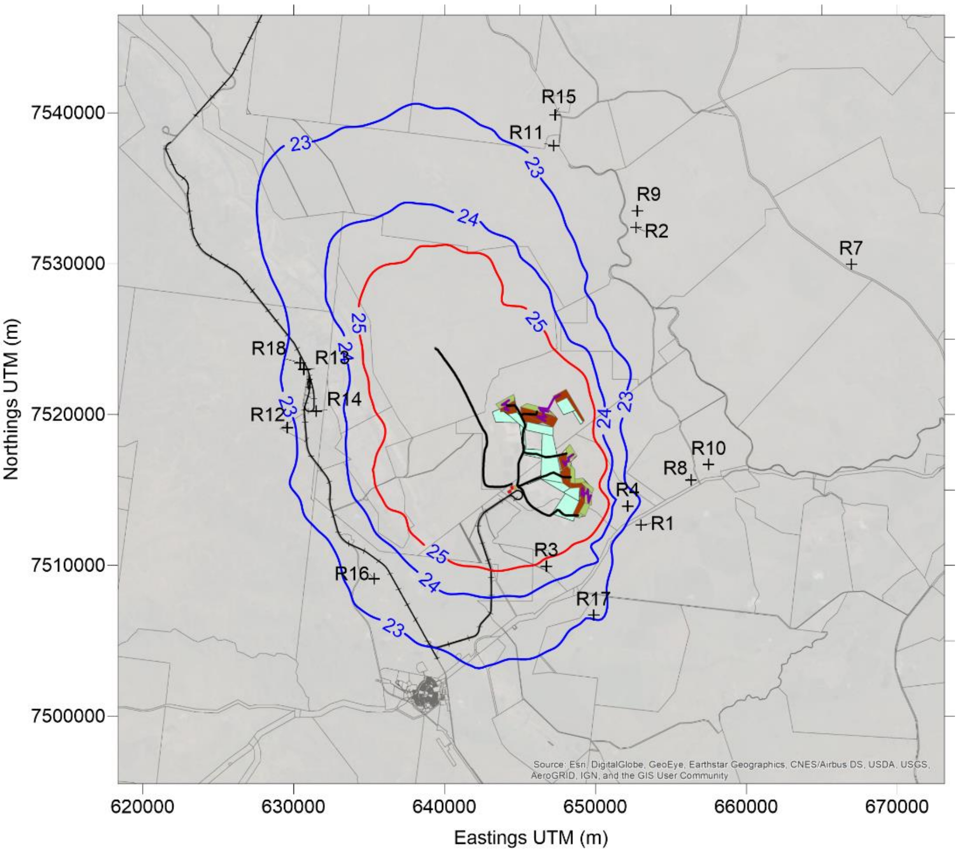

Figure 13.12: Predicted annual average PM_{10} ($\mu g/m^3$) cumulative emissions Year 7

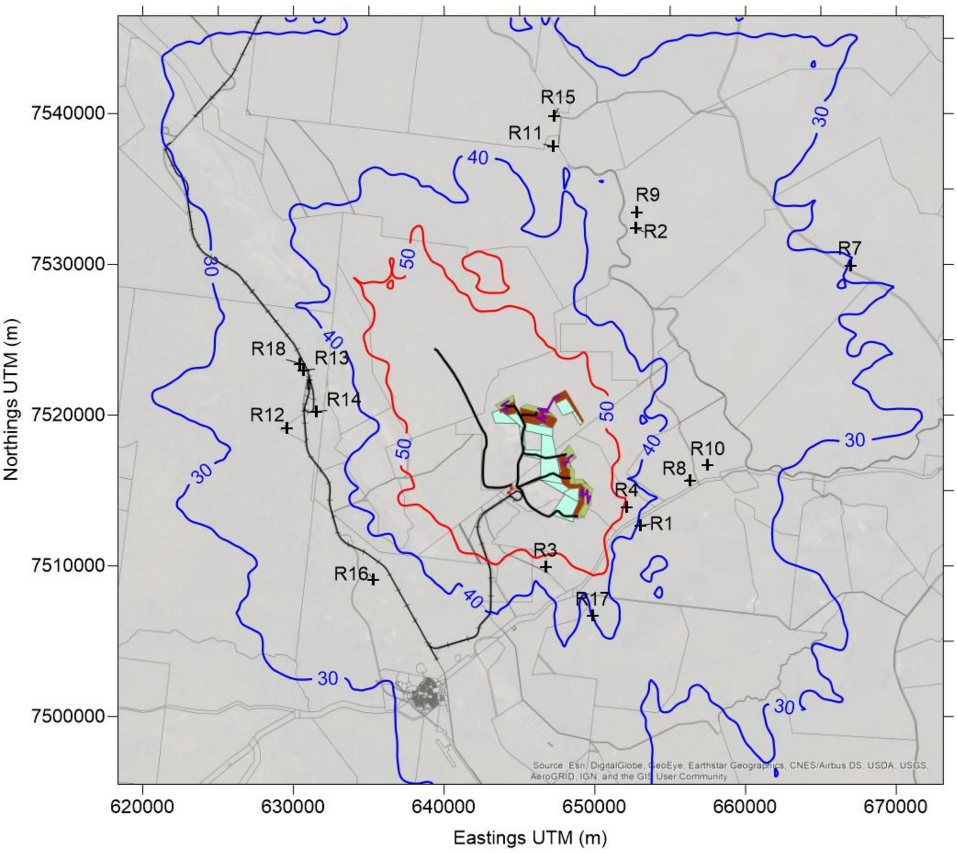

Figure 13.13: Predicted 24-hour maximum PM^{10} ($\mu g/m^3$) cumulative emissions Year 7

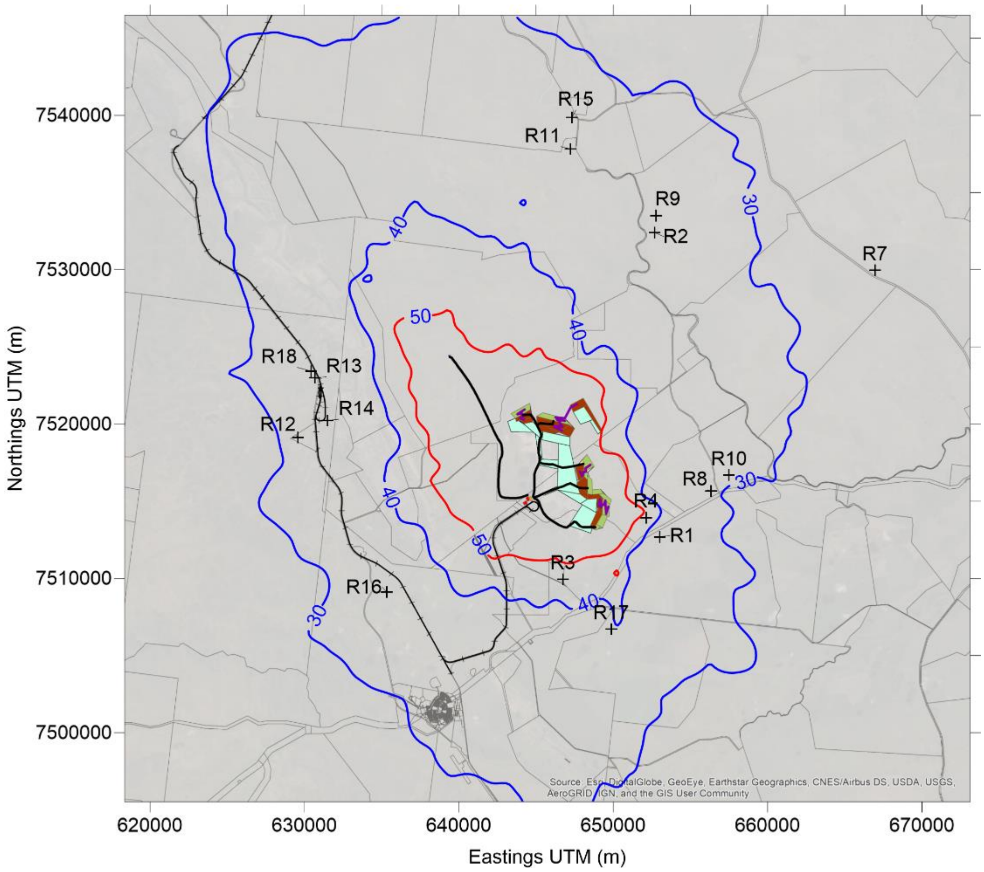

Figure 13.14: Predicted 6th highest PM_{10} ($\mu g/m^3$) cumulative emissions Year 7

13.3.2.2 Project Year 22

Predicted ground-level concentrations of TSP and dust deposition rates for Project Year 22 are presented in Table 13.8. Predicted ground-level concentrations of $PM_{2.5}$ and PM_{10} are presented in Table 13.9. The results of the cumulative assessment are presented as contour plots in Figure 13.15 to Figure 13.21. Results are sourced from Appendix L (Air Quality and GHG Assessment, Section 3.6) and have been presented as:

- Proposed—the Project underground mine operations and Lake Vermont Mine open-cut mine operations in isolation;
- Combined—the Project underground mine operations, open-cut mine operations and existing Lake Vermont Mine operations in isolation; and
- Cumulative—combined emissions with ambient backgrounds included.

Results from Year 22 modelling illustrate that:

- Predicted annual average concentrations of TSP comply with the Air EPP objective at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.
- Predicted maximum monthly dust deposition rates comply with the EA limit at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.
- Predicted 24-hour average concentrations of $PM_{2.5}$ comply with the Air EPP objective at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.

- Predicted annual average concentrations of $PM_{2.5}$ comply with the Air EPP objective at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.
- Predicted 24-hour average concentrations of PM_{10} comply with the EA limit at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations. Additional dust mitigation measures have been applied that reflect current proactive management practices.
- Predicted annual average concentrations of PM_{10} comply with the Air EPP objective at all assessed Project sensitive receptors in isolation and cumulatively, using standard mitigation measures for the Project and the existing operations.

Table 13.8: Predicted annual average TSP and dust deposition rates for Project Year 22

Receptors		TSP (µg/m³)			Dust deposition (mg/m²/day)		
		Annual			Max monthly		
		Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG
R1	Pownalls	0.1	0.4	44.6	0.2	1.5	80.9
R2	Seloh Nolem 1	0.1	0.6	44.8	0.3	0.8	80.2
R3	Old Kyewong	0.3	1.3	45.5	0.6	1.9	81.3
R4	Mockingbird Downs	0.1	0.7	44.9	0.3	2.8	82.2
R7	Willunga	0.02	0.1	44.3	0.1	0.6	80.0
R8	Leichardt	0.05	0.3	44.5	0.1	1.3	80.7
R9	Seloh Nolem 2	0.1	0.5	44.7	0.2	0.6	80.0
R10	Old Bombandy	0.04	0.2	44.4	0.1	1.2	80.6
R11	Vermont Park	0.2	1.0	45.2	0.2	1.4	80.8
R12	Saraji Homestead 1	0.6	1.3	45.5	1.8	4.4	83.8
R13	Saraji Homestead 3	0.9	1.9	46.1	2.0	6.2	85.6
R14	BMA Saraji	1.0	2.0	46.2	2.6	5.8	85.2
R15	Iffley	0.2	0.8	45.0	0.2	1.0	80.4
R16	Tay Glen	0.5	1.3	45.5	1.3	4.9	84.3
R17	Semple Residence	0.1	0.6	44.8	0.3	0.8	80.2
R18	Saraji Homestead 2	0.9	1.9	46.1	1.9	5.8	85.2
Objective		**90 µg/m³ (EPP, Air)**			**120 µg/m³ (DES 2017b)**		

Table 13.9: Predicted 24-hour and annual average $PM_{2.5}$ and PM_{10} for Year 22

Receptors		PM2.5 (µg/m3)						PM10 (µg/m3)								
		24-hour			Annual			24-hour Maximum			24-hour 6th Highest			Annual		
		Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG
R1	Pownalls	0.96	3.0	9.6	0.02	0.1	6.5	2.4	9.1	36.3	1.3	5.1	32.3	0.1	0.4	22.5
R2	Seloh Nolem 1	1.39	3.2	9.8	0.04	0.1	6.5	4.4	10.4	37.6	2.3	7.6	34.8	0.1	0.5	22.6
R3	Old Kyewong	2.36	7.4	14.0	0.09	0.3	6.7	5.9	17.0	44.2	2.9	12.7	39.9	0.2	1.2	23.3
R4	Mockingbird Downs	1.53	4.4	11.0	0.03	0.1	6.5	3.5	13.8	41.0	1.9	8.8	36.0	0.1	0.6	22.7
R7	Willunga	0.31	1.0	7.6	0.01	0.02	6.4	0.7	4.2	31.4	0.3	1.4	28.6	0.01	0.1	22.2
R8	Leichardt	1.12	2.8	9.4	0.01	0.1	6.5	2.7	9.9	37.1	0.6	4.1	31.3	0.04	0.2	22.3
R9	Seloh Nolem 2	1.15	3.9	10.5	0.03	0.1	6.5	3.5	11.4	38.6	2.0	6.3	33.5	0.11	0.5	22.6
R10	Old Bombandy	0.89	3.0	9.6	0.01	0.04	6.4	2.1	11.9	39.1	0.4	2.3	29.5	0.03	0.2	22.3
R11	Vermont Park	1.49	7.2	13.8	0.06	0.2	6.6	5.3	20.7	47.9	3.8	10.9	38.1	0.20	1.0	23.1
R12	Saraji Homestead 1	1.36	2.8	9.4	0.17	0.3	6.7	3.7	6.9	34.1	2.5	5.5	32.7	0.5	1.1	23.2
R13	Saraji Homestead 3	2.03	3.6	10.2	0.27	0.5	6.9	5.7	9.8	37.0	3.9	8.0	35.2	0.8	1.6	23.7
R14	BMA Saraji	1.96	3.8	10.4	0.28	0.5	6.9	5.5	9.7	36.9	4.6	8.8	36.0	0.8	1.7	23.8
R15	Iffley	1.41	5.6	12.2	0.05	0.2	6.6	4.2	16.9	44.1	2.7	8.4	35.6	0.2	0.7	22.8

Receptors		PM2.5 (µg/m3)						PM10 (µg/m3)								
		24-hour			Annual			24-hour Maximum			24-hour 6th Highest			Annual		
		Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG	Proposed	Combined	Combined + BG
R16	Tay Glen	1.55	2.9	9.5	0.16	0.3	6.7	3.7	9.6	36.8	2.5	7.8	35.0	0.4	1.1	23.2
R17	Semple Residence	1.07	4.9	11.5	0.04	0.2	6.6	2.6	16.9	44.1	1.5	5.5	32.7	0.1	0.5	22.6
R18	Saraji Homestead 2	2.13	3.6	10.2	0.27	0.5	6.9	6.1	9.2	36.4	3.9	8.0	35.2	0.8	1.6	23.7
Objective		**25 µg/m3**			**8 µg/m3**			**50 µg/m3**						**25 µg/m3**		

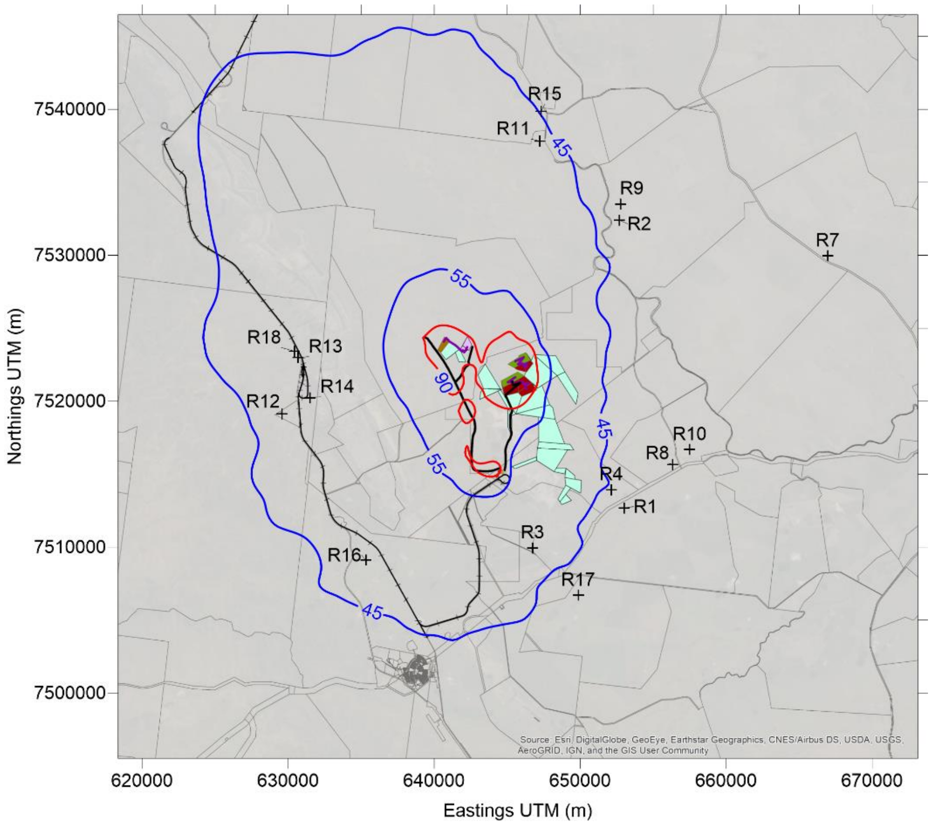

Figure 13.15: Predicted annual average TSP (µg/m³) cumulative emissions Year 22

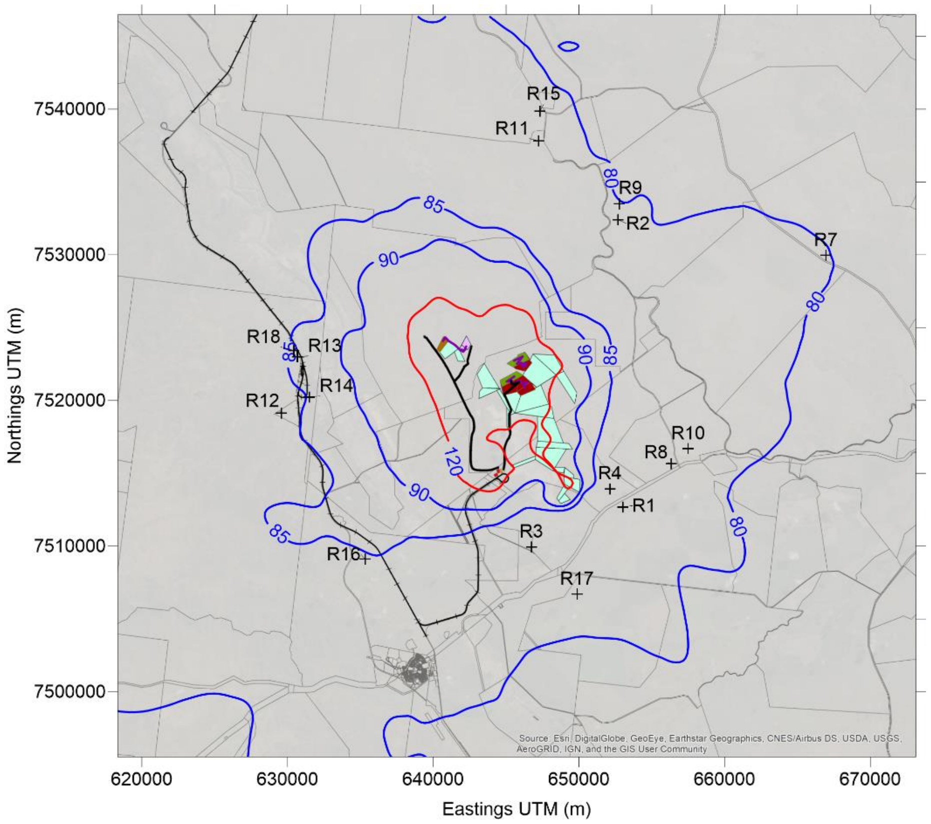

Figure 13.16: Predicted maximum monthly dust deposition (mg/m²/day) cumulative emissions Year 22

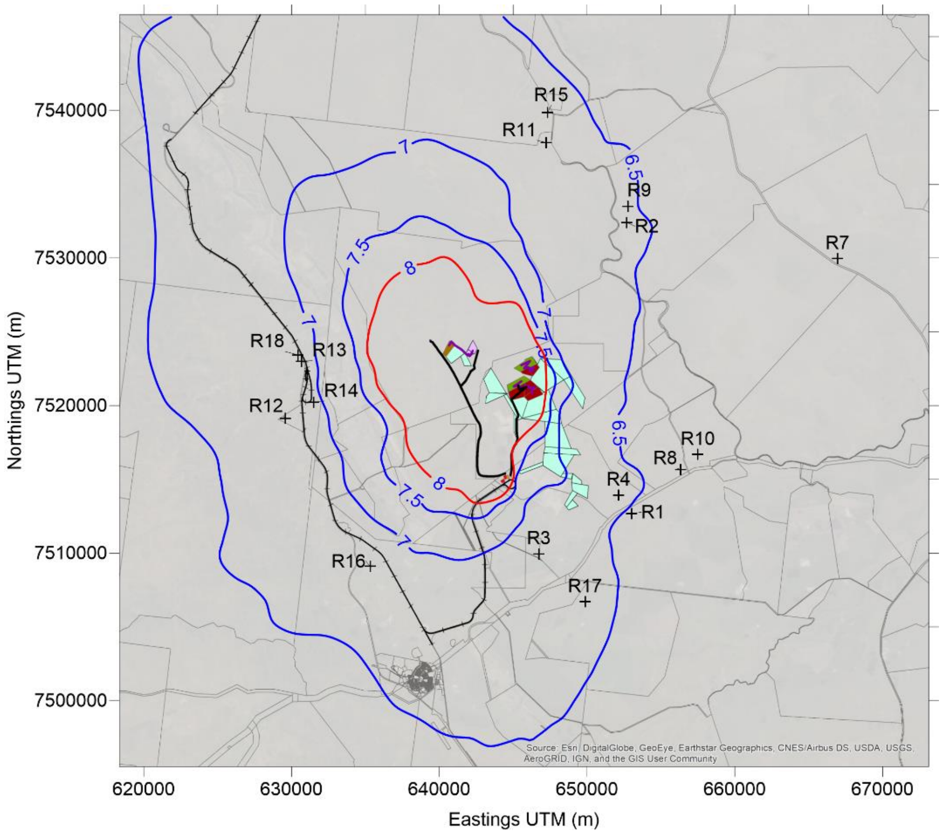

Figure 13.17: Predicted annual average PM2.5 levels (µg/m³) cumulative emissions for Year 22

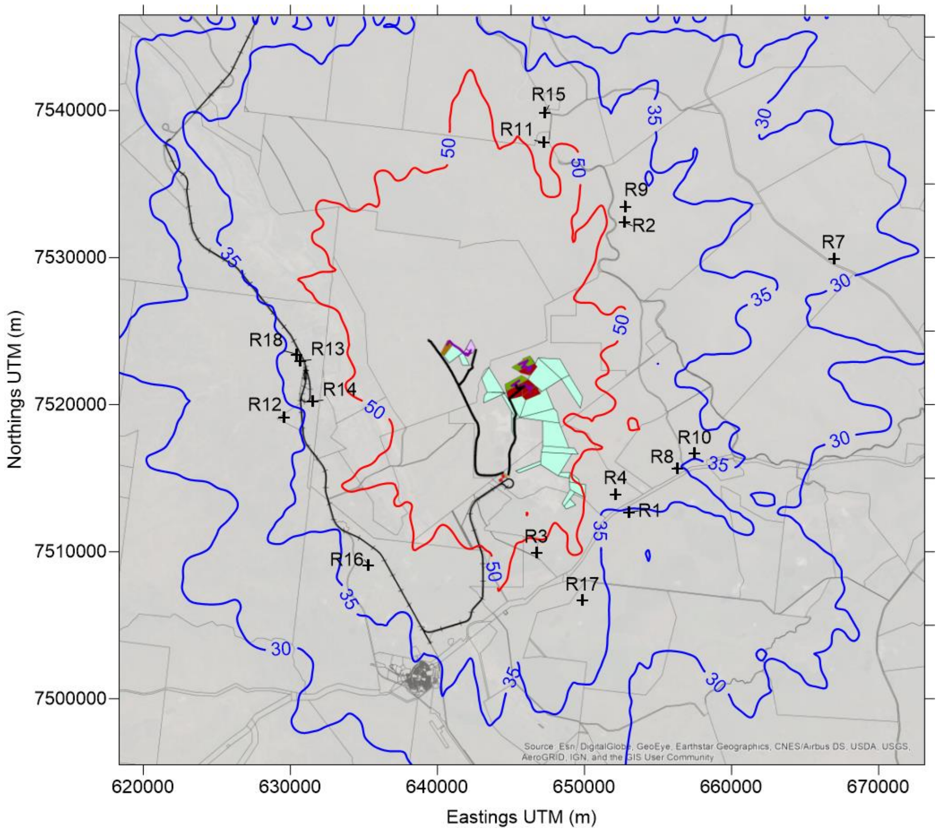

Figure 13.18: Predicted 24-hour maximum PM2.5 levels (µg/m³) cumulative emissions for Year 22

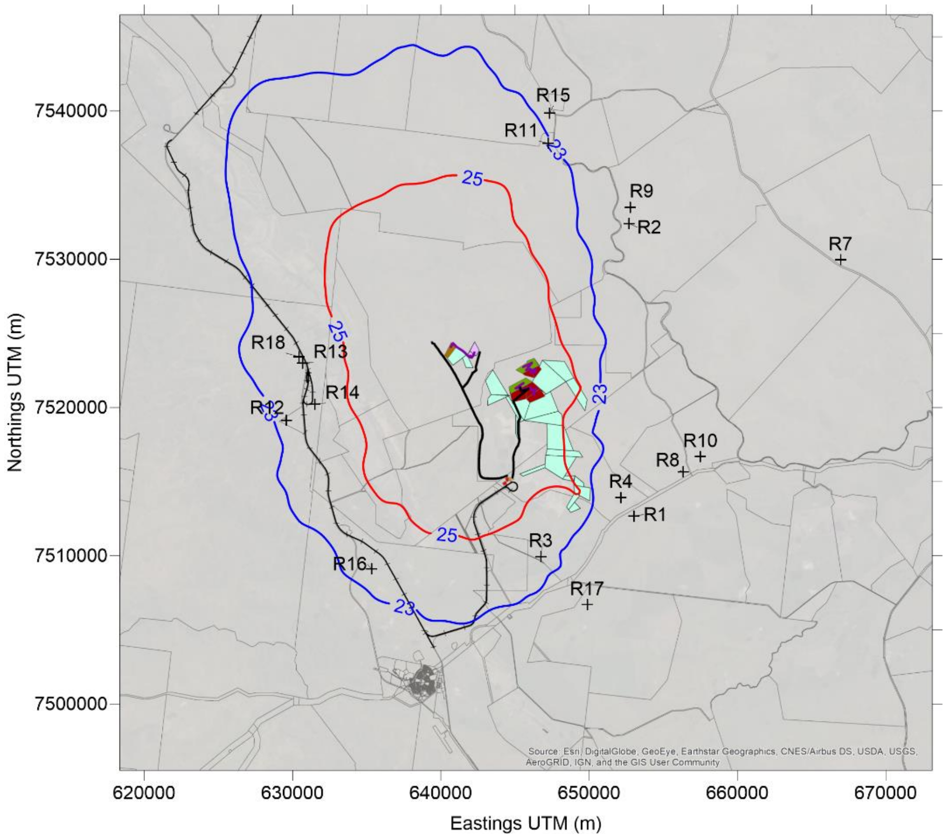

Figure 13.19: Predicted annual average PM_{10} levels (µg/m^3) cumulative emissions for Year 22

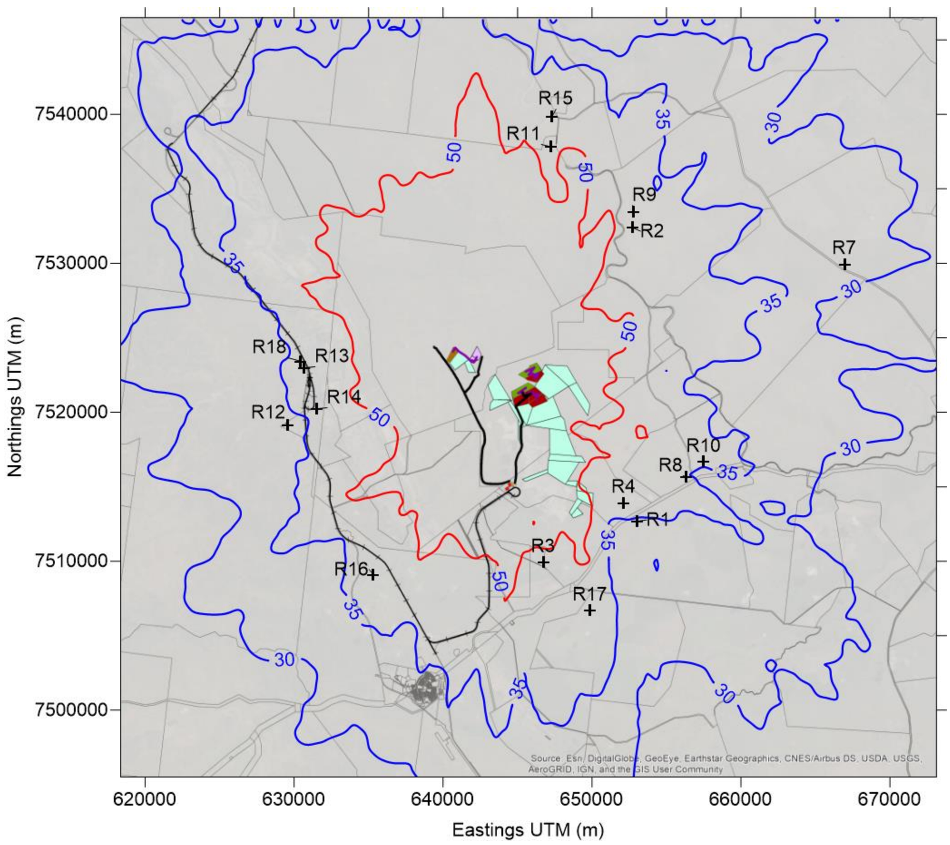

Figure 13.20: Predicted 24-hour maximum PM_{10} levels (µg/m^3) cumulative emissions for Year 22

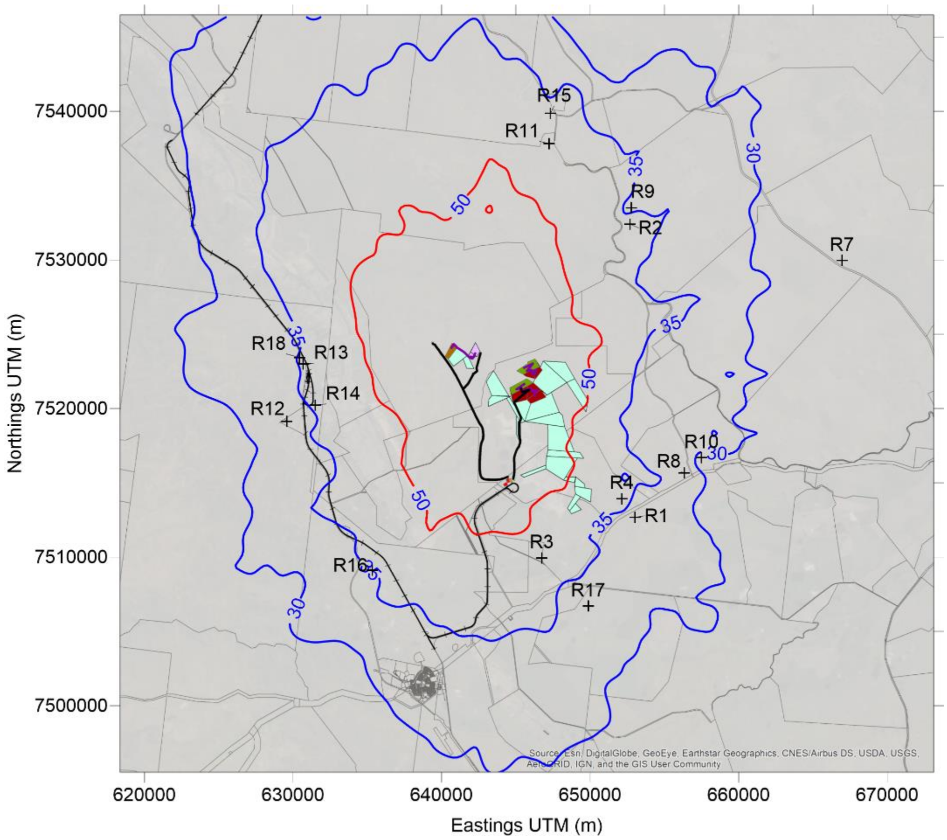

Figure 13.21: Predicted 6th highest PM_{10} 24hr levels (µg/m³) cumulative emissions for Year 22

13.3.3 GHG assessment methodology

The GHG assessment methodology (Appendix L, Air Quality and GHG Assessment, Section 4.4) includes the assessment of the emissions of GHGs from the Project during the construction and operation phases of the existing and approved Lake Vermont operations and the proposed Meadowbrook open-cut and underground operations.

Pollutants of importance associated with the Project include CO_2, CH_4 and N_2O, with total emissions expressed in 'CO_2 equivalent' terms. Methodology considers relevant legislation and regulations in Australia associated with the reporting and monitoring of GHG emissions (Appendix L, Air Quality and GHG Assessment, Section 4.4).

13.3.3.1 Reporting thresholds

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act), and its subordinate legislation the National Greenhouse and Energy Reporting Regulations 2008, assist corporations in reporting GHG emissions and energy consumption. Emissions of GHG in relation to a facility means the release of GHG into the atmosphere as a direct result of:

- an activity or series of activities (including ancillary activities) that constitute the facility (Scope 1 emissions); and
- one or more activities that generate electricity, heating, cooling or steam that is consumed by the facility but that do not form part of the facility (Scope 2 emissions).

Emissions that occur as a consequence of the activities of a facility, but from sources not owned or controlled by the facility's business, are indirect GHG emissions (Scope 3 emissions). These emissions are generated in the wider economy and are not included in the NGER reporting. Potential Scope 3 emissions are still considered as part of the GHG assessment (Appendix L, Air Quality and GHG Assessment, Section 4.4).

Corporations reporting under section 19 of the NGER Act must report Scope 1 and Scope 2 emissions, energy production and energy consumption data when one or more of the thresholds under section 13 of the NGER Act are met. NGER reporting thresholds and recent NGER reporting for Lake Vermont Mine are summarised in Appendix L, Air Quality and GHG Assessment, Section 4.2.

The regulatory obligations for NGER and the Safeguard Mechanism in consideration of cumulative annual GHG emissions (Scope 1 + Scope 2, excluding land use, land use change and forestry [LULUCF] emissions for the combined Lake Vermont Mine and the Project) are outlined in Section 4.5 of Appendix L, Air Quality and GHG Assessment.

In all years of operation, with the exception of the final years (Project Year 35 and 36), estimated Scope 1 emissions (excluding LULUCF) exceed the reporting threshold of 100 kt CO_2-e/y. Under the current Safeguard Mechanism, facilities with Scope 1 emissions of more than 100 kt CO_2-e/y are required to keep their emissions within baseline levels. This Safeguard Mechanism would apply to the Project; however, the exact implications of this would need to be reviewed on an annual basis in communication with the Clean Energy Regulator (Appendix L, Air Quality and GHG Assessment, Section 4.5).

13.3.4 GHG emissions results

Scopes 1, 2 and 3 GHG emissions have been estimated on an annual basis for the Project against the background of ongoing existing and approved Lake Vermont Mine operations and for the proposed Project. Potential GHG emissions have been identified in Table 13.10. A summary of the emissions factors (Scopes 1, 2, and 3) and energy content for emission sources associated with the existing and proposed operations at the facility is presented in Appendix L, Air Quality and GHG Assessment, Section 4.4.

Table 13.10: Scopes 1, 2 and 3 emissions

Emission factor	Potential source
Scope 1 (direct)	Diesel combustion: • heavy machinery and equipment • haulage vehicles • fugitive emissions of methane from mining of coal deposits (waste mine gas) • explosives use
Scope 2 (direct)	Electricity usage: • conveyors • underground operations • coal processing plant • amenities

Scope 3 (indirect)	• Transport of coal:
	  o rail transport to coal terminal
	  o shipping to international customers
	• Use of coal:
	  o thermal application
	• Electricity distribution losses
	• Diesel extraction and processing

Table 13.11 provides a summary of the energy content and emissions factors for emissions sources associated with the existing and proposed operations at the facility (Appendix L, Air Quality and GHG Assessment, Section 4.3).

Table 13.11: Summary of energy content and emissions factors

Emission source	Energy content	Units	Emission factor			Units
			Scope 1	Scope 2	Scope 3	
Diesel	38.6	GJ/kL	70.2			kg CO_2-e/GJ [1]
Fugitive methane (Qld – open cut)	37.7 x 10^{-3}	GJ/t	0.031			t CO_2-e/tROM [1]
Explosives (Ammonium Nitrate Fuel Oil - ANFO)	2.4	GJ/t	0.17			t CO_2-e/tANFO [2]
Electricity (Queensland)	3.6	MJ/kWh		0.73	0.12	kg CO_2-e/kWh [1]
Coking coal	30	GJ/t			92.03	kg CO_2-e/GJ [1]
Thermal coal	22 – 24	GJ/t			90.24	kg CO_2-e/GJ [1,5]
Forest clearing	29.83	tC/ha	109			t CO_2-e/ha [3]
Shipping – bulk carrier					0.00354	kg CO_2-e/ tonne.km [4]

Table notes:

[1]*National Greenhouse and Energy Reporting (Measurement) Determination 2008*, as amended in June 2023, and *National Greenhouse Accounts Factors* (DCCEEW, 2023)

[2]*National Greenhouse Accounts (NGA) Factors* (Department of Climate Change, 2008)

[3]Fullcam model, based on 100% conversion of C to CO2, Latitude: -25.5N, Longitude: 148.6E, 50% Acacia Shrubland +50% Agricultural annual grass

[4]*UK Government GHG Conversion Factors for Company Reporting* (DEFRA, 2021).

[5]Industrial coal as defined in the EIS has been approximate as thermal coal for the purposes of estimating GHG emissions

GJ/kL = gigajoules per kilolitre, kg CO_2-e/GJ = kilograms of carbon dioxide equivalent per gigajoule, GJ/t = gigajoules per tonne, t CO_2-e/tROM = tonnes of carbon dioxide equivalent per tonne of ROM coal, t CO_2-e/tANFO = tonnes of carbon dioxide equivalent per tonne of ANFO, MJ/kWh = megajoules per kilowatt hour, kg CO_2-e/kWh = kilograms of carbon dioxide equivalent per kilowatt hour and kg CO_2-e/t.km = kilograms of carbon dioxide equivalent per tonne per kilometre, tC/ha = tonnes of carbon per hectare of clearing.

GHG emissions associated with land clearing are not covered by the NGER scheme. Estimated GHG emissions from land clearing account for approximately 1% of the overall annual GHG emissions for the Project. As mining operations progress, spent pits and waste emplacement landforms will progressively be rehabilitated, with the aim of offsetting any previous GHG emissions from land clearing (Appendix L, Air Quality and GHG Assessment, Section 4.3).

13.3.4.1 Estimated GHG emissions

A comparative assessment has been made in Appendix L (Air Quality and GHG Assessment, Section 4.4) of the Project emissions against the background of the existing Lake Vermont Mine operations emissions. Emissions associated with LULUCF have also been assessed.

Scope 1 and Scope 2 GHG emissions

Maximum annual GHG emissions (Scope 1 + Scope 2) associated with the Project are 3,124 ktCO_2-e nominally occurring in Year 11.

Average annual GHG emissions (Scope 1 + Scope 2) associated with the Project are:

- 922,353 tCO2-e (including land use, land use change, and forestry (LULUCF) emissions).
- 920,034 tCO2-e (excluding LULUCF).

A summary of the estimated Scope 1 and Scope 2 emissions associated with the Project are presented in Table 13.13. Scope 1 includes the potential sources from diesel (mining), fugitive gas, blasting and land clearing. Scope 2 includes electricity.

A summary of the contribution of the Project to annual GHG emissions associated with Lake Vermont mining operations is presented in (excluding LULUCF) is presented in Table 13.14. This includes assessment of the total emissions for the Project and Lake Vermont Mine separately, comparing to existing and proposed operations combined. In comparison to combined mining operations (Lake Vermont Mine + Project) the Project accounts for 49% of total mine emissions over the life of the Project.

State and National GHG emissions

GHG emissions from the Project would contribute to Australia's and Queensland's annual GHG emissions inventories (Appendix L, Air Quality and GHG Assessment, Section 4.5). A summary of the impact of the maximum estimated annual (Scopes 1 and 2) GHG emissions from the Lake Vermont and Meadowbrook operations at a State and National scale is provided in Table 13.12. This refers to a summary of data from Queensland's and Australia's most recently published GHG emissions inventories from 2019 (Australian Government Department of Industry, Science, Energy and Resources 2021).

Table 13.12: Comparison of estimated maximum annual GHG emissions (t CO_2-e) for the Project to State and National emissions

Category	Project[1]	Australia[2]		Queensland[2]	
	Emissions (Mt CO_2-e)	**Emissions (Mt CO_2-e)**	**Project %**	**Emissions (Mt CO_2-e)**	**Project %**
Inventory total	3.12	487.1	0.64%	144.2	2.13%
Notes: [1]Estimated maximum annual GHG emissions [2]DCCEE&W, National Greenhouse Gas Inventory Quarterly Update: December 2022					

Scope 3 GHG emissions

A summary of key parameters used in the quantification of potential Scope 3 emissions associated with coal transportation is provided in Table 20 of Appendix L, Air Quality and GHG Assessment, Section 4.5. Scope 3 GHG emissions associated with the Lake Vermont Mine operations and the Project have been estimated on an annual basis for the life of the Project. Estimated annual Scope 3 GHG emissions associated with the Project are 7,956,355 tCO_2-e on average and will account for approximately 35% of Scope 3 GHG emissions for Lake Vermont Mine over the life of the Project.

The estimated annual Scope 3 GHG emissions associated with the Project are presented below in Table 13.15. Additionally, Table 13.16 provides combined annual emissions for Lake Vermont Mine operations and the Project.

Table 13.13: Estimated Project annual Scope 1 and 2 GHG emissions and energy use

Project Year	Energy	Scope 1					Scope 2	TOTAL (Scope 1 + Scope 2)	
		Diesel (mining)	Fugitive methane	Blasting	Land clearing	Total	Electricity	Including LULUCF	Excluding LULUCF
	GJ	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
-2	-	-	38,091	0	0	38,091	0	38,091	38,091
-1	118,320	3,261	206,494	0	0	209,755	14,600	224,355	224,355
0	154,320	3,261	228,547	0	0	231,808	21,900	253,708	253,708
1	186,250	4,242	198,475	0	0	202,717	25,550	228,267	228,267
2	246,070	4,651	773,853	0	0	778,504	36,500	815,004	815,004
3	382,729	10,075	1,649,950	0	0	1,660,025	48,590	1,708,615	1,708,615
4	591,803	13,695	1,419,398	0	0	1,433,093	80,559	1,513,652	1,513,652
5	618,018	14,149	1,014,429	0	0	1,028,578	84,567	1,113,144	1,113,144
6	636,233	14,464	884,117	0	0	898,581	87,352	985,933	985,933
7	587,712	13,624	1,074,573	0	0	1,088,197	79,933	1,168,130	1,168,130
8	504,994	12,192	1,984,752	0	0	1,996,944	67,285	2,064,229	2,064,229
9	506,621	12,220	1,780,262	0	0	1,792,482	67,534	1,860,016	1,860,016
10	466,334	11,522	1,904,560	0	0	1,916,082	61,374	1,977,456	1,977,456
11	514,017	12,348	3,043,286	0	0	3,055,634	68,665	3,124,299	3,124,299
12	389,094	10,185	2,339,602	0	0	2,349,786	49,564	2,399,350	2,399,350
13	465,775	11,513	2,373,683	0	0	2,385,196	61,288	2,446,484	2,446,484

Project Year	Energy	Scope 1					Scope 2	TOTAL (Scope 1 + Scope 2)	
		Diesel (mining)	Fugitive methane	Blasting	Land clearing	Total	Electricity	Including LULUCF	Excluding LULUCF
	GJ	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
14	508,288	12,249	3,041,282	0	0	3,053,530	67,789	3,121,319	3,121,319
15	546,846	12,538	1,984,752	0	0	1,997,290	74,776	2,072,065	2,072,065
16	428,017	10,480	679,627	0	0	690,107	56,606	746,713	746,713
17	448,553	10,836	1,152,760	0	0	1,163,596	59,746	1,223,342	1,223,342
18	475,492	11,302	994,381	0	0	1,005,683	63,865	1,069,548	1,069,548
19	435,212	10,604	1,054,525	0	0	1,065,129	57,706	1,122,836	1,122,836
20	1,025,839	50,097	675,618	1,403	14,013	741,132	59,679	800,810	786,797
21	1,278,079	63,262	417,991	1,655	10,671	493,579	72,181	565,760	555,089
22	1,207,708	63,893	694,534	1,823	8,350	768,600	55,610	824,209	815,860
23	1,048,397	58,998	87,689	1,827	4,857	153,372	37,392	190,764	185,907
24	736,950	50,111	43,462	1,771	4,586	99,929	0	99,929	95,343
25	775,915	52,836	46,133	1,789	11,788	112,545	0	112,545	100,757
26	841,312	57,379	44,730	1,849	3,233	107,192	0	107,192	103,958
27	768,371	52,245	40,821	1,848	3,486	98,400	0	98,400	94,914
28	731,586	49,730	44,983	1,774	2,890	99,376	0	99,376	96,487
29	589,690	40,191	59,661	1323	806	101,981	0	101,981	101,175
30	67,951	63,682	35677	2303	2,858	104,520	0	104,520	101,662
31	171,963	85,787	46500	2675	3,494	138,456	0	138,456	134,962

Project Year	Energy	Scope 1					Scope 2	TOTAL (Scope 1 + Scope 2)	
		Diesel (mining)	Fugitive methane	Blasting	Land clearing	Total	Electricity	Including LULUCF	Excluding LULUCF
	GJ	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
32	196,130	87,157	43400	2675	3,494	136,727	0	136,727	133,233
33	191,070	86,801	43400	2675	3,494	136,371	0	136,371	132,877
34	160,640	83,998	37200	2675	3,494	127,368	0	127,368	123,873
35	23,352	74,060	26,298	2,675	4,285	107,318	0	107,318	103,033
36	-	38,077	17,460	1,379	2,286	59,203	0	59,203	56,917
TOTAL	**19,025,652**	**1,277,711**	**32,188,866**	**34,122**	**88,086**	**33,588,786**	**1,460,611**	**35,049,397**	**34,961,310**
Max Annual	**487,837**	**87,157**	**3,043,286**	**2,675**	**14,013**	**3,055,634**	**87,352**	**3,124,299**	**3,124,299**
%	Scope 1	4%	96%	0.1%	0.26%	100%	-	-	-
	Scope 1 + 2	4%	92%	0.1%	0.25%	95%	5%	100%	-

Table 13.14: Estimated Project and Lake Vermont Mine annual Scope 1 and 2 GHG emissions

Mine Year	Project			Lake Vermont Existing Operations			Lake Vermont Mine (TOTAL)			Project (%)
	Scope 1	Scope 2	Scope 1 + 2	Scope 1	Scope 2	Scope 1 + 2	Scope 1	Scope 2	Scope 1 & 2	Scope 1 + 2
-3	-	0	0	606,675	54,020	660,695	606,675	54,020	660,695	0%
-2	38,091	0	38,091	613,072	54,020	667,092	651,163	54,020	705,183	5%
-1	209,755	14,600	224,355	614,983	54,020	654,403	824,738	54,020	878,758	26%
0	231,808	21,900	253,708	611,642	54,020	643,762	843,450	54,020	897,470	28%
1	202,717	25,550	228,267	605,318	54,020	633,788	808,035	54,020	862,055	26%
2	778,504	36,500	815,004	599,809	54,020	617,329	1,378,313	54,020	1,432,333	57%
3	1,660,025	48,590	1,708,615	392,541	54,020	397,970	2,052,566	54,020	2,106,586	81%
4	1,433,093	80,559	1,513,652	255,051	54,020	228,512	1,688,144	54,020	1,742,164	87%
5	1,028,578	84,567	1,113,144	239,388	54,020	208,841	1,267,965	54,020	1,321,985	84%
6	898,581	87,352	985,933	244,947	54,020	211,615	1,143,528	54,020	1,197,548	82%
7	1,088,197	79,933	1,168,130	286,218	54,020	260,305	1,374,415	54,020	1,428,435	82%
8	1,996,944	67,285	2,064,229	322,294	54,020	309,029	2,319,238	54,020	2,373,258	87%
9	1,792,482	67,534	1,860,016	333,877	54,020	320,363	2,126,359	54,020	2,180,379	85%
10	1,916,082	61,374	1,977,456	345,088	54,020	337,734	2,261,170	54,020	2,315,190	85%
11	3,055,634	68,665	3,124,299	366,578	54,020	351,933	3,422,212	54,020	3,476,232	90%
12	2,349,786	49,564	2,399,350	410,760	54,020	415,216	2,760,546	54,020	2,814,566	85%
13	2,385,196	61,288	2,446,484	387,122	54,020	379,853	2,772,318	54,020	2,826,338	87%
14	3,053,530	67,789	3,121,319	379,265	54,020	365,496	3,432,795	54,020	3,486,815	90%
15	1,997,290	74,776	2,072,065	371,807	54,020	351,051	2,369,096	54,020	2,423,116	86%

Mine Year	Project			Lake Vermont Existing Operations			Lake Vermont Mine (TOTAL)			Project (%)
	Scope 1	Scope 2	Scope 1 + 2	Scope 1	Scope 2	Scope 1 + 2	Scope 1	Scope 2	Scope 1 & 2	Scope 1 + 2
16	690,107	56,606	746,713	400,909	54,020	398,322	1,091,016	54,020	1,145,036	65%
17	1,163,596	59,746	1,223,342	408,047	54,020	402,321	1,571,643	54,020	1,625,663	75%
18	1,005,683	63,865	1,069,548	376,903	54,020	367,058	1,382,586	54,020	1,436,606	74%
19	1,065,129	57,706	1,122,836	377,541	54,020	373,854	1,442,670	54,020	1,496,690	75%
20	727,118	59,679	786,797	271,996	54,020	266,337	999,114	54,020	1,053,134	75%
21	482,909	72,181	555,089	198,116	54,020	179,955	681,025	54,020	735,045	76%
22	760,250	55,610	815,860	229,431	54,020	227,842	989,681	54,020	1,043,701	78%
23	148,515	37,392	185,907	290,349	54,020	306,977	438,864	54,020	492,884	38%
24	95,343	0	95,343	208,195	54,020	262,215	303,538	54,020	357,558	27%
25	100,757	0	100,757	191,551	54,020	245,571	292,308	54,020	346,328	29%
26	103,958	0	103,958	179,577	54,020	233,597	283,536	54,020	337,556	31%
27	94,914	0	94,914	188,133	54,020	242,153	283,047	54,020	337,067	28%
28	96,487	0	96,487	175,597	54,020	229,617	272,084	54,020	326,104	30%
29	101,175	0	101,175	137,453	54,020	191,473	238,628	54,020	292,648	35%
30	101,662	0	101,662	88,016	54,020	142,036	189,678	54,020	243,698	42%
31	134,962	0	134,962	0	54,020	54,020	134,962	54,020	188,982	71%
32	133,233	0	133,233	0	54,020	54,020	133,233	54,020	187,253	71%
33	132,877	0	132,877	0	54,020	54,020	132,877	54,020	186,897	71%
34	123,873	0	123,873	0	54,020	54,020	123,873	54,020	177,893	70%

Mine Year	Project			Lake Vermont Existing Operations			Lake Vermont Mine (TOTAL)			Project (%)
	Scope 1	Scope 2	Scope 1 + 2	Scope 1	Scope 2	Scope 1 + 2	Scope 1	Scope 2	Scope 1 & 2	Scope 1 + 2
35	103,033	0	103,033	0	54,020	54,020	103,033	54,020	157,053	66%
36	56,917	0	56,917	0	54,020	54,020	56,917	54,020	110,937	51%
TOTAL	33,500,700	1,460,611	34,961,310	11,708,248	700,189	12,408,437	43,989,201	2,052,760	46,041,961	76%
Max Annual	3,055,634	87,352	3,124,299	614,983	54,020	667,092	3,432,795	54,020	3,486,815	90%

Table 13.15: Estimated annual Scope 3 GHG emissions for the Project

Year	Diesel (product rail transportation)	Shipping of coal	End use of product coal (thermal)	End use of product coal (coking)	Total (Excl. electricity)
	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e
-1	0	0	0	0	0
0	0	0	0	0	0
1	1,262	3,803	19,616	270,473	295,154
2	4,492	13,535	91,434	941,797	1,051,258
3	40,981	123,471	744,445	8,678,345	9,587,242
4	69,034	207,990	1,162,571	14,707,230	16,146,825
5	72,917	219,688	1,030,639	15,725,036	17,048,280
6	75,058	226,140	934,922	16,308,542	17,544,662
7	68,486	206,339	1,134,502	14,608,679	16,018,006
8	56,892	171,408	1,030,474	12,050,555	13,309,329
9	53,797	162,084	2,531,788	9,890,728	12,638,398
10	48,871	147,242	2,382,754	8,905,005	11,483,872
11	54,166	163,196	2,906,402	9,613,455	12,737,219
12	39,519	119,066	2,153,689	6,981,842	9,294,117
13	49,466	149,036	2,236,872	9,182,465	11,617,839
14	54,650	164,652	2,218,323	10,388,948	12,826,572
15	60,794	183,164	2,277,474	11,740,799	14,262,232
16	47,300	142,508	771,356	10,101,275	11,062,439

Year	Diesel (product rail transportation)	Shipping of coal	End use of product coal (thermal)	End use of product coal (coking)	Total (Excl. electricity)
	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e
17	50,340	151,669	781,098	10,789,088	11,772,195
18	53,679	161,729	789,334	11,546,825	12,551,567
19	48,243	145,351	699,927	10,386,649	11,280,171
20	51,601	155,468	1,105,101	10,765,268	12,077,438
21	68,207	205,498	1,792,235	13,909,326	15,975,265
22	56,187	169,285	1,808,150	11,137,762	13,171,384
23	40,770	122,835	1,363,065	8,032,394	9,559,064
24	13,679	41,212	650,215	2,508,567	3,213,672
25	13,933	41,978	843,073	2,380,612	3,279,596
26	12,453	37,521	1,016,774	1,873,561	2,940,309
27	11,522	34,715	821,851	1,848,310	2,716,398
28	13,832	41,674	785,014	2,413,544	3,254,064
29	18,990	57,214	880,600	3,504,000	4,460,804
30	11,180	33,684	585,864	1,997,758	2,628,486
31	14,448	43,530	814,595	2,526,224	3,398,797
32	13,485	40,628	760,289	2,357,809	3,172,210
33	13,485	40,628	760,289	2,357,809	3,172,210
34	11,558	34,824	651,676	2,020,979	2,719,037
35	10,595	31,922	597,370	1,852,564	2,492,451

Year	Diesel (product rail transportation)	Shipping of coal	End use of product coal (thermal)	End use of product coal (coking)	Total (Excl. electricity)
	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e
36	8,137	24,515	458,768	1,422,732	1,914,152
TOTAL	1,334,012	4,019,202	41,592,550	265,726,952	312,672,717
Average	27,225	82,025	848,828	5,422,999	6,381,076

Table 13.16: Cumulative annual Scope 3 GHG emissions for the Project and Lake Vermont Mine

Year	Project	Lake Vermont Existing Operations	Lake Vermont Mine (TOTAL)	Project (%)
-3	0	0	0	0%
-2	0	0	0	0%
-1	0	25,032,881	25,032,881	0%
0	0	50,011,255	50,011,255	0%
1	295,154	74,378,662	74,673,817	0%
2	1,346,412	97,944,995	99,291,407	1%
3	10,933,654	113,425,782	124,359,436	9%
4	27,080,480	123,364,882	150,445,362	18%
5	44,128,760	132,648,100	176,776,860	25%
6	61,673,422	142,291,853	203,965,274	30%
7	77,691,428	151,711,020	229,402,448	34%
8	91,000,757	163,319,829	254,320,586	36%
9	103,639,155	175,881,515	279,520,670	37%
10	115,123,027	189,124,972	304,247,999	38%
11	127,860,245	201,071,439	328,931,685	39%
12	137,154,363	215,989,041	353,143,404	39%
13	148,772,201	228,921,626	377,693,827	39%
14	161,598,774	240,989,420	402,588,194	40%
15	175,861,006	252,648,006	428,509,012	41%
16	186,923,445	265,778,181	452,701,626	41%
17	198,695,640	279,518,212	478,213,852	42%
18	211,247,207	291,727,996	502,975,203	42%
19	222,527,378	304,185,153	526,712,531	42%
20	234,604,817	312,412,451	547,017,268	43%
21	250,580,081	316,424,140	567,004,221	44%
22	263,751,465	321,596,481	585,347,947	45%
23	273,310,530	330,891,730	604,202,259	45%
24	276,524,202	338,021,207	614,545,409	45%
25	279,803,798	344,154,126	623,957,924	45%

Year	Project	Lake Vermont Existing Operations	Lake Vermont Mine (TOTAL)	Project (%)
26	282,744,107	348,904,467	631,648,573	45%
27	285,460,505	353,920,478	639,380,983	45%
28	288,714,569	358,629,088	647,343,656	45%
29	293,175,373	362,280,364	655,455,737	45%
30	295,803,859	365,661,888	661,465,747	45%
31	299,202,656	365,661,888	664,864,544	45%
32	302,374,866	365,661,888	668,036,755	45%
33	305,547,076	365,661,888	671,208,965	46%
34	308,266,114	365,661,888	673,928,002	46%
35	310,758,565	365,661,888	676,420,453	46%
36	312,672,717	365,661,888	678,334,605	46%
TOTAL	312,672,717	365,661,888	678,334,605	46%
Average	7,956,355	10,903,015	18,262,643	

13.4 Regulatory obligations—NGER and the Safeguard Mechanism

Cumulative annual GHG emissions (Scope 1 + Scope 2, excluding LULUCF) for the combined Lake Vermont Mine and the Project, range are:

- Scope 1: 57 – 3,433 ktCO_2-e/y
- Scope 2: 54 – 141 ktCO_2-e/y
- Total: 111 – 3,574 ktCO_2-e/y.

In all years of operation, except for the final years (Years 35 and 36), estimated Scope 1 emissions (excluding LULUCF) will exceed the reporting threshold of 100 kt CO_2-e/y. Under the current Safeguard Mechanism, facilities with Scope 1 emissions of more than 100 kt CO_2-e/y are required to keep their emissions within baseline levels. This Safeguard Mechanism would apply to the Project; however, the exact implications of this would need to be reviewed on an annual basis in communication with the Clean Energy Regulator (Appendix L, Air Quality and GHG Assessment, Section 4.5).

13.5 Mitigation and management measures

The impact of particulates was assessed as the critical air pollutant for determining impacts and achieving no impact from particulates is considered to sufficient to manage potential impacts from other pollutants (refer section 13.1.2.3). Practices to mitigate air quality emissions are in place for the existing Lake Vermont Mine and will be continued for the duration of the proposed Project. The practices are included in an Environmental Management Plan, which will be updated to include the proposed measures for the Project. The proposed measures to mitigate air quality impacts are targeted to managing potential impacts from particulates and will also provide benefits to mitigate potential impacts from other pollutants. These mitigation measures include:

- application of water to haul roads;
- watering during handling activities;
- machine and vehicle maintenance;
- vegetation establishment on recontoured/rehabilitated areas
- watering of stockpiles; and
- sealing of the ROM haul road from the Project to the existing CHPP.

Additional emissions controls are proactively applied when necessary at the Lake Vermont Mine and will be implemented during the Project. These controls typically are applied during periods when meteorological conditions promote an increase in dust generation, including:

- additional road watering concentrated at problem areas;
- speed restrictions imposed on haul trucks when dust is visible, which reduces the overall hauling capacity by approximately 20%;
- re-routing haul trucks to reduce waste haulage distances by up to 50%; and
- re-assigning haulage location(s) to areas experiencing less dust.

The proposed mitigation measures are considered sufficient to manage potential air quality impacts to within the proposed limits (refer section 13.1.2). Restricting impacts to within the proposed limits will achieve the objectives of the Environmental Protection (Air) Policy and ensure compatibility of the Project activities with existing and potential land uses of the area which are low intensity cattle grazing, mining and resource exploration.

13.5.1 Additional air quality controls

Additional air quality control measures may be implemented, if and as required, following a complaint; for example:

- applying additional at-source dust air quality controls;
- increasing the intensity of air quality controls;
- modifying certain operations to reduce impacts to air quality; and
- investigating exceedances of air quality objectives.

13.5.2 GHG mitigation and management

The Queensland resources sector is in position to contribute to emission reduction actions, as identified in 'A Queensland zero net emissions economy: Resources' (Queensland Government, 2022b). The resources industry can promote low emissions transitions through approaches to attract investment and facilitate growth for low emissions outcomes identified as follows:

- maintain a reputation as a global leader through;
  - innovative practices;
  - skilled workforce development; and
  - automation and reliable supply;
- sustain a skilled and adaptable workforce;
- invest in training programs; and
- conduct strategic planning for areas to be affected by a mine closure.

The resources sector can also contribute to the facilitation of growth in pursuit of GHG emission reduction through:

- support the labour force to transition to new opportunities in growing areas of the resources sector as mines reach the end of their operational life:
- advocate to the government for policies that are likely to improve certainty around future demand and governance frameworks;
- develop forward looking strategies which incorporate projected changes in global resources and leverage opportunities; and
- develop infrastructure for re-using existing gas and coal infrastructure for critical minerals.

Bowen Basin Coal has incorporated these approaches into the proposed Project and the Project is an example of the attraction of investment and efforts to facilitate growth in the interests of realising opportunities, optimising skilled labour and infrastructure to mitigate climate change risks. Bowen Basin Coal will investigate preferred and alternative measures to contribute towards the Queensland Government emissions reduction and renewable energy targets by taking climate action measures advised by the Queensland Government recommended climate actions (Queensland Government 2022c) including:

- assess and manage the exposure of the Project to climate change risks (refer Chapter 4, Climate);
- investigate the development of a Project emissions reduction target;
- investigate renewable energy options;
- acquire carbon credits through carbon farming initiatives where practicable to offset Project carbon emissions; and
- investigate options for producing energy onsite from waste materials.

For measures designed to mitigate, reduce, control or manage GHG emissions from the Project Bowen Basin Coal is committed to implementing the following initiatives:

- regular plant and equipment maintenance will occur to minimise fuel consumption and associated emissions, including training staff on continuous improvement strategies regarding efficient use of plant and equipment;
- adherence to a Waste Management Plan which includes provisions for the monitoring and reduction of waste;
- regular assessments, reviews and evaluations of GHG reduction opportunities will occur;
- procurement policies that require the selection of energy-efficient equipment and vehicles will apply;
- monitoring and maintenance of equipment will occur in accordance with manufacturer recommendations;
- optimisation of diesel consumption through logistics analysis and planning will occur (e.g. review of the mine plan to optimise haul lengths, dump locations and road gradients); and
- flaring waste coal mine gas as part of gas drainage activities will occur when practicable to reduce equivalent CO_2 emissions.
- Offering waste coal mine gas to power station developers as an alternative measure should it prove practical and economically viable

13.5.3 Monitoring and reporting

The predictive modelling shows that the Project air quality impacts are unlikely to exceed the proposed limits (refer section 13.1.2) and are likely to achieve the objectives of the Environmental Protection (Air) Policy. The Project will be subject to reporting obligations, in conjunction with Lake Vermont Mine. Where the Project exceeds the air quality limits or receives a complaint of nuisance at a sensitive place, targeted monitoring will be required to investigate potential impacts.

The Project will be subject to annual monitoring and reporting of GHG emissions under requirements of the NGER scheme, described in section 13.4.