
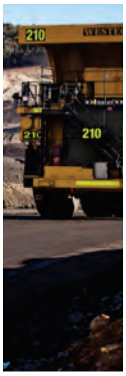



MOOLARBENCOAL

Moolarben Coal Complex
Open Cut Optimisation Modification

Environmental Assessment

APPENDIX B

Air Quality Assessment

YANCOAL
兖煤澳大利亚有限公司

AIR QUALITY ASSESSMENT

MOOLARBEN COAL PROJECT
OC OPTIMISATION MODIFICATION

Moolarben Coal Operations Pty Ltd

25 October 2017

Job Number 17010656

Prepared by

Todoroski Air Sciences Pty Ltd

Suite 2B, 14 Glen Street

Eastwood, NSW 2122

Phone: (02) 9874 2123

Fax: (02) 9874 2125

Email: info@airsciences.com.au

Air Quality Assessment
Moolarben Coal Project
OC Optimisation Modification

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1 INTRODUCTION

Moolarben Coal Operations Pty Ltd (MCO) is proposing to optimise open cut mining operations at the Moolarben Coal Complex. These optimisations would require MCO to modify Project Approvals for Stage 1 and Stage 2 (herein referred to as the Open Cut Optimisation Modification (the Modification)) under section 75W of the Environmental Planning and Assessment Act, 1979 (EP&A Act).

Todoroski Air Sciences has been engaged by MCO to prepare an air quality assessment for the Modification.

1.1 Background

MCO is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd (MCM), Sojitz Moolarben Resources Pty Ltd and a consortium of Korean power companies). MCM and MCO are wholly owned subsidiaries of Yancoal Australia Limited (Yancoal).

Mining operations at the Moolarben Coal Complex are approved until 31 December 2038 and are carried out in accordance with Project Approval (05_0117) (Moolarben Coal Project Stage 1) and Project Approval (08_0135) (Moolarben Coal Project Stage 2).

1.2 Previous modifications

Previously, detailed air quality impact assessments have been prepared for the Moolarben Coal Complex by Todoroski Air Sciences for the Moolarben Coal Project Stage 1 Optimisation Modification (MOD9) (**Todoroski Air Sciences, 2013**), the OC4 South-West Modification (OC4 South-West MOD) (**Todoroski Air Sciences, 2014**) and UG1 Optimisation Modification (UG1 MOD) (**Todoroski Air Sciences, 2015a**). This assessment has incorporated these modifications and has applied a similar methodology for assessing the potential air quality impacts associated with this Modification.

2 MODIFICATION DESCRIPTION

A summary of the description of the proposed Modification is outlined below.

2.1 Open cut production increase and mine sequence

The Stage 1 and Stage 2 Project Approvals authorise the following from open cut operations:

- The extraction of up to 8 million tonnes per annum (Mtpa) of run-of-mine (ROM) from Stage 1 open cut pits; and
- The extraction of up to 12Mtpa of ROM from Stage 2 open cut pits.

However, the combined total of ROM coal able to be extracted from the Stage 1 and Stage 2 open cuts is currently limited to 13Mtpa.

With no material change to the existing open cut mining fleet, and with changes to the sequencing of open cut mining operations, MCO would be able to optimise operations to achieve the following production:

- Up to 10Mtpa of ROM coal from Stage 1 open cuts (OC1, OC2 and OC3);
- Up to 16Mtpa of ROM coal from the Stage 2 open cut (OC4); and,
- Combined total (Stage 1 and Stage 2) of up to 16Mtpa of ROM coal.

These changes in open cut production rates would also result in changes to the following:

- Increase in the combined open cut and underground ROM coal limit from 21 to 24Mtpa (i.e. 16Mtpa from open cuts and 8Mtpa from underground);
- Increase in coal processing (washing) limit from 13 to 16Mtpa;
- Increase in the product coal limit from 18 to 22Mtpa;
- Increase in the product coal rail movements (1 additional train per day on average and 2 additional trains per day at peak);
- Increase in the annual rate of coal rejects production; and,
- Increase in the size of ROM coal stockpiles and product coal stockpiles.

2.2 Pit disturbance limits

The Modification would involve minor extensions to the disturbance limits of the OC2 and OC3 open cut pits. These extensions are required to enable the following:

- Minor extension of the OC2 western pit limit to provide a stable long-term final landform;
- Straightening of the western pit limits of OC3 to facilitate safe and efficient mining; and,
- Minor extension of the OC3 eastern pit limit to reflect the latest resource definition results.

There would be no change to OC1 or OC4 disturbance limits for the Modification.

2.3 Other optimisations

MCO has also identified the following additional operational optimisations, which form part of the scope of the Modification:

- Installation of water treatment facilities to support authorised discharge under Environmental Protection Licence (EPL) release conditions, and associated increase in the rate of controlled releases, when required;
- Construction of a bypass coal conveyor to facilitate bypass of ROM coal from the open cuts;
- Additional train loadout bin and conveyor;
- Minor changes to the alignment of the haul road from OC2 to OC3, and the location of the OC3 Mine Infrastructure Area;
- Additional internal road from OC2 to OC4 via Carrs Gap;
- Ancillary infrastructure (e.g. access tracks, power, services, communications, conveyors and pipelines); and,
- Ongoing exploration activities within mining lease areas.

3 PROJECT SETTING

The Moolarben Coal Complex is located in the Western Coalfields of New South Wales (NSW), approximately 40 kilometres (km) north of Mudgee.

It is bordered by the Goulburn River to the northwest, Goulburn River National Park to the northeast and Munghorn Gap Nature Reserve to the south. The Ulan Coal Mine is located to the northwest and Wilpinjong Coal Mine is located to the east. Ulan settlement and Cooks Gap are located to the west and southwest, respectively.

Figure 3-1 presents the location of the Moolarben Coal Complex in relation to the neighbouring coal mining operations and **Figure 3-2** identifies privately-owned and mine-owned (or Under Contract/ Purchase Agreement) receptors of relevance to this study. **Appendix A** provides a detailed list of all the privately-owned and mine-owned or Under Contract/ Purchase Agreement receptors considered in this assessment.

Figure 3-3 presents a three-dimensional visualisation of the topography in the vicinity of the Moolarben Coal Complex. The area can be characterised as complex hilly terrain with the majority of the elevated areas forming the Goulburn River National Park and the Munghorn Gap Nature Reserve. The local terrain in this area has a significant effect on wind patterns and the dispersion of dust.

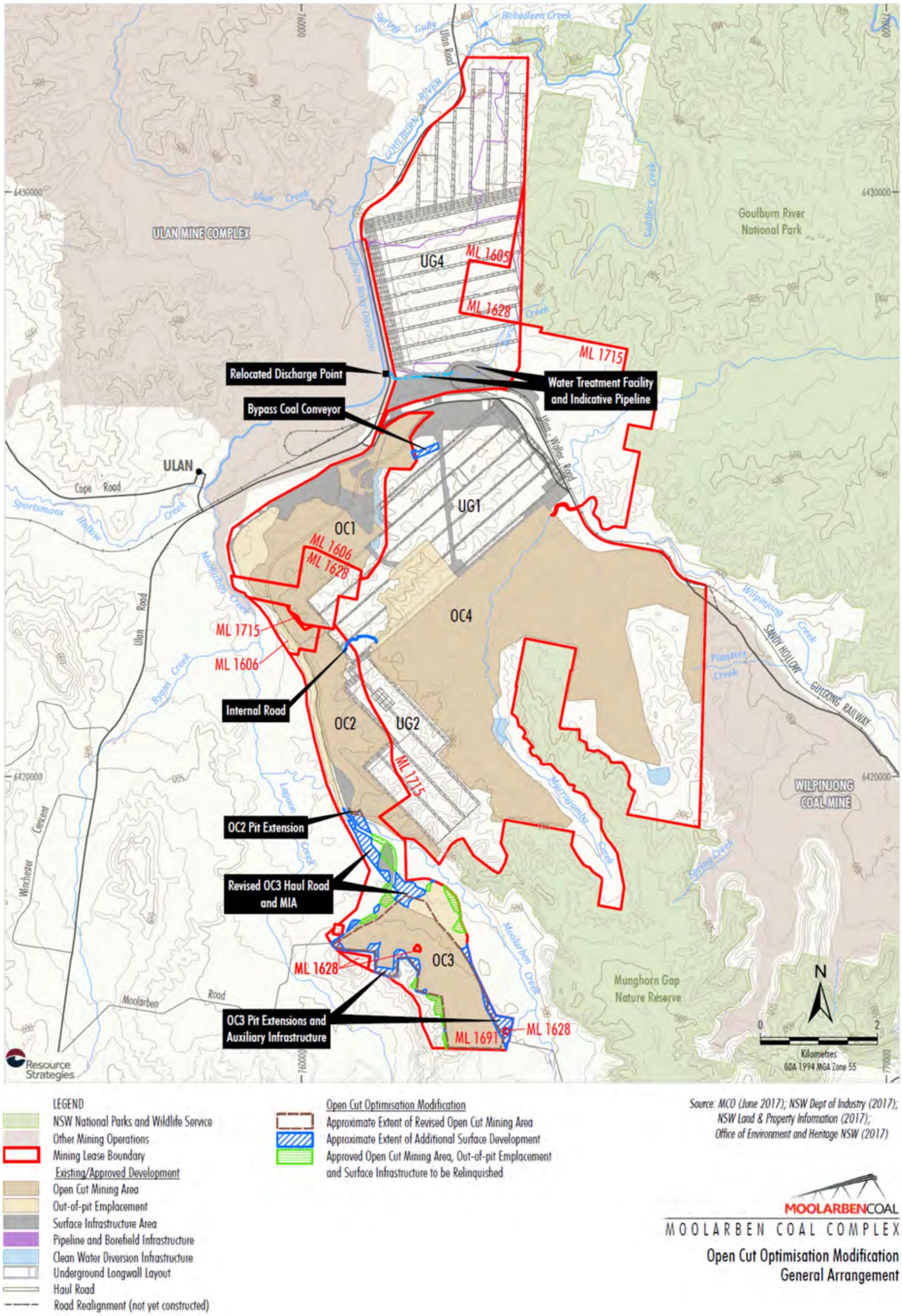

Figure 3-1: Local setting

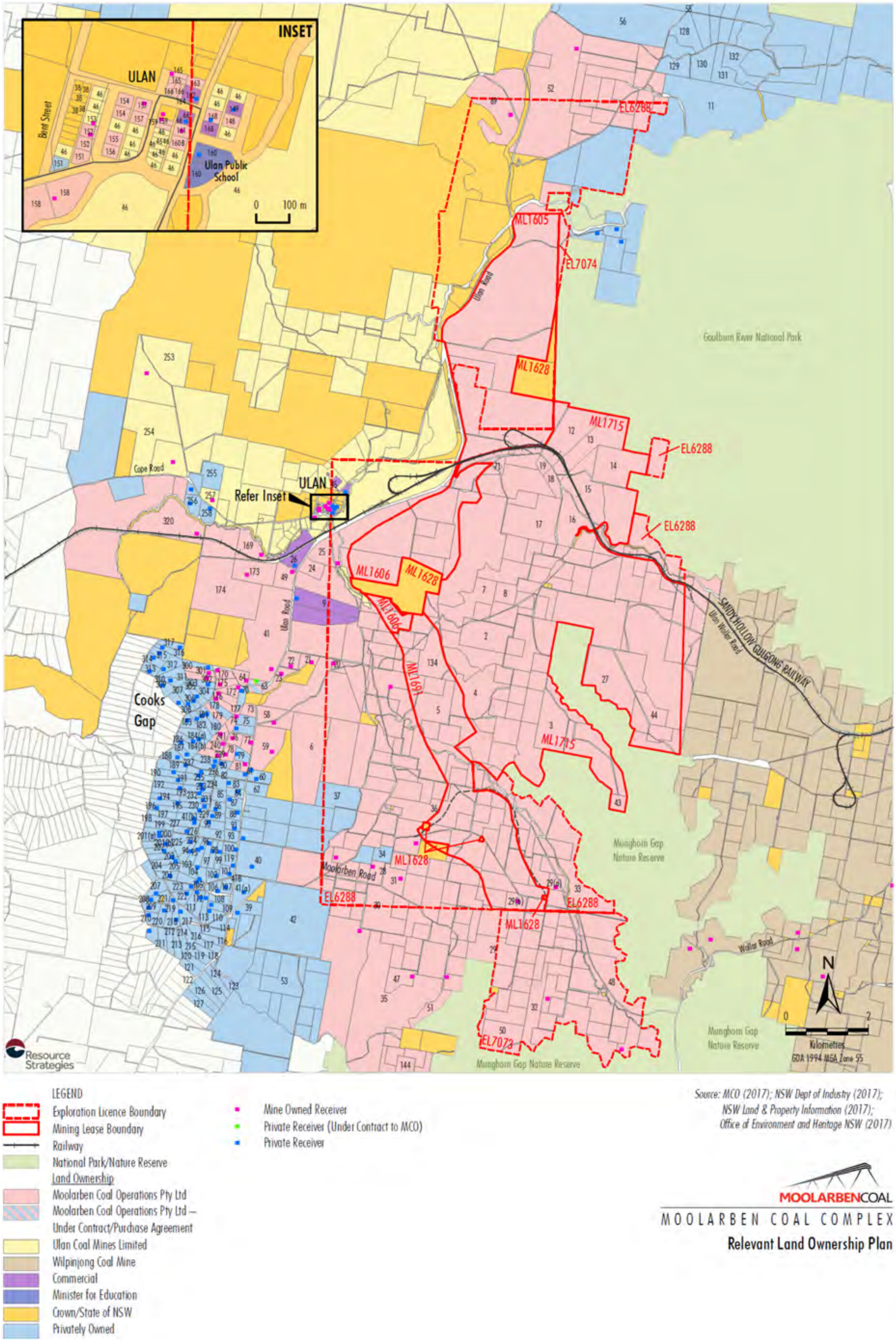

Figure 3-2: Land ownership

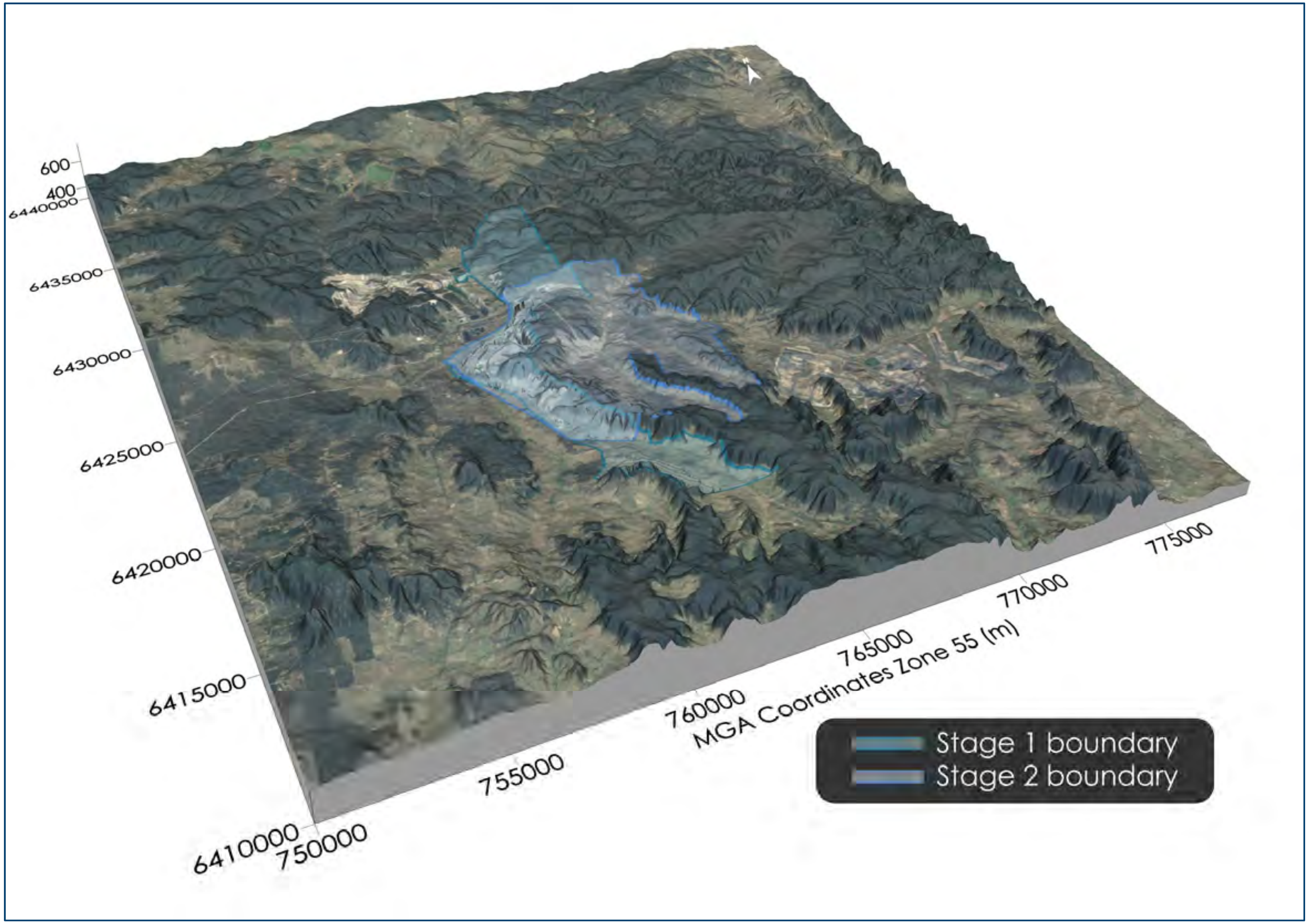

Figure 3-3 Topography surrounding the Moolarben Coal Complex

4 AIR QUALITY ASSESSMENT CRITERIA

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the potential air emissions generated by the proposed modification and the applicable air quality criteria.

4.1 NSW EPA impact assessment criteria

Table 4-1 summarises the air quality goals that are relevant to this assessment as outlined in the NSW Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2017**).

The air quality goals for total impact relate to the total dust burden in the air and not just the dust from the proposed modification. Consideration of background dust levels needs to be made when using these goals to assess potential impacts.

Table 4-1: NSW EPA air quality impact assessment criteria

Pollutant	Averaging Period	Impact	Criterion
Total suspended particulate (TSP) matter	Annual	Total	90µg/m^3
Particulate matter ≤ 10µm (PM_{10})	Annual	Total	25µg/m^3
	24 hour	Total	50µg/m^3
Particulate matter ≤ 2.5µm ($PM_{2.5}$)	Annual	Total	8µg/m^3
	24 hour	Total	25µg/m^3
Deposited dust	Annual	Incremental	2g/m^2/month
		Total	4g/m^2/month

Source: NSW EPA (2017)

µm = micrometre µg/m^3 = micrograms per cubic metre g/m^2/month = grams per square metre per month

The Mining State Environment Protection Policy (SEPP) non-discretionary standard with respect to cumulative air quality at private dwellings for PM_{10} annual average is 30µg/m^3.

4.2 NSW Voluntary Land Acquisition and Mitigation Policy

Part of the NSW Voluntary Land Acquisition and Mitigation Policy (VLAMP) dated 15 December 2014 and gazetted on 19 December 2014 describes the NSW Government's policy for voluntary mitigation and land acquisition to address particulate matter impacts from state significant mining, petroleum and extractive industry developments.

Voluntary mitigation rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in **Table 4-2** at any residence or workplace. [1]

Table 4-2: Particulate matter mitigation criteria

Pollutant	Averaging period	Mitigation Criterion		Impact Type
PM_{10}	Annual	30µg/m^3*		Human health
PM_{10}	24 hour	50µg/m^3**		Human health
TSP	Annual	90µg/m^3*		Amenity
Deposited dust	Annual	2g/m^2/month**	4g/m^2/month*	Amenity

Source: NSW Government (2014)

*Cumulative impact (i.e. increase in concentration due to the development plus background concentrations due to all other sources).

**Incremental impact (i.e. increase in concentrations due to the development alone), with zero allowable exceedances of the criteria.

[1] Where any exceedance would be unreasonably detrimental to workers health or carrying out of the business.

Voluntary acquisition rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in **Table 4-3** at any residence, workplace or on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls (vacant land).

Table 4-3: Particulate matter acquisition criteria

Pollutant	Averaging period	Acquisition Criterion		Impact Type
PM_{10}	Annual	30µg/m³*		Human health
PM_{10}	24 hour	50µg/m³**		Human health
TSP	Annual	90µg/m³*		Amenity
Deposited dust	Annual	2g/m²/month**	4g/m²/month*	Amenity

Source: **NSW Government (2014)**

*Cumulative impact (i.e. increase in concentration due to the development plus background concentrations due to all other sources).

**Incremental impact (i.e. increase in concentrations due to the development alone), with up to 5 allowable exceedances of the criteria over the life of the development.

4.3 Project approval criteria

The Stage 1 and 2 Project Approvals provide air quality performance criteria for the Moolarben Coal Complex.

Condition 17, Schedule 3 of Project Approval (05_0117) and Condition 18, Schedule 3 of Project Approval (08_0135) require that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the Moolarben Coal Complex do not cause an exceedance of the criteria presented in **Table 4-4**, **Table 4-5** and **Table 4-6**.

Table 4-4: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
TSP	Annual	[a] 90µg/m³
PM10	Annual	[a] 30µg/m³

Source: Table 5 of Project Approval (05_0117) and Table 8 of Project Approval (08_0135)

Table 4-5: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	[d] Criterion
PM10	24 hour	[a] 50µg/m³

Source: Table 6 of Project Approval (05_0117) and Table 9 of Project Approval (08_0135)

Table 4-6: Long term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c] Deposited dust	Annual	[b] 2g/m²/month	[a] 4g/m²/month

Source: Table 7 of Project Approval (05_0117) and Table 10 of Project Approval (08_0135)

[a] Cumulative (i.e. incremental increase in concentrations due to the Moolarben Mine Complex plus background concentrations due to all other sources);
[b] Incremental impact (i.e. incremental increase in concentrations due to the Moolarben Mine Complex on its own);
[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580,10,1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method; and
[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed by the Secretary.

4.4 Environmental Protection Licence operating conditions

EPL 12932 provides qualitative operating conditions and monitoring requirements for air pollution at the Moolarben Coal Complex.

Condition O3 of EPL 12932 states:

O3 Dust

O3.1 All areas in or on the premises must be maintained in a condition that prevents or minimises the emission into the air of air pollutants (which includes dust).

O3.2 Any activity in or on the premises must be carried out by such practicable means as to prevent or minimise the emission into the air of air pollutants (which includes dust).

O3.3 Any plant in or on the premises must be operated by such practicable means as to prevent or minimise the emission into the air or air pollutants (which includes dust).

EPL 12932 does not provide any specific concentration limits relating to air pollution.

5 EXISTING ENVIRONMENT

This section describes the existing environment including the climate and ambient air quality in the area surrounding the Moolarben Coal Complex.

5.1 Local climate

Long term climatic data collected at the Bureau of Meteorology (BoM) weather station at Gulgong Post Office were analysed to characterise the local climate in the proximity of the Moolarben Coal Complex. The Gulgong Post Office is located approximately 25km southwest of the Moolarben Coal Complex and is the nearest BoM weather station with available long-term climate statistics.

Table 5-1 and **Figure 5-1** show climatic parameters that have been collected from the Gulgong Post Office over a 23 to 136 year period for the various meteorological parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 31.0 degrees Celsius (ºC) and July is the coldest month with a mean minimum temperature of 2.7ºC.

Rainfall peaks during the summer months and declines during winter. The data show January is the wettest month with an average rainfall of 70.8 millimetres (mm) over 5.2 days and April is the driest month with an average rainfall of 43.9mm over 3.9 days.

Relative humidity levels exhibit variability over the day. Mean 9am relative humidity levels range from 61% in October to 84% in June and July. Mean 3pm relative humidity levels vary from 36% in December to 57% in June.

Wind speeds during the colder months tend to have a greater spread between the 9am and 3pm conditions compared to the warmer months. The mean 9am wind speeds range from 4.4 kilometres per hour (km/h) in June to 9.1km/h in October and November. The mean 3pm wind speeds vary from 7.8km/h in April to 11.7km/h in August.

Table 5-1: Monthly climate statistics summary – Gulgong Post Office

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temperature (ºC)	31.0	29.9	27.4	23.4	19.1	15.4	14.7	16.5	19.8	23.6	26.8	29.7	23.1
Mean min. temperature (ºC)	16.8	16.3	13.8	9.8	6.3	3.7	2.7	3.4	6.1	9.2	12.3	14.9	9.6
Rainfall													
Rainfall (mm)	70.8	61.1	55.2	43.9	45.1	51.2	49.4	46.0	47.4	55.4	59.7	67.4	652.8
Mean No. of rain days (≥1mm)	5.2	4.8	4.6	3.9	4.8	6.0	6.1	5.7	5.3	5.6	5.5	5.5	63.0
9am conditions													
Mean temperature (ºC)	21.7	20.6	18.9	15.8	11.3	7.7	6.7	8.5	12.6	16.5	18.3	20.8	15.0
Mean relative humidity (%)	64	71	71	70	79	84	84	76	70	61	63	62	71
Mean wind speed (km/h)	8.2	6.7	6.2	5.9	5.0	4.4	4.9	6.1	7.7	9.1	9.1	8.9	6.9
3pm conditions													
Mean temperature (ºC)	29.5	28.4	26.2	22.3	18.0	14.3	13.5	15.3	18.5	22.1	25.1	28.2	21.8
Mean relative humidity (%)	37	42	41	42	49	57	54	46	44	40	39	36	44
Mean wind speed (km/h)	9.6	8.5	7.9	7.8	9.0	8.8	9.9	11.7	11.4	11.5	11.4	11.2	9.9

Source: **Bureau of Meteorology (2017), accessed June 2017**

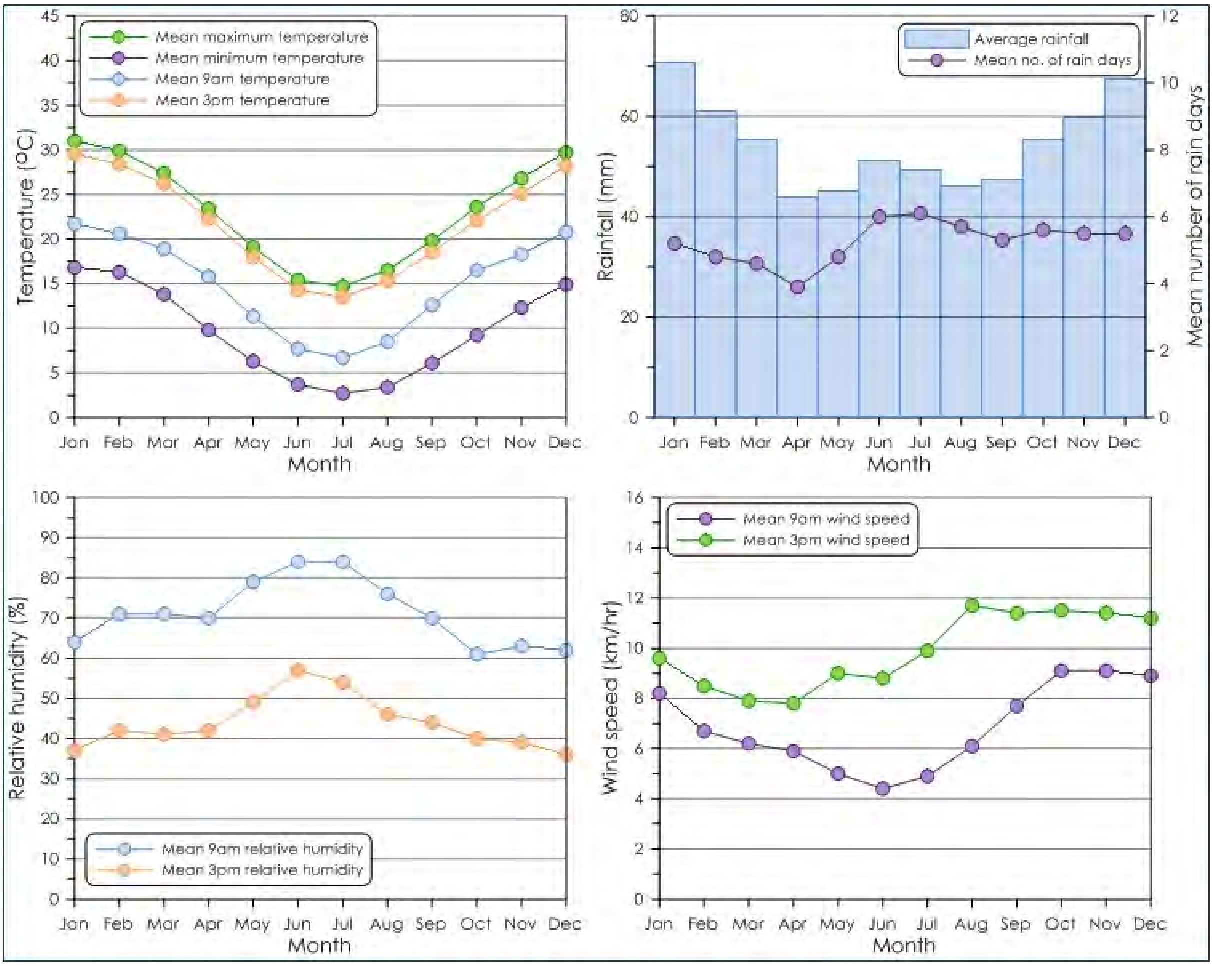

Figure 5-1: Monthly climate statistics summary – Gulgong Post Office

5.2 Local meteorological conditions

MCO operates a meteorological station (WS3) as required by EPL 12932, with an additional station (WS1) used to supplement data when required. The location of these stations are shown in **Figure 5-2**.

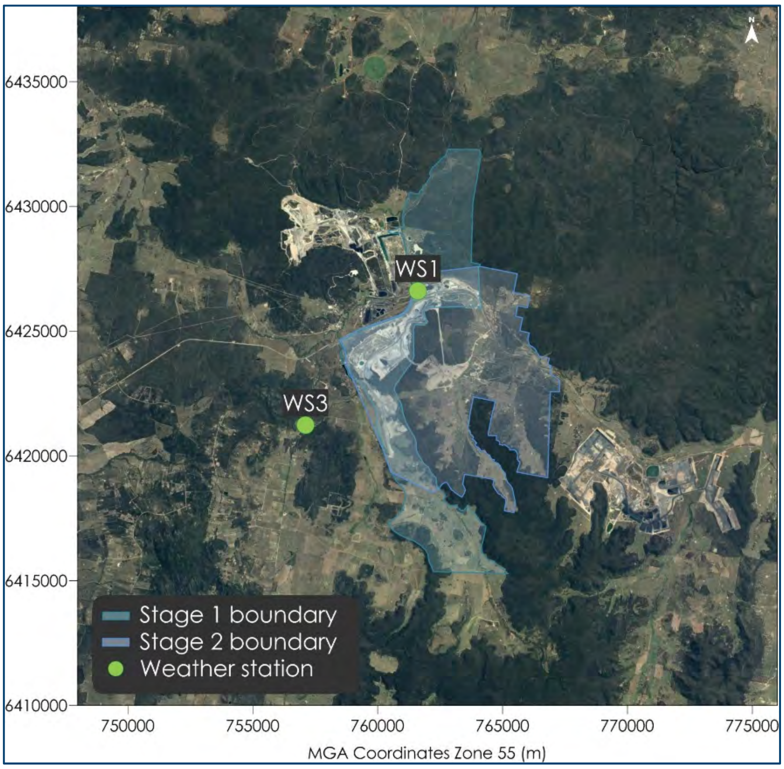

Figure 5-2: MCO weather station locations

Annual and seasonal windroses prepared from the available data collected for the 2011 calendar period for WS1 are presented in **Figure 5-3**. WS3 was commissioned in late 2011 with data only available from September 2011. Annual and seasonal windroses prepared from the available data collected for the 2012 calendar period for WS3 are presented in **Figure 5-4** for comparison to the WS1 data.

Analysis of the windroses from the two weather stations indicates very similar patterns with winds generally flowing along an east-west axis on an annual basis and very few winds from the north and south directions. The location of WS3 is subject to a high portion of drainage flows compared to WS1 as indicated by the light winds from the southwest.

In summer the winds predominately occur from the east. The autumn and spring wind distributions shows similarities with predominant winds from the east and progressively lighter winds originating from the east-northeast to the northeast. During winter, the dominant winds arise from the west-southwest and west. In all seasons, WS3 records a high percentage of low wind speed winds from the southwest.

Windroses for the 2013 to 2016 periods for WS3 are presented in **Appendix B**. A review of the annual windroses indicate similar wind patterns.

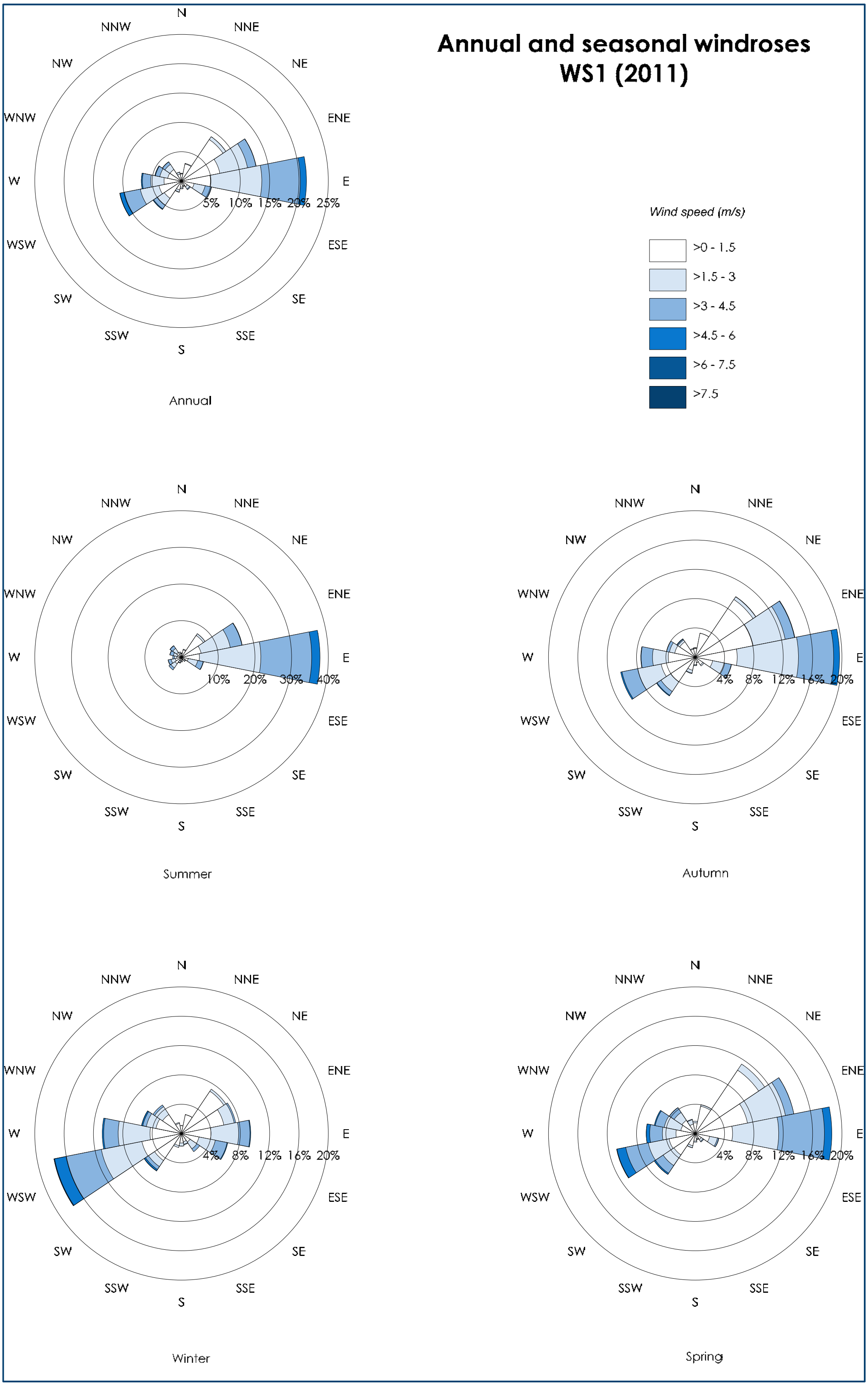

Figure 5-3: Annual and seasonal windroses for WS1 (2011)

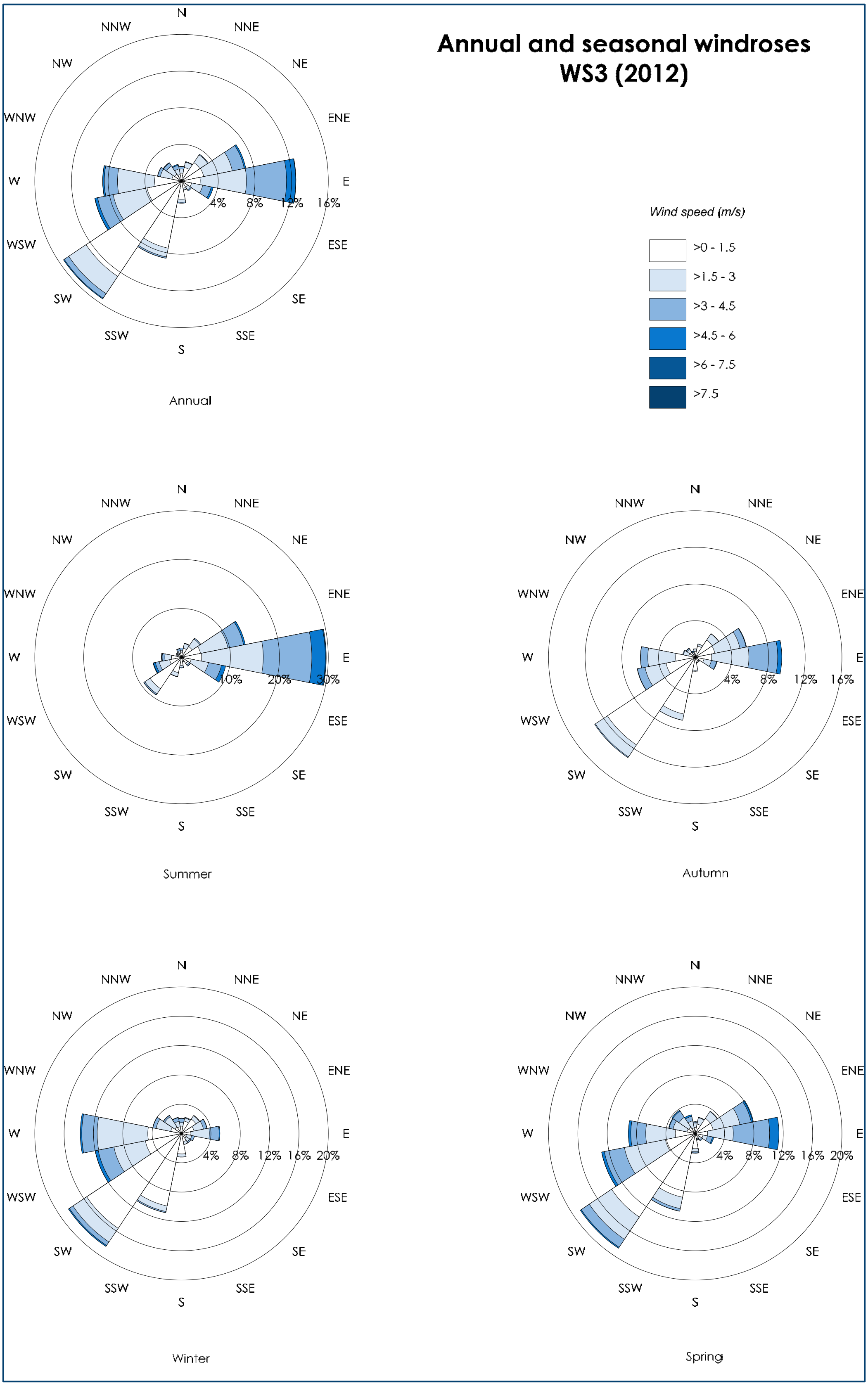

Figure 5-4: Annual and seasonal windroses for WS3 (2012)

5.3 Local air quality monitoring

The main sources of particulate matter in the wider area include active mining, agricultural activities, emissions from local anthropogenic activities such as motor vehicle exhaust and domestic wood heaters, urban activity and various other commercial and industrial activities.

This section reviews the ambient monitoring data collected from a number of ambient monitoring locations in the vicinity of the Moolarben Coal Complex. The monitoring data reviewed in this assessment include data collected at six Tapered Element Oscillating Microbalances (TEOMs) measuring PM_{10}, two High Volume Air Samplers (HVAS) measuring PM_{10} and 13 dust deposition gauges measuring dust fallout.

Figure 5-5 shows the approximate location of each of the monitoring stations reviewed in this assessment.

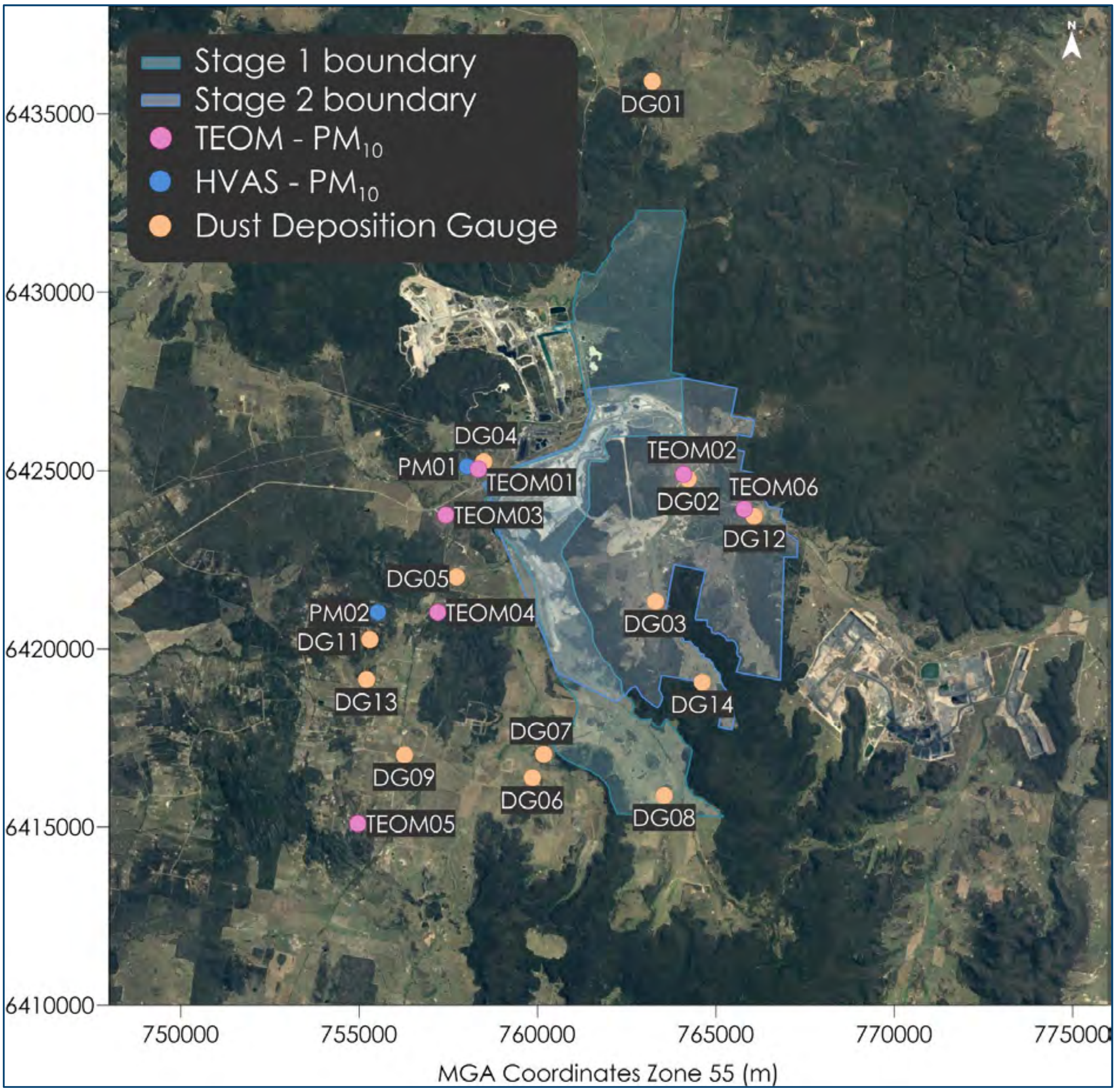

Figure 5-5: Monitoring locations

5.3.1 TEOM monitoring

A summary of the available ambient TEOM PM_{10} monitoring data is presented in **Table 5-2**. Recorded 24-hour average PM_{10} concentrations are presented in **Figure 5-6**.

The monitoring data in **Table 5-2** include all emission sources in the general vicinity of the Moolarben Coal Complex. Where TEOM datasets are less than 75% complete for the annual period, they have not been included in the annual average analysis. The annual average PM_{10} concentrations for the monitoring stations were below the relevant criterion of 25µg/m³ for the period review.

Table 5-2: Summary of TEOM PM_{10} levels MCO monitoring stations (µg/m³)

Station ID	2011	2012	2013	2014	2015	2016
Annual average						
TEOM 01	10.3	11.3	12.7	14.0	12.5	13.1
TEOM 02 (1)	9.3	10.3	12.4	11.2	-	-
TEOM 03 (2)	-	-	-	-	-	-
TEOM 04 (3)	-	9.0	10.8	12.8	9.0	11.7
TEOM 05 (4)	-	-	-	10.8	8.7	8.5
TEOM 06 (5)	-	-	-	-	-	11.2
Maximum 24-hour average						
TEOM 01	31	41	47	56	64	42
TEOM 02 (1)	26	42	60	54	107	-
TEOM 03 (2)	46	-	-	-	-	-
TEOM 04 (3)	26	42	45	130	63	38
TEOM 05 (4)	-	-	40	65	86	32
TEOM 06 (5)	-	-	-	-	39	71
Number of days >50µg/m³						
TEOM 01	-	-	-	3	2	-
TEOM 02 (1)	-	-	1	2	3	-
TEOM 03 (2)	-	-	-	-	-	-
TEOM 04 (3)	0	0	0	10	1	0
TEOM 05 (4)	-	-	-	4	1	-
TEOM 06 (5)	-	-	-	-	0	2

(1) Data available till July 2015 then relocated and renamed TEOM 06.
(2) Data available till July 2011 then relocated and renamed TEOM 04.
(3) Data available from September 2011.
(4) Data available from December 2013.
(5) Data available from August 2015.

The maximum 24-hour average PM_{10} concentrations (see **Figure 5-6**) recorded at the MCO TEOM monitors were above the relevant criterion of 50µg/m³ on a number of occasions during the review period.

Most notable were the elevated levels occurring at all the TEOM monitors during January 2014. A review of the Annual Environmental Management Report for the period (**Moolarben Coal Operations, 2015a**) indicates a visible smoke haze associated with a bushfire as well as road works occurring adjacent to the TEOM 04 as a likely source of the elevated levels.

The exceedance in 2013 was attributed to smoke haze in the surrounding area. Exceedances in 2015 were related to road works undertaken near the relevant monitors and one regional dust event. Two exceedances were recorded in 2016 at TEOM06 and were attributed to hazard reduction burns in the Goulburn River National Park.

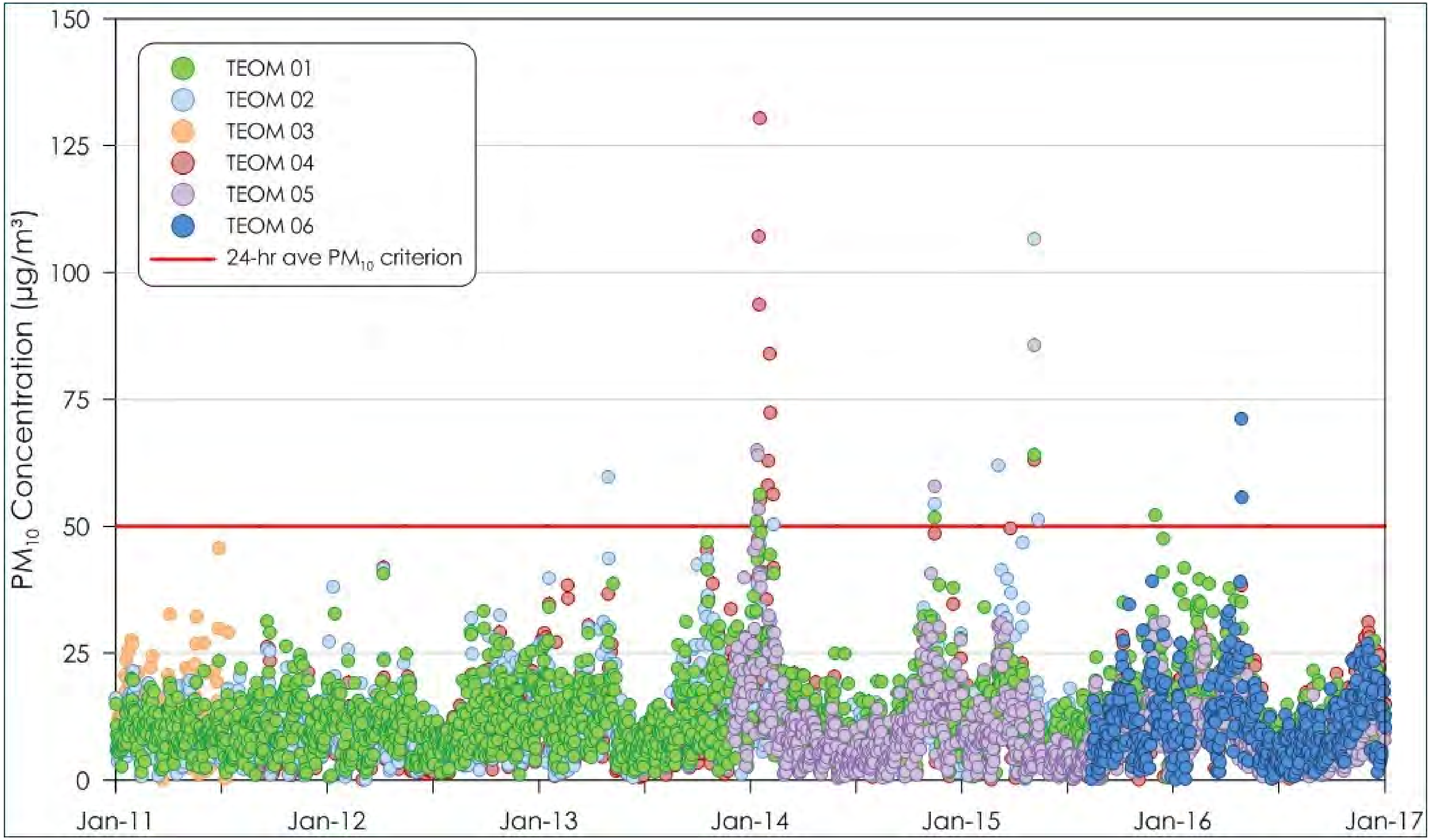

Figure 5-6: TEOM 24-hour average PM_{10} concentrations at MCO TEOM monitors

5.3.2 HVAS monitoring

A summary of the available HVAS PM_{10} monitoring data collected between January 2011 and December 2016 is shown in **Table 5-3**. Recorded 24-hour average PM_{10} concentrations are presented in **Figure 5-7**.

The monitoring data presented in **Table 5-3** indicate that the annual average PM_{10} concentrations for the monitoring stations are well below the criterion of 25µg/m³. **Figure 5-7** shows that the recorded 24-hour average PM_{10} concentrations follow a seasonal trend with concentrations nominally highest in the spring and summer months with the warmer weather raising the potential for drier ground elevating windblown dust, pollen levels and the occurrence of bushfires.

Table 5-3: Summary of annul average HVAS PM_{10} levels (µg/m³)

Year	Annual average	
	PM 01	PM 02
2011	12.4	10.5
2012	11.8	9.6
2013	12.2	10.0
2014	13.8	11.7
2015	13.2	10.8
2016	12.3	10.4

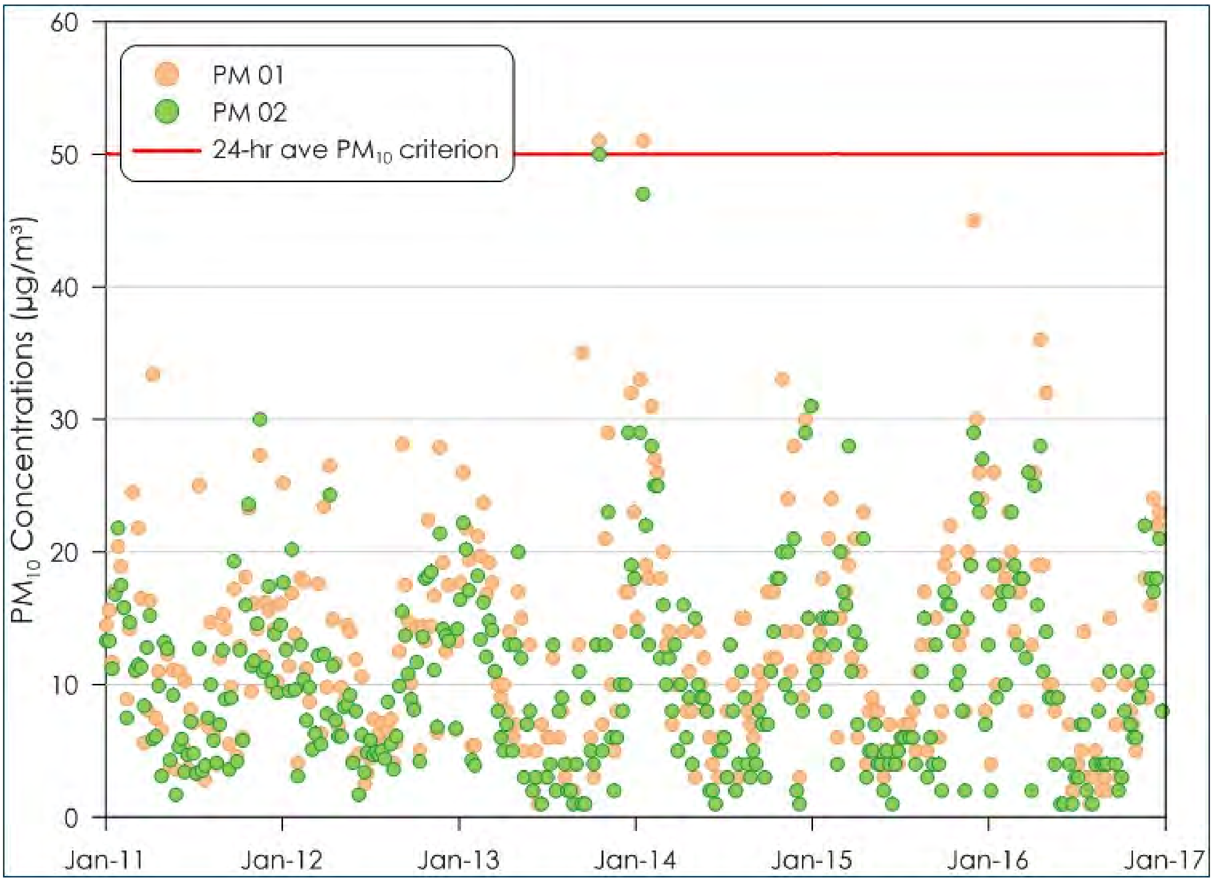

Figure 5-7: HVAS 24-hour average PM_{10} concentrations

5.3.3 Dust deposition monitoring

Table 5-4 summarises the annual average deposition levels at each gauge during 2011 to 2016.

All gauges recorded an annual average insoluble deposition level below the criterion of 4g/m^2/month.

Table 5-4: Annual average dust deposition (g/m²/month)

Dust gauge	2011	2012	2013	2014	2015	2016
DG01	0.4	0.3	0.5	0.8	0.6	0.5
DG04	1.6	1.3	1.3	1.6	1	1.2
DG05	1.5	0.8	1	2	0.8	1.3
DG06	0.6	0.4	0.7	1	0.6	0.6
DG07	0.7	0.8	1	0.9	0.9	0.9
DG08	0.8	0.7	0.7	0.8	0.6	0.7
DG09	0.5	0.4	0.7	2	0.6	0.6
DG11	-	-	0.6	0.8	0.6	0.7
DG12	-	-	-	-	1.5	1
DG13	-	-	-	-	0.7	0.7

6 DISPERSION MODELLING APPROACH

6.1 Modelling scenarios

This assessment considers three mine plan years (scenarios) to represent the proposed Modification over the life of the mine, Year 2019, Year 2021 and Year 2026. The scenarios chosen represent potential worst-case impacts in regard to the quantity of material extracted in each year, the location of the operations and the potential to generate dust impacts at the sensitive receptor locations.

Mining operations would consist of a drill and blast, truck, shovel and dozer operation to remove overburden material and extract the coal resources. Overburden emplacement would typically occur behind the progression of the mine extraction with rehabilitation of emplacement areas progressing as they are completed. The active mining areas and exposed areas are to be kept to a minimum for the efficiency of the operation and this also has a positive effect in minimising the potential amount of dust levels generated from the operations.

Indicative mine plans for each of the assessed scenarios are presented in **Figure 6-1** to **Figure 6-3**.

During Year 2019 (see **Figure 6-1**), all four open cut pits are in operation at the proposed maximum combined Stage 1 and 2 open cut mining rate of 16Mtpa. ROM coal is transported to the Coal Handling and Preparation Plant (CHPP) by haul truck from OC1, OC2 and OC3 with a conveyor used to deliver ROM coal from OC4. The total combined ROM from the open cut (16Mtpa) and underground operations (6Mtpa) is 22Mtpa and the total product coal is at 19Mtpa.

In Year 2021 (see **Figure 6-2**), operations in OC2 have been completed. Mining operations continue in the other open cuts at the proposed maximum rate of 10Mtpa from the Stage 1 open cuts and combined Stage 1 and 2 open cut mining rate of 16Mtpa. The total combined ROM from the open cut (16Mtpa) and underground (8Mtpa) operations is at the proposed maximum of 24Mtpa, and the total product coal is at 21Mtpa.

For Year 2026 (see **Figure 6-3**), OC4 is the only operational open cut and is operating at the proposed maximum rate of 16Mtpa. The total combined ROM from the open cut (16Mtpa) and underground (6Mtpa) operations is 22Mtpa and the total product coal is at 20Mtpa.

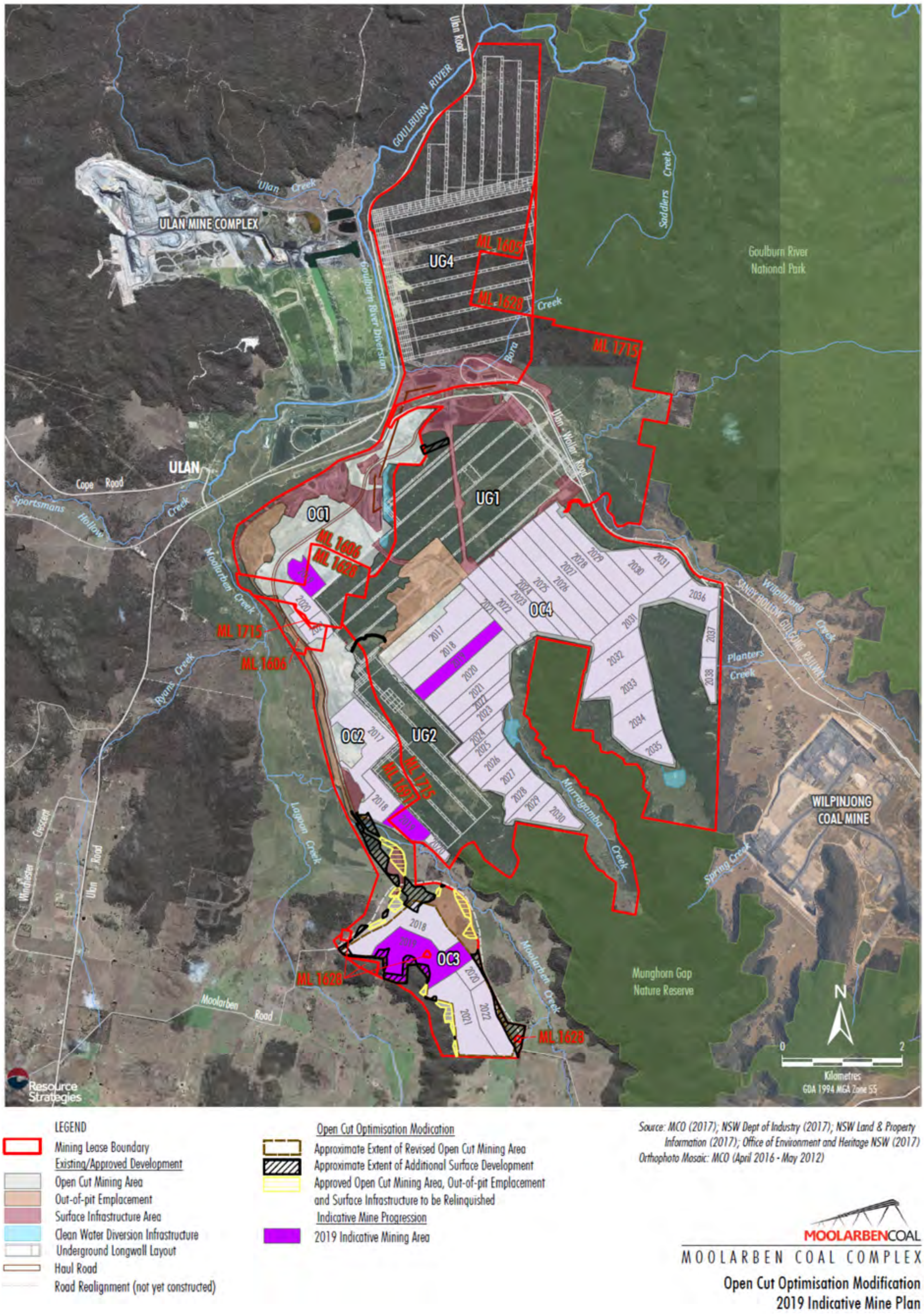

Figure 6-1: Indicative mine plan for 2019

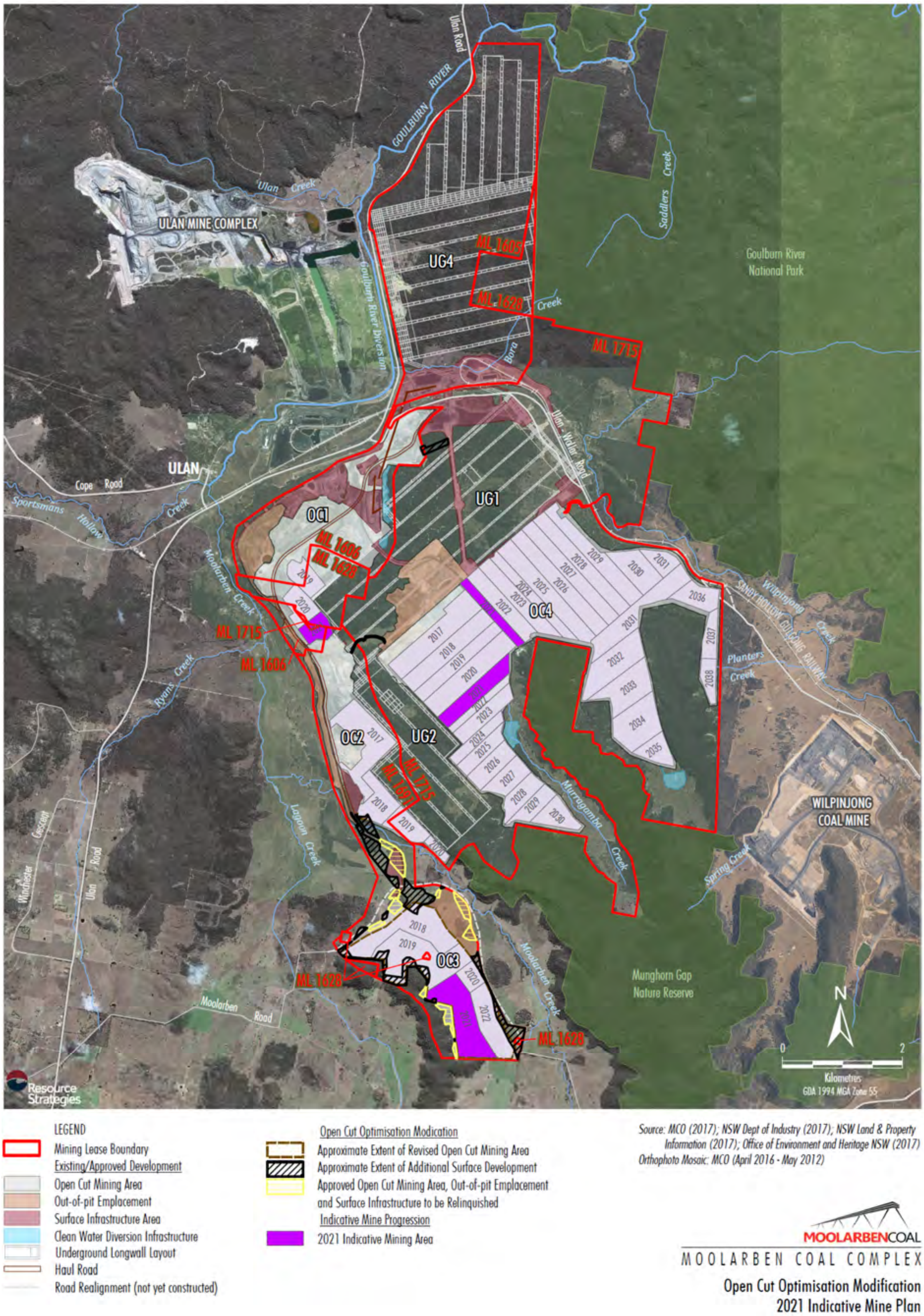

Figure 6-2: Indicative mine plan for 2021

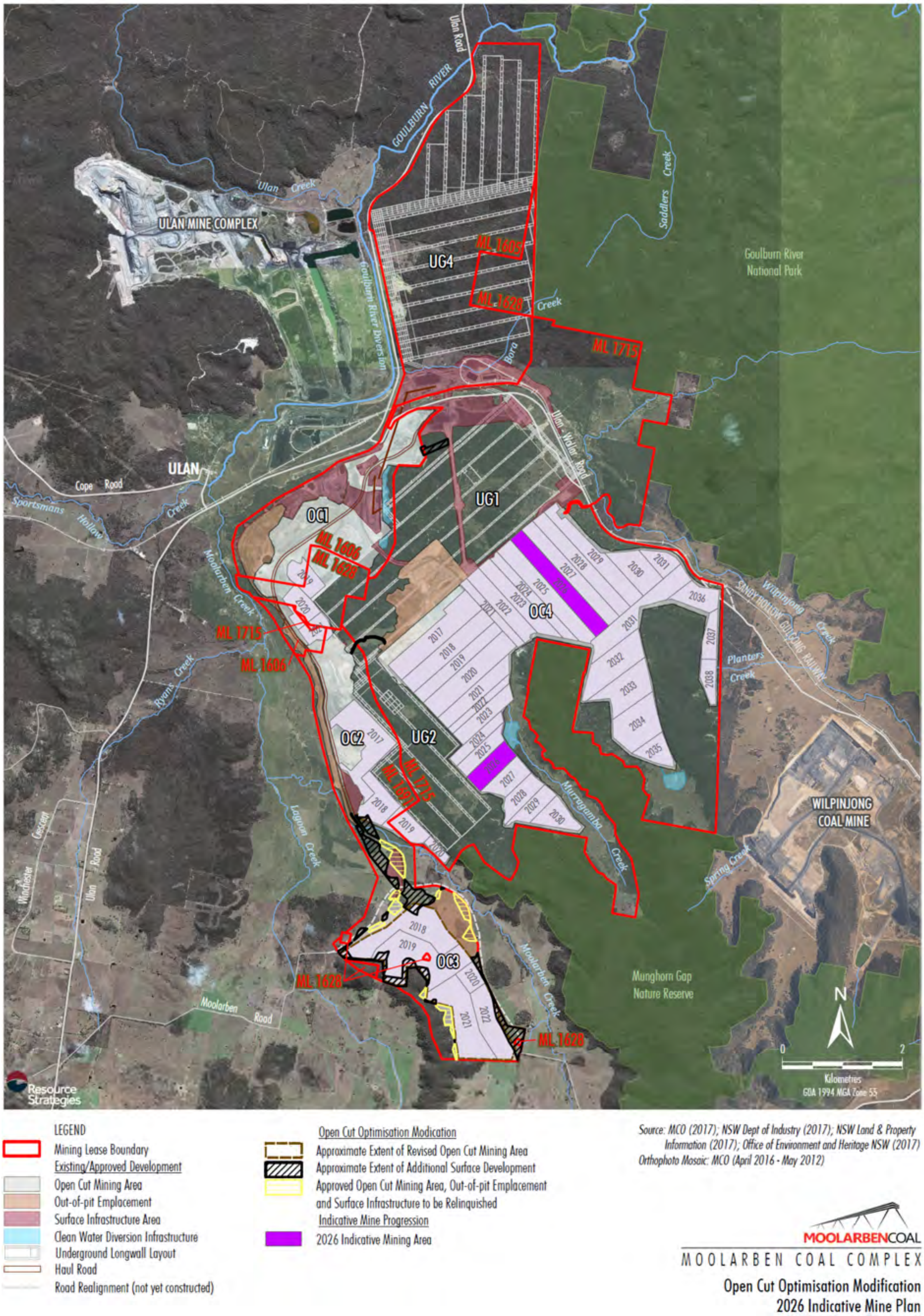

Figure 6-3: Indicative mine plan for 2026

6.2 Emissions estimation

For the modelled scenario, dust emission estimates have been calculated by analysing the various types of dust generating activities taking place and utilising suitable emission factors.

The emission factors were sourced from both locally developed and United States Environmental Protection Agency (US EPA) developed documentation. Total dust emissions from all significant dust generating activities for the project are presented in **Table 6-1**. Detailed emission inventories and emission estimation calculations are presented in **Appendix C**.

The estimated emissions presented in **Table 6-1** are commensurate with a mining operation utilising reasonable and feasible best practice dust mitigation applied where applicable. Further details on the dust control measures applied for the Moolarben Coal Complex are outlined in **Section 6.3**. Where relevant, mitigation measures have been incorporated in the emissions estimations including those identified in the EPL 12932 Coal Mine Particulate Matter Control Best Practice Pollution Reduction Scheme.

Table 6-1: Estimated emission for the proposed modification (kg of TSP)

ACTIVITY	2019	2021	2026
Overburden			
OB - Stripping Topsoil - OC1	1,356	1,290	-
OB - Stripping Topsoil - OC2	1,472	-	-
OB - Stripping Topsoil - OC3	1,419	1,470	-
OB - Stripping Topsoil - OC4	2,053	3,540	6,300
OB - Drilling - OC1	1,304	1,155	-
OB - Drilling - OC2	1,415	-	-
OB - Drilling - OC3	1,364	1,316	-
OB - Drilling - OC4	3,291	4,351	8,184
OB - Blasting - OC1	11,953	10,582	-
OB - Blasting - OC2	12,972	-	-
OB - Blasting - OC3	12,502	12,057	-
OB - Blasting - OC4	30,157	39,874	75,010
OB - Excavator loading OB to haul truck - OC1	23,153	20,496	-
OB - Excavator loading OB to haul truck - OC2	25,126	-	-
OB - Excavator loading OB to haul truck - OC3	24,215	23,355	-
OB - Excavator loading OB to haul truck - OC4	35,048	56,226	105,337
OB - Excavator rehandle - OC1	-	512	-
OB - Excavator rehandle - OC3	-	584	-
OB - Excavator rehandle - OC4	1,168	1,699	3,196
OB - Hauling to dump - OC1 (OC1 void)	169,248	-	-
OB - Hauling to dump - OC1 (OC1 dump)	82,586	146,817	-
OB - Hauling to dump - OC2	179,250	-	-
OB - Hauling to dump - OC3	104,773	101,727	-
OB - Hauling to dump - OC4 (930 E)	64,424	101,353	137,761
OB - Hauling to dump - OC4 (830 E)	149,614	221,105	304,955
OB - Hauling to dump - OC4 (830 E) (south)	-	-	203,303
OB - Emplacing at dump - OC1 (OC1 void)	11,576	-	-
OB - Emplacing at dump - OC1 (OC1 dump)	11,576	20,496	-
OB - Emplacing at dump - OC2	25,126	-	-
OB - Emplacing at dump - OC3	24,215	23,355	-
OB - Emplacing at dump - OC4	35,048	56,226	105,337
OB - Dozers on OB (dump and pit) - OC1	-	134,636	-
OB - Dozers on OB (dump and pit) - OC2	309,620	-	-
OB - Dozers on OB (dump and pit) - OC3	155,689	149,664	-
OB - Dozers on OB (dump and pit) - OC4	681,262	844,749	1,110,055
Coal			

ACTIVITY	2019	2021	2026
CL - Drilling - OC1	39	82	-
CL - Drilling - OC2	106	-	-
CL - Drilling - OC3	92	218	-
CL - Drilling - OC4	243	176	480
CL - Blasting - OC1	3,234	6,831	-
CL - Blasting - OC2	8,841	-	-
CL - Blasting - OC3	7,625	18,086	-
CL - Blasting - OC4	20,168	14,577	39,867
CL - Dozers ripping/pushing/clean-up - OC1	7,756	17,232	-
CL - Dozers ripping/pushing/clean-up - OC2	20,573	-	-
CL - Dozers ripping/pushing/clean-up - OC3	17,742	45,633	-
CL - Dozers ripping/pushing/clean-up - OC4	48,400	36,776	116,727
CL - Loading ROM coal to haul truck - OC1	68,160	143,987	-
CL - Loading ROM coal to haul truck - OC2	186,352	-	-
CL - Loading ROM coal to haul truck - OC3	160,734	381,244	-
CL - Loading ROM coal to haul truck - OC4	425,123	307,275	840,369
CL - Hauling ROM to hopper - OC1	28,508	79,588	-
CL - Hauling ROM to hopper - OC2	154,950	-	-
CL - Hauling ROM to hopper - OC3	198,410	476,588	-
CL - Hauling ROM to hopper - OC4	100,949	87,310	278,086
CL - Unload to hopper or stockpile (OC1, OC2, OC3)	207,623	236,354	-
CL - Unload to hopper or stockpile (OC4)	212,562	153,637	420,184
CL - Rehandling - (OC1 + OC2 + OC3) - at hopper	110,621	125,929	-
CL - Rehandling - OC4 - at hopper	113,253	81,858	111,937
CHPP - Transfer to Sizing Station (OC4)	1,370	990	2,708
Bypass			
CL - bypass - direct dumping at bypass stockpile (OC1 + OC3)	-	169	-
CL - bypass - conveying to bypass stockpile (OC4) (1 transfer point)	-	205	1,124
CL - bypass - discharge to bypass stockpile (OC4)	-	205	1,124
CL - bypass - transfer station (OC)	-	374	1,124
CL - bypass - bypass coal sizing station	-	5,967	17,924
CL - bypass - OC bypass coal conveyed to product stockpile	-	376	376
CL - bypass - bypass coal conveyed to TLO (3 transfer points)	-	1,122	3,371
Open Cut			
CHPP - Conveying to Sizing Station (OC1+OC2+OC3)	158	158	-
CHPP - Transfer to Sizing Station (OC4)	-	785	1,585
CHPP - Sizing Station (OC1+OC2+OC3+OC4)	43,200	36,829	25,276
CHPP - Conveying to CHPP (OC)	39	39	39
CHPP - Washing (OC)	-	-	-
CHPP - Conveying to CHPP Product Stockpile (OC)	208	208	208
CHPP - Unloading to CHPP Product Stockpile (OC)	1,393	1,195	801
CHPP - Reclaim and Conveying to TLO (3 transfer points)	4,179	4,321	4,616
Underground			
CHPP - Conveyor transfer point at UG portal entrance	310	310	310
CHPP - Conveyor to UG1 pit top	386	386	386
CHPP - Unload to ROM stockpile	1,024	1,354	1,354
CHPP - Transfer to sizing station (at product coal stockpile area)	1,024	1,354	1,354
CHPP - Unload to product stockpile	1,024	1,354	1,354
CHPP - Reclaim and conveyor to TLO (3 transfer points)	3,072	4,062	4,062
Dozers			
CHPP - Dozer pushing ROM coal at UG1 pit top	27,746	36,694	27,063
CHPP - Dozer pushing ROM coal (bypass) at product stockpile	37,517	13,712	41,173
CHPP - Dozer pushing Product coal	59,526	51,069	34,312
CHPP - Dozer pushing bypass (UG + OC) Product coal	-	48,452	59,498
Rejects			
CHPP - Conveying rejects from CHPP to loadout	183	183	183
CHPP - Loading rejects	145	121	90
CHPP - Hauling rejects	126,674	114,889	68,714
CHPP - Unloading rejects	145	121	90

ACTIVITY	2019	2021	2026
Wind Erosion			
OC1 - Active mining area (pit, active dumping area) (OC1 void)	8,713	-	-
OC1 - Active mining area (pit, active dumping area) (OC1)	51,502	31,152	-
OC1 - Inactive area (no rehabilitation) (OC1 north)	4,977	-	-
OC1 - Inactive area (no rehabilitation) (OC1 south)	5,576	4,977	-
OC1 - Partially rehabilitated (e.g. stable and seeded) (OC1 north)	-	2,614	3,118
OC1 - Partially rehabilitated (e.g. stable and seeded)	12,123	19,502	
OC1 - Hard Stand Areas (Workshops, roads, conveyors etc)	105,239	85,179	94,952
OC2 - Active mining area (pit, active dumping area)	51,170	-	-
OC2 - Inactive area (no rehabilitation)	1,216	1,216	-
OC2 - Partially rehabilitated (e.g. stable and seeded)	21,224	-	-
OC2 - Hard Stand Areas (Workshops, roads, conveyors etc)	17,850	17,850	17,851
OC3 - Active mining area (pit, active dumping area)	120,318	110,475	-
OC3 - Inactive area (no rehabilitation)	-	-	-
OC3 - Partially rehabilitated (e.g. stable and seeded)	16,111	44,602	-
OC3 - Hard Stand Areas (Workshops, roads, conveyors etc)	31,969	31,969	-
OC4 - Active mining area (pit, active dumping area)	168,904	129,421	156,671
OC4 - Active mining area (pit, active dumping area) (OC4 south)	-	-	112,024
OC4 - Inactive area (no rehabilitation)	16,970	16,635	-
OC4 - Partially rehabilitated (e.g. stable and seeded)	18,202	32,449	41,005
OC4 - Hard Stand Areas (Workshops, roads, conveyors etc)	28,968	29,589	18,343
Stockpile - ROM coal stockpile (OC1)	3,107	3,107	3,105
Stockpile - ROM coal stockpile (UG)	769	769	768
Stockpile - ROM coal stockpile (OC3)	1,471	1,471	-
Stockpile - ROM coal stockpile (OC4)	3,336	3,336	3,953
Stockpile - Bypass Coal Stockpile	-	5,143	5,143
Stockpile - Product Coal Stockpile	2,384	4,526	2,383
Grading roads	141,796	141,796	141,796
Total TSP emissions (kg/yr)	**5,439,254**	**5,236,797**	**4,768,420**

6.2.1 Emissions from other mining operations

In addition to the estimated dust emissions from the proposed modification, emissions from all nearby approved mining operations were also modelled, in accordance with their current consent (or current proposed project), to assess potential cumulative dust effects.

Emissions estimates from these sources were derived from information provided in the air quality assessments available in the public domain at the time of modelling. These estimates are likely to be conservative, as in many cases, mines do not continually operate at the maximum extraction rates assessed in their respective environmental assessments. **Table 6-2** summarises the emissions adopted in this assessment for each of the nearby mining operations.

Table 6-2: Estimated emissions from nearby mining operations (kg of TSP)

Mining operation	2019	2021	2026
Ulan Coal Mine (1)	2,322,489	1,283,404	1,280,276
Wilpinjong Coal Mine (2)	6,874,251	6,342,619	5,033,886

(1) PAEHolmes (2009)

(2) Todoroski Air Sciences (2015b)

6.3 Existing air quality monitoring and management

The existing Air Quality Management Plan (**Moolarben Coal Operations, 2015c**) describes the air quality management and monitoring regime at the Moolarben Coal Complex.

The existing Air Quality Management Plan (**Moolarben Coal Operations, 2015c**) describes:

- Project Approval air quality criteria;
- Air quality monitoring locations and frequency, comprising:
  - Four TEOMs measuring PM_{10} continuously (i.e. real-time monitor);
  - Two HVAS measuring PM_{10} on a one day in six cycle; and
  - Eleven dust deposition gauges;
- Ongoing dust management measures; and
- Performance indicators (real-time response triggers) which, if certain thresholds are reached, trigger the implementation of additional dust management measures.

Operational air quality management measures used at the Moolarben Coal Complex include the implementation of best practice management techniques to proactively reduce dust (as described in the EPL 12932 Coal Mine Particulate Matter Control Best Practice Pollution Reduction Scheme), and reactive measures such as enforcing a cessation of particular operations during unfavourable conditions.

MCO has implemented a comprehensive air quality management system that assists in pro-active management of dust emissions. The system provides daily reports and predictions of upcoming meteorological conditions and potential dust risks. Based on prevailing wind conditions, MCO can strategically alter its operations to reduce these impacts.

Real-time air quality monitoring is used by MCO to provide notification of dust levels in the surrounding environment and at locations representative of receptor locations. When certain thresholds are reached, indicating excessive ambient dust levels, MCO is able to take action to minimise the generation of dust emissions before there is any significant effect at the receptor locations.

6.4 Modelling methodology

The dispersion modelling methodology applied in this assessment is the same as that applied in the MOD9, OC4 South-West MOD and UG1 MOD assessments using the CALPUFF modelling suite.

The CALMET meteorological modelling has been revised to incorporate the changes to the local mine terrain for the proposed modelling scenario which affect the local wind flows of the area (e.g. to account for the updated sequencing of the open cut pits). This assessment used the same meteorological conditions assessed in the MOD9 assessment which were based on data for January 2011 to December 2011 from six surrounding monitoring sites.

Dust emissions from each activity were represented by a series of volume sources and included in the CALPUFF model via an hourly varying emission file. Meteorological conditions associated with dust generation (such as wind speed) and levels of dust generating activity were considered in calculating the hourly varying emission rate for each source.

It should be noted that as a conservative measure, the effect of the precipitation rate (rainfall) in reducing dust emissions has not been considered in this assessment.

7 DISPERSION MODELLING RESULTS

The dispersion model predictions for each of the assessed scenarios are presented in this section. The results presented include those for the operation in isolation (incremental impact) and the operation with other sources (total (cumulative) impact). The results show the estimated:

- Maximum 24 hour average $PM_{2.5}$ and PM_{10} concentrations;
- Annual average $PM_{2.5}$ and PM_{10} concentrations;
- Annual average TSP concentrations; and,
- Annual average dust (insoluble solids) deposition rates.

It is important to note that when assessing impacts per the maximum 24-hour average $PM_{2.5}$ and PM_{10} criteria, the predictions show the highest predicted 24-hour average concentrations that were modelled at each point within the modelling domain for the worst day (a 24-hour period) in the one year long modelling period. When assessing the total (cumulative) 24-hour average impacts based on model predictions, challenges arise with identification and quantification of emissions from non-modelled sources over the 24-hour period. Due to these factors, the 24-hour average impacts need to be calculated differently to annual averages and as such, the predicted total (cumulative) impacts for maximum 24-hour average $PM_{2.5}$ and PM_{10} concentrations have been addressed specifically in **Section 7.3.**

Each of the sensitive receptors shown in **Figure 3-2** and detailed in **Appendix A** were assessed individually as discrete receptors with the predicted results presented in tabular form for each of the assessed scenarios in **Appendix D**.

Associated isopleth diagrams of the dispersion modelling results are presented in **Appendix E**.

To account for sources not explicitly included in the model, and to fully account for all cumulative dust levels, the unaccounted fractions of background dust levels (which arise from the other non-modelled sources), were added to the annual average model predictions.

The contribution of background dust levels was estimated by modelling the past (known) mining activities during 2011 and comparing model predictions with the actual measured data from the corresponding monitoring stations. The average difference between the measured and predicted PM_{10}, TSP and deposited dust levels from each of the monitoring points was considered to be the contribution from other non-modelled dust sources.

In this case, the estimated background levels for TSP, PM_{10} and deposited dust are identical to the levels applied in the MOD9 assessment (**Todoroski Air Sciences, 2013**). **Table 7-1** outlines the estimated annual average contribution from other non-modelled dust sources for the area surrounding the Moolarben Coal Complex incorporating the Modification.

Table 7-1: Estimated annual average contribution from other non-modelled dust sources

Pollutant	Background level	Unit
TSP	13.5	µg/m³
PM_{10}	5.4	µg/m³
Dust deposition	0.6	µg/m³

In the absence of available $PM_{2.5}$ monitoring data for the area, the background levels applied in the recent air quality assessment for the Wilpinjong Coal Mine (**Todoroski Air Sciences, 2015b**) are considered appropriate with a background $PM_{2.5}$ level of 4.3µg/m³.

7.1 Summary of modelling predictions (incremental Project-only impacts)

No exceedances of the criteria for $PM_{2.5}$, PM_{10}, TSP or dust deposition are predicted at any privately-owned receptor due to emissions from the Moolarben Coal Complex incorporating the Modification.

Table 7-2 summarises the sensitive receptor locations where impacts are predicted to exceed relevant assessment criteria. The receptor locations highlighted in grey are identified as mine-owned or Under Contract/ Purchase Agreement receptors.

Cumulative 24-hour $PM_{2.5}$ and PM_{10} impacts are assessed specifically in **Section 7.3**.

Table 7-2: Summary of modelled predictions for the Moolarben Coal Complex including the Modification where predicted impacts exceed assessment criteria

Receptor ID	Property Ownership	$PM_{2.5}$	PM_{10}		PM_{10}	TSP	DD	
		Total annual average	Project 24-hour average		Total annual average		Project annual average	Total annual average
		NEPM 8µg/m³	Criterion 50µg/m³		Criterion 25µg/m³	Criterion 90µg/m³	Criterion 2g/m²/mth	Criterion 4g/m²/mth
		Year of impact (level of impact - µg/m³)		No. of days >50µg/m³	Year of impact (level of impact - µg/m³)		Year of impact (level of impact - g/m²/mth)	
5	MCO	2019 (9) 2021 (8)	2021 (54)	1	2019 (27) 2021 (27)	-	-	-
36	MCO	2019 (12) 2021 (9)	2019 (103) 2021 (74)	70 25	2019 (37) 2021 (31)	-	-	-

7.2 Comparison of modelling predictions

To show the effect of the Modification relative to the historically approved operations, the key results (maximum 24-hour average and cumulative annual average PM_{10}) for each scenario have been overlayed with results for the nearest corresponding year from the MOD9 assessment (**Todoroski Air Sciences, 2013**) in **Figure 7-1** to **Figure 7-6**.

While there is some variation in the shape of the contours between the modelled years compared, this is largely attributed to the revised staging of operations, the location of activity and also recent approved modifications to other mining operations (i.e. Wilpinjong Coal Mine during Year 2026).

Overall, the comparisons indicate that the predicted dust levels associated with the Modification would be of a generally similar extent to the previously approved operations.

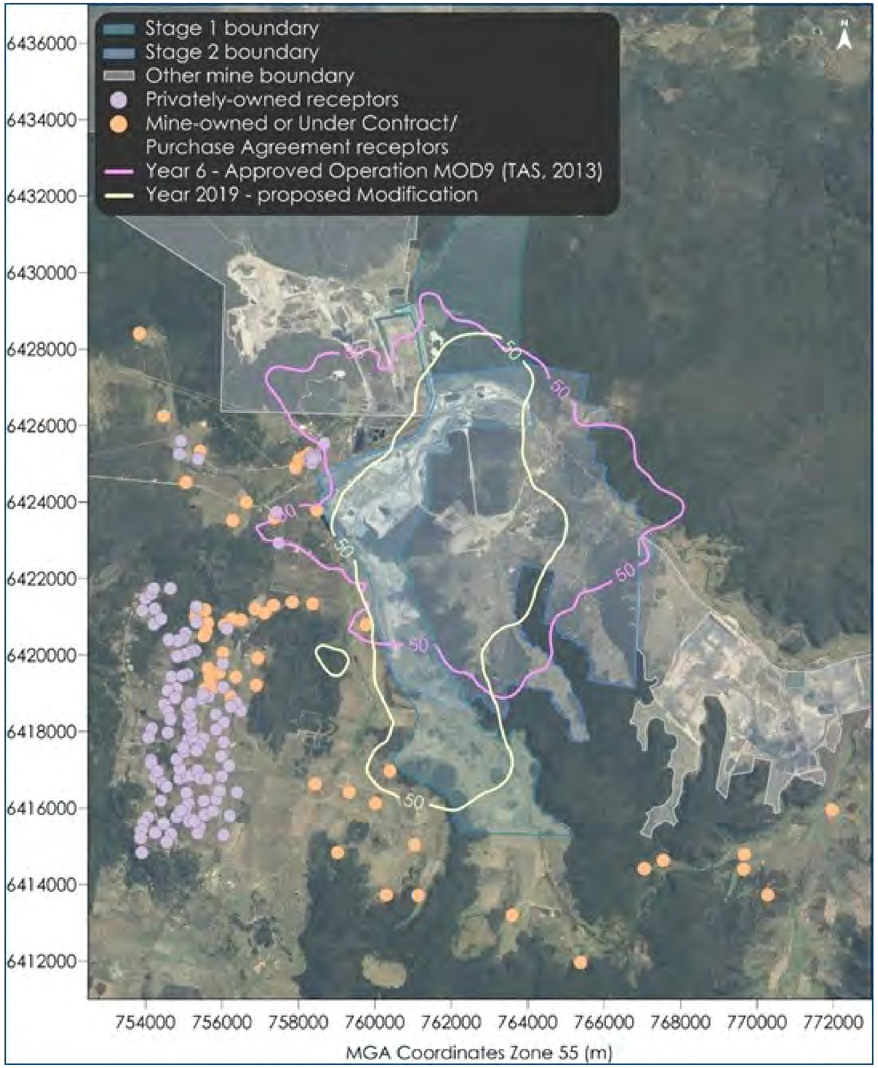

Figure 7-1: Comparison of maximum incremental 24-hour average PM_{10} concentrations for Year 6 (previously assessed – MOD9) and Year 2019 (the Modification) (µg/m³)

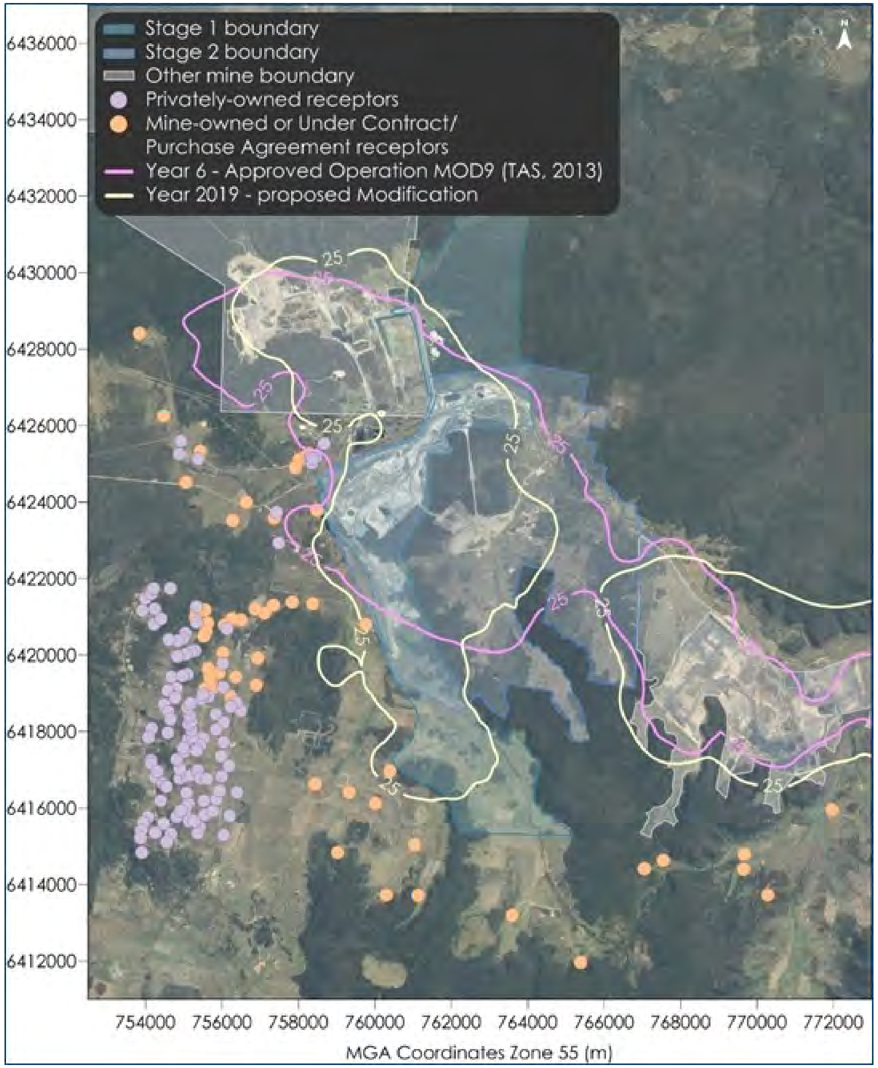

Figure 7-2: Comparison of cumulative annual average PM_{10} concentrations for Year 6 (previously assessed – MOD9) and Year 2019 (the Modification) (µg/m³)

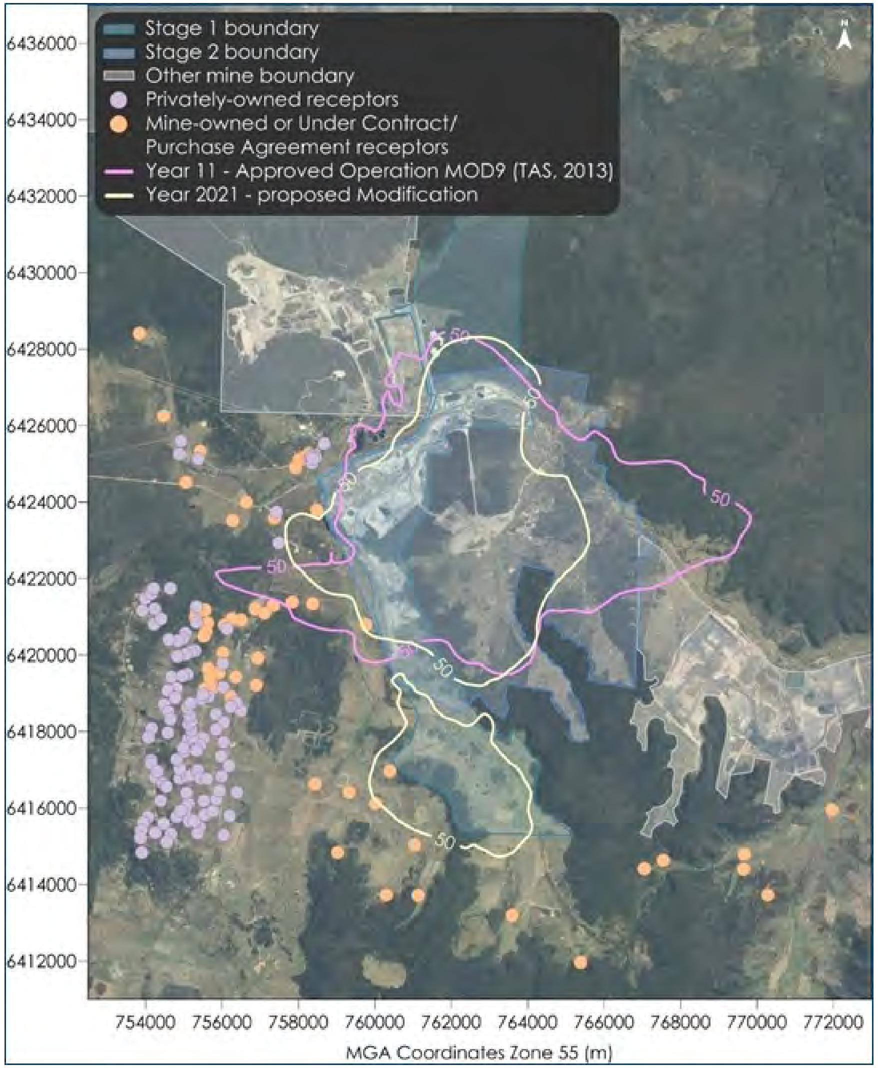

Figure 7-3: Comparison of maximum incremental 24-hour average PM_{10} concentrations for Year 11 (previously assessed – MOD9) and Year 2021 (the Modification) (µg/m³)

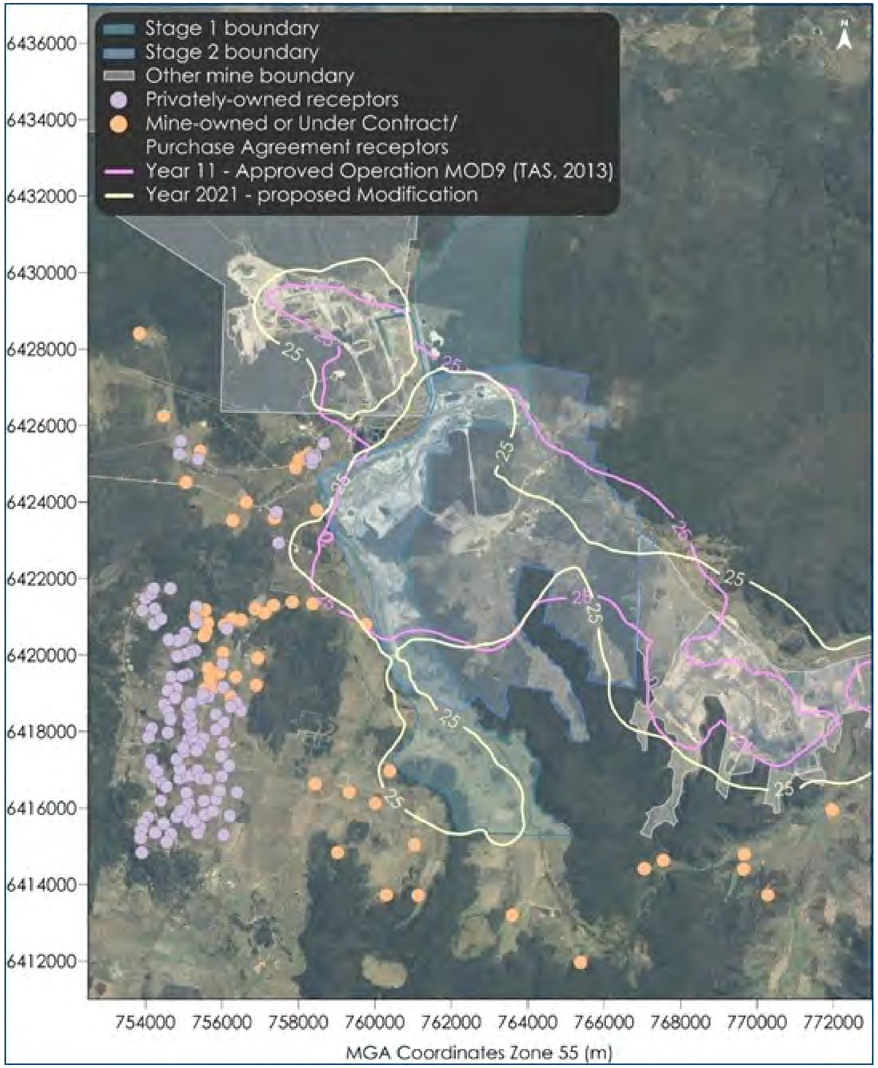

Figure 7-4: Comparison of cumulative annual average PM_{10} concentrations for Year 11 (previously assessed) and Year 2021 (the Modification) (µg/m³)

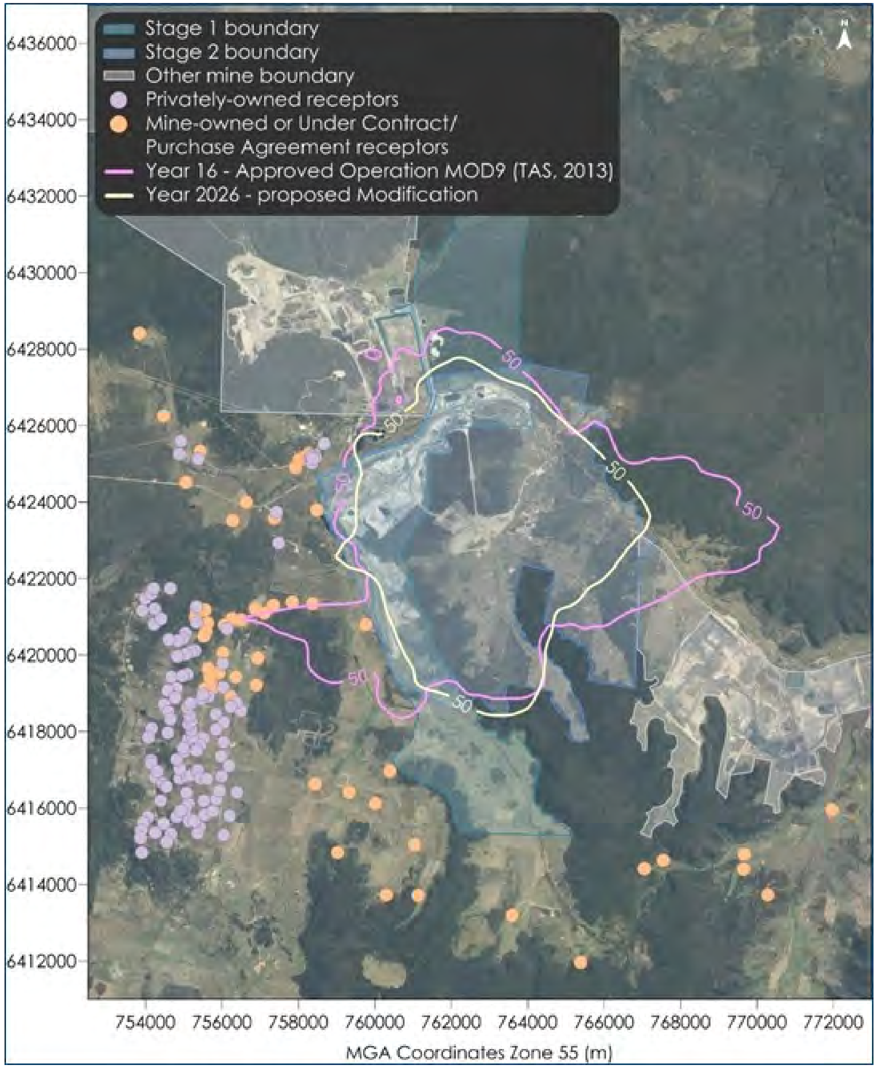

Figure 7-5: Comparison of maximum incremental 24-hour average PM_{10} concentrations for Year 16 (previously assessed) and Year 2026 (the Modification) (µg/m³)

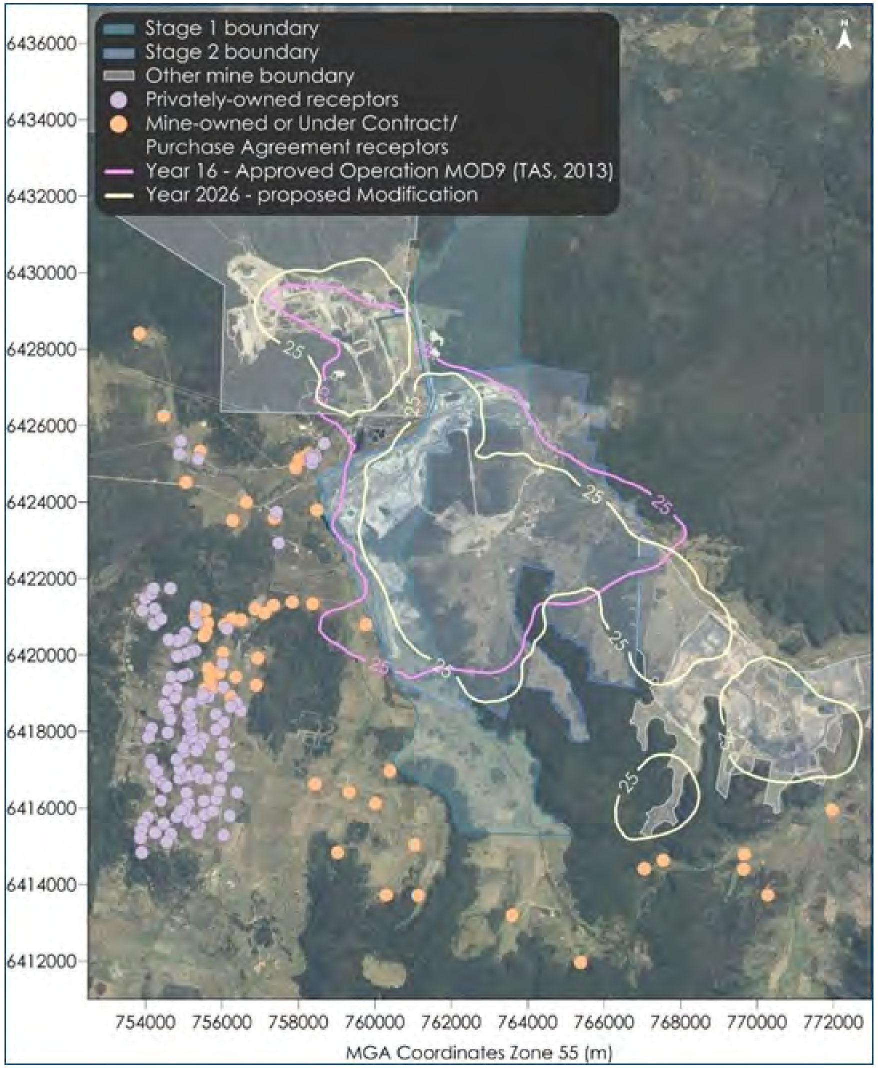

Figure 7-6: Comparison of cumulative annual average PM_{10} concentrations for Year 16 (previously assessed) and Year 2026 (the Modification) (µg/m³)

7.3 Assessment of total (cumulative) 24-hour average $PM_{2.5}$ and PM_{10} concentrations

Cumulative 24-hour average $PM_{2.5}$ and PM_{10} impacts are focused on the closest and most potentially impacted privately-owned receptor locations.

Three PM_{10} monitoring stations operated by MCO where suitable ambient monitoring data are available over the contemporaneous modelling period have been chosen to be representative of the privately-owned receptor locations. **Figure 7-7** shows the location of each of these monitors in relation to the Modification and the privately-owned receptor locations assessed.

As there are no readily available ambient $PM_{2.5}$ monitoring data collected near to the Moolarben Coal Complex, monitoring data from the NSW Office of Environment and Heritage (OEH) monitoring stations at Muswellbrook and Singleton have been applied for the assessment.

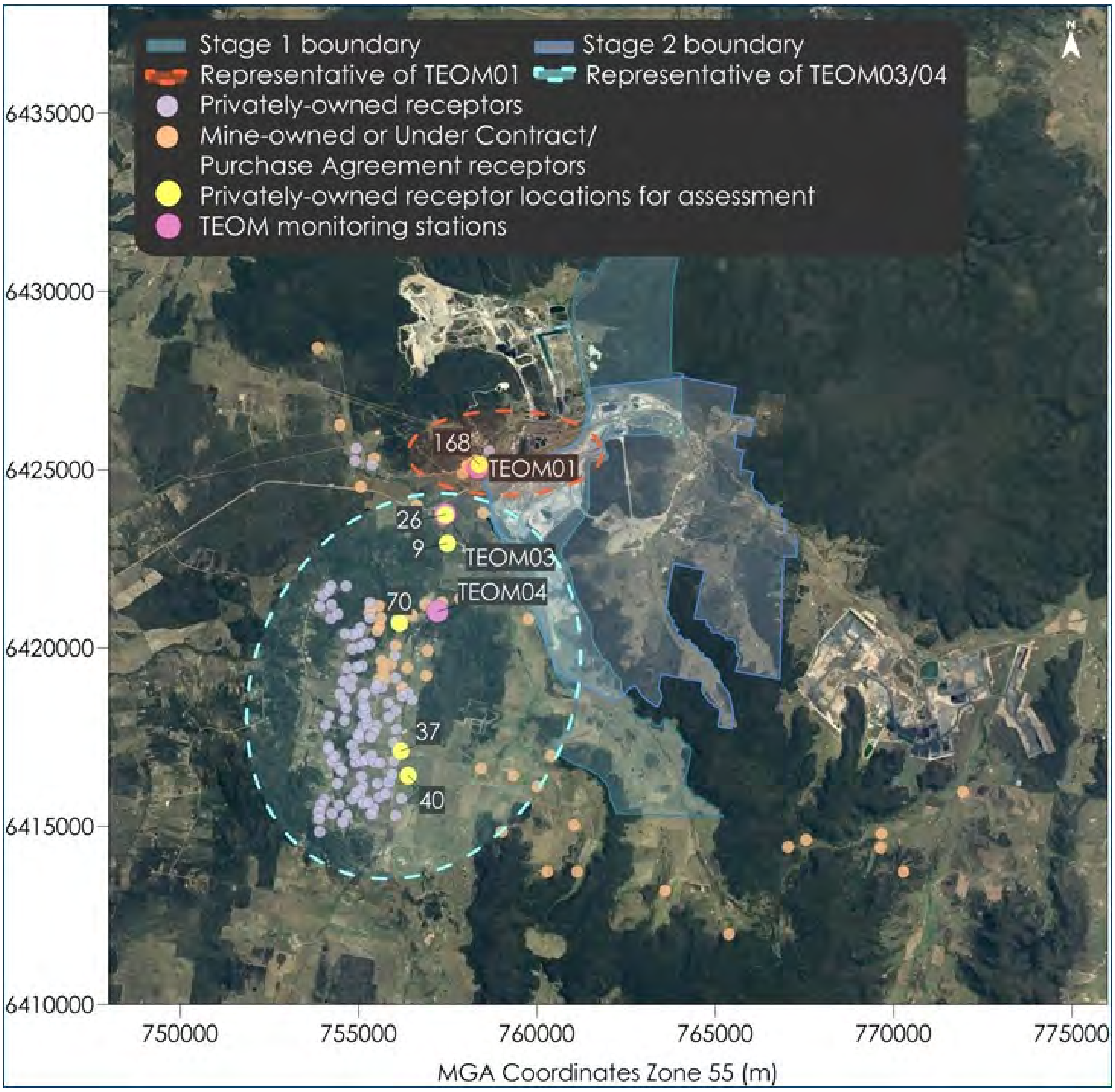

Figure 7-7: Locations available for contemporaneous cumulative impact assessment

7.3.1 Assessment of cumulative $PM_{2.5}$ impacts

To assess the potential cumulative 24-hour average $PM_{2.5}$ impacts due to the Modification, the Victorian EPA approach[2] with the available ambient $PM_{2.5}$ monitoring data from the NSW OEH monitoring stations at Muswellbrook and Singleton during 2011 has been applied.

This approach is considered suitable for this assessment in the absence of readily available ambient $PM_{2.5}$ monitoring data for the Modification. The monitoring data from Muswellbrook and Singleton monitoring stations are representative of a more densely populated area with greater influences of anthropogenic sources compared to the area surrounding the Moolarben Coal Complex. The monitoring data therefore would provide a conservative assessment of potential cumulative impacts for the area surrounding the Modification.

The 70th percentile of the measured Muswellbrook and Singleton $PM_{2.5}$ monitoring data during 2011 is 10.5µg/m^3 and 8.5µg/m^3, respectively and the average of the 70th percentile levels, 9.5µg/m^3 is considered for the cumulative assessment.

The results of the cumulative assessment are presented in **Table 7-3** for each of the assessed receptors. The results indicate that the predicted cumulative impact would not exceed the relevant criterion of 25µg/m^3 for the receptor locations.

Table 7-3: Cumulative 24-hour average $PM_{2.5}$ assessment - maximum number of additional days above 24-hour average $PM_{2.5}$ criterion

Receptor ID	Property Ownership	Year 2019	Year 2021	Year 2026
9	Orica Australia Pty Ltd	0	0	0
26	Forty North Pty Limited	0	0	0
37	M Stewart	0	0	0
40	JM Devenish	0	0	0
70	DJ & A Coventry	0	0	0
168	PJL Construction Complete Mine Service and Solution P/L	0	0	0

7.3.2 Assessment of cumulative PM_{10} impacts

An assessment of cumulative 24-hour average PM_{10} impacts was undertaken in accordance with the methods outlined in Section 11.2 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA**, **2017**). The "Level 2 assessment - Contemporaneous impact and background approach" was applied to assess potential impacts.

Ambient (background) dust concentration data for January 2011 to December 2011 from the TEOM monitors (same data used for MOD9) have been applied in the Level 2 contemporaneous 24-hour average. As the existing mine was operational during this period, it would have contributed to the measured levels for dust in the area on some occasions and needs to be accounted for in the cumulative assessment. Modelling of the actual mining scenario for the Moolarben Coal Complex for the 2011 period was conducted to determine the existing contribution in the measured levels of dust. The results

[2] The Victorian Government's State Environment Protection Policy (Air Quality Management), **SEPP (2001)** states at Part B, 3(b) "Proponents required to include background data where no appropriate hourly background data exists must add the 70th percentile of one year's observed hourly concentrations as a constant value to the predicted maximum concentration from the model simulation. In cases where a 24-hour averaging time is used in the model, the background data must be based on 24-hour averages.

were applied in the cumulative assessment to minimise potential double counting of existing mine emissions (as they would occur in both the measured data and in the predicted levels), and thus to make a more reliable prediction of the likely cumulative total dust level.

Table 7-4 provides a summary of the findings of the contemporaneous assessment at each of the representative receptor locations. Detailed tables of the full assessment results are provided in **Appendix F**.

Table 7-4: NSW EPA contemporaneous assessment - maximum number of additional days above 24-hour average PM_{10} criterion

Receptor ID	Property Ownership	Year 2019	Year 2021	Year 2026
9	Orica Australia Pty Ltd	1	2	1
26	Forty North Pty Limited	0	1	0
37	M Stewart	1	1	0
40	JM Devenish	1	1	0
70	DJ & A Coventry	1	1	0
168	PJL Construction Complete Mine Service and Solution P/L	0	0	0

The results in **Table 7-4** indicate that there is potential for cumulative 24-hour average PM_{10} impacts to occur at the assessed receptor locations, with the exception of Receptor 168 in Ulan Village.

Further analysis of the predicted cumulative PM_{10} impacts at Receptors 9 and 40 are presented in **Figure 7-8** to **Figure 7-10**. The figures show time series plots of the 24-hour average PM_{10} concentrations predicted to be experienced as a result of the Modification. The light blue bars represent the existing ambient background level at the monitoring location, the dark blue bars represent the potential reduction in background level due to the Modification and the orange bars represent the predicted incremental contribution due to the Modification.

Figure 7-8 to **Figure 7-10** indicate that the majority of predicted exceedances at the locations only marginally exceed the criteria and would be easily mitigated through day-to-day management of the operations.

MCO use predictive meteorological modelling software to predict daily weather events and identify adverse conditions in combination real-time dust monitoring to inform proactive and reactive dust management requirements.

To demonstrate the effectiveness of the implementation of the predictive/ reactive measures at the Moolarben Coal Complex incorporating the Modification, the dispersion modelling was re-run to consider the effects of temporarily pausing activities in the pit and overburden areas during periods of elevated dust.

Only the activities that can be controlled in the pit and overburden areas were ceased in the model, and dust from other sources such as wind erosion was still assumed for the purpose of the revised modelling.

Table 7-5 outlines the maximum number of additional days in a year predicted to exceed the 24-hour criterion with the implementation of reactive measures.

The results indicate that all of the predicted additional exceedance days due to the Modification can be prevented using the predictive/ reactive controls, which would be effective in reducing the incremental contribution of the Modification to cumulative levels.

Table 7-5: NSW EPA contemporaneous assessment - maximum number of additional days above 24-hour average criterion with implementation of predictive/ reactive measures

Receptor ID	Property Ownership	Year 2019	Year 2021	Year 2026
9	Orica Australia Pty Ltd	0	0	0
26	Forty North Pty Limited	0	0	0
37	M Stewart	0	0	0
40	JM Devenish	0	0	0
70	DJ & A Coventry	0	0	0
168	PJL Construction Complete Mine Service and Solution P/L	0	0	0

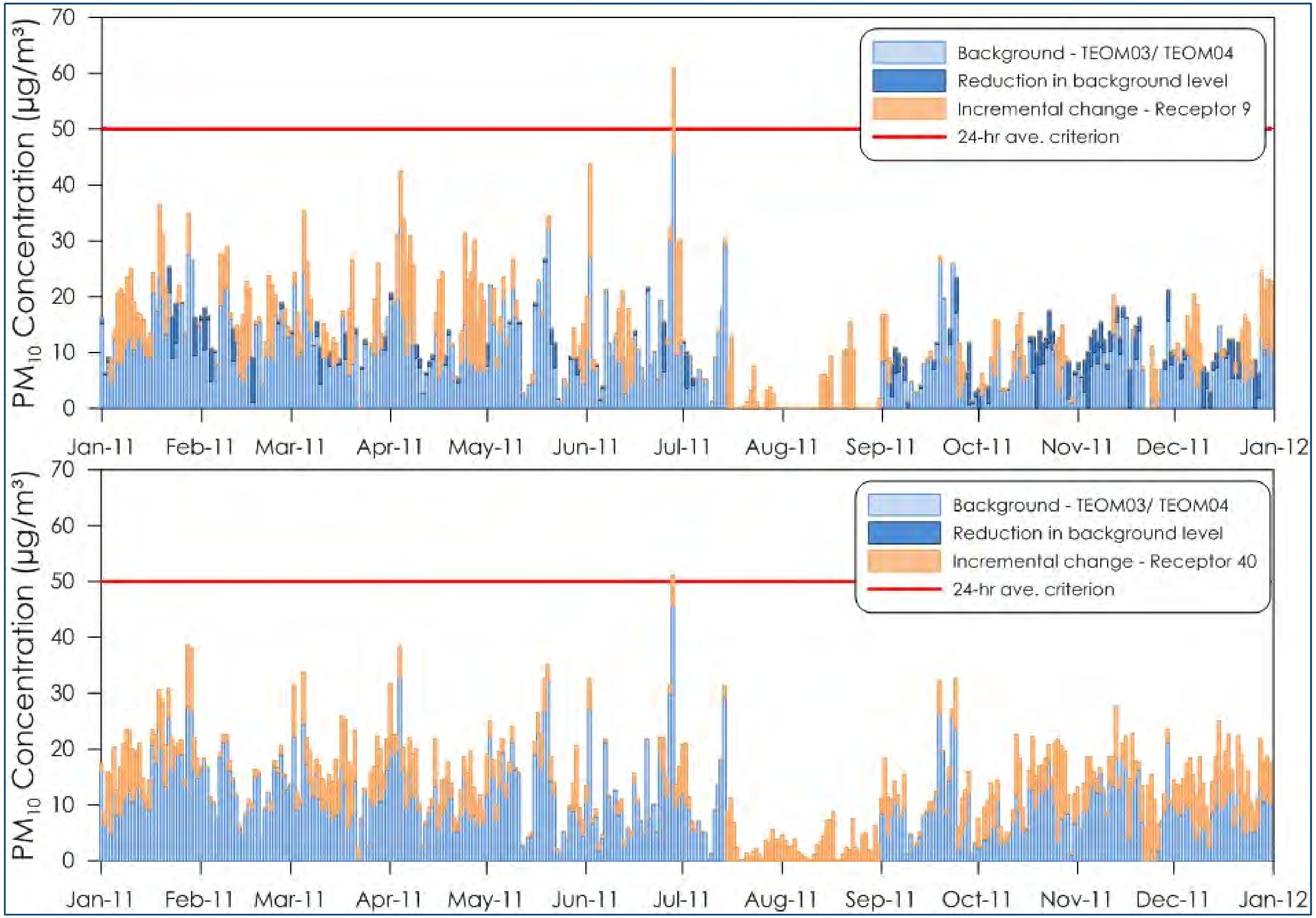

Figure 7-8: Predicted 24-hour average PM_{10} concentrations for sensitive receptor locations 9 and 40 in Year 2019 (unmitigated)

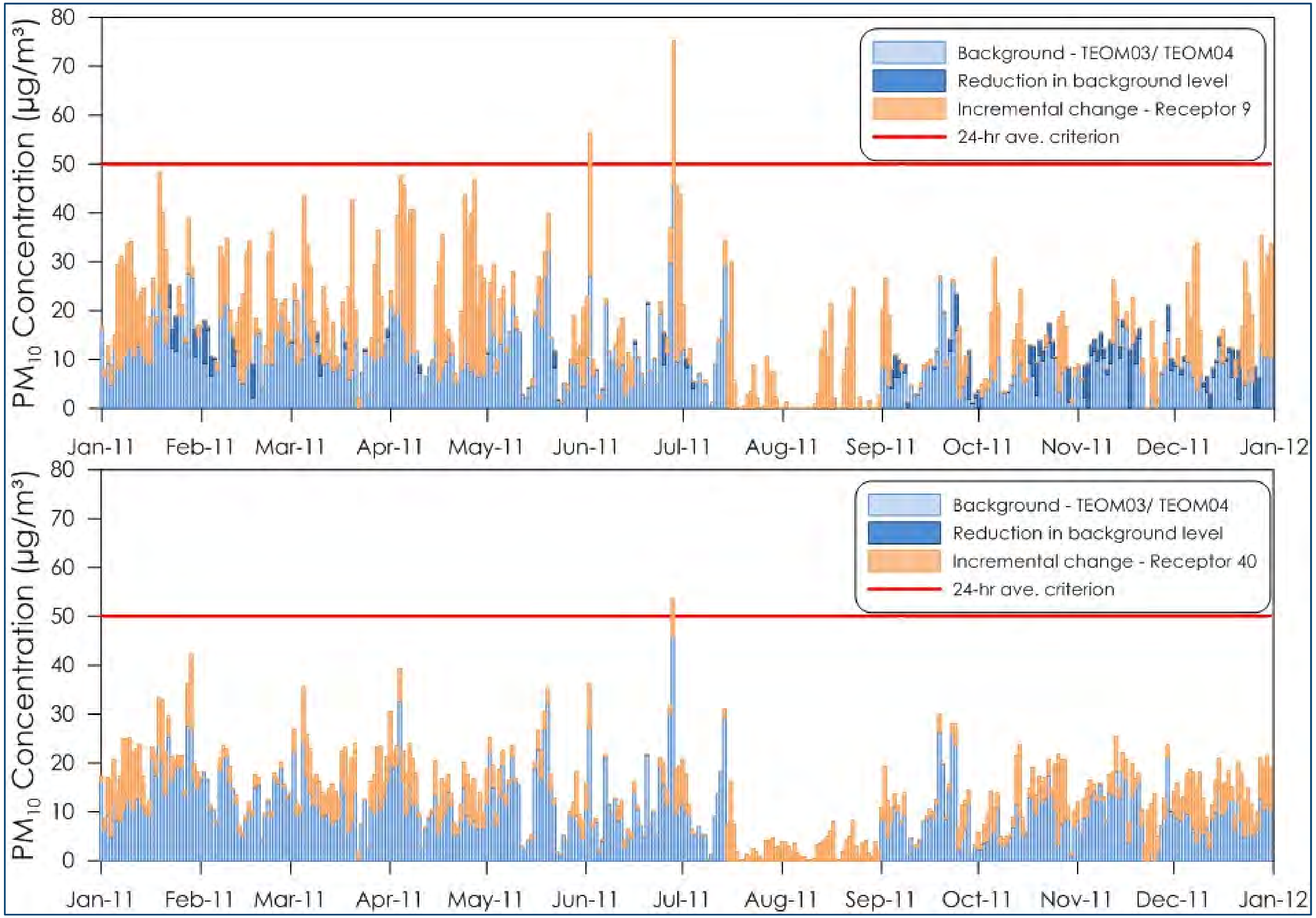

Figure 7-9: Predicted 24-hour average PM_{10} concentrations for sensitive receptor locations 9 and 40 in Year 2021 (unmitigated)

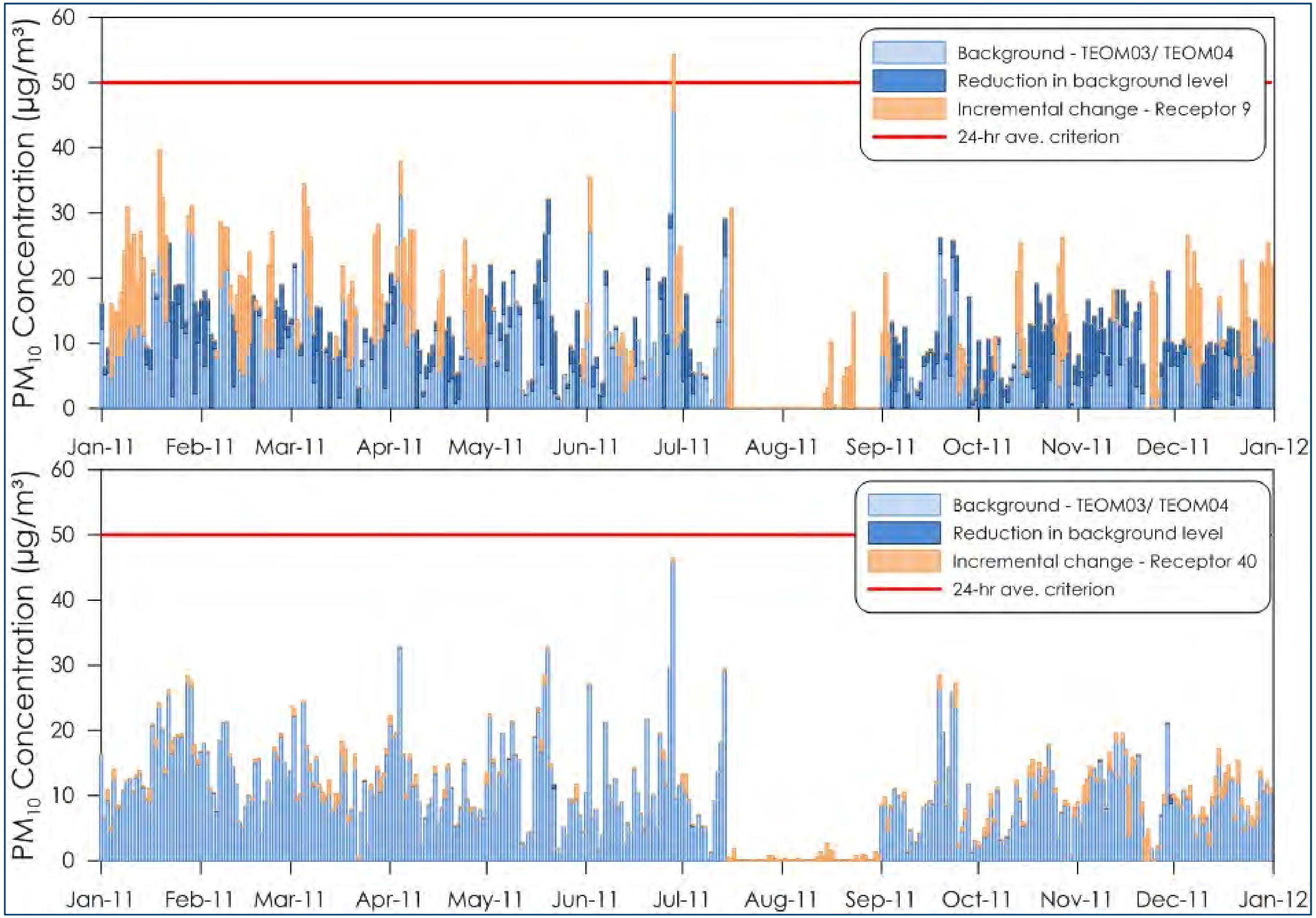

Figure 7-10: Predicted 24-hour average PM_{10} concentrations for sensitive receptor locations 9 and 40 in Year 2026 (unmitigated)

8 POTENTIAL COAL DUST EMISSIONS FROM TRAIN WAGONS

The Modification seeks to increase the number of trains transporting coal off-site from the Moolarben Coal Complex from an existing average of seven trains per day to eight trains and a maximum of nine trains per day to 11 trains. This activity has the potential to generate coal dust emissions from train wagons during the transportation and is assessed in this section.

8.1 Emission estimation

A study conducted by Katestone Environmental on behalf of Connell Hatch for Queensland Rail Limited (**Connell Hatch, 2008**) completed a review of a study by **Ferreira et al. (2003)** which focused on the release of coal dust from train wagons. The **Ferreira et al. (2003)** study conducted full-scale measurements of coal dust emissions from coal wagons over a 350km journey with an average train speed of between 55 and 60km/hr. The findings of this study determined that the total emission for an uncovered rail wagon was determined to be 9.6 grams (g) of TSP per km.

The Katestone Environmental study applied this emission factor with dispersion modelling and found that the resulting predicted concentration compared well with actual air quality monitoring conducted. This suggests that the findings of the **Ferreria et al. (2003)** study are realistic and therefore have been applied to estimate emissions for the Modification.

The Modification is proposing an increase in peak train movements from 9 to 11 per day. Each train would have an average capacity of approximately 10,500 tonnes of product coal and consist of approximately 91 wagons per train. This would result in an estimated emission rate of approximately 874g of TSP per km per train.

8.2 Modelling approach

The transportation model CAL3QHCR, developed by the US EPA, has been used to assess potential impacts from this source. CAL3QHCR was designed for use in dispersion modelling of road transport emissions, however given the similar linear nature of the potential train wagon emissions compared to road transport emissions it is considered to be a suitable model for this situation also.

To consider the range of varying land use between the Moolarben Coal Complex and the Port of Newcastle, and the varying orientation of the rail line relative to the prevailing winds, the dispersion model has been set up to assess theoretical sections of the rail line over a distance of 3km with two varying alignments (north/south and east/west) and two different land use categories. Dust level calculation points were applied at a spacing of 10 metres (m), perpendicular from the centre of the rail line source alignment out to a distance of 200m either side of the rail line.

8.3 Modelling predictions

Figure 8-1 presents the model predictions for each scenario. The modelling predictions indicate that at distances of 50m and beyond the rail track centreline, the maximum 24-hour average increase in TSP concentration due to the two additional peak rail movements for all scenarios would be approximately 0.7µg/m^3. By assuming 40% of the TSP is comprised of PM_{10}, the predicted maximum 24-hour average PM_{10} concentration would be approximately 0.3µg/m^3.

For urban areas, the predicted maximum 24-hour average TSP level at 50m from the rail track centreline would be approximately 0.5µg/m³ with an equivalent PM_{10} level of 0.2µg/m³.

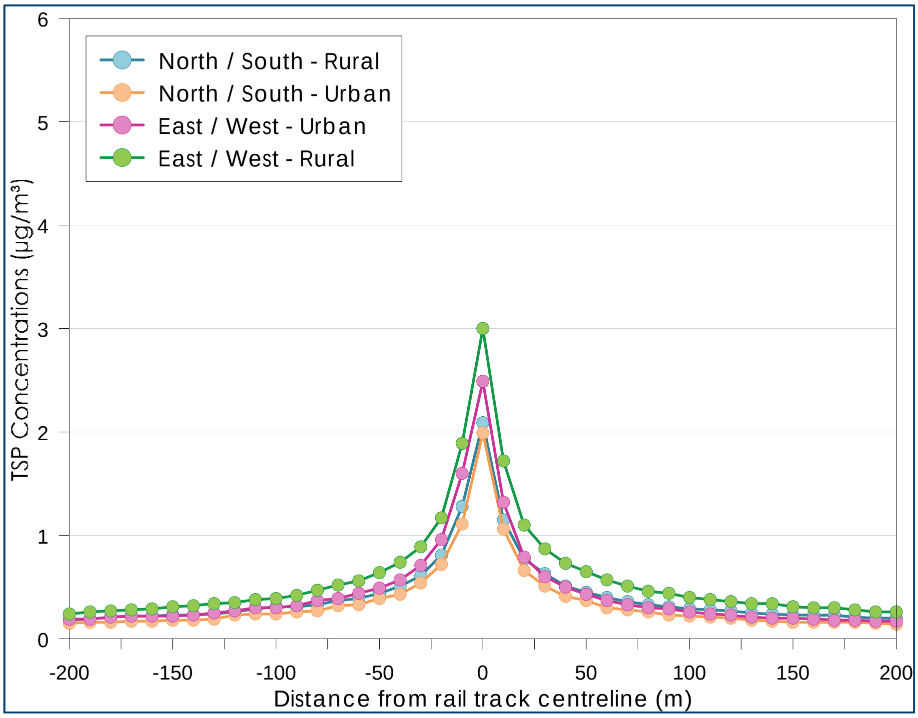

Figure 8-1: Maximum predicted 24-hour average TSP concentration based on train wagon emissions

8.4 Summary

The detailed study of dust emissions generated during rail transport of coal conducted by Katestone Environmental for Queensland Rail Limited (**Connell Hatch, 2008**) found that, based on monitoring and modelling of the emissions and impacts of coal train wagons, there appears to be a minimal risk of adverse impact on human health. The study found that concentrations of coal dust at the edge of the rail corridor are below levels known to cause adverse impacts on amenity.

A more recent review of a study conducted for the Australian Rail Track Corporation Ltd (**Ryan and Wand, 2014**) for trains travelling on the Hunter Valley network found no significant difference in the particulate matter measurements for passing freight and coal trains (loaded and unloaded).

Further analysis of the dataset, taking into account additional data suggests that a key mechanism for the increased particulate levels was due to the passing trains stirring up existing dust particles settled on the tracks and nearby ground (**Ryan & Malecki, 2015**).

This assessment is consistent with the findings of these studies in indicating that the potential for any adverse air quality impacts associated with coal dust generated during rail transport would be low and would not make any appreciable difference to air quality.

9 BLAST FUME ASSESSMENT

Air quality impacts from blast fume emissions are rare, but are possible when there are unforeseeable complications with a blast that causes high levels of NO_2 or dust emission, and when this occurs during unfavourable air dispersion conditions.

MCO employs best practice blast management measures to ensure that blasting activities are managed in a manner which would minimise the risk of impacts arising.

9.1 General outline of best practice blast management

The potential effects from blasting activities are generally managed by scheduling the blast to times when there would be a low risk of impact, for example, when winds blow away from receptors. These conditions are forecast using a predictive blast dust management system. Blast operators make the final decision to blast based on the available information, including available forecasts.

The decision of whether to initiate a blast at any given time will generally need to balance many potentially conflicting factors; for example water ingress will increase the risk of a high emissions event, thus waiting too long for ideal air dispersion conditions to occur may present an unacceptable level of risk and therefore the blast may be initiated under less than ideal weather conditions.

On the other hand, a dry blast with low scope for any degradation of the explosive over time or low potential to lead to any elevated emissions might be delayed if it appears that air dispersion conditions would soon improve significantly.

Occasionally safety concerns may also arise, and may require a blast to be detonated under less than ideal (environmental) conditions.

9.2 Management of potential air quality impacts from blasting

Air quality impacts of blast operations at the Moolarben Coal Complex will continue to be managed via the Blast Management Plan (BMP) (**Moolarben Coal Operations, 2015b**). The purpose of the BMP is to ensure that blasting operations comply with all relevant requirements particularly noise, overpressure, vibration, blast fume and dust effects.

The BMP requires a pre-blast environmental assessment to be conducted to guide operators on the suitability of various factors including the current weather conditions for blasting. The pre-blast environmental assessment takes into consideration an exclusion zone of 500m, meteorological factors such as wind speed and direction which can affect the scale of potential blast impacts at receptor locations, the design of the blast and notification to external stakeholders.

A predictive blast management system is also part of the blast management system at the Moolarben Coal Complex to aid with management of blasting operations. Such a system uses the weather conditions for each blast to predict the potential impact which may occur. The prediction is made on the basis of forecast weather data, allowing operators to schedule a blast to the time of least impact up to 48 hours in advance.

Overall, it is anticipated that with due care, potential blast impacts would be averted at the Moolarben Coal Complex. The BMP is regularly reviewed to ensure best practice blast management.

10 GREENHOUSE GAS ASSESSMENT

The Modification seeks to increase the amount of open cut ROM produced from 13Mtpa to 16Mtpa.

This increase in the annual coal extraction rate would result in an increase in the annual greenhouse gas emissions by increasing the intensity of mining activities on an annual basis, however maintaining the total resource mined is not expected to change the overall generation of greenhouse gas emissions over the life of the mine.

10.1 Greenhouse gas inventory

The National Greenhouse Accounts (NGA) Factors document published by the Commonwealth Department of the Environment and Energy (DEE) defines three scopes (Scopes 1, 2 and 3) for different emission categories based on whether the emissions generated are from "direct" or "indirect" sources.

Scope 1 emissions encompass the direct sources from a project defined as:

"*...from sources within the boundary of an organisation as a result of that organisation's activities*" (**DEE, 2016a**).

Scope 2 and 3 emissions occur due to the indirect sources from a project as:

"*...emissions generated in the wider economy as a consequence of an organisation's activities (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation*" (**DEE, 2016a**).

Scope 2 emissions are associated with the generation of purchased and consumed electricity, while Scope 3 emissions involve other indirect GHG emissions.

For the purpose of this assessment, emissions generated in Scopes 1 and 2 defined above provide a suitable approximation of the total GHG emissions generated from the Modification.

Scope 3 emissions can often result in a significant component of the total emissions inventory; however, these emissions are often not directly controlled by a project. These emissions are understood to be considered in the Scope 1 emissions from other various organisations related to the project. The primary contribution of the Scope 3 emissions from the Modification occurs from the transportation of the product coal and from the end use of the product coal.

The reported Moolarben Coal Complex GHG emissions for July 2012 to June 2015 are presented in **Table 10-1**. The relationship between ROM production and GHG emissions generated were examined for the three years to develop scaling factors used to estimate the Scope 1 and 2 emissions generated per tonne of ROM produced for the Modification.

Table 10-1: Annual greenhouse gas emissions for the Moolarben Coal Complex – Open Cut Operations

	2012 - 2013	2013 - 2014	2014 – 2015	Average
ROM production (tpa)	7,866,864	8,006,592	8,389,149	8,087,535
Scope 1 (t CO2-e/year)	63,160	68,712	75,748	69,207
Scope 2 (t CO2-e/year)	28,613	34,986	33,523	32,374
Total (Scope 1 + 2) (t CO_2-e)	91,773	103,698	109,271	-
Scaling factor – Scope 1	**0.0080**	**0.0086**	**0.0090**	**0.0085**
Scaling factor – Scope 2	**0.0036**	**0.0044**	**0.0040**	**0.0040**

10.2 Summary of greenhouse gas emissions

Table 10-2 summarises the estimated annual increase in CO_2-e emissions due to the proposed increase in open cut ROM coal production of 3Mtpa Modification using the relationships in **Table 10-1**.

Table 10-2: Summary of increased annual CO_2-e emissions for the Modification

	Annual average
ROM production (tpa)	3,000,000
Scope 1 (t CO_2-e/year)	25,640
Scope 2 (t CO_2-e/year)	12,000
Total (Scope 1 + 2) (t CO_2-e)	**37,640**

11 SUMMARY AND CONCLUSIONS

This study has examined potential air quality and greenhouse gas impacts which may arise from the Moolarben Coal Complex incorporating the Modification for three indicative mine plan years representing year of maximum proposed rate of ROM coal production. Conservative emission estimation (e.g. using maximum mining rates) and dispersion modelling (e.g. not including the effect of rainfall) has been completed for this assessment.

This study has applied a similar methodology for assessing the potential air quality impacts associated with this Modification as has been applied for assessments of potential impacts for approved operations.

The results indicate that the Modification would be of a generally similar extent to the approved operations and that the proposed Modification would therefore not result in any significant change to what is already approved for the Moolarben Coal Complex.

No exceedance of criteria for PM2.5, PM10, TSP or dust deposition are predicted at any privately-owned receptor due to emissions from the Moolarben Coal Complex incorporating the Modification.

Short-term cumulative PM_{10} dust impacts may potentially arise at a small number of privately-owned receptor locations. However with the continued application of the predictive/ reactive dust mitigation measures by MCO, it is predicted that short-term cumulative PM_{10} dust would be adequately managed to acceptable levels.

Predicted levels for the other assessed dust metrics would be below the relevant criterion at privately-owned receptor locations. There are no likely air quality impacts associated with rail transport and blast fumes identified for the Modification.

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Appendix A

Sensitive Receptor Locations

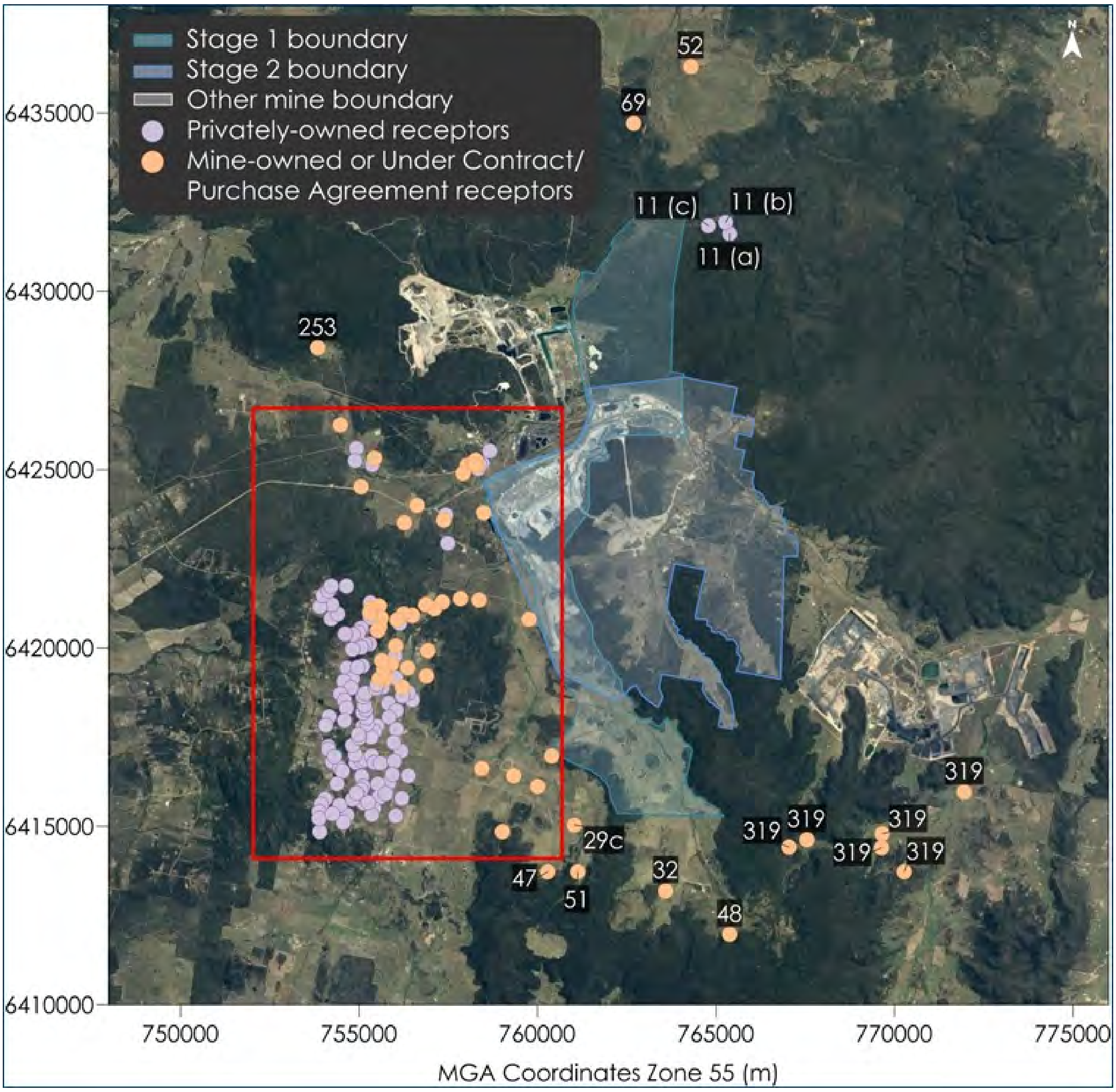

Figure A-1: Location of sensitive receptors assessed in this study

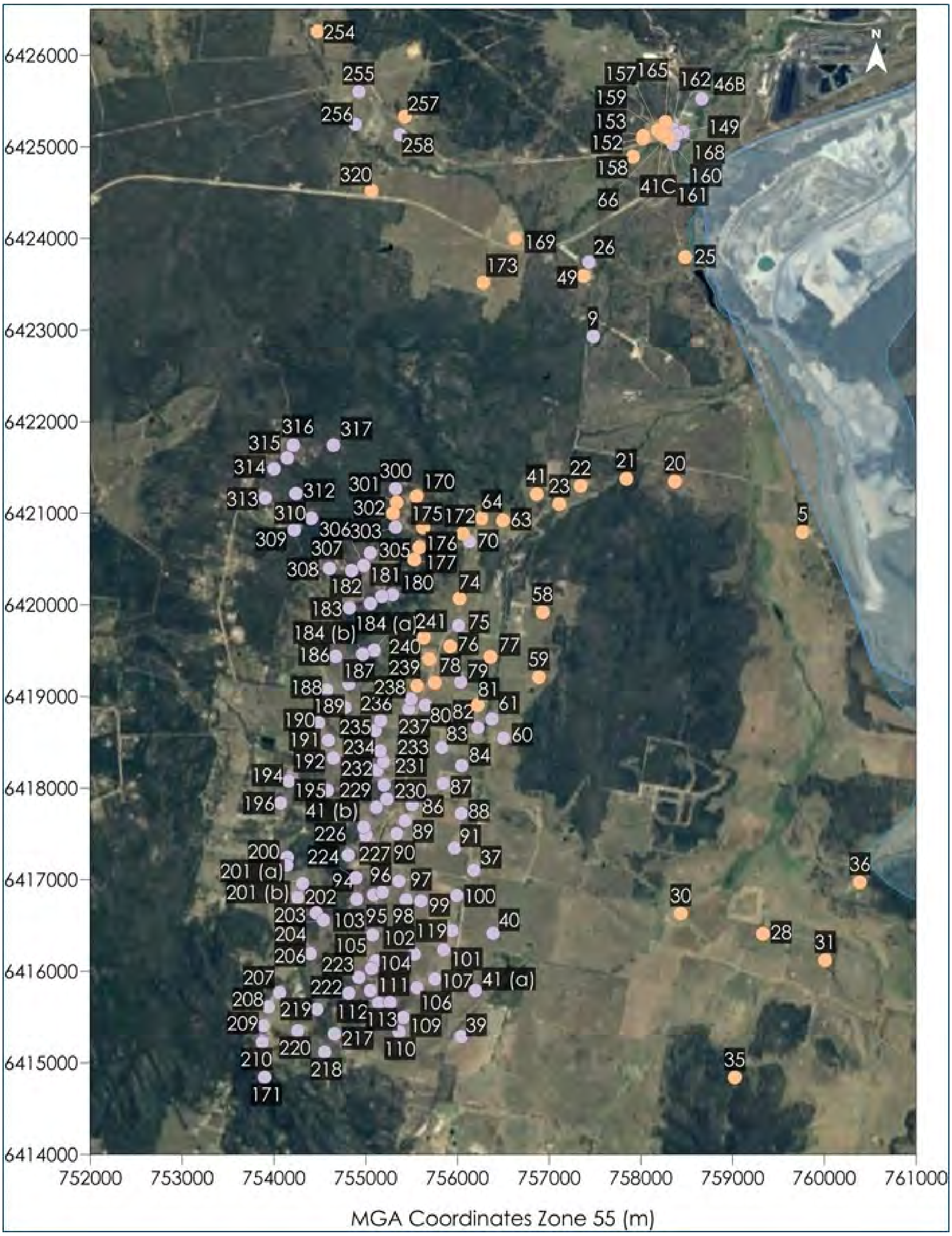

Figure A-2: Location of sensitive receptors assessed in this study - Insert

Table A-1: List of privately-owned sensitive receptors assessed in this study

ID	Type	Easting	Northing	ID	Type	Easting	Northing
9	Commercial	757478	6422930	195	Private	754583	6417973
26	Commercial	757430	6423741	196	Private	754072	6417840
37	Private	756179	6417107	200	Private	754141	6417241
39	Private	756038	6415288	202	Private	754258	6416804
40	Private	756389	6416414	203	Private	754462	6416639
60	Private	756500	6418546	204	Private	754537	6416557
61	Private	756375	6418755	206	Private	754394	6416192
66	Commercial	758310	6425130	207	Private	754057	6415768
70	Private	756132	6420692	208	Private	753938	6415612
75	Private	756012	6419777	209	Private	753883	6415407
79	Private	756034	6419159	210	Private	753873	6415226
80	Private	755649	6418908	217	Private	754659	6415319
82	Private	756223	6418659	218	Private	754550	6415117
83	Private	755832	6418444	219	Private	754468	6415587
84	Private	756047	6418248	220	Private	754258	6415351
86	Private	755506	6417818	222	Private	754813	6415761
87	Private	755841	6418051	223	Private	754921	6415935
88	Private	756043	6417724	224	Private	754895	6417021
89	Private	755431	6417645	226	Private	754812	6417270
90	Private	755337	6417501	227	Private	755000	6417482
91	Private	755969	6417348	229	Private	755115	6417791
94	Private	754900	6416785	230	Private	755229	6417879
95	Private	755085	6416834	231	Private	755200	6418034
96	Private	755183	6416867	232	Private	755121	6418197
97	Private	755364	6416985	233	Private	755196	6418290
98	Private	755440	6416783	234	Private	755157	6418405
99	Private	755603	6416770	235	Private	755107	6418631
100	Private	755992	6416832	236	Private	755165	6418738
101	Private	755850	6416237	237	Private	755468	6418862
102	Private	755530	6416189	238	Private	755497	6418969
103	Private	755072	6416399	255	Private	754922	6425602
104	Private	755112	6416116	256	Private	754887	6425251
105	Private	755061	6416033	258	Private	755375	6425132
106	Private	755558	6415823	300	Private	755327	6421268
107	Private	755752	6415919	303	Private	755327	6420850
109	Private	755410	6415494	305	Private	755052	6420566
110	Private	755361	6415339	306	Private	754978	6420431
111	Private	755052	6415789	307	Private	754843	6420373
112	Private	755138	6415655	308	Private	754605	6420402
113	Private	755269	6415661	309	Private	754219	6420817
119	Private	755937	6416447	310	Private	754407	6420948
149	Commercial	758457	6425165	312	Private	754239	6421215
160	School	758350	6425029	313	Private	753906	6421166
162	Commercial	758342	6425199	314	Private	753997	6421486
168	Church	758386	6425136	315	Private	754141	6421605
171	Private	753898	6414840	316	Private	754210	6421744
180	Private	755292	6420111	317	Private	754646	6421744
181	Private	755178	6420092	11 (a)	Commercial	765376	6431622
182	Private	755049	6420016	11 (b)	Private	765265	6431931
183	Private	754822	6419969	11 (c)	Commercial	764784	6431839
186	Private	754674	6419437	184 (a)	Private	755093	6419504
187	Private	754816	6419137	184 (b)	Private	754967	6419464
188	Private	754577	6419073	201 (a)	Private	754138	6417158
189	Private	754772	6418881	201 (b)	Private	754311	6416962
190	Private	754488	6418711	41 (a)	Private	756194	6415791
191	Private	754592	6418520	41 (b)	Private	754978	6417572
192	Private	754649	6418328	46B	Commercial	758663	6425526
194	Private	754160	6418080				

Table A-2: List of mine-owned sensitive receptors assessed in this study

ID	Type	Easting	Northing	ID	Type	Easting	Northing
5	Mine	759764	6420796	158	Mine	757911	6424895
20	Mine	758370	6421350	159	Mine	758237	6425137
21	Mine	757840	6421380	161	Mine	758298	6425100
22	Mine	757342	6421298	165	Mine	758268	6425275
23	Mine	757110	6421102	169	Mine	756630	6424000
25	Mine	758484	6423794	170	Mine	755557	6421185
28	Mine	759330	6416410	172	Mine	756058	6420779
30	Mine	758435	6416631	173	Mine	756280	6423520
31	Mine	760008	6416123	175	Mine	755624	6420844
32	Mine	763590	6413194	176	Mine	755585	6420625
35	Mine	759021	6414840	177	Mine	755530	6420496
36	Mine	760388	6416975	239	Mine	755558	6419118
41	Mine	756863	6421212	240	Mine	755694	6419408
47	Mine	760293	6413734	241	Mine	755631	6419645
48	Mine	765380	6411970	253	Mine	753840	6428415
49	Mine	757370	6423590	254	Mine	754474	6426260
51	Mine	761130	6413720	257	Mine	755429	6425331
52	Mine	764290	6436310	301	Mine	755336	6421121
58	Mine	756926	6419919	302	Mine	755299	6420997
59	Mine	756886	6419210	319	Mine	767049	6414413
63	MCO Pty Ltd - Under Contract/ Purchase Agreement	756497	6420923	319	Mine	767545	6414629
64	Mine	756262	6420946	319	Mine	769659	6414795
69	Mine	762690	6434710	319	Mine	769645	6414405
74	Mine	756021	6420067	319	Mine	770276	6413737
76	Mine	755920	6419546	319	Mine	771960	6415964
77	Mine	756357	6419434	320	Mine	755059	6424522
78	Mine	755750	6419149	41C	Mine	758241	6425152
81	Mine	756220	6418906	29c	Mine	761033.5	6415038
152	Mine	758019	6425090				
153	Mine	758029	6425124				
157	Mine	758183	6425184				

Appendix B

Windrose Plots

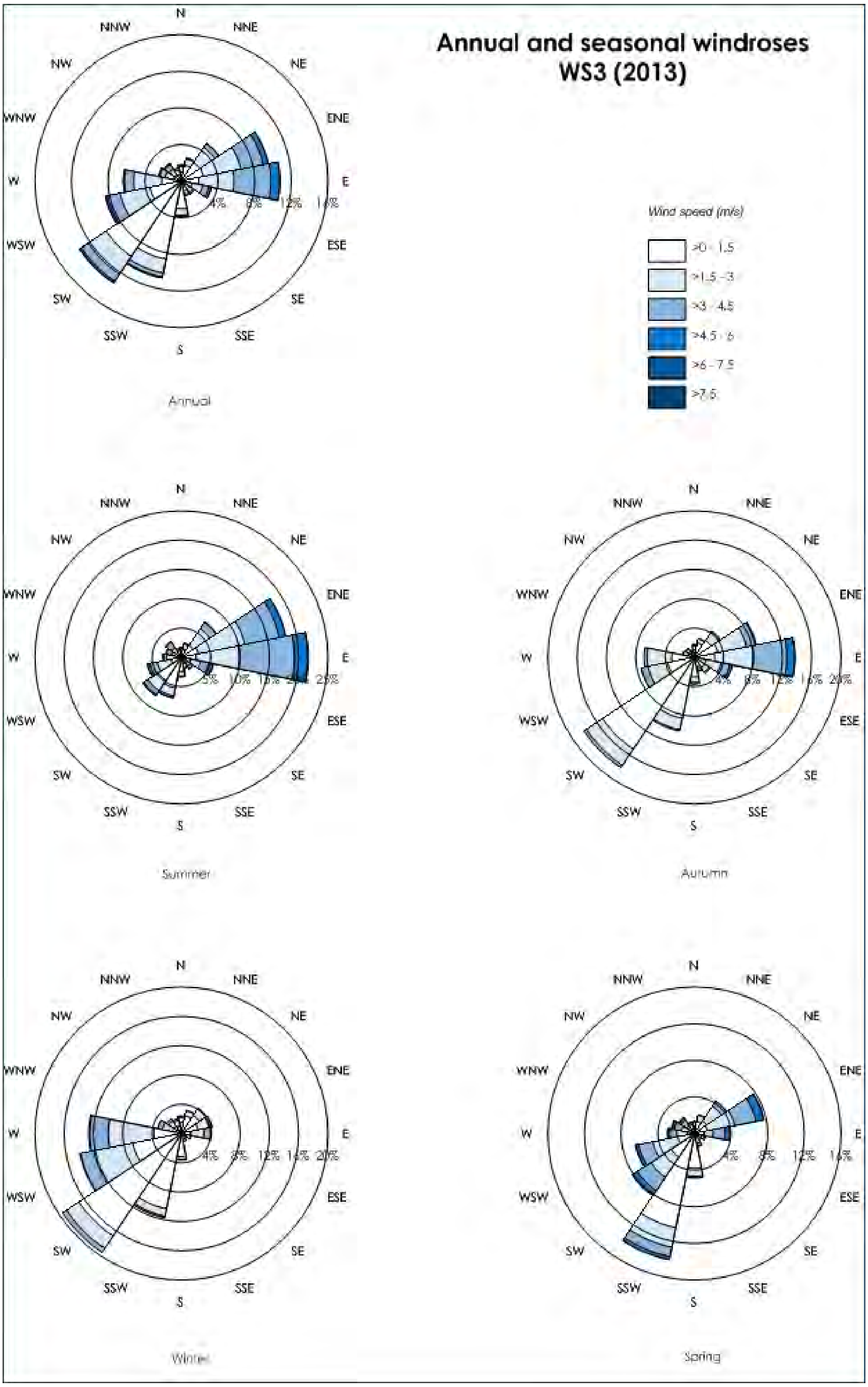

Figure B-1: Annual and seasonal windroses for WS3 (2013)

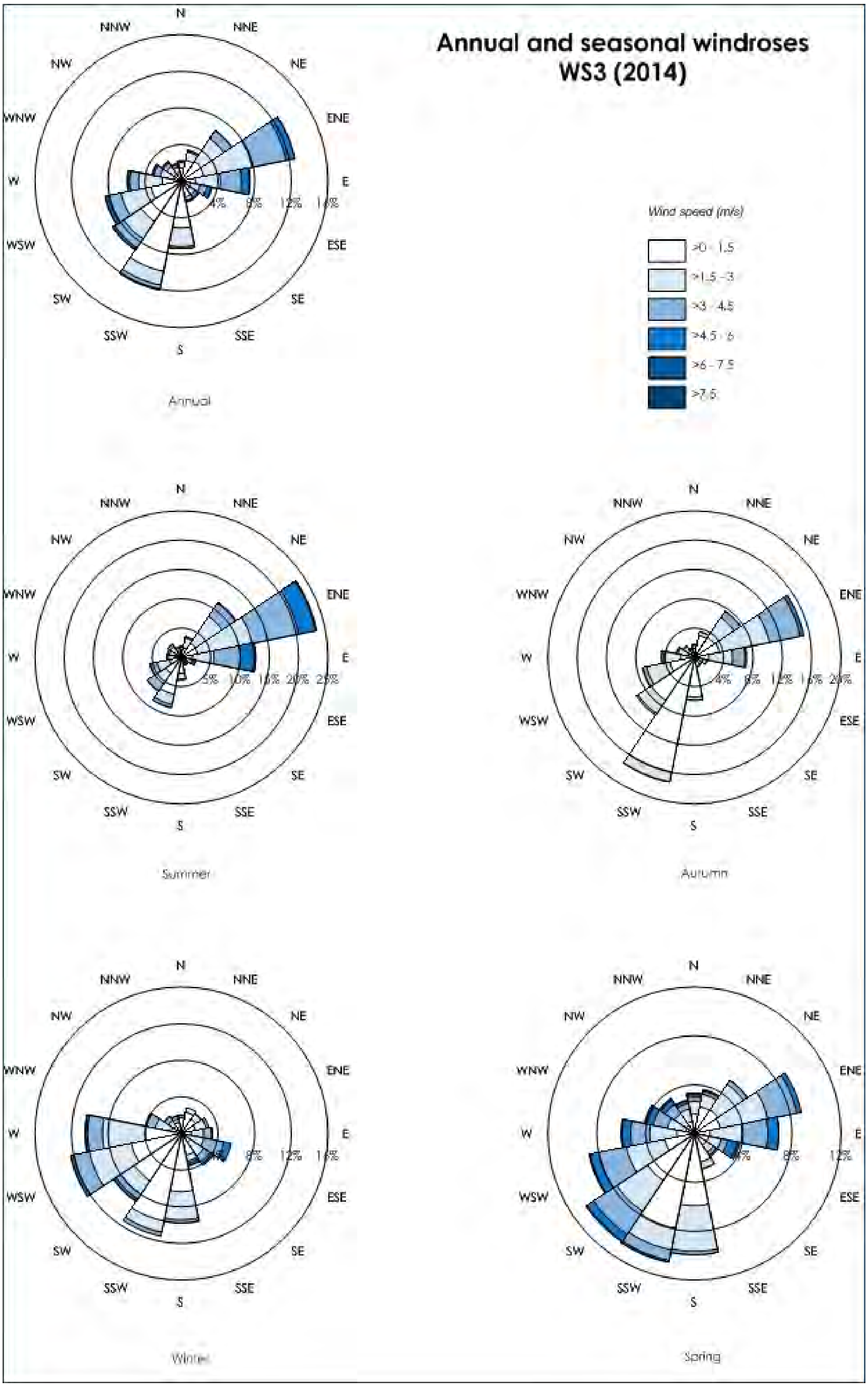

Figure B-2: Annual and seasonal windroses for WS3 (2014)

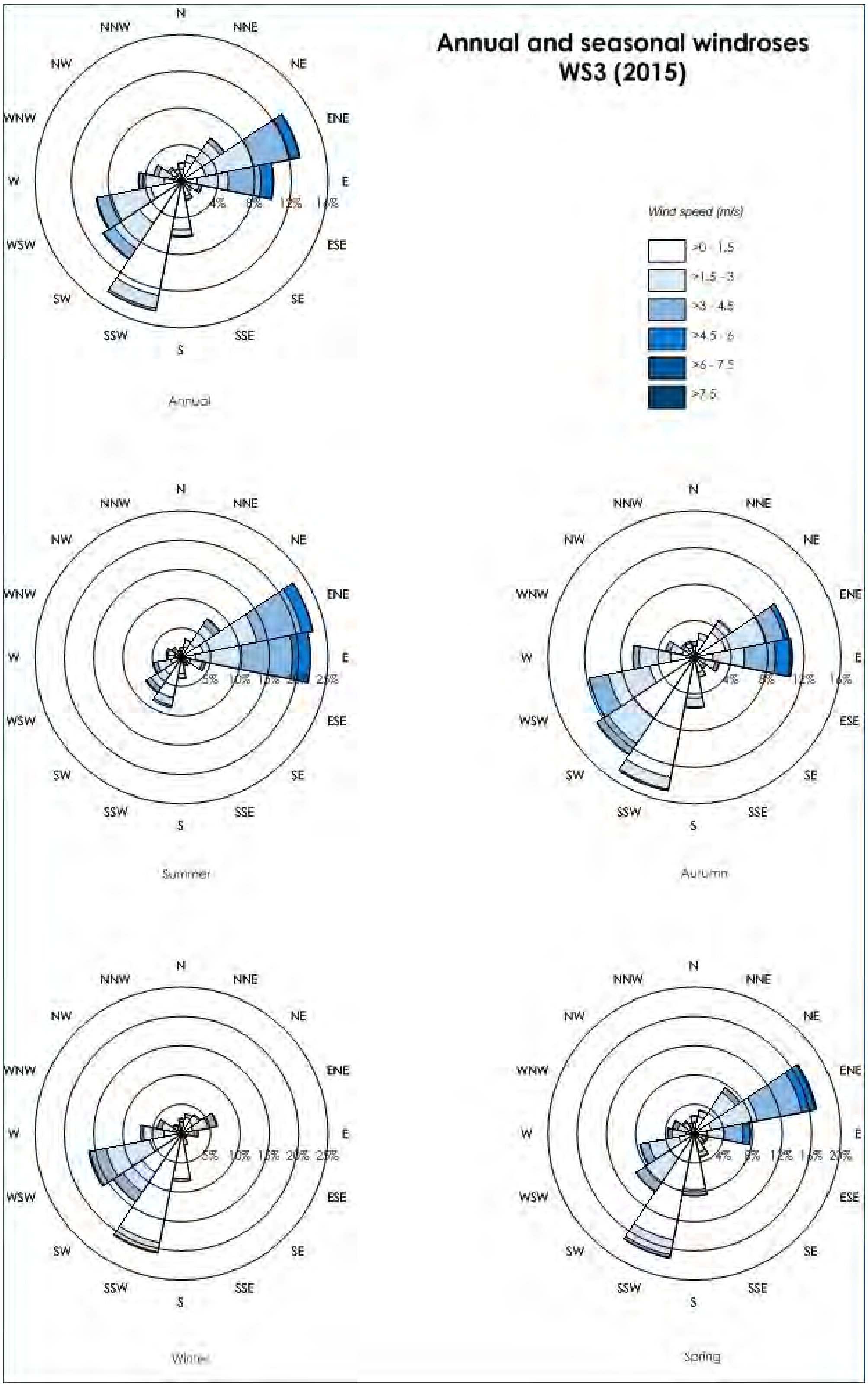

Figure B-3: Annual and seasonal windroses for WS3 (2015)

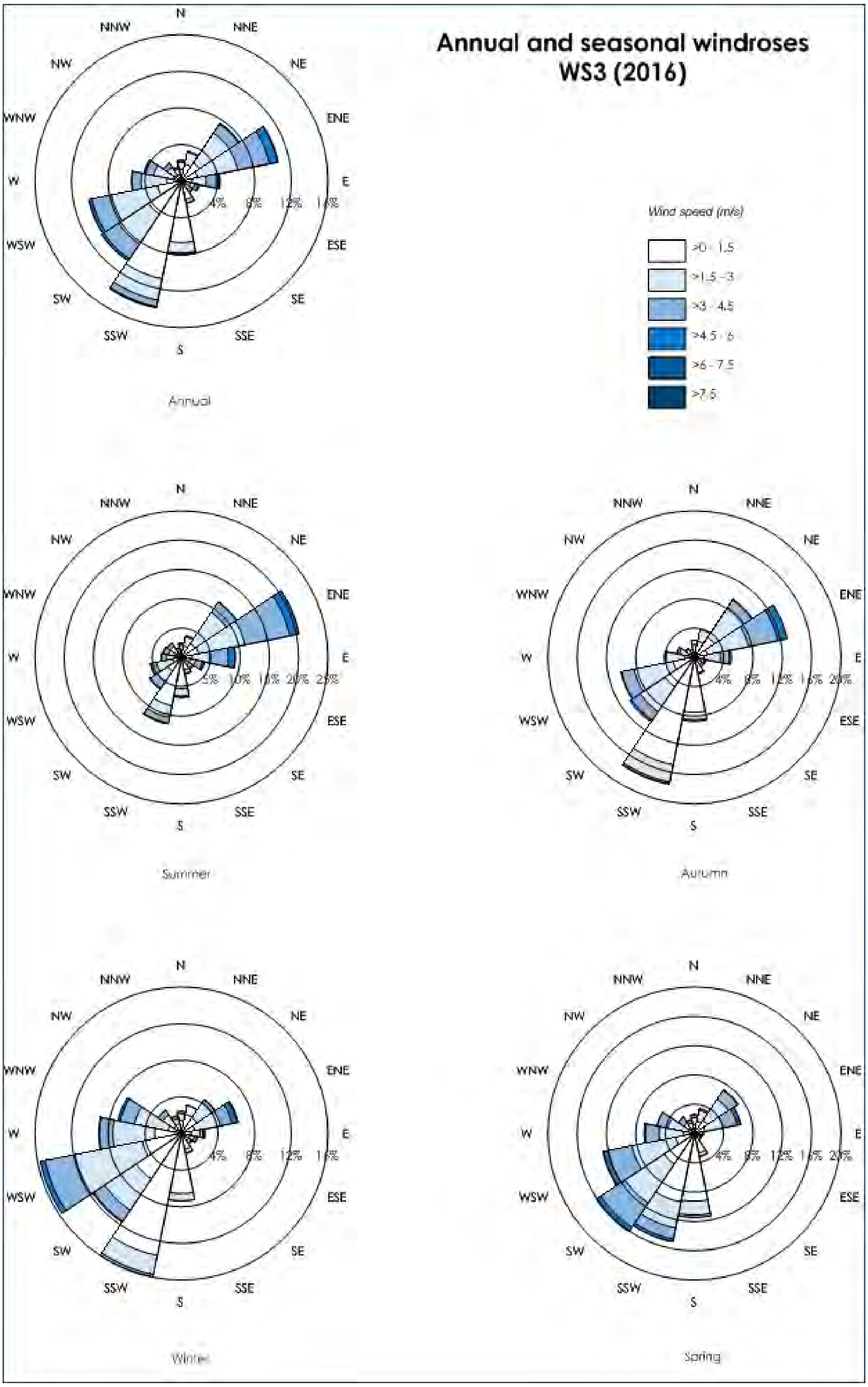

Figure B-4: Annual and seasonal windroses for WS3 (2016)

Appendix C

Emissions Calculation

Emission Calculation

The mining schedule and mine plan designs provided by MCO have been combined with emissions factor equations that relate to the quantity of dust emitted from particular activities based on intensity, the prevailing meteorological conditions, and composition of the material being handled.

Emission factors and associated controls have been sourced from the US EPA AP42 Emission Factors (**US EPA, 1985 and Updates**), the National Pollutant Inventory document *Emission Estimation Technique Manual for Mining, Version 3.1* (**NPI, 2012**) and the NSW EPA document, *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*, prepared by Katestone Environmental (**Katestone Environmental, 2010**).

The emission factor equations used for each dust generating activity are outlined in **Table C-1** below. Detailed emission inventories for each scenario are presented in **Table C-2** to **Table C-4**.

Control factors include the following:

- Hauling on unpaved surfaces – 90% control for watering of trafficked areas. Note the control factor is only applied to the mechanically generated emissions and not the contributions from the diesel exhaust emissions.
- Drilling – 70% control for use of dust suppression.
- Unloading ROM to hopper at CHPP – 50% control for fogging sprays.
- Conveyor – 70% control for enclosed conveyors.
- Dozer on coal – 50% for keeping travel routes moist.
- Inactive areas – 50% for watering of exposed surface and surface crusting.
- Partial rehabilitation – 70% for vegetative ground cover.
- Coal stockpiles – 50% for watering stockpile surface.

Table C-1: Emission factor equations

Activity	Emission factor equation		
	TSP	PM_{10}	$PM_{2.5}$
Drilling (overburden)	$EF = 0.59\ kg/hole$	$0.52 \times TSP$	$0.03 \times TSP$
Drilling (coal)	$EF = 0.1\ kg/hole$	$0.52 \times TSP$	$0.03 \times TSP$
Blasting (overburden/ coal)	$EF = 0.00022 \times A^{1.5}\ kg/blast$	$0.52 \times TSP$	$0.03 \times TSP$
Loading / emplacing overburden & loading product coal to stockpile & conveyor transfer	$EF = 0.74 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right) kg/tonne$	$EF = 0.35 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right) kg/tonne$	$EF = 0.053 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right) kg/tonne$
Hauling on unsealed surfaces	$EF = \left(\frac{0.4536}{1.6093}\right) \times 4.9 \times (s/12)^{0.7} \times (1.1023 \times M/3)^{0.45}\ kg/VKT$	$EF = \left(\frac{0.4536}{1.6093}\right) \times 1.5 \times (s/12)^{0.9} \times (1.1023 \times M/3)^{0.45}\ kg/VKT$	$EF = \left(\frac{0.4536}{1.6093}\right) \times 0.15 \times (s/12)^{0.9} \times (1.1023 \times M/3)^{0.45}\ kg/VKT$
Dozers on overburden	$EF = 2.6 \times \frac{s^{1.2}}{M^{1.3}}\ kg/hour$	$EF = 0.45 \times \frac{s^{1.5}}{M^{1.4}} \times 0.75\ kg/hour$	$EF = 2.6 \times \frac{s^{1.2}}{M^{1.3}} \times 0.105\ kg/hour$
Dozers on coal	$EF = 35.6 \times \frac{s^{1.2}}{M^{1.4}}\ kg/hour$	$EF = 8.44 \times \frac{s^{1.5}}{M^{1.4}} \times 0.75\ kg/hour$	$EF = 35.6 \times \frac{s^{1.2}}{M^{1.4}} \times 0.022\ kg/hour$
Loading / emplacing coal	$EF = \frac{0.58}{M^{1.2}}\ kg/tonne$	$EF = \frac{0.0596}{M^{0.9}} \times 0.75\ kg/tonne$	$EF = \frac{0.58}{M^{1.2}} \times 0.019\ kg/tonne$
Sizing coal	$EF = 0.0027\ kg/tonne$	$EF = 0.0012\ kg/tonne$	$0.047 \times TSP$
Wind erosion on exposed areas, stockpiles & conveyors	$EF = 850\ kg/ha/year$	$0.5 \times TSP$	$0.075 \times TSP$
Grading roads	$EF = 0.0034 \times sp^{2.5}\ kg/VKT$	$EF = 0.0056 \times sp^{2.0} \times 0.6\ kg/VKT$	$EF = 0.0034 \times sp^{2.0} \times 0.031\ kg/VKT$

EF = emission factor, A = area of blast (m^2), U = wind speed (m/s), M = moisture content (%), s = silt content (%), VKT = vehicle kilometres travelled (km), p = number of days per year when rainfall is greater than 0.25mm (days), f = percentage of time that wind speed is greater than 5.4m/s (%), sp = speed of grader (km/h).

Table C-2: Emission inventory – Year 2019

ACTIVITY	TSP emission	PM10 emission	PM25 emission	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Variable 1	Units	Variable 2	Units	Variable 3 - TSP	Variable 3 - PM10	Variable 3 - PM25	Units	Variable 4	Units	Variable 5	Units	Variable 6	Units
Overbuden																							
OB - Stripping Topsoil - OC1	1,356	530	64	97	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Stripping Topsoil - OC2	1,472	576	69	105	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Stripping Topsoil - OC3	1,419	555	67	101	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Stripping Topsoil - OC4	2,053	803	96	147	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Drilling - OC1	1,304	678	39	7,368	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Contro
OB - Drilling - OC2	1,415	736	42	7,997	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Contro
OB - Drilling - OC3	1,364	709	41	7,707	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Contro
OB - Drilling - OC4	3,291	1,711	99	18,590	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Contro
OB - Blasting - OC1	11,953	6,216	359	21	blasts/year	572	297.2	17.1	kg/blast	18,900	Area of blast in n	0.0000021	blasts/bcm										
OB - Blasting - OC2	12,972	6,745	389	23	blasts/year	572	297.2	17.1	kg/blast	18,900	Area of blast in n	0.0000021	blasts/bcm										
OB - Blasting - OC3	12,502	6,501	375	22	blasts/year	572	297.2	17.1	kg/blast	18,900	Area of blast in n	0.0000021	blasts/bcm										
OB - Blasting - OC4	30,157	15,682	905	53	blasts/year	572	297.2	17.1	kg/blast	18,900	Area of blast in n	0.0000021	blasts/bcm										
OB - Excavator loading OB to haul truck - OC1	23,153	10,951	1,658	21,906,259	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %	2.2			tonnes/BCM						
OB - Excavator loading OB to haul truck - OC2	25,126	11,884	1,800	23,773,456	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %	2.2			tonnes/BCM						
OB - Excavator loading OB to haul truck - OC3	24,215	11,453	1,734	22,911,843	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %	2.2			tonnes/BCM						
OB - Excavator loading OB to haul truck - OC4	35,048	16,577	2,510	33,161,330	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %	2.2			tonnes/BCM	60	% OB excavator only				
OB - Excavator rehandle - OC4	1,168	553	84	1,105,378	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %	2.2			tonnes/BCM	2	% OB rehandle				
OB - Hauling to dump - OC1 (OC1 void)	169,248	43,005	5,466	10,953,130	tonnes/year	0.153	0.038	0.004	kg/t	215	tonnes/load	6.2	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt conten	279	Ave GMV	90	% Contro
OB - Hauling to dump - OC1 (OC1 dump)	82,586	21,500	3,315	10,953,130	tonnes/year	0.074	0.018	0.002	kg/t	215	tonnes/load	3.0	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt conten	279	Ave GMV	90	% Contro
OB - Hauling to dump - OC2	179,250	46,666	7,196	23,773,456	tonnes/year	0.074	0.018	0.002	kg/t	215	tonnes/load	3.0	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt conten	279	Ave GMV	90	% Contro
OB - Hauling to dump - OC3	104,773	28,106	5,248	22,911,843	tonnes/year	0.045	0.011	0.001	kg/t	215	tonnes/load	1.8	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt conten	279	Ave GMV	90	% Contro
OB - Hauling to dump - OC4 (930 E)	64,424	18,474	4,726	16,580,665	tonnes/year	0.037	0.009	0.001	kg/t	317	tonnes/load	2.0	km/return tr	5.8	1.4	0.1	kg/VKT	4.2	% silt conten	344	Ave GMV	90	% Contro
OB - Hauling to dump - OC4 (830 E)	149,614	38,651	5,629	16,580,665	tonnes/year	0.089	0.022	0.002	kg/t	215	tonnes/load	3.6	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt conten	279	Ave GMV	90	% Contro
OB - Emplacing at dump - OC1 (OC1 void)	11,576	5,475	829	10,953,130	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %										
OB - Emplacing at dump - OC1 (OC1 dump)	11,576	5,475	829	10,953,130	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %										
OB - Emplacing at dump - OC2	25,126	11,884	1,800	23,773,456	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %										
OB - Emplacing at dump - OC3	24,215	11,453	1,734	22,911,843	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %										
OB - Emplacing at dump - OC4	35,048	16,577	2,510	33,161,330	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	2	MC in %										
OB - Dozers on OB (dump and pit) - OC1	-	-	-	-	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
OB - Dozers on OB (dump and pit) - OC2	309,620	74,822	32,510	18,501	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
OB - Dozers on OB (dump and pit) - OC3	155,689	37,623	16,347	9,303	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
OB - Dozers on OB (dump and pit) - OC4	681,262	164,631	71,533	40,708	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
Coal																							
CL - Drilling - OC1	39	20	1	1,298	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Contro
CL - Drilling - OC2	106	55	3	3,548	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Contro
CL - Drilling - OC3	92	48	3	3,060	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Contro
CL - Drilling - OC4	243	126	7	8,094	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Contro
CL - Blasting - OC1	3,234	1,681	97	4	blasts / year	859	446.8	25.8	kg/blast	24,800	Area of blast in n	0.0000029	blasts/tonne ROM										
CL - Blasting - OC2	8,841	4,597	265	10	blasts / year	859	446.8	25.8	kg/blast	24,800	Area of blast in n	0.0000029	blasts/tonne ROM										
CL - Blasting - OC3	7,625	3,965	229	9	blasts / year	859	446.8	25.8	kg/blast	24,800	Area of blast in n	0.0000029	blasts/tonne ROM										
CL - Blasting - OC4	20,168	10,487	605	23	blasts / year	859	446.8	25.8	kg/blast	24,800	Area of blast in n	0.0000029	blasts/tonne ROM										
CL - Dozers ripping/pushing/clean-up - OC1	7,756	1,830	171	852	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Contro
CL - Dozers ripping/pushing/clean-up - OC2	20,573	4,853	453	2,260	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Contro
CL - Dozers ripping/pushing/clean-up - OC3	17,742	4,185	390	1,949	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Contro
CL - Dozers ripping/pushing/clean-up - OC4	48,400	11,417	1,065	5,317	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Contro
CL - Loading ROM coal to haul truck - OC1	68,160	9,576	1,295	1,297,709	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Loading ROM coal to haul truck - OC2	186,352	26,181	3,541	3,548,002	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Loading ROM coal to haul truck - OC3	160,734	22,582	3,054	3,060,260	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Loading ROM coal to haul truck - OC4	425,123	59,726	8,077	8,094,029	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Hauling ROM to hopper - OC1	28,508	7,331	1,030	1,297,709	tonnes/year	0.217	0.054	0.005	kg/t	181	tonnes/load	8.0	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt conten	234	Ave GMV	90	% Contro
CL - Hauling ROM to hopper - OC2	154,950	39,153	4,728	3,548,002	tonnes/year	0.434	0.108	0.011	kg/t	181	tonnes/load	16.0	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt conten	234	Ave GMV	90	% Contro
CL - Hauling ROM to hopper - OC3	198,410	49,841	5,685	3,060,260	tonnes/year	0.646	0.160	0.016	kg/t	181	tonnes/load	23.8	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt conten	234	Ave GMV	90	% Contro
CL - Hauling ROM to hopper - OC4	100,949	26,652	4,519	8,094,029	tonnes/year	0.122	0.030	0.003	kg/t	181	tonnes/load	4.5	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt conten	234	Ave GMV	90	% Contro
CL - Unload to hooper or stockpile (OC1, OC2, OC3)	207,623	29,169	3,945	7,905,971	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %											50	% Contro
CL - Unload to hopper or stockpile (OC4)	212,562	29,863	4,039	8,094,029	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %											50	% Contro
CL - Rehandling - (OC1 + OC2 + OC3) - at hopper	110,621	15,541	2,102	2,106,151	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Rehandling - OC4 - at hopper	113,253	15,911	2,152	2,156,249	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												

ACTIVITY	TSP emission	PM10 emission	PM25 emission	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Variable 1	Units	Variable 2	Units	Variable 3 - TSP	Variable 3 - PM10	Variable 3 - PM25	Units	Variable 4	Units	Variable 5	Units	Variable 6	Units
Open Cut																							
CHPP - Conveying to Sizing Station (OC1+OC2+OC3)	158	62	7	0.2	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Contro
CHPP - Transfer to Sizing Station (OC4)	1,370	648	98	8,094,029	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	7.4	MC in %										
CHPP - Sizing Station (OC1+OC2+OC3+OC4)	43,200	19,200	2,030	16,000,000	tonnes/year	0.0027	0.00120	0.0	kg/t														
CHPP - Conveying to CHPP (OC)	39	15	2	0.04	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Contro
CHPP - Washing (OC)	-	-	-	16,000,000	tonnes/year																		
CHPP - Conveying to CHPP Product Stockpile (OC)	208	81	10	0.2	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Contro
CHPP - Unloading to CHPP Product Stockpile (OC)	1,393	659	100	12,543,993	tonnes/year	0.000	0.00005	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	10	MC in %										
CHPP - Reclaim and Conveying to TLO (3 transfer poin	4,179	1,976	299	12,543,993	tonnes/year	0.000	0.00005	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	10	MC in %										
Underground																							
CHPP - Conveyor transfer point at UG portal entrance	310	121	15	0.3	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Contro
CHPP - Conveyor to UG1 pit top	386	151	18	0.4	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Contro
CHPP - Unload to ROM stockpile	1,024	484	73	6,050,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	7.4	MC in %										
CHPP - Transfer to sizing station (at product coal stoc	1,024	484	73	6,050,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	7.4	MC in %										
CHPP - Unload to product stockpile	1,024	484	73	6,050,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	7.4	MC in %										
CHPP - Reclaim and conveyor to TLO (3 transfer points	3,072	1,453	220	6,050,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	7.4	MC in %										
Dozers																							
CHPP - Dozer pushing ROM coal at UG1 pit top	27,746	6,545	610	3,048	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Contro
CHPP - Dozer pushing ROM coal (bypass) at product s	37,517	8,588	825	6,096	hours/year	12.3	2.8	0.3	kg/h	5	SC in %	10	MC in %									50	% Contro
CHPP - Dozer pushing Product coal	59,526	12,743	1,310	12,642	hours/year	9.4	2.0	0.2	kg/h	4	SC in %	10	MC in %									50	% Contro
Rejects																							
CHPP - Conveying rejects from CHPP to loadout	183	72	9	0.17	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Contro
CHPP - Loading rejects	145	69	10	3,456,006	tonnes/year	0.000	0.00002	0.00000	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	20	MC in %										
CHPP - Hauling rejects	126,674	32,118	4,003	3,456,006	tonnes/year	0.364	0.090	0.009	kg/t	181	tonnes/load	13.4	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt conten	234	Ave GMV	90	% Control
CHPP - Unloading rejects	145	69	10	3,456,006	tonnes/year	0.000	0.00002	0.00000	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/	20	MC in %										
Wind Erosion																							
OC1 - Active mining area (pit, active dumping area) (O	8,713	4,356	653	10	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC1 - Active mining area (pit, active dumping area) (O	51,502	25,751	3,863	61	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC1 - Inactive area (no rehabilitation) (OC1 north)	4,977	2,488	373	11.71	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
OC1 - Inactive area (no rehabilitation) (OC1 south)	5,576	2,788	418	13.12	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
OC1 - Partially rehabilitated (e.g. stable and seeded)	12,123	6,061	909	47.54	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Contro
OC1 - Hard Stand Areas (Workshops, roads, conveyor	105,239	52,619	7,893	123.81	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC2 - Active mining area (pit, active dumping area)	51,170	25,585	3,838	60.20	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC2 - Inactive area (no rehabilitation)	1,216	608	91	2.86	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
OC2 - Partially rehabilitated (e.g. stable and seeded)	21,224	10,612	1,592	83.23	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Contro
OC2 - Hard Stand Areas (Workshops, roads, conveyor	17,850	8,925	1,339	21.00	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC3 - Active mining area (pit, active dumping area)	120,318	60,159	9,024	141.55	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC3 - Inactive area (no rehabilitation)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
OC3 - Partially rehabilitated (e.g. stable and seeded)	16,111	8,055	1,208	63.18	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Contro
OC3 - Hard Stand Areas (Workshops, roads, conveyor	31,969	15,984	2,398	37.61	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC4 - Active mining area (pit, active dumping area)	168,904	84,452	12,668	198.71	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC4 - Inactive area (no rehabilitation)	16,970	8,485	1,273	39.93	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
OC4 - Partially rehabilitated (e.g. stable and seeded)	18,202	9,101	1,365	71.38	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Contro
OC4 - Hard Stand Areas (Workshops, roads, conveyor	28,968	14,484	2,173	34.08	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
Stockpile - ROM coal stockpile (OC1)	3,107	1,553	233	7.31	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
Stockpile - ROM coal stockpile (UG)	769	385	58	1.81	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
Stockpile - ROM coal stockpile (OC3)	1,471	735	110	3.46	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
Stockpile - ROM coal stockpile (OC4)	3,336	1,668	250	7.85	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
Stockpile - Bypass Coal Stockpile	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
Stockpile - Product Coal Stockpile	2,384	1,192	179	5.61	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Contro
Grading roads	141,796	49,543	4,396	230,388	km	0.62	0.22	0.02	kg/VKT	8	speed of graders	0.6575	hours utilised/total hours										
Total TSP emissions (kg/yr)	**5,439,254**	**1,473,606**	**283,560**																				

Note: ha = hectares, SC=silt content, kg/h = kilograms/hour, WS = wind speed, MC = moisture content.

Table C-3: Emission inventory – Year 2021

ACTIVITY	TSP emission	PM10 emission	PM25 emission	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Variable 1	Units	Variable 2	Units	Variable 3 - TSP	Variable 3 - PM10	Variable 3 - PM25	Units	Variable 4	Units	Variable 5	Units	Variable 6	Units
Overbuden																							
OB - Stripping Topsoil - OC1	1,290	504	61	92	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Stripping Topsoil - OC2	-	-	-	-	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Stripping Topsoil - OC3	1,470	575	69	105	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Stripping Topsoil - OC4	3,540	1,384	166	253	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Drilling - OC1	1,155	600	35	6,523	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Control
OB - Drilling - OC2	-	-	-	-	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Control
OB - Drilling - OC3	1,316	684	39	7,433	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Control
OB - Drilling - OC4	4,351	2,262	131	24,580	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Control
OB - Blasting - OC1	10,582	5,503	317	19	blasts/year	572	297.2	17.1	kg/blas	18,900	Area of blast in m	0.0000021	blasts/bcm										
OB - Blasting - OC2	-	-	-	-	blasts/year	572	297.2	17.1	kg/blas	18,900	Area of blast in m	0.0000021	blasts/bcm										
OB - Blasting - OC3	12,057	6,270	362	21	blasts/year	572	297.2	17.1	kg/blas	18,900	Area of blast in m	0.0000021	blasts/bcm										
OB - Blasting - OC4	39,874	20,734	1,196	70	blasts/year	572	297.2	17.1	kg/blas	18,900	Area of blast in m	0.0000021	blasts/bcm										
OB - Excavator loading OB to haul truck - OC1	20,496	9,694	1,468	19,393,058	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM						
OB - Excavator loading OB to haul truck - OC2	-	-	-	-	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM						
OB - Excavator loading OB to haul truck - OC3	23,355	11,046	1,673	22,097,591	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM						
OB - Excavator loading OB to haul truck - OC4	56,226	26,593	4,027	53,199,124	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM	72.8	% OB excavator only				
OB - Excavator rehandle - OC1	512	242	37	484,826.44	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM	2.5	% OB rehandle				
OB - Excavator rehandle - OC3	584	276	42	552,439.78	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM	2.5	% OB rehandle				
OB - Excavator rehandle - OC4	1,699	804	122	1,607,666	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM	2.2	% OB rehandle				
OB - Hauling to dump - OC1	146,817	38,663	6,447	19,393,058	tonnes/year	0.074	0.018	0.002	kg/t	215	tonnes/load	3.0	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt content	279	Ave GMV (ton	90	% Control
OB - Hauling to dump - OC2	-	-	-	-	tonnes/year	0.074	0.018	0.002	kg/t	215	tonnes/load	3.0	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt content	279	Ave GMV (ton	90	% Control
OB - Hauling to dump - OC3	101,727	27,785	5,719	22,097,591	tonnes/year	0.045	0.011	0.001	kg/t	215	tonnes/load	1.8	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt content	279	Ave GMV (ton	90	% Control
OB - Hauling to dump - OC4 (930 E)	101,353	27,638	5,642	26,599,562	tonnes/year	0.037	0.009	0.001	kg/t	317	tonnes/load	2.0	km/return tr	5.8	1.4	0.1	kg/VKT	4.2	% silt content	344	Ave GMV (ton	90	% Control
OB - Hauling to dump - OC4 (830 E)	221,105	57,926	9,333	26,599,562	tonnes/year	0.082	0.020	0.002	kg/t	215	tonnes/load	3.3	km/return tr	5.3	1.3	0.1	kg/VKT	4.2	% silt content	279	Ave GMV (ton	90	% Control
OB - Emplacing at dump - OC1	20,496	9,694	1,468	19,393,058	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %										
OB - Emplacing at dump - OC2	-	-	-	-	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %										
OB - Emplacing at dump - OC3	23,355	11,046	1,673	22,097,591	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %										
OB - Emplacing at dump - OC4	56,226	26,593	4,027	53,199,124	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %										
OB - Dozers on OB (dump and pit) - OC1	134,636	32,536	14,137	8,045	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
OB - Dozers on OB (dump and pit) - OC2	-	-	-	-	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
OB - Dozers on OB (dump and pit) - OC3	149,664	36,167	15,715	8,943	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
OB - Dozers on OB (dump and pit) - OC4	844,749	204,139	88,699	50,477	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
Coal																							
CL - Drilling - OC1	82	43	2	2,741	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Control
CL - Drilling - OC2	-	-	-	-	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Control
CL - Drilling - OC3	218	113	7	7,259	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Control
CL - Drilling - OC4	176	91	5	5,850	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Control
CL - Blasting - OC1	6,831	3,552	205	8	blasts / year	859	446.8	25.8	kg/blas	24,800	Area of blast in m	0.0000029	blasts/tonne ROM										
CL - Blasting - OC2	-	-	-	-	blasts / year	859	446.8	25.8	kg/blas	24,800	Area of blast in m	0.0000029	blasts/tonne ROM										
CL - Blasting - OC3	18,086	9,405	543	21	blasts / year	859	446.8	25.8	kg/blas	24,800	Area of blast in m	0.0000029	blasts/tonne ROM										
CL - Blasting - OC4	14,577	7,580	437	17	blasts / year	859	446.8	25.8	kg/blas	24,800	Area of blast in m	0.0000029	blasts/tonne ROM										
CL - Dozers ripping/pushing/clean-up - OC1	17,232	4,065	379	1,893	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Control
CL - Dozers ripping/pushing/clean-up - OC2	-	-	-	-	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Control
CL - Dozers ripping/pushing/clean-up - OC3	45,633	10,765	1,004	5,013	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Control
CL - Dozers ripping/pushing/clean-up - OC4	36,776	8,675	809	4,040	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Control
CL - Loading ROM coal to haul truck - OC1	143,987	20,229	2,736	2,741,398	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Loading ROM coal to haul truck - OC2	-	-	-	-	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Loading ROM coal to haul truck - OC3	381,244	53,561	7,244	7,258,602	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Loading ROM coal to haul truck - OC4	307,275	43,169	5,838	5,850,284	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Hauling ROM to hopper - OC1	79,588	20,313	2,684	2,741,398	tonnes/year	0.288	0.071	0.007	kg/t	181	tonnes/load	10.6	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt content	234	Ave GMV (ton	90	% Control
CL - Hauling ROM to hopper - OC2	-	-	-	-	tonnes/year	0.434	0.108	0.011	kg/t	181	tonnes/load	16.0	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt content	234	Ave GMV (ton	90	% Control
CL - Hauling ROM to hopper - OC3	476,588	119,757	13,703	7,258,602	tonnes/year	0.654	0.162	0.016	kg/t	181	tonnes/load	24.1	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt content	234	Ave GMV (ton	90	% Control
CL - Hauling ROM to hopper - OC4	87,310	22,869	3,679	5,850,284	tonnes/year	0.147	0.036	0.004	kg/t	181	tonnes/load	5.4	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt content	234	Ave GMV (ton	90	% Control
CL - Unload to hopper or stockpile for washing (OC1,	236,354	33,206	4,491	9,000,000	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %											50	% Control
CL - Unload to hopper or stockpile (OC4)	153,637	21,585	2,919	5,850,284	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %											50	% Control
CL - Rehandling - (OC1 + OC2 + OC3) - at hopper for	125,929	17,692	2,393	2,397,600	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Rehandling - OC4 - at hopper	81,858	11,500	1,555	1,558,516	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CHPP - Transfer to Sizing Station (OC4)	990	468	71	5,850,284	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										

ACTIVITY	TSP emission (kg/y)	PM10 emission (kg/y)	PM25 emission (kg/y)	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Variable 1	Units	Variable 2	Units	Variable 3 - TSP	Variable 3 - PM10	Variable 3 - PM25	Units	Variable 4	Units	Variable 5	Units	Variable 6	Units
Bypass																							
CL - bypass - direct dumping at bypass stockpile (OC1	169	80	12	1,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CL - bypass - conveying to bypass stockpile (OC4) (1	205	97	15	1,209,935	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CL - bypass - discharge to bypass stockpile (OC4)	205	97	15	1,209,935	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CL - bypass - transfer station (OC)	374	177	27	2,209,935	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CL - bypass - bypass coal sizing station	5,967	2,652	280	2,209,935	tonnes/year	0.0027	0.00120	0.0	kg/t														
CL - bypass - OC bypass coal conveyed to product sto	376	147	18	0.36	ha	0.40	0.2	0.0	kg/ha/	8,760	hours											70	% Control
CL - bypass - bypass coal conveyed to TLO (3 transfe	1,122	531	80	2,209,935	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
Open Cut																							
CHPP - Conveying to Sizing Station (OC1+OC2+OC3)	158	62	7	0.15	ha	0.40	0.2	0.0	kg/ha/	8,760	hours											70	% Control
CHPP - Transfer to Sizing Station (OC4)	785	371	56	4,640,349	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Sizing Station (OC1+OC2+OC3+OC4)	36,829	16,368	1,731	13,640,349	tonnes/year	0.0027	0.00120	0.0	kg/t														
CHPP - Conveying to CHPP (OC)	39	15	2	0.04	ha	0.40	0.2	0.0	kg/ha/	8,760	hours											70	% Control
CHPP - Washing (OC)	-	-	-	13,640,349	tonnes/year																		
CHPP - Conveying to CHPP Product Stockpile (OC)	208	81	10	0.2	ha	0.40	0.2	0.0	kg/ha/	8,760	hours											70	% Control
CHPP - Unloading to CHPP Product Stockpile (OC)	1,195	565	86	10,762,539	tonnes/year	0.000	0.00005	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	10	MC in %										
CHPP - Reclaim and Conveying to TLO (3 transfer poin	4,321	2,044	310	12,972,474	tonnes/year	0.000	0.00005	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	10	MC in %										
Underground																							
CHPP - Conveyor transfer point at UG portal entrance	310	121	15	0.3	ha	0.40	0.2	0.0	kg/ha/	8,760	hours											70	% Control
CHPP - Conveyor to UG1 pit top	386	151	18	0.4	ha	0.40	0.2	0.0	kg/ha/	8,760	hours											70	% Control
CHPP - Unload to ROM stockpile	1,354	640	97	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Transfer to sizing station (at product coal stoc	1,354	640	97	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Unload to product stockpile	1,354	640	97	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Reclaim and conveyor to TLO (3 transfer points	4,062	640	97	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
Dozers		-	-																				
CHPP - Dozer pushing ROM coal at UG1 pit top	36,694	8,656	807	4,031	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Control
CHPP - Dozer pushing ROM coal (bypass) at bypass st	13,712	3,139	302	2,228	hours/year	12.3	2.8	0.3	kg/h	5	SC in %	10	MC in %									50	% Control
CHPP - Dozer pushing washed Product coal	51,069	10,933	1,124	10,846	hours/year	9.4	2.0	0.2	kg/h	4	SC in %	10	MC in %									50	% Control
CHPP - Dozer pushing bypass (UG + OC) Product coal	48,452	10,372	1,066	10,290	hours/year	9.4	2.0	0.2	kg/h	4	SC in %	10	MC in %									50	% Control
Rejects		-	-																				
CHPP - Conveying rejects from CHPP to loadout	183	72	9	0.17	ha	0.40	0.2	0.0	kg/ha/	8,760	hours											70	% Control
CHPP - Loading rejects	121	57	9	2,877,809	tonnes/year	0.000	0.00002	0.00000	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	20	MC in %										
CHPP - Hauling rejects	114,889	29,101	3,595	2,877,809	tonnes/year	0.396	0.098	0.010	kg/t	181	tonnes/load	14.6	km/return tr	4.9	1.2	0.1	kg/VKT	4.2	% silt content	234	Ave GMV (tonr	90	% Control
CHPP - Unloading rejects	121	57	9	2,877,809	tonnes/year	0.000	0.00002	0.00000	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	20	MC in %										
Wind Erosion		-	-																				
OC1 - Active Mining Area	31,152	15,576	2,336	36.65	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
OC1 - Inactive area (no rehabilitation)	4,977	2,488	373	11.71	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
OC1 - Partially rehabilitated (e.g. stable and seeded)	2,614	1,307	196	10.25	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											70	% Control
OC1 - Partially rehabilitated (e.g. stable and seeded)	19,502	9,751	1,463	76	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											70	% Control
OC1 - Hard Stand Areas (Workshops, roads, conveyo	85,179	42,589	6,388	100	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
OC2 - Active mining area (pit, active dumping area)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
OC2 - Inactive area (no rehabilitation)	1,216	608	91	3	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
OC2 - Partially rehabilitated (e.g. stable and seeded)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											70	% Control
OC2 - Hard Stand Areas (Workshops, roads, conveyo	17,850	8,925	1,339	21	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
OC3 - Active mining area (pit, active dumping area)	110,475	55,237	8,286	130	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
OC3 - Inactive area (no rehabilitation)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
OC3 - Partially rehabilitated (e.g. stable and seeded)	44,602	22,301	3,345	175	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											70	% Control
OC3 - Hard Stand Areas (Workshops, roads, conveyo	31,969	15,984	2,398	38	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
OC4 - Active mining area (pit, active dumping area)	129,421	64,711	9,707	152	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
OC4 - Inactive area (no rehabilitation)	16,635	8,317	1,248	39	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
OC4 - Partially rehabilitated (e.g. stable and seeded)	32,449	16,224	2,434	127	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											70	% Control
OC4 - Hard Stand Areas (Workshops, roads, conveyo	29,589	14,794	2,219	35	ha	0.10	0.05	0.007	kg/ha/	8,760	hours												
Stockpile - ROM coal stockpile (OC1)	3,107	1,553	233	7	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
Stockpile - ROM coal stockpile (UG)	769	385	58	2	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
Stockpile - ROM coal stockpile (OC3)	1,471	735	110	3	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
Stockpile - ROM coal stockpile (OC4)	3,336	1,668	250	8	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
Stockpile - Bypass Coal Stockpile	5,143	2,571	386	12	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
Stockpile - Product Coal Stockpile	4,526	2,263	339	11	ha	0.10	0.05	0.007	kg/ha/	8,760	hours											50	% Control
Grading roads	141,796	49,543	4,396	230,388	ha	0.62	0.22	0.02	kg/VKT	8	speed of graders	0.6575	hours utilised/total hours										
Total TSP emissions (kg/yr)	**5,236,797**	**1,394,039**	**270,888**																				

Table C-4: Emission inventory – Year 2026

ACTIVITY	TSP emission	PM10 emission	PM25 emission	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Variable 1	Units	Variable 2	Units	Variable 3 TSP	Variable 3 - PM10	Variable 3 - PM25	Units	Variable 4	Units	Variable 5	Units	Variable 6	Units
Overbuden																							
OB - Stripping Topsoil - OC4	6,300	2,463	296	450	hours/year	14.0	5.5	0.7	kg/h	450	total hours/year												
OB - Drilling - OC4	8,184	4,256	246	46,240	holes/year	0.59	0.31	0.02	kg/hole	0.00074	holes/bcm											70	% Control
OB - Blasting - OC4	75,010	39,005	2,250	131	blasts/year	572	297.2	17.1	kg/blast	18,900	Area of blast in m2	0.0000021	blasts/bcm										
OB - Excavator loading OB to haul truck - OC4	105,337	49,822	7,544	99,666,144	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM	72.5	% OB excavator only				
OB - Excavator rehandle - OC4	3,196	1,512	229	3,024,352	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %	2.2			tonnes/BCM	2.2	% OB rehandle				
OB - Hauling to dump - OC4 (930 E)	137,761	34,185	3,418	37,374,804	tonnes/year	0.037	0.009	0.001	kg/t	317	tonnes/load	2.0	km/return trip	5.8	1.4	0.1	kg/VKT	4.2	% silt content	344	Ave GMV (ton	90	% Control
OB - Hauling to dump - OC4 (830 E) (north)	304,955	75,674	7,567	37,374,804	tonnes/year	0.082	0.020	0.002	kg/t	215	tonnes/load	3.3	km/return trip	5.3	1.3	0.1	kg/VKT	4.2	% silt content	279	Ave GMV (ton	90	% Control
OB - Hauling to dump - OC4 (830 E) (south)	203,303	50,449	5,045	24,916,536	tonnes/year	0.082	0.020	0.002	kg/t	215	tonnes/load	3.3	km/return trip	5.3	1.3	0.1	kg/VKT	4.2	% silt content	279	Ave GMV (ton	90	% Control
OB - Emplacing at dump - OC4	105,337	49,822	7,544	99,666,144	tonnes/year	0.001	0.00050	0.00008	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	2	MC in %										
OB - Dozers on OB (dump and pit) - OC4	1,110,055	268,251	116,556	66,330	hours/year	16.7	4.0	1.8	kg/h	10	SC in %	2	MC in %										
Coal																							
CL - Drilling - OC4	480	250	14	16,000	holes/year	0.10	0.05	0.00	kg/hole	0.001	Holes/tonne ROM											70	% Control
CL - Blasting - OC4	39,867	20,731	1,196	46	blasts / year	859	446.8	25.8	kg/blast	24,800	Area of blast in m2	0.0000029	blasts/tonne ROM										
CL - Dozers ripping/pushing/clean-up - OC4	116,727	27,536	2,568	12,823	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Control
CL - Loading ROM coal to haul truck - OC4	840,369	118,064	15,967	16,000,000	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %												
CL - Hauling ROM to hopper - OC4	278,086	69,006	6,901	16,000,000	tonnes/year	0.174	0.043	0.004	kg/t	181	tonnes/load	6.4	km/return trip	4.9	1.2	0.1	kg/VKT	4.2	% silt content	234	Ave GMV (ton	90	% Control
CL - Unload to hopper or stockpile (OC4)	420,184	59,032	7,984	16,000,000	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %											50	% Control
CL - Rehandling - OC4 - at hopper	111,937	15,726	2,127	4,262,400	tonnes/year	0.053	0.007	0.001	kg/t	7.4	MC in %											50	% Control
CHPP - Transfer to Sizing Station (OC4)	2,708	1,281	194	16,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
Bypass																							
CL - bypass - conveying to bypass stockpile (OC4) (1 transfer po	1,124	531	80	6,638,573	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CL - bypass - discharge to bypass stockpile (OC4)	1,124	531	80	6,638,573	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CL - bypass - transfer station (OC)	1,124	531	80	6,638,573	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CL - bypass - bypass coal sizing station	17,924	7,966	842	6,638,573	tonnes/year	0.0027	0.00120	0.0	kg/t														
CL - bypass - OC bypass coal conveyed to product stockpile	376	147	18	0.36	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Control
CL - bypass - bypass coal conveyed to TLO (3 transfer points)	3,371	1,594	241	6,638,573	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
Open Cut																							
CHPP - Transfer to Sizing Station (OC4)	1,585	749	113	9,361,427	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Sizing Station (OC1+OC2+OC3+OC4)	25,276	11,234	1,188	9,361,427	tonnes/year	0.0027	0.00120	0.0	kg/t														
CHPP - Conveying to CHPP (OC)	39	15	2	0.04	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Control
CHPP - Washing (OC)	-	-	-	9,361,427	tonnes/year																		
CHPP - Conveying to CHPP Product Stockpile (OC)	208	81	10	0.20	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Control
CHPP - Unloading to CHPP Product Stockpile (OC)	801	379	57	7,217,144	tonnes/year	0.000	0.00005	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	10	MC in %										
CHPP - Reclaim and Conveying to TLO (3 transfer points)	4,616	2,183	331	13,855,717	tonnes/year	0.000	0.00005	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	10	MC in %										
Underground																							
CHPP - Conveyor transfer point at UG portal entrance	310	121	15	0.30	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Control
CHPP - Conveyor to UG1 pit top	386	151	18	0.37	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Control
CHPP - Unload to ROM stockpile	1,354	640	97	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Transfer to sizing station (at product coal stockpile area)	1,354	640	97	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Unload to product stockpile	1,354	640	97	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
CHPP - Reclaim and conveyor to TLO (3 transfer points)	4,062	1,921	291	8,000,000	tonnes/year	0.000	0.00008	0.00001	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	7.4	MC in %										
Dozers																							
CHPP - Dozer pushing ROM coal at UG1 pit top	27,063	6,384	595	2,973	hours/year	18.2	4.3	0.4	kg/h	5	SC in %	7.4	MC in %									50	% Control
CHPP - Dozer pushing ROM coal (bypass) at bypass stockpile	41,173	9,424	906	6,690	hours/year	12.3	2.8	0.3	kg/h	5	SC in %	10	MC in %									50	% Control
CHPP - Dozer pushing washed Product coal	34,312	7,345	755	7,287	hours/year	9.4	2.0	0.2	kg/h	4	SC in %	10	MC in %									50	% Control
CHPP - Dozer pushing bypass (UG + OC) Product coal	59,498	12,737	1,309	12,636	hours/year	9.4	2.0	0.2	kg/h	4	SC in %	10	MC in %									50	% Control
Rejects																							
CHPP - Conveying rejects from CHPP to loadout	183	72	9	0.17	ha	0.40	0.2	0.0	kg/ha/hour	8,760	hours											70	% Control
CHPP - Loading rejects	90	43	6	2,144,283	tonnes/year	0.000	0.00002	0.00000	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	20	MC in %										
CHPP - Hauling rejects	68,714	17,051	1,705	2,144,283	tonnes/year	0.320	0.080	0.008	kg/t	181	tonnes/load	11.8	km/return trip	4.9	1.2	0.1	kg/VKT	4.2	% silt content	234	Ave GMV (ton	90	% Control
CHPP - Unloading rejects	90	43	6	2,144,283	tonnes/year	0.000	0.00002	0.00000	kg/t	0.893	$(WS/2.2)^{1.3}$ in m/s	20	MC in %										
Wind Erosion																							
OC1 - Inactive area (no rehabilitation)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
OC1 - Partially rehabilitated (e.g. stable and seeded)	3,118	1,559	234	12.23	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Control
OC1 - Hard Stand Areas (Workshops, roads, conveyors etc)	94,952	47,476	7,121	111.71	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC2 - Active mining area (pit, active dumping area)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC2 - Inactive area (no rehabilitation)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
OC2 - Partially rehabilitated (e.g. stable and seeded)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Control
OC2 - Hard Stand Areas (Workshops, roads, conveyors etc)	17,851	8,925	1,339	21.00	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC3 - Active mining area (pit, active dumping area)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC3 - Inactive area (no rehabilitation)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
OC3 - Partially rehabilitated (e.g. stable and seeded)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Control
OC3 - Hard Stand Areas (Workshops, roads, conveyors etc)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC4 - Active mining area (pit, active dumping area) (OC4 north)	156,671	78,336	11,750	184.32	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC4 - Active mining area (pit, active dumping area) (OC4 south)	112,024	56,012	8,402	131.79	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
OC4 - Inactive area (no rehabilitation)	-	-	-	-	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
OC4 - Partially rehabilitated (e.g. stable and seeded)	41,005	20,503	3,075	160.81	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											70	% Control
OC4 - Hard Stand Areas (Workshops, roads, conveyors etc)	18,343	9,172	1,376	21.58	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours												
Stockpile - ROM coal stockpile (OC1)	3,105	1,553	233	7.31	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
Stockpile - ROM coal stockpile (UG)	768	384	58	1.81	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
Stockpile - ROM coal stockpile (OC4)	3,953	1,976	296	9.30	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
Stockpile - Bypass Coal Stockpile	5,143	2,572	386	12.10	ha	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
Stockpile - Product Coal Stockpile	2,383	1,191	179	5.61	square metres	0.10	0.05	0.007	kg/ha/hour	8,760	hours											50	% Control
Grading roads	141,796	49,543	4,396	230,388	km	0.62	0.22	0.02	kg/VKT	8	speed of graders in k	0.6575	hours utilised/total hours										
Total TSP emissions (kg/yr)	**4,768,420**	**1,249,423**	**235,441**																				

Appendix D

Modelling Predictions

Table D-1: Modelling predictions for 2019

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
Privately-owned receptors										
9	5	2	26	10	21	0.42	6.8	19	39	1
26	6	2	27	9	17	0.37	6.3	18	36	1
37	3	1	14	4	9	0.17	5.5	11	24	1
39	3	1	11	2	4	0.08	4.9	8	19	1
40	3	1	18	4	8	0.16	5.4	10	23	1
60	4	1	14	5	10	0.22	5.7	12	26	1
61	3	1	13	5	10	0.22	5.7	12	26	1
66	4	1	20	7	14	0.28	6.3	18	35	1
70	4	1	16	6	13	0.24	6.1	14	30	1
75	4	1	19	5	12	0.24	5.9	13	28	1
79	3	1	15	5	10	0.22	5.7	12	27	1
80	3	1	13	4	8	0.18	5.5	11	25	1
82	3	1	13	5	9	0.21	5.6	12	25	1
83	3	1	13	4	8	0.17	5.5	11	24	1
84	3	1	13	4	8	0.17	5.5	11	24	1
86	3	1	13	4	7	0.14	5.3	10	22	1
87	3	1	13	4	8	0.16	5.4	11	23	1
88	3	1	13	4	8	0.16	5.5	11	23	1
89	3	1	12	4	7	0.14	5.3	10	22	1
90	3	1	12	3	7	0.14	5.3	10	22	1
91	3	1	13	4	8	0.16	5.4	11	23	1
94	3	1	11	3	5	0.13	5.1	9	20	1
95	3	1	12	3	6	0.13	5.2	9	21	1
96	3	1	12	3	6	0.13	5.2	10	21	1
97	3	1	12	3	6	0.14	5.2	10	21	1
98	3	1	13	3	6	0.14	5.2	10	21	1
99	3	1	14	4	7	0.14	5.3	10	22	1
100	3	1	15	4	8	0.16	5.4	10	23	1
101	3	1	14	3	6	0.13	5.2	10	21	1
102	3	1	12	3	6	0.12	5.1	9	20	1
103	3	1	12	3	5	0.12	5.1	9	20	1
104	2	1	9	3	5	0.11	5.0	9	19	1
105	2	1	10	2	5	0.11	5.0	9	19	1
106	3	1	10	3	5	0.10	5.0	9	19	1
107	3	1	10	3	5	0.11	5.1	9	20	1
109	2	1	10	2	4	0.08	4.9	8	18	1
110	2	0	11	2	4	0.08	4.9	8	18	1
111	2	1	10	2	4	0.09	4.9	8	19	1
112	2	1	10	2	4	0.09	4.9	8	18	1
113	2	1	10	2	4	0.09	4.9	8	19	1
119	3	1	16	4	7	0.14	5.3	10	22	1
149	4	1	19	7	14	0.29	6.3	19	36	1
160	4	1	20	7	14	0.28	6.3	18	35	1

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
162	4	1	20	7	14	0.28	6.3	19	36	1
168	4	1	20	7	14	0.29	6.3	18	35	1
171	2	0	7	1	2	0.05	4.6	7	16	1
180	4	1	17	4	9	0.22	5.7	12	26	1
181	4	1	16	4	9	0.22	5.6	12	26	1
182	4	1	16	4	9	0.21	5.6	12	25	1
183	3	1	15	4	8	0.22	5.5	11	25	1
186	3	1	13	4	7	0.20	5.4	11	23	1
187	3	1	12	3	7	0.18	5.4	11	23	1
188	3	1	11	3	6	0.18	5.3	10	22	1
189	3	1	11	3	7	0.17	5.3	10	22	1
190	3	1	10	3	6	0.16	5.2	10	21	1
191	3	1	10	3	6	0.15	5.2	10	21	1
192	3	1	10	3	6	0.15	5.2	10	21	1
194	2	1	9	3	5	0.14	5.1	9	20	1
195	3	1	10	3	5	0.13	5.1	9	21	1
196	2	1	9	2	5	0.13	5.0	9	20	1
200	2	1	9	2	4	0.12	5.0	9	19	1
202	2	1	9	2	4	0.12	5.0	9	19	1
203	2	1	10	2	5	0.12	5.0	9	19	1
204	2	1	10	2	5	0.12	5.0	9	19	1
206	2	1	9	2	4	0.10	4.9	8	19	1
207	2	0	8	2	3	0.08	4.8	8	17	1
208	2	0	8	2	3	0.08	4.8	8	17	1
209	2	0	8	1	2	0.07	4.7	7	17	1
210	2	0	8	1	2	0.06	4.7	7	17	1
217	2	0	9	2	3	0.07	4.8	8	17	1
218	2	0	8	1	3	0.06	4.7	7	17	1
219	2	0	8	2	3	0.08	4.8	8	18	1
220	2	0	8	2	3	0.07	4.7	8	17	1
222	2	0	9	2	4	0.09	4.9	8	18	1
223	2	1	10	2	4	0.10	4.9	8	19	1
224	3	1	11	3	6	0.13	5.1	9	20	1
226	3	1	10	3	6	0.13	5.1	9	21	1
227	3	1	10	3	6	0.13	5.2	10	21	1
229	3	1	10	3	6	0.14	5.2	10	21	1
230	3	1	11	3	6	0.14	5.3	10	22	1
231	3	1	11	3	6	0.14	5.3	10	22	1
232	3	1	10	3	6	0.14	5.3	10	22	1
233	3	1	11	3	7	0.15	5.3	10	22	1
234	3	1	11	3	7	0.15	5.3	10	22	1
235	3	1	11	3	7	0.16	5.3	10	23	1
236	3	1	11	4	7	0.16	5.4	11	23	1
237	3	1	13	4	8	0.18	5.5	11	24	1
238	3	1	13	4	8	0.18	5.5	11	24	1

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
255	3	1	13	3	6	0.14	5.3	12	24	1
256	3	1	13	3	6	0.14	5.3	12	24	1
258	3	1	15	4	7	0.16	5.4	12	25	1
300	4	1	15	5	11	0.27	5.8	13	28	1
303	3	1	14	5	10	0.24	5.8	13	27	1
305	3	1	14	4	9	0.23	5.6	12	26	1
306	3	1	14	4	9	0.22	5.6	12	26	1
307	3	1	14	4	8	0.22	5.6	12	25	1
308	3	1	13	4	8	0.23	5.5	11	24	1
309	3	1	12	4	7	0.25	5.4	11	24	1
310	3	1	12	4	8	0.25	5.5	11	25	1
312	3	1	12	4	8	0.27	5.5	11	25	1
313	3	1	12	4	7	0.27	5.4	11	24	1
314	3	1	12	4	8	0.29	5.5	11	25	1
315	3	1	12	4	8	0.30	5.5	12	25	1
316	3	1	12	4	8	0.31	5.6	12	25	1
317	3	1	13	5	10	0.32	5.7	12	26	1
11 (a)	1	0	6	0	1	0.01	4.7	8	18	1
11 (b)	1	0	6	0	1	0.01	4.7	8	17	1
11 (c)	1	0	7	0	1	0.01	4.7	8	18	1
184 (a)	3	1	14	4	8	0.20	5.5	11	25	1
184 (b)	3	1	14	4	8	0.20	5.5	11	24	1
201 (a)	2	1	9	2	4	0.12	5.0	9	19	1
201 (b)	2	1	9	2	5	0.12	5.0	9	19	1
41 (a)	3	1	12	3	6	0.11	5.1	9	20	1
41 (b)	3	1	10	3	6	0.13	5.2	10	21	1
46B	5	1	21	8	16	0.32	6.7	21	40	1
Mine-owned receptors										
5	10	4	44	17	38	0.75	9	27	58	1
20	7	3	30	12	26	0.49	7	21	45	1
21	6	2	24	10	21	0.42	7	18	40	1
22	6	2	23	8	18	0.35	7	17	37	1
23	6	2	25	8	17	0.31	7	16	35	1
25	6	2	29	10	20	0.46	7	20	39	1
28	7	2	33	8	17	0.33	6	15	32	1
30	6	2	32	8	17	0.30	6	14	32	1
31	8	2	35	10	19	0.36	7	16	35	1
32	2	0	8	1	1	0.03	5	7	16	1
35	4	1	18	3	6	0.12	5	10	21	1
36	20	7	103	30	74	1.39	12	37	89	2
41	6	2	24	8	16	0.31	6	16	34	1
47	4	0	15	2	3	0.05	5	8	17	1
48	1	0	4	0	1	0.02	4	6	15	1
49	6	2	26	9	18	0.39	6	18	36	1
51	4	0	15	2	3	0.05	5	8	17	1

Receptor ID	PM$_{2.5}$ (µg/m³)		PM$_{10}$ (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM$_{2.5}$ (µg/m³)	PM$_{10}$ (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
52	1	0	5	0	0	0.01	4	6	15	1
58	6	2	24	8	17	0.35	6	16	34	1
59	4	2	17	7	15	0.32	6	14	32	1
63	5	2	21	7	14	0.26	6	15	32	1
64	5	1	19	6	13	0.25	6	14	31	1
69	1	0	6	0	1	0.01	4	7	15	1
74	4	1	19	6	12	0.24	6	13	29	1
76	4	1	17	5	11	0.23	6	13	27	1
77	4	1	17	6	12	0.27	6	13	29	1
78	3	1	14	5	9	0.20	6	12	26	1
81	3	1	13	5	10	0.22	6	12	26	1
152	4	1	20	7	13	0.26	6	18	35	1
153	4	1	20	7	13	0.26	6	18	35	1
157	4	1	20	7	14	0.27	6	18	35	1
158	4	1	19	7	13	0.24	6	17	33	1
159	4	1	20	7	14	0.27	6	18	35	1
161	4	1	20	7	14	0.28	6	18	35	1
165	4	1	20	7	14	0.28	6	19	36	1
169	4	1	20	6	12	0.25	6	15	30	1
170	4	1	15	5	11	0.26	6	13	29	1
172	4	1	16	6	12	0.24	6	14	30	1
173	4	1	18	6	13	0.29	6	15	31	1
175	4	1	14	5	11	0.24	6	13	28	1
176	3	1	15	5	11	0.23	6	13	28	1
177	4	1	16	5	10	0.22	6	13	28	1
239	3	1	14	4	9	0.19	6	11	25	1
240	4	1	16	5	10	0.21	6	12	26	1
241	4	1	17	5	10	0.21	6	12	27	1
253	2	0	10	1	2	0.05	5	12	23	1
254	2	0	12	2	4	0.10	5	11	23	1
257	3	1	15	4	7	0.16	5	12	25	1
301	4	1	15	5	10	0.26	6	13	28	1
302	4	1	14	5	10	0.25	6	13	27	1
319	1	0	5	1	1	0.04	5	7	16	1
319	1	0	4	1	1	0.04	5	7	16	1
319	1	0	2	0	1	0.03	5	7	16	1
319	1	0	2	0	1	0.02	5	7	16	1
319	1	0	2	0	0	0.02	5	7	15	1
319	1	0	2	0	0	0.02	5	10	20	1
320	3	1	13	4	8	0.17	5	12	25	1
41C	4	1	20	7	14	0.27	6	18	35	1
29c	6	1	23	4	8	0.14	5	11	23	1

Table D-2: Modelling predictions for 2021

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
Privately-owned receptors										
9	9	3	40	13	27	0.50	7.6	21	45	1
26	9	2	40	10	18	0.31	6.7	18	36	1
37	3	1	15	4	6	0.11	5.2	10	21	1
39	2	1	11	3	4	0.08	4.9	9	19	1
40	3	1	18	4	7	0.12	5.3	10	22	1
60	3	1	11	3	5	0.09	5.3	10	21	1
61	3	1	10	3	5	0.08	5.2	10	21	1
66	5	1	20	7	14	0.26	6.2	17	33	1
70	4	1	16	4	7	0.13	5.6	12	24	1
75	4	1	14	3	5	0.08	5.3	11	22	1
79	3	1	11	3	5	0.08	5.2	10	21	1
80	3	1	10	3	4	0.07	5.1	10	20	1
82	3	1	10	3	5	0.08	5.2	10	21	1
83	2	1	11	3	5	0.08	5.1	10	20	1
84	2	1	12	3	5	0.08	5.2	10	20	1
86	3	1	13	3	5	0.08	5.1	10	20	1
87	3	1	13	3	5	0.08	5.1	10	20	1
88	3	1	14	3	5	0.09	5.2	10	21	1
89	3	1	13	3	5	0.08	5.1	9	20	1
90	3	1	12	3	5	0.09	5.1	9	20	1
91	3	1	14	3	6	0.10	5.2	10	21	1
94	2	1	11	3	4	0.09	5.0	9	19	1
95	2	1	12	3	5	0.09	5.0	9	19	1
96	2	1	12	3	5	0.09	5.0	9	20	1
97	3	1	13	3	5	0.09	5.1	9	20	1
98	3	1	13	3	5	0.10	5.1	9	20	1
99	3	1	14	3	5	0.10	5.1	10	20	1
100	3	1	14	4	6	0.11	5.2	10	21	1
101	3	1	17	3	6	0.11	5.1	10	20	1
102	3	1	15	3	5	0.10	5.1	9	20	1
103	2	1	13	3	5	0.10	5.0	9	19	1
104	2	1	13	3	4	0.09	5.0	9	19	1
105	2	1	13	3	4	0.09	5.0	9	19	1
106	2	1	14	3	5	0.09	5.0	9	19	1
107	3	1	16	3	5	0.10	5.1	9	20	1
109	2	1	10	2	4	0.08	4.9	9	18	1
110	2	0	9	2	4	0.08	4.9	8	18	1
111	2	1	11	2	4	0.09	4.9	9	19	1
112	2	1	11	2	4	0.08	4.9	9	18	1
113	2	1	11	3	4	0.09	4.9	9	19	1
119	3	1	16	4	6	0.11	5.2	10	21	1
149	5	1	20	8	14	0.28	6.2	17	34	1
160	5	1	20	8	14	0.26	6.2	17	33	1

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
162	5	1	20	8	14	0.27	6.3	17	34	1
168	5	1	20	7	14	0.27	6.2	17	33	1
171	1	0	6	1	2	0.05	4.6	7	16	1
180	3	1	13	3	5	0.09	5.2	10	21	1
181	3	1	13	3	4	0.09	5.2	10	21	1
182	3	1	12	3	4	0.09	5.2	10	21	1
183	3	1	12	2	4	0.09	5.1	10	20	1
186	3	1	10	2	4	0.08	5.0	9	20	1
187	3	1	10	2	4	0.07	5.0	9	19	1
188	2	0	9	2	3	0.07	5.0	9	19	1
189	2	1	9	2	4	0.07	5.0	9	19	1
190	2	0	8	2	3	0.07	5.0	9	19	1
191	2	0	8	2	3	0.07	5.0	9	19	1
192	2	0	8	2	4	0.07	5.0	9	19	1
194	2	0	8	2	3	0.08	4.9	9	18	1
195	2	1	9	2	4	0.08	5.0	9	19	1
196	2	0	8	2	3	0.08	4.9	9	18	1
200	2	0	8	2	3	0.08	4.9	9	18	1
202	2	0	9	2	4	0.09	4.9	9	18	1
203	2	1	10	2	4	0.09	4.9	9	19	1
204	2	1	11	2	4	0.09	4.9	9	19	1
206	2	0	10	2	4	0.09	4.9	8	18	1
207	1	0	8	2	3	0.08	4.8	8	17	1
208	1	0	6	2	3	0.07	4.7	8	17	1
209	1	0	6	2	3	0.07	4.7	8	17	1
210	1	0	6	1	2	0.06	4.7	7	17	1
217	2	0	8	2	3	0.07	4.8	8	17	1
218	1	0	7	2	3	0.06	4.7	8	17	1
219	2	0	8	2	3	0.08	4.8	8	18	1
220	1	0	6	2	3	0.07	4.7	8	17	1
222	2	0	10	2	4	0.09	4.9	8	18	1
223	2	1	12	2	4	0.09	4.9	9	19	1
224	2	1	10	3	4	0.09	5.0	9	19	1
226	2	1	10	3	4	0.09	5.0	9	19	1
227	2	1	10	3	4	0.08	5.0	9	19	1
229	2	1	11	3	4	0.08	5.0	9	19	1
230	2	1	11	3	4	0.08	5.0	9	20	1
231	2	1	11	3	4	0.08	5.0	9	19	1
232	2	1	10	3	4	0.08	5.0	9	19	1
233	2	1	10	3	4	0.07	5.0	9	19	1
234	2	1	10	3	4	0.07	5.0	9	19	1
235	2	1	9	2	4	0.07	5.0	9	19	1
236	2	1	9	3	4	0.07	5.1	9	20	1
237	3	1	10	3	4	0.07	5.1	10	20	1
238	3	1	10	3	4	0.07	5.1	10	20	1

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
255	3	1	15	3	6	0.12	5.2	11	22	1
256	3	1	14	3	6	0.13	5.3	11	23	1
258	4	1	16	4	7	0.15	5.4	12	24	1
300	4	1	15	4	8	0.19	5.6	12	24	1
303	4	1	14	4	6	0.14	5.4	11	23	1
305	3	1	14	3	5	0.12	5.3	11	22	1
306	3	1	13	3	5	0.11	5.2	10	21	1
307	3	1	13	3	4	0.11	5.2	10	21	1
308	3	1	12	3	4	0.11	5.2	10	21	1
309	3	1	12	3	5	0.14	5.2	10	21	1
310	3	1	12	3	5	0.16	5.3	10	22	1
312	3	1	12	3	6	0.19	5.3	11	22	1
313	3	1	12	3	5	0.18	5.3	10	22	1
314	3	1	12	3	6	0.21	5.3	11	22	1
315	3	1	13	4	6	0.23	5.4	11	23	1
316	3	1	14	4	7	0.24	5.4	11	23	1
317	4	1	15	4	8	0.25	5.5	12	24	1
11 (a)	2	0	7	0	1	0.01	4.6	7	17	1
11 (b)	1	0	6	0	1	0.01	4.6	7	16	1
11 (c)	1	0	7	1	1	0.01	4.6	7	17	1
184 (a)	3	1	11	3	4	0.08	5.1	10	20	1
184 (b)	3	1	11	2	4	0.08	5.1	10	20	1
201 (a)	2	0	8	2	3	0.09	4.9	8	18	1
201 (b)	2	0	9	2	4	0.09	4.9	9	18	1
41 (a)	3	1	17	3	6	0.10	5.1	9	20	1
41 (b)	2	1	10	3	4	0.08	5.0	9	19	1
46B	7	1	28	8	16	0.31	6.5	19	37	1
Mine-owned receptors										
5	13	4	54	18	34	0.63	8	27	53	1
20	8	3	32	12	23	0.40	7	20	41	1
21	6	2	26	9	18	0.33	7	18	36	1
22	6	2	23	8	14	0.26	6	16	32	1
23	5	1	19	6	12	0.21	6	14	29	1
25	9	3	38	12	23	0.39	7	21	41	1
28	8	2	36	10	19	0.29	7	17	34	1
30	6	2	28	8	14	0.20	6	14	29	1
31	10	3	49	14	26	0.41	7	21	41	1
32	3	0	11	1	2	0.03	5	7	16	1
35	3	1	17	4	7	0.11	5	10	22	1
36	14	5	74	24	44	0.67	9	31	60	1
41	5	1	19	6	11	0.21	6	14	29	1
47	3	1	13	2	4	0.07	5	9	19	1
48	1	0	5	0	1	0.02	4	6	15	1
49	9	2	40	10	19	0.33	7	18	36	1
51	4	1	19	2	4	0.07	5	9	18	1

<table>
<tr><th rowspan="5">Receptor ID</th><th colspan="2">PM2.5 (µg/m³)</th><th colspan="2">PM10 (µg/m³)</th><th>TSP (µg/m³)</th><th>DD (g/m²/mth)</th><th>PM2.5 (µg/m³)</th><th>PM10 (µg/m³)</th><th>TSP (µg/m³)</th><th>DD (g/m²/mth)</th></tr>
<tr><th colspan="6">Moolarben Coal Complex incorporating the Modification</th><th colspan="4">Total impact</th></tr>
<tr><th>24-hr ave.</th><th>Ann. ave.</th><th>24-hr ave.</th><th>Ann. ave.</th><th>Ann. ave.</th><th>Ann. ave.</th><th>Ann. ave.</th><th>Ann. ave.</th><th>Ann. ave.</th><th>Ann. ave.</th></tr>
<tr><th colspan="10">Air quality impact criteria</th></tr>
<tr><th>25</th><th>-</th><th>50</th><th>-</th><th>-</th><th>2</th><th>8</th><th>25</th><th>90</th><th>4</th></tr>
<tr><td>52</td><td>1</td><td>0</td><td>5</td><td>0</td><td>0</td><td>0.00</td><td>4</td><td>6</td><td>14</td><td>1</td></tr>
<tr><td>58</td><td>4</td><td>1</td><td>17</td><td>4</td><td>7</td><td>0.11</td><td>6</td><td>12</td><td>23</td><td>1</td></tr>
<tr><td>59</td><td>3</td><td>1</td><td>13</td><td>4</td><td>6</td><td>0.09</td><td>5</td><td>11</td><td>22</td><td>1</td></tr>
<tr><td>63</td><td>4</td><td>1</td><td>17</td><td>5</td><td>9</td><td>0.15</td><td>6</td><td>13</td><td>26</td><td>1</td></tr>
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<tr><td>69</td><td>1</td><td>0</td><td>7</td><td>0</td><td>0</td><td>0.00</td><td>4</td><td>6</td><td>15</td><td>1</td></tr>
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<tr><td>76</td><td>3</td><td>1</td><td>13</td><td>3</td><td>5</td><td>0.08</td><td>5</td><td>10</td><td>21</td><td>1</td></tr>
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<tr><td>152</td><td>5</td><td>1</td><td>21</td><td>7</td><td>14</td><td>0.24</td><td>6</td><td>17</td><td>33</td><td>1</td></tr>
<tr><td>153</td><td>5</td><td>1</td><td>20</td><td>7</td><td>14</td><td>0.24</td><td>6</td><td>17</td><td>33</td><td>1</td></tr>
<tr><td>157</td><td>5</td><td>1</td><td>20</td><td>7</td><td>14</td><td>0.25</td><td>6</td><td>17</td><td>33</td><td>1</td></tr>
<tr><td>158</td><td>5</td><td>1</td><td>21</td><td>7</td><td>13</td><td>0.23</td><td>6</td><td>16</td><td>32</td><td>1</td></tr>
<tr><td>159</td><td>5</td><td>1</td><td>20</td><td>7</td><td>14</td><td>0.26</td><td>6</td><td>17</td><td>33</td><td>1</td></tr>
<tr><td>161</td><td>5</td><td>1</td><td>20</td><td>7</td><td>14</td><td>0.26</td><td>6</td><td>17</td><td>33</td><td>1</td></tr>
<tr><td>165</td><td>5</td><td>1</td><td>21</td><td>8</td><td>15</td><td>0.27</td><td>6</td><td>17</td><td>34</td><td>1</td></tr>
<tr><td>169</td><td>6</td><td>1</td><td>26</td><td>7</td><td>12</td><td>0.21</td><td>6</td><td>14</td><td>29</td><td>1</td></tr>
<tr><td>170</td><td>4</td><td>1</td><td>15</td><td>4</td><td>8</td><td>0.18</td><td>6</td><td>12</td><td>25</td><td>1</td></tr>
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<tr><td>173</td><td>6</td><td>1</td><td>26</td><td>7</td><td>13</td><td>0.24</td><td>6</td><td>15</td><td>30</td><td>1</td></tr>
<tr><td>175</td><td>4</td><td>1</td><td>15</td><td>4</td><td>7</td><td>0.14</td><td>5</td><td>12</td><td>23</td><td>1</td></tr>
<tr><td>176</td><td>4</td><td>1</td><td>15</td><td>4</td><td>6</td><td>0.12</td><td>5</td><td>11</td><td>23</td><td>1</td></tr>
<tr><td>177</td><td>4</td><td>1</td><td>15</td><td>3</td><td>6</td><td>0.11</td><td>5</td><td>11</td><td>22</td><td>1</td></tr>
<tr><td>239</td><td>3</td><td>1</td><td>11</td><td>3</td><td>4</td><td>0.07</td><td>5</td><td>10</td><td>20</td><td>1</td></tr>
<tr><td>240</td><td>3</td><td>1</td><td>12</td><td>3</td><td>4</td><td>0.08</td><td>5</td><td>10</td><td>21</td><td>1</td></tr>
<tr><td>241</td><td>3</td><td>1</td><td>13</td><td>3</td><td>5</td><td>0.08</td><td>5</td><td>10</td><td>21</td><td>1</td></tr>
<tr><td>253</td><td>3</td><td>0</td><td>10</td><td>1</td><td>2</td><td>0.04</td><td>5</td><td>10</td><td>20</td><td>1</td></tr>
<tr><td>254</td><td>3</td><td>0</td><td>13</td><td>2</td><td>4</td><td>0.09</td><td>5</td><td>10</td><td>21</td><td>1</td></tr>
<tr><td>257</td><td>4</td><td>1</td><td>17</td><td>4</td><td>7</td><td>0.15</td><td>5</td><td>12</td><td>24</td><td>1</td></tr>
<tr><td>301</td><td>3</td><td>1</td><td>14</td><td>4</td><td>7</td><td>0.18</td><td>6</td><td>12</td><td>24</td><td>1</td></tr>
<tr><td>302</td><td>3</td><td>1</td><td>14</td><td>4</td><td>7</td><td>0.16</td><td>5</td><td>11</td><td>23</td><td>1</td></tr>
<tr><td>319</td><td>1</td><td>0</td><td>5</td><td>1</td><td>1</td><td>0.03</td><td>5</td><td>7</td><td>16</td><td>1</td></tr>
<tr><td>319</td><td>1</td><td>0</td><td>4</td><td>1</td><td>1</td><td>0.03</td><td>5</td><td>7</td><td>16</td><td>1</td></tr>
<tr><td>319</td><td>1</td><td>0</td><td>3</td><td>0</td><td>1</td><td>0.02</td><td>5</td><td>7</td><td>16</td><td>1</td></tr>
<tr><td>319</td><td>1</td><td>0</td><td>3</td><td>0</td><td>1</td><td>0.02</td><td>5</td><td>7</td><td>16</td><td>1</td></tr>
<tr><td>319</td><td>1</td><td>0</td><td>2</td><td>0</td><td>0</td><td>0.01</td><td>5</td><td>7</td><td>15</td><td>1</td></tr>
<tr><td>319</td><td>1</td><td>0</td><td>2</td><td>0</td><td>0</td><td>0.01</td><td>5</td><td>10</td><td>21</td><td>1</td></tr>
<tr><td>320</td><td>4</td><td>1</td><td>16</td><td>4</td><td>8</td><td>0.15</td><td>5</td><td>12</td><td>24</td><td>1</td></tr>
<tr><td>41C</td><td>5</td><td>1</td><td>20</td><td>7</td><td>14</td><td>0.26</td><td>6</td><td>17</td><td>33</td><td>1</td></tr>
<tr><td>29c</td><td>8</td><td>2</td><td>38</td><td>9</td><td>16</td><td>0.27</td><td>6</td><td>15</td><td>31</td><td>1</td></tr>
</table>

Table D-3: Modelling predictions for 2026

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	**-**	**50**	**-**	**-**	**2**	**8**	**25**	**90**	**4**
Privately-owned receptors										
9	7	2	33	7	14	0.28	6	15	30	1
26	5	1	25	7	12	0.23	6	14	29	1
37	2	0	9	1	1	0.03	5	7	16	1
39	1	0	6	1	1	0.02	5	7	15	1
40	2	0	8	1	1	0.02	5	7	16	1
60	2	0	9	1	2	0.05	5	8	18	1
61	2	0	9	1	2	0.05	5	8	18	1
66	6	1	27	6	10	0.17	6	15	28	1
70	3	1	14	3	6	0.12	5	10	22	1
75	2	0	10	2	4	0.08	5	9	20	1
79	2	0	9	2	3	0.06	5	8	18	1
80	2	0	9	1	2	0.05	5	8	18	1
82	2	0	9	1	2	0.05	5	8	18	1
83	2	0	9	1	2	0.04	5	8	17	1
84	2	0	9	1	2	0.04	5	8	17	1
86	2	0	9	1	1	0.03	5	7	16	1
87	2	0	9	1	2	0.04	5	8	17	1
88	2	0	9	1	2	0.03	5	7	17	1
89	2	0	9	1	1	0.03	5	7	16	1
90	2	0	8	1	1	0.03	5	7	16	1
91	2	0	9	1	1	0.03	5	7	16	1
94	2	0	8	1	1	0.02	5	7	16	1
95	2	0	8	1	1	0.02	5	7	16	1
96	2	0	8	1	1	0.02	5	7	16	1
97	2	0	8	1	1	0.03	5	7	16	1
98	2	0	8	1	1	0.02	5	7	16	1
99	2	0	8	1	1	0.02	5	7	16	1
100	2	0	8	1	1	0.03	5	7	16	1
101	2	0	7	1	1	0.02	5	7	16	1
102	2	0	7	1	1	0.02	5	7	16	1
103	2	0	7	1	1	0.02	5	7	16	1
104	2	0	7	1	1	0.02	5	7	15	1
105	2	0	7	1	1	0.02	5	7	15	1
106	2	0	7	1	1	0.02	5	7	15	1
107	2	0	7	1	1	0.02	5	7	16	1
109	2	0	7	0	1	0.02	5	7	15	1
110	1	0	6	0	1	0.02	5	7	15	1
111	2	0	7	1	1	0.02	5	7	15	1
112	2	0	7	1	1	0.02	5	7	15	1
113	2	0	7	1	1	0.02	5	7	15	1
119	2	0	8	1	1	0.02	5	7	16	1
149	6	1	28	6	10	0.18	6	15	29	1
160	6	1	27	6	10	0.18	6	15	29	1

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
162	6	1	27	6	10	0.17	6	15	29	1
168	6	1	27	6	10	0.18	6	15	29	1
171	1	0	4	0	1	0.02	4	6	15	1
180	2	0	11	2	4	0.10	5	9	20	1
181	2	0	11	2	4	0.10	5	9	19	1
182	2	0	11	2	4	0.10	5	9	19	1
183	2	0	11	2	3	0.10	5	9	19	1
186	2	0	10	1	2	0.07	5	8	18	1
187	2	0	10	1	2	0.06	5	8	17	1
188	2	0	10	1	2	0.06	5	8	17	1
189	2	0	9	1	2	0.05	5	8	17	1
190	2	0	9	1	2	0.05	5	8	17	1
191	2	0	9	1	2	0.04	5	7	17	1
192	2	0	9	1	2	0.04	5	7	17	1
194	2	0	8	1	1	0.04	5	7	16	1
195	2	0	9	1	1	0.03	5	7	16	1
196	2	0	8	1	1	0.03	5	7	16	1
200	2	0	7	1	1	0.03	5	7	16	1
202	2	0	7	1	1	0.02	5	7	16	1
203	2	0	7	1	1	0.02	5	7	16	1
204	2	0	7	1	1	0.02	5	7	16	1
206	1	0	6	1	1	0.02	5	7	15	1
207	1	0	5	0	1	0.02	4	6	15	1
208	1	0	5	0	1	0.02	4	6	15	1
209	1	0	5	0	1	0.02	4	6	15	1
210	1	0	4	0	1	0.02	4	6	15	1
217	1	0	5	0	1	0.02	4	6	15	1
218	1	0	5	0	1	0.02	4	6	15	1
219	1	0	5	0	1	0.02	4	6	15	1
220	1	0	5	0	1	0.02	4	6	15	1
222	2	0	7	0	1	0.02	5	7	15	1
223	2	0	7	1	1	0.02	5	7	15	1
224	2	0	8	1	1	0.03	5	7	16	1
226	2	0	8	1	1	0.03	5	7	16	1
227	2	0	8	1	1	0.03	5	7	16	1
229	2	0	9	1	1	0.03	5	7	16	1
230	2	0	9	1	1	0.03	5	7	16	1
231	2	0	9	1	1	0.03	5	7	16	1
232	2	0	9	1	2	0.04	5	7	17	1
233	2	0	9	1	2	0.04	5	7	17	1
234	2	0	9	1	2	0.04	5	8	17	1
235	2	0	9	1	2	0.04	5	8	17	1
236	2	0	9	1	2	0.04	5	8	17	1
237	2	0	9	1	2	0.05	5	8	17	1
238	2	0	9	1	2	0.05	5	8	18	1

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
255	3	0	12	2	4	0.08	5	10	20	1
256	3	1	14	3	4	0.09	5	10	20	1
258	3	1	15	3	5	0.09	5	10	21	1
300	3	1	13	3	5	0.15	5	10	22	1
303	3	1	12	3	5	0.13	5	10	21	1
305	2	1	12	2	4	0.12	5	9	20	1
306	2	1	11	2	4	0.12	5	9	20	1
307	2	0	11	2	4	0.12	5	9	20	1
308	2	0	11	2	4	0.12	5	9	19	1
309	2	0	11	2	4	0.15	5	9	20	1
310	2	1	11	2	4	0.15	5	9	20	1
312	3	1	12	2	4	0.16	5	9	20	1
313	3	1	13	2	4	0.17	5	9	20	1
314	3	1	13	3	5	0.18	5	10	20	1
315	3	1	13	3	5	0.19	5	10	21	1
316	3	1	14	3	5	0.19	5	10	21	1
317	3	1	14	3	6	0.19	5	10	21	1
11 (a)	2	0	7	0	1	0.01	5	7	16	1
11 (b)	1	0	6	0	1	0.01	5	7	16	1
11 (c)	2	0	8	1	1	0.01	5	7	17	1
184 (a)	2	0	10	2	3	0.07	5	8	18	1
184 (b)	2	0	10	2	3	0.07	5	8	18	1
201 (a)	2	0	7	1	1	0.03	5	7	16	1
201 (b)	2	0	7	1	1	0.02	5	7	16	1
41 (a)	2	0	7	1	1	0.02	5	7	16	1
41 (b)	2	0	8	1	1	0.03	5	7	16	1
46B	7	1	34	6	10	0.17	6	16	30	1
Mine-owned receptors										
5	7	2	33	10	18	0.39	7	18	35	1
20	5	1	22	7	12	0.21	6	15	29	1
21	4	1	20	6	10	0.19	6	13	27	1
22	4	1	18	5	9	0.17	6	13	26	1
23	3	1	16	4	8	0.15	6	12	24	1
25	7	2	33	9	15	0.30	6	17	33	1
28	2	0	9	1	2	0.04	5	8	17	1
30	2	0	8	1	2	0.04	5	8	17	1
31	2	0	9	1	2	0.04	5	8	17	1
32	1	0	5	0	0	0.01	4	6	15	1
35	1	0	5	1	1	0.02	5	7	16	1
36	3	0	14	2	3	0.05	5	8	18	1
41	3	1	16	4	8	0.14	6	12	24	1
47	1	0	5	0	1	0.01	4	6	15	1
48	1	0	3	0	0	0.01	4	6	14	1
49	5	1	24	7	12	0.24	6	14	29	1
51	1	0	6	0	1	0.01	4	6	15	1

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Moolarben Coal Complex incorporating the Modification						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
52	1	0	5	0	0	0.00	4	6	14	1
58	2	1	12	3	5	0.11	5	10	21	1
59	2	0	10	2	3	0.07	5	9	19	1
63	3	1	14	4	6	0.13	5	11	23	1
64	3	1	14	3	6	0.12	5	11	22	1
69	1	0	6	0	0	0.00	4	6	15	1
74	2	1	11	3	4	0.10	5	10	20	1
76	2	0	10	2	3	0.07	5	9	19	1
77	2	0	9	2	3	0.07	5	9	19	1
78	2	0	9	2	3	0.06	5	8	18	1
81	2	0	9	1	2	0.05	5	8	18	1
152	6	1	26	6	9	0.16	6	15	28	1
153	6	1	26	6	9	0.16	6	15	28	1
157	6	1	27	6	10	0.16	6	15	28	1
158	5	1	24	6	9	0.16	6	14	27	1
159	6	1	27	6	10	0.17	6	15	28	1
161	6	1	27	6	10	0.17	6	15	28	1
165	6	1	27	6	10	0.16	6	15	29	1
169	4	1	20	5	9	0.16	6	13	25	1
170	3	1	13	3	6	0.14	5	10	22	1
172	3	1	13	3	6	0.12	5	10	22	1
173	4	1	20	5	9	0.19	6	12	25	1
175	3	1	12	3	5	0.12	5	10	21	1
176	3	1	13	3	5	0.12	5	10	21	1
177	3	1	13	3	5	0.11	5	10	21	1
239	2	0	9	1	2	0.05	5	8	18	1
240	2	0	10	2	3	0.07	5	8	18	1
241	2	0	10	2	3	0.08	5	9	19	1
253	3	0	11	1	1	0.03	5	9	19	1
254	3	0	12	2	3	0.06	5	9	19	1
257	3	1	14	3	5	0.09	5	10	21	1
301	3	1	13	3	5	0.14	5	10	21	1
302	3	1	12	3	5	0.14	5	10	21	1
319	1	0	4	0	1	0.02	5	8	17	1
319	1	0	4	0	1	0.02	5	9	19	1
319	1	0	3	0	1	0.02	5	7	16	1
319	1	0	3	0	1	0.02	5	7	16	1
319	1	0	3	0	0	0.01	5	7	15	1
319	1	0	3	0	0	0.01	5	8	18	1
320	3	1	15	3	6	0.12	5	10	22	1
41C	6	1	27	6	10	0.17	6	15	28	1
29c	2	0	7	1	1	0.02	5	7	16	1

Appendix E

Isopleth Diagrams

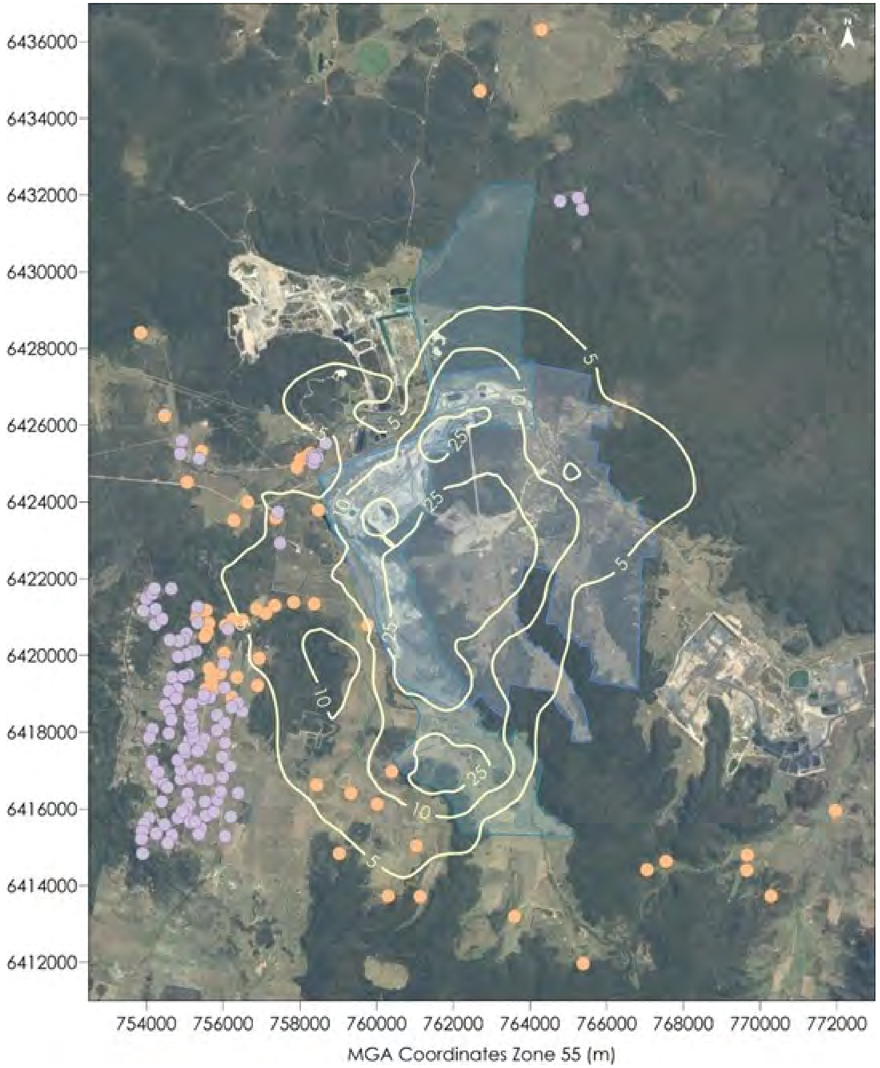

Figure E-1: Predicted maximum 24-hour average $PM_{2.5}$ concentrations due to emissions from the Modification in 2019 (µg/m³)

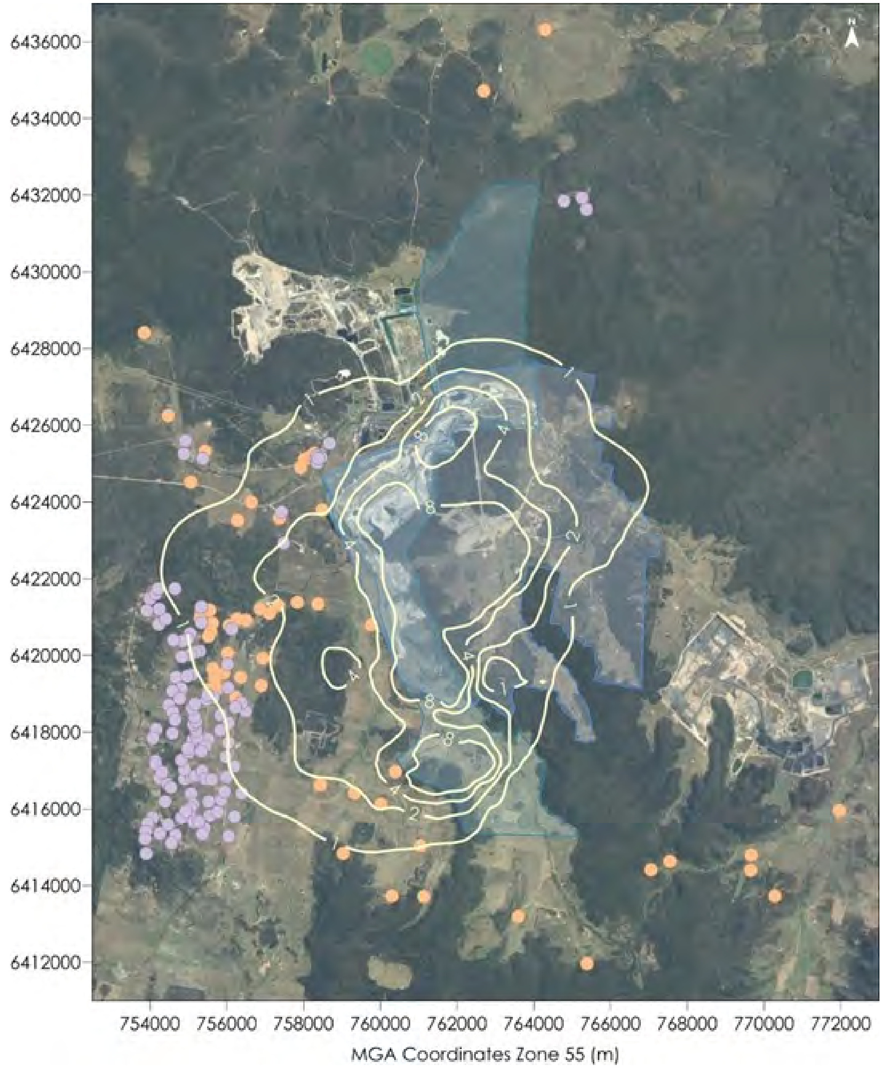

Figure E-2: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Modification in 2019 (µg/m³)

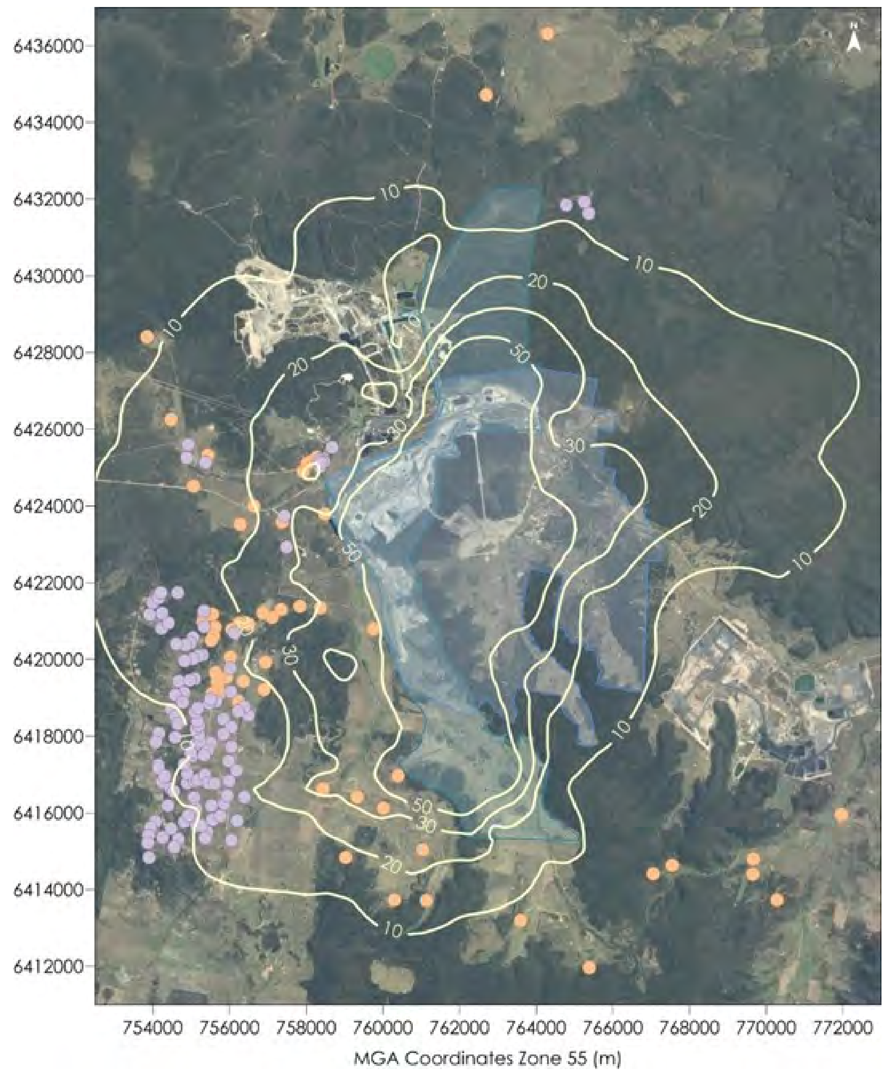

Figure E-3: Predicted maximum 24-hour average PM_{10} concentrations due to emissions from the Modification in 2019 (µg/m³)

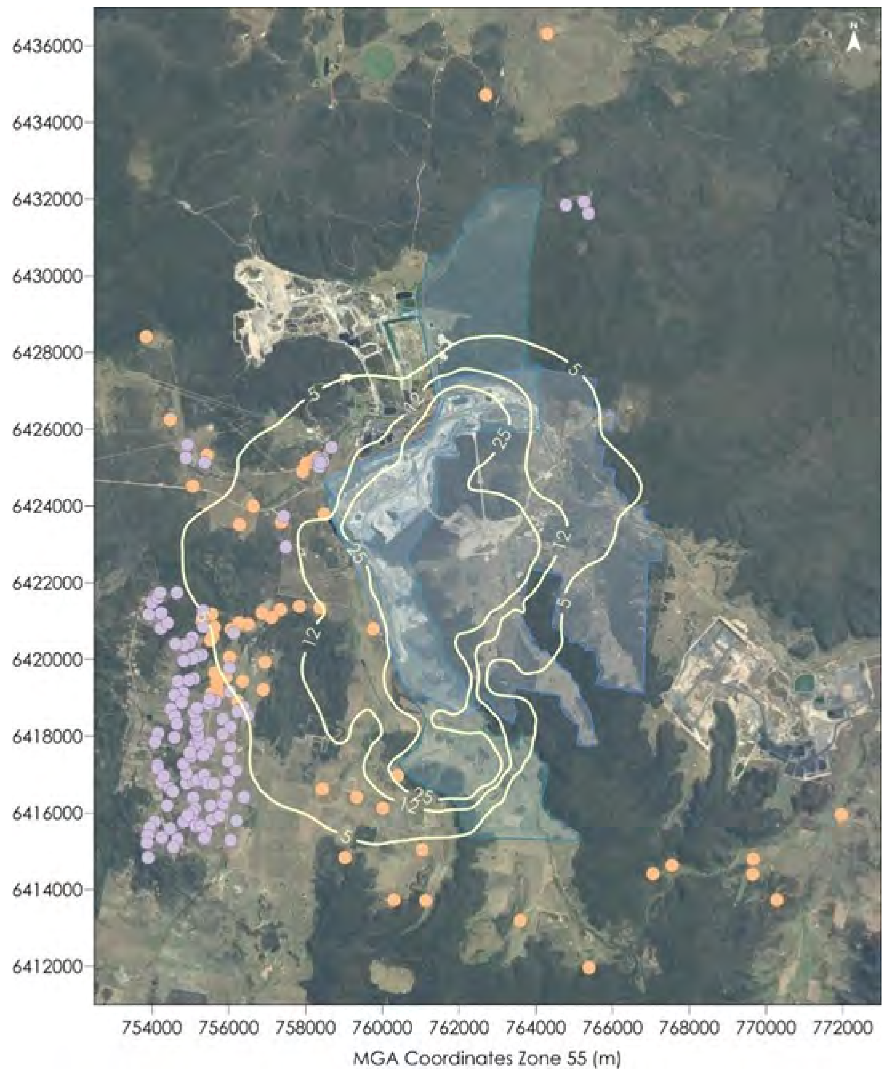

Figure E-4: Predicted annual average PM_{10} concentrations due to emissions from the Modification in 2019 (µg/m³)

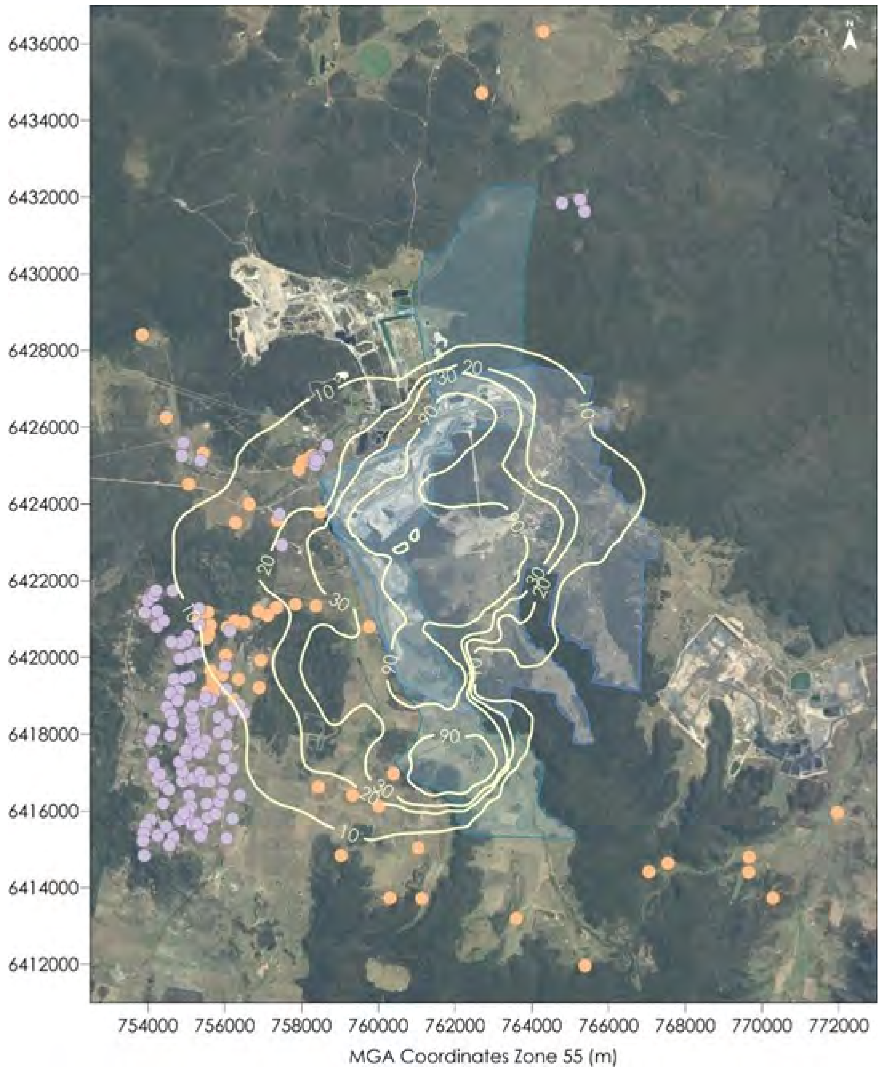

Figure E-5: Predicted annual average TSP concentrations due to emissions from the Modification in 2019 (µg/m³)

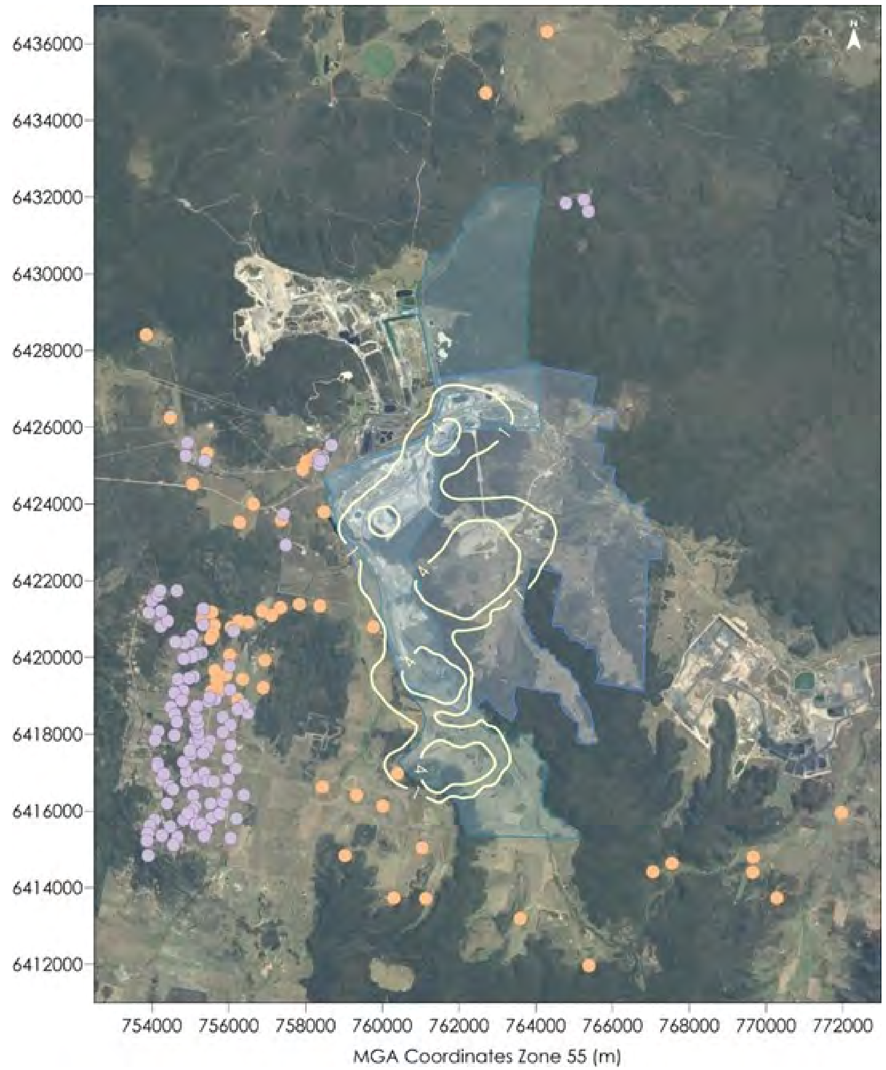

Figure E-6: Predicted annual average dust deposition levels due to emissions from the Modification in 2019 (g/m²/month)

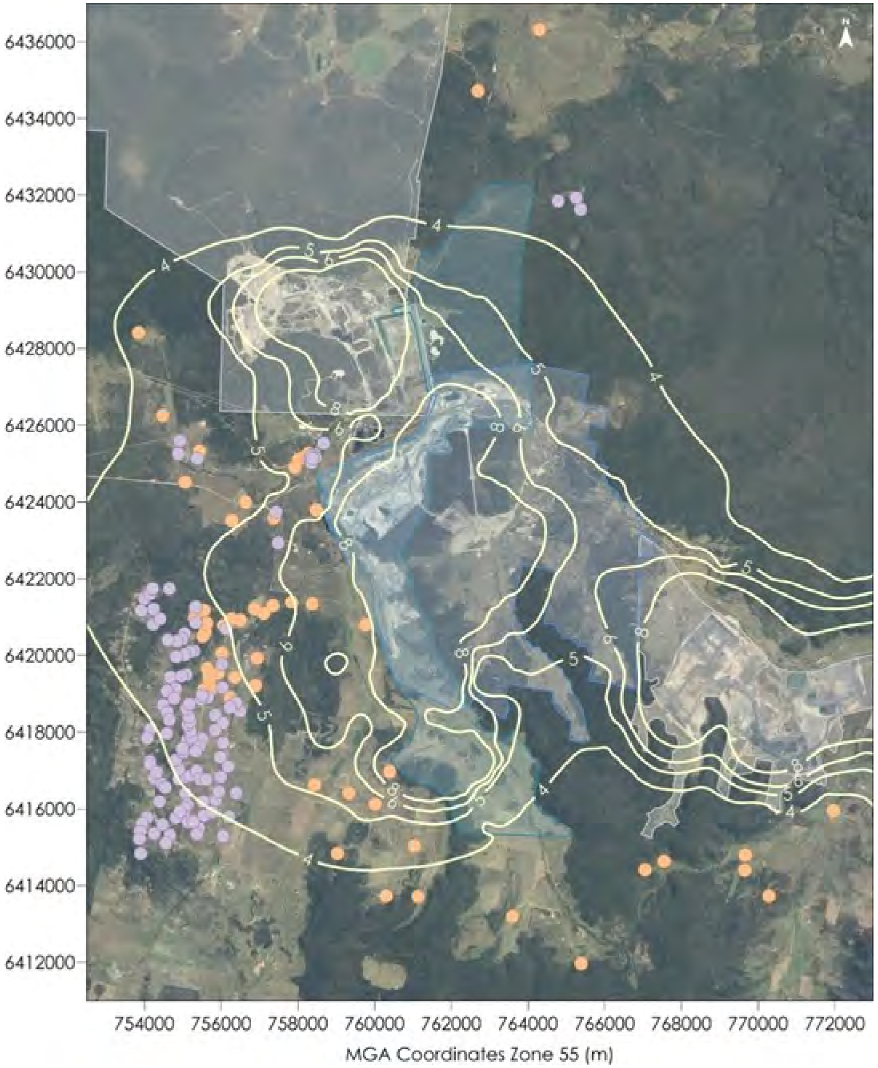

Figure E-7: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Modification and other sources in 2019 (µg/m³)

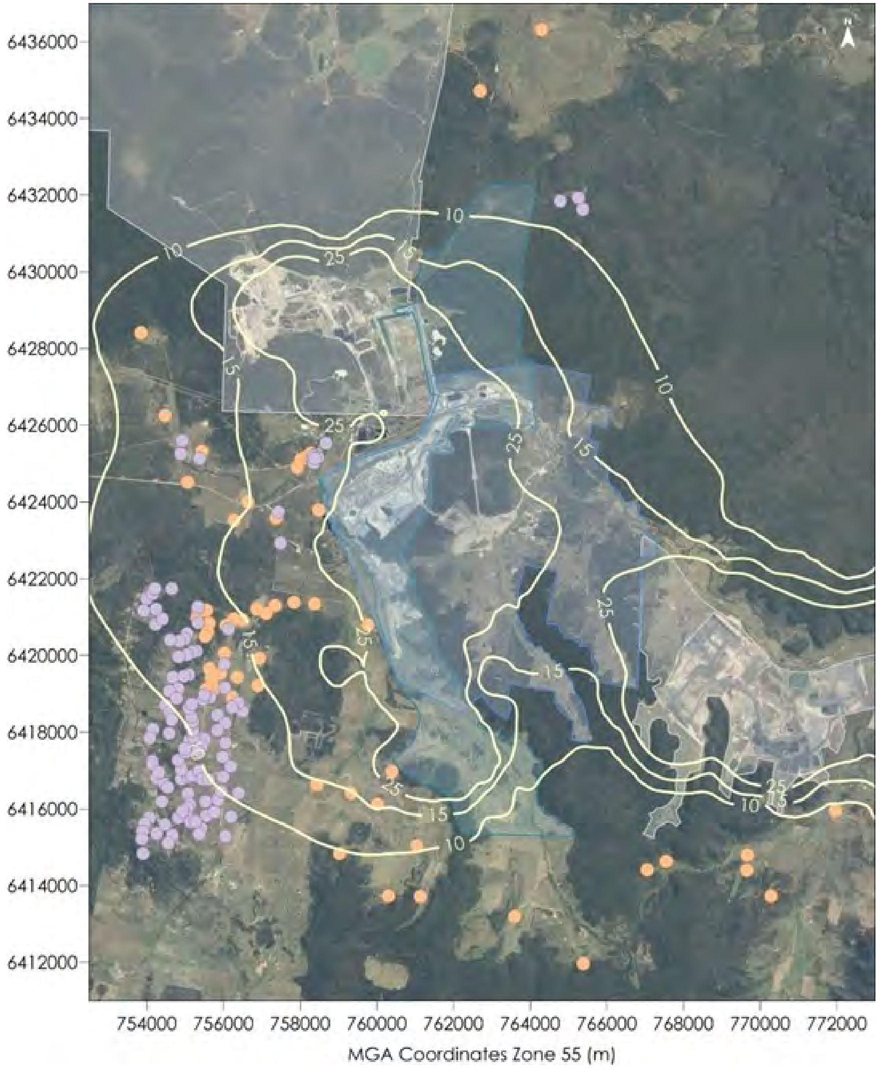

Figure E-8: Predicted annual average PM_{10} concentrations due to emissions from the Modification and other sources in 2019 (µg/m³)

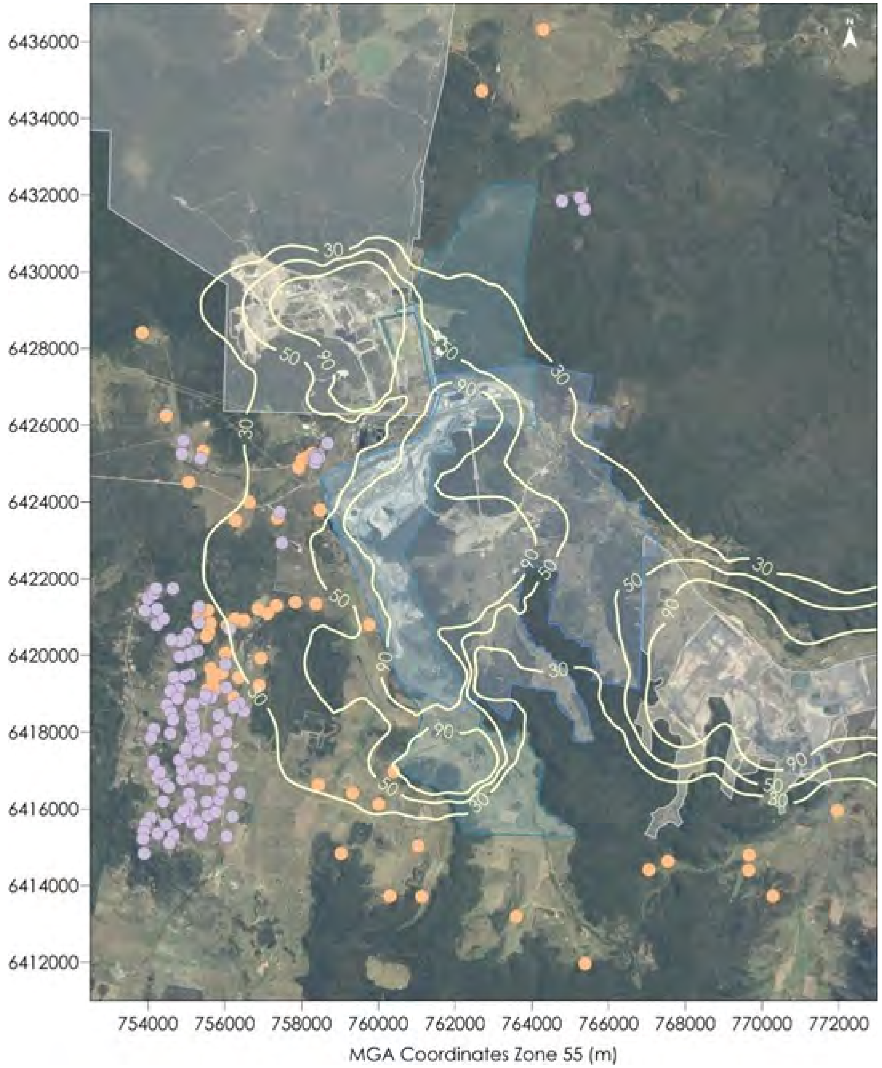

Figure E-9: Predicted annual average TSP concentrations due to emissions from the Modification and other sources in 2019 (µg/m³)

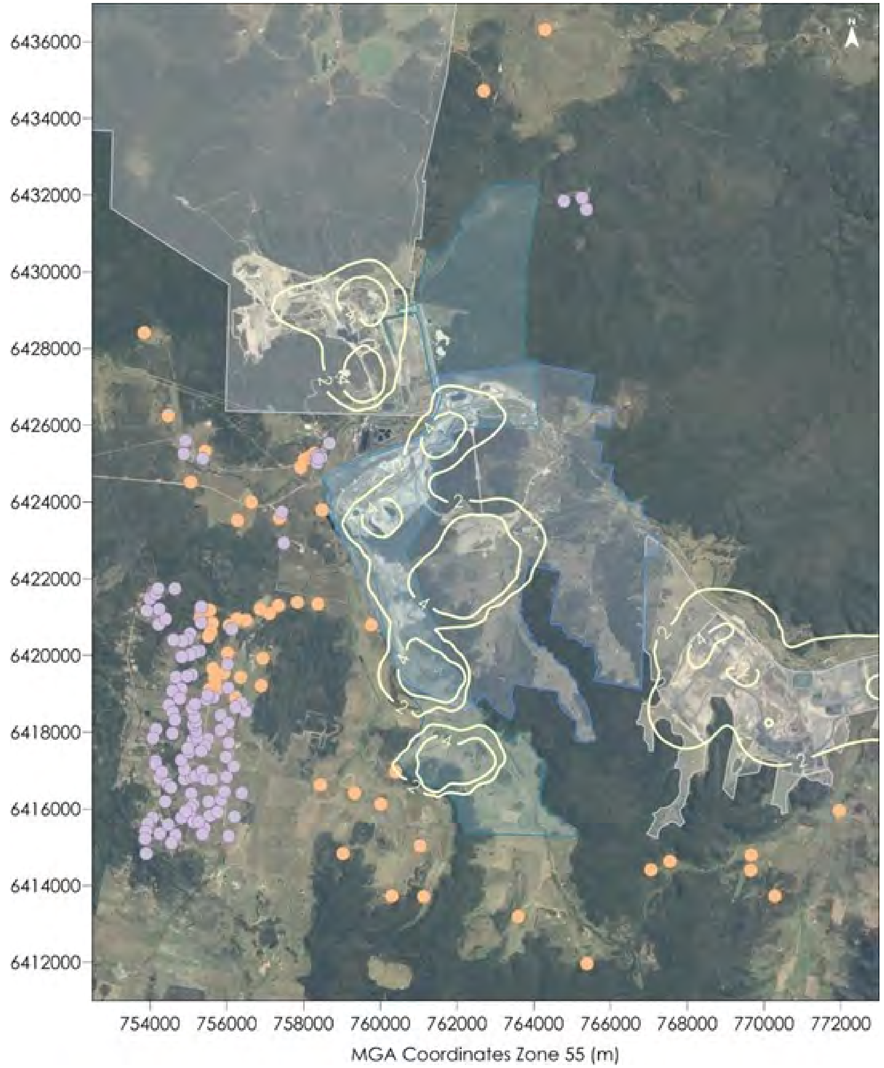

Figure E-10: Predicted annual average dust deposition levels due to emissions from the Modification and other sources in 2019 (g/m²/month)

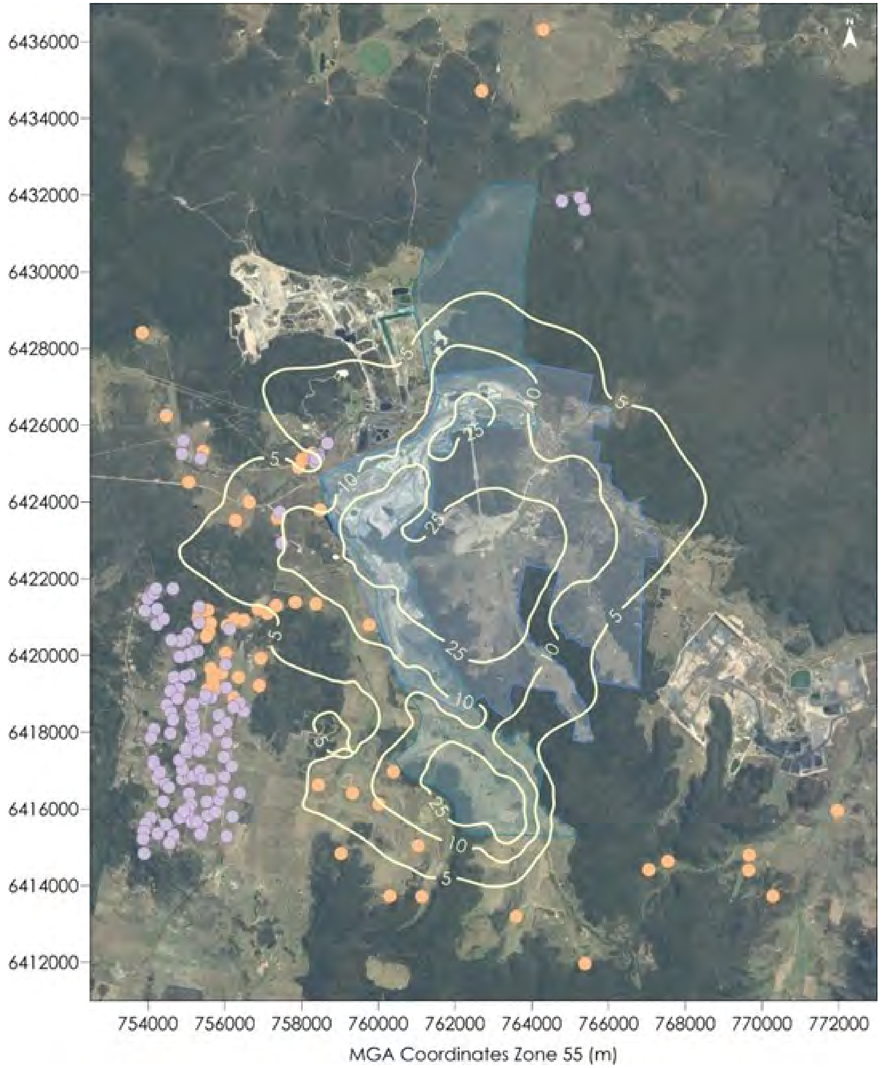

Figure E-11: Predicted maximum 24-hour average $PM_{2.5}$ concentrations due to emissions from the Modification in 2021 (µg/m³)

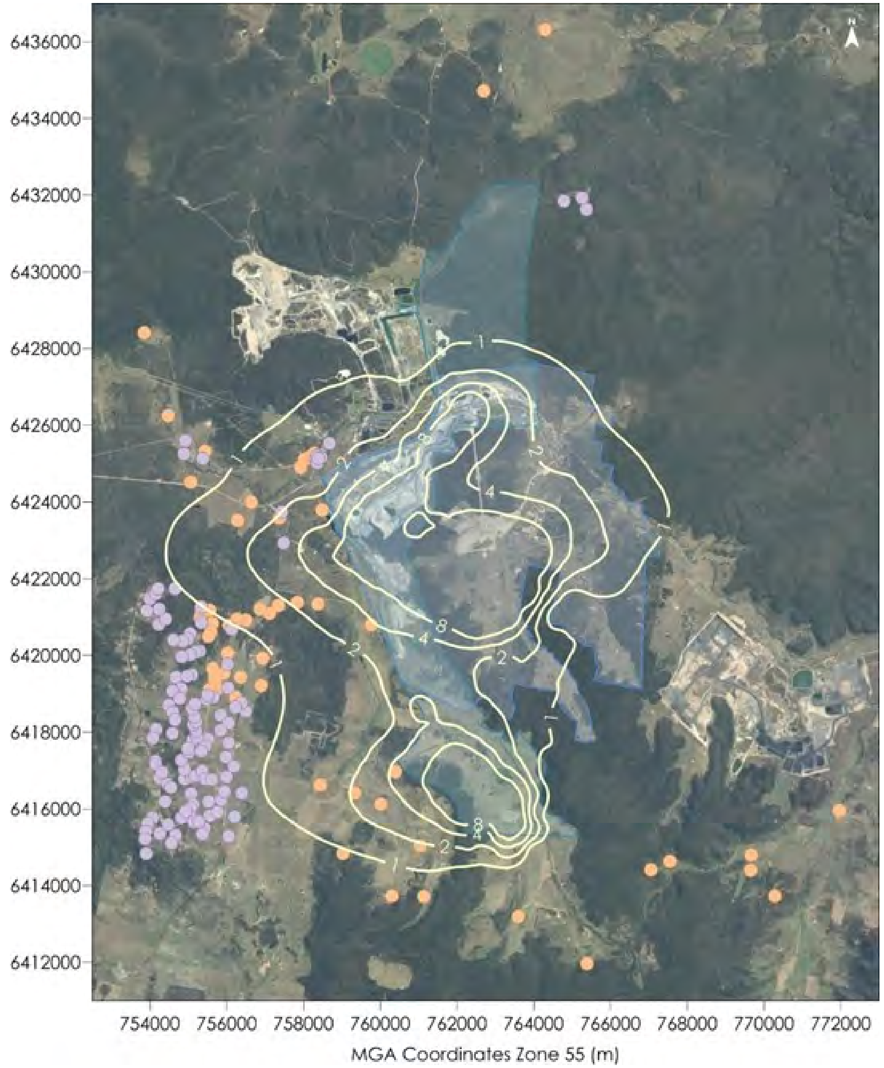

Figure E-12: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Modification in 2021 (µg/m³)

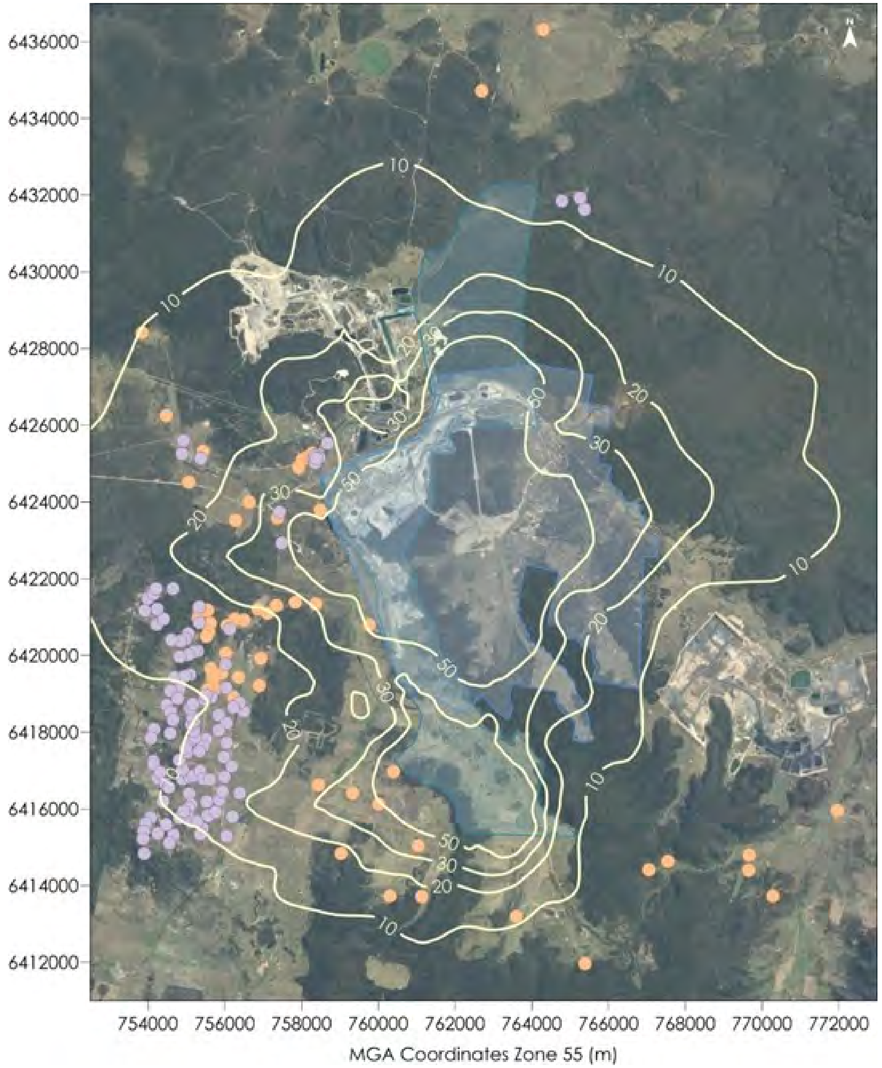

Figure E-13: Predicted maximum 24-hour average PM_{10} concentrations due to emissions from the Modification in 2021 (µg/m³)

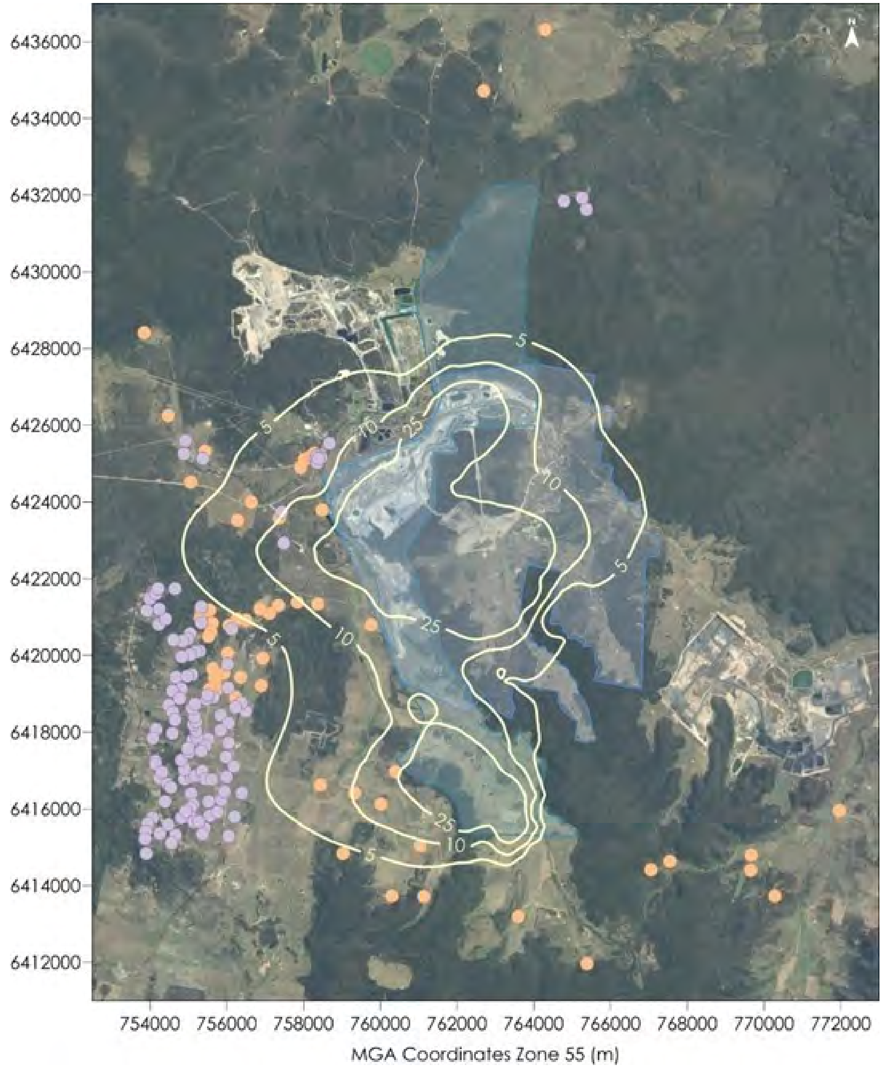

Figure E-14: Predicted annual average PM_{10} concentrations due to emissions from the Modification in 2021 (µg/m³)

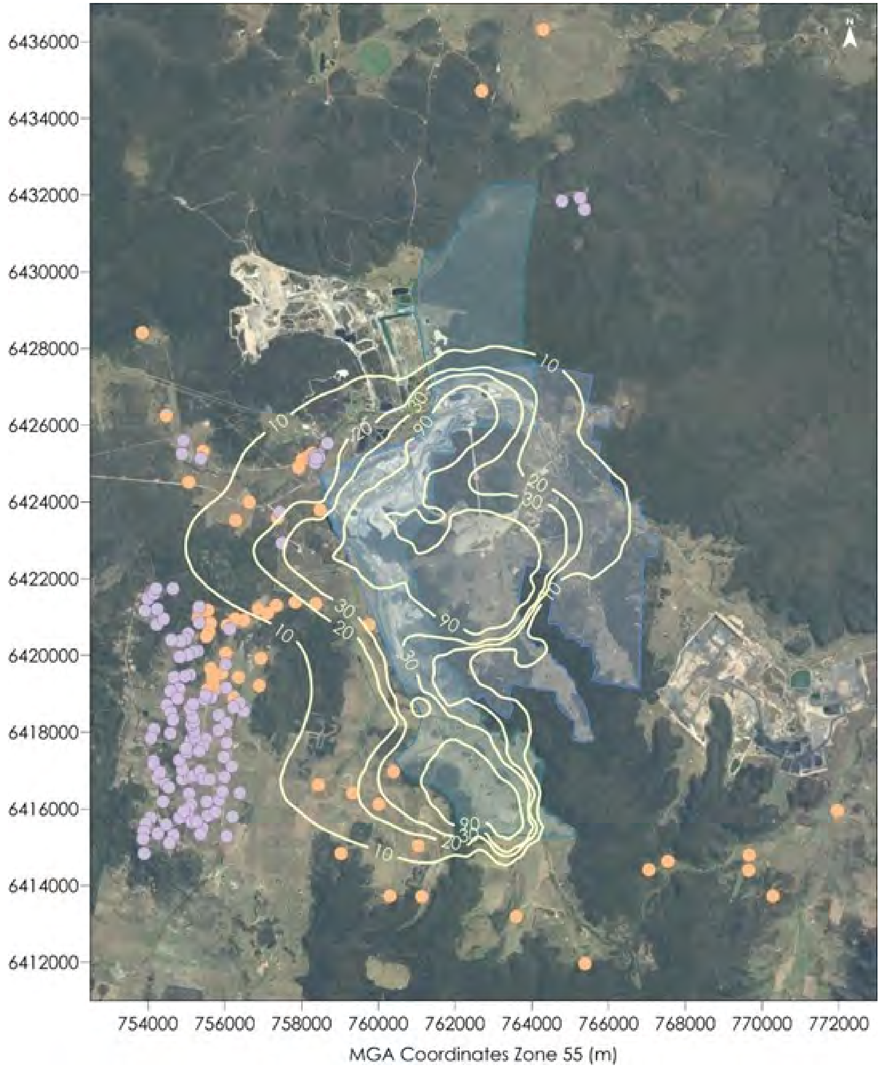

Figure E-15: Predicted annual average TSP concentrations due to emissions from the Modification in 2021 (µg/m³)

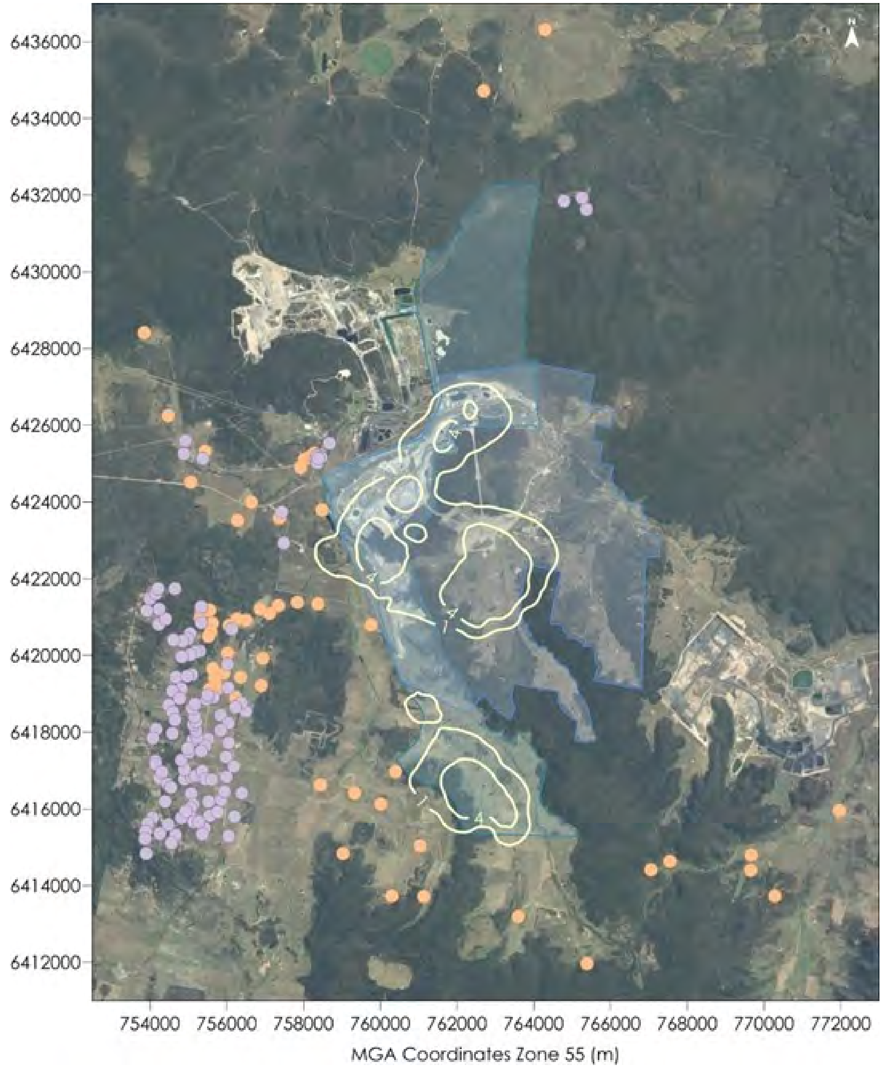

Figure E-16: Predicted annual average dust deposition levels due to emissions from the Modification in 2021 (g/m²/month)

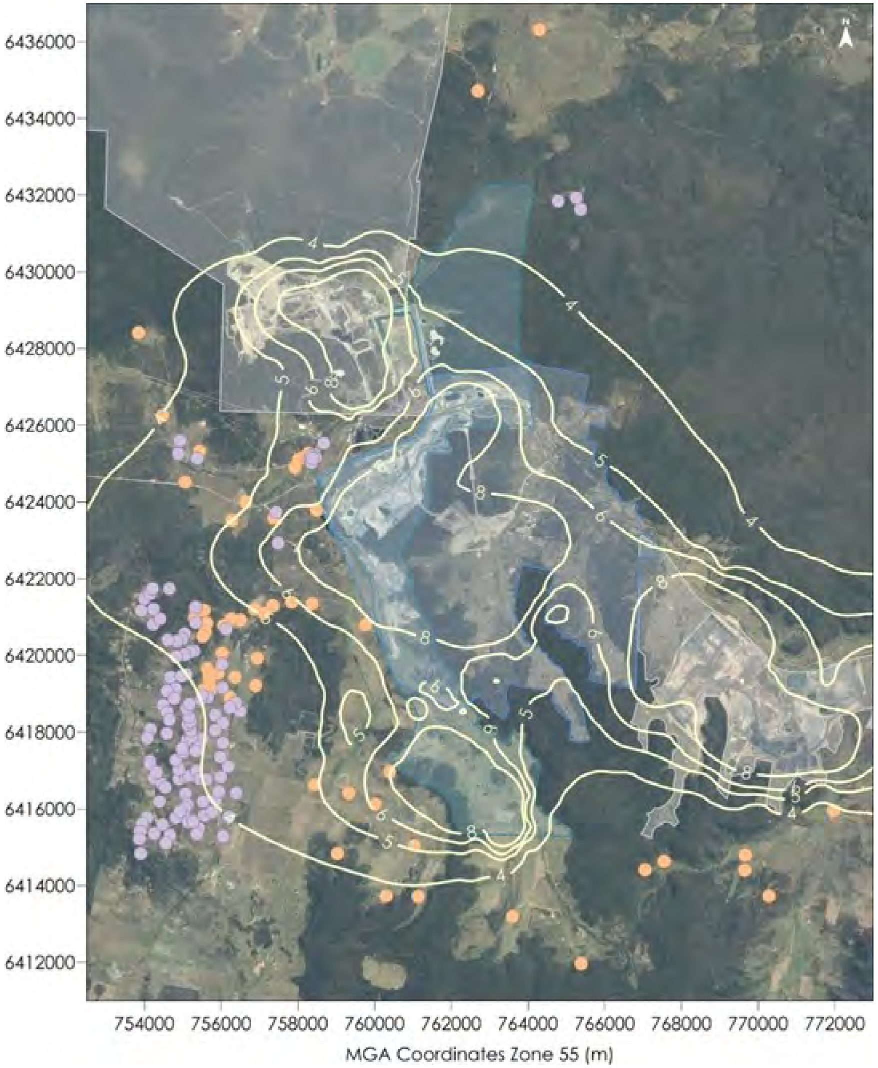

Figure E-17: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Modification and other sources in 2021 (µg/m³)

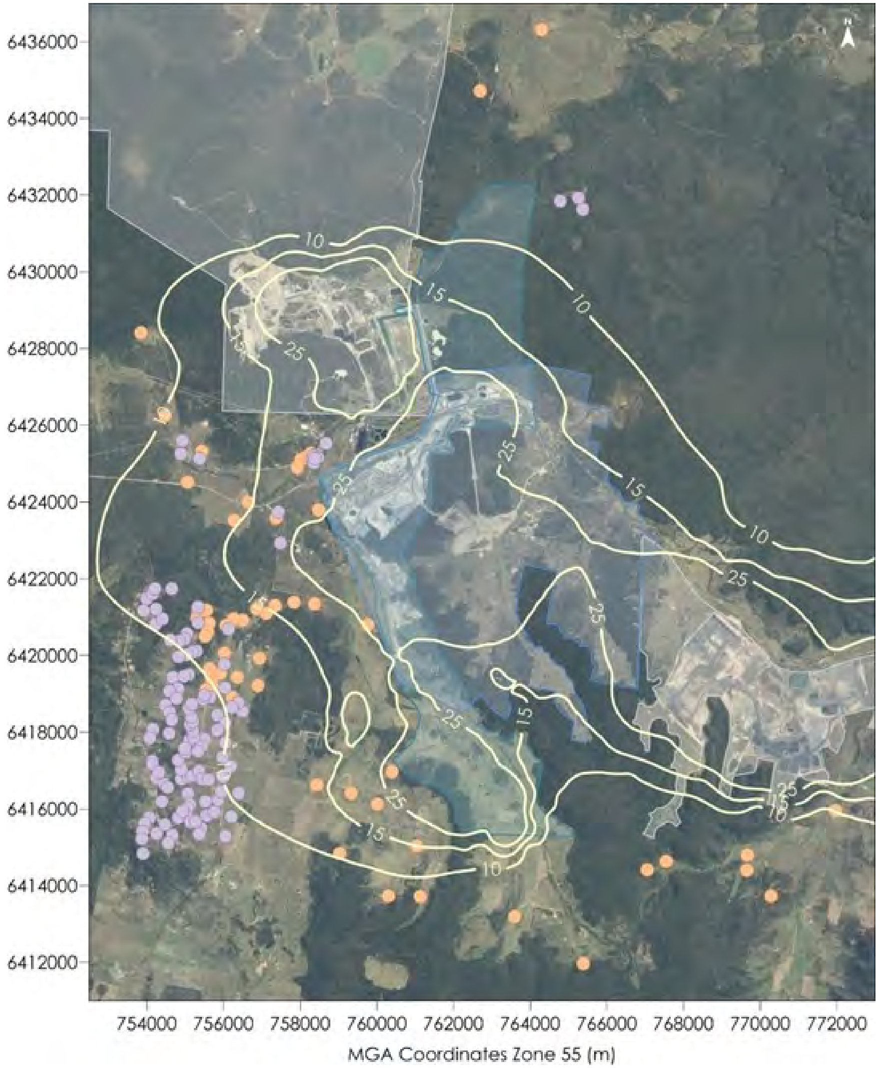

Figure E-18: Predicted annual average PM_{10} concentrations due to emissions from the Modification and other sources in 2021 (µg/m³)

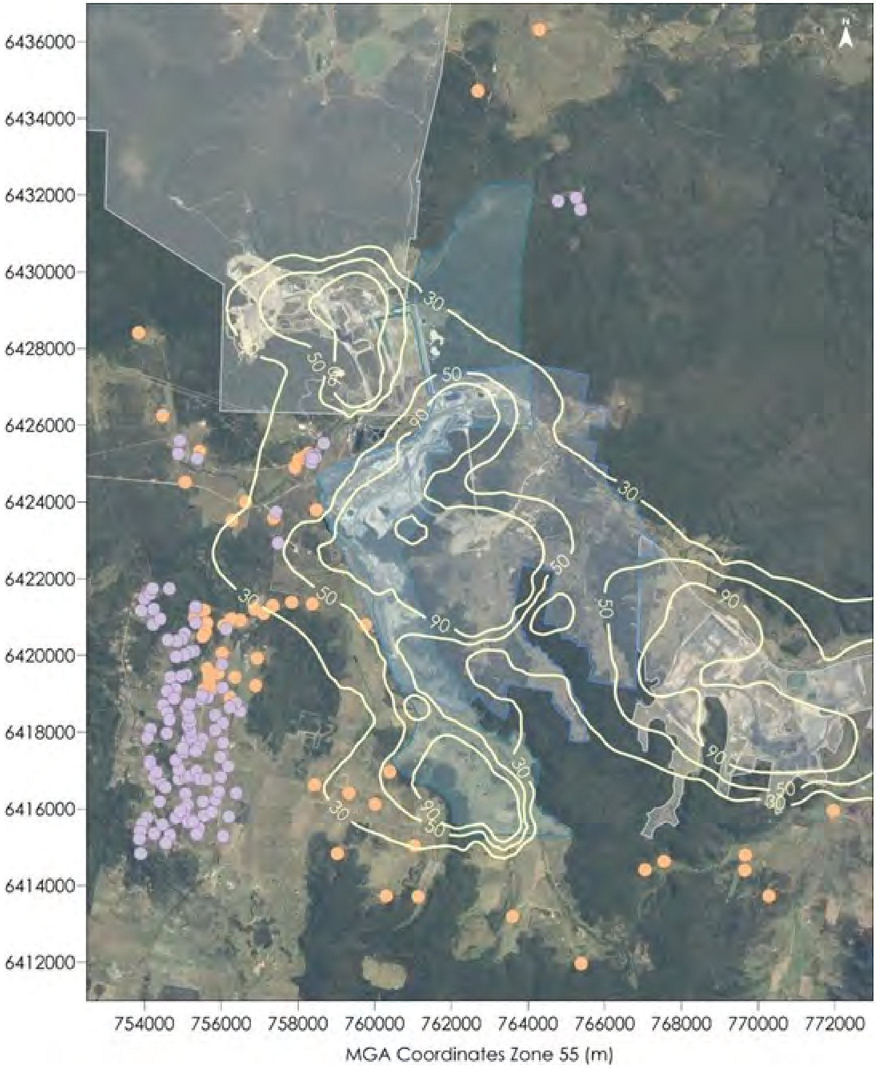

Figure E-19: Predicted annual average TSP concentrations due to emissions from the Modification and other sources in 2021 (µg/m³)

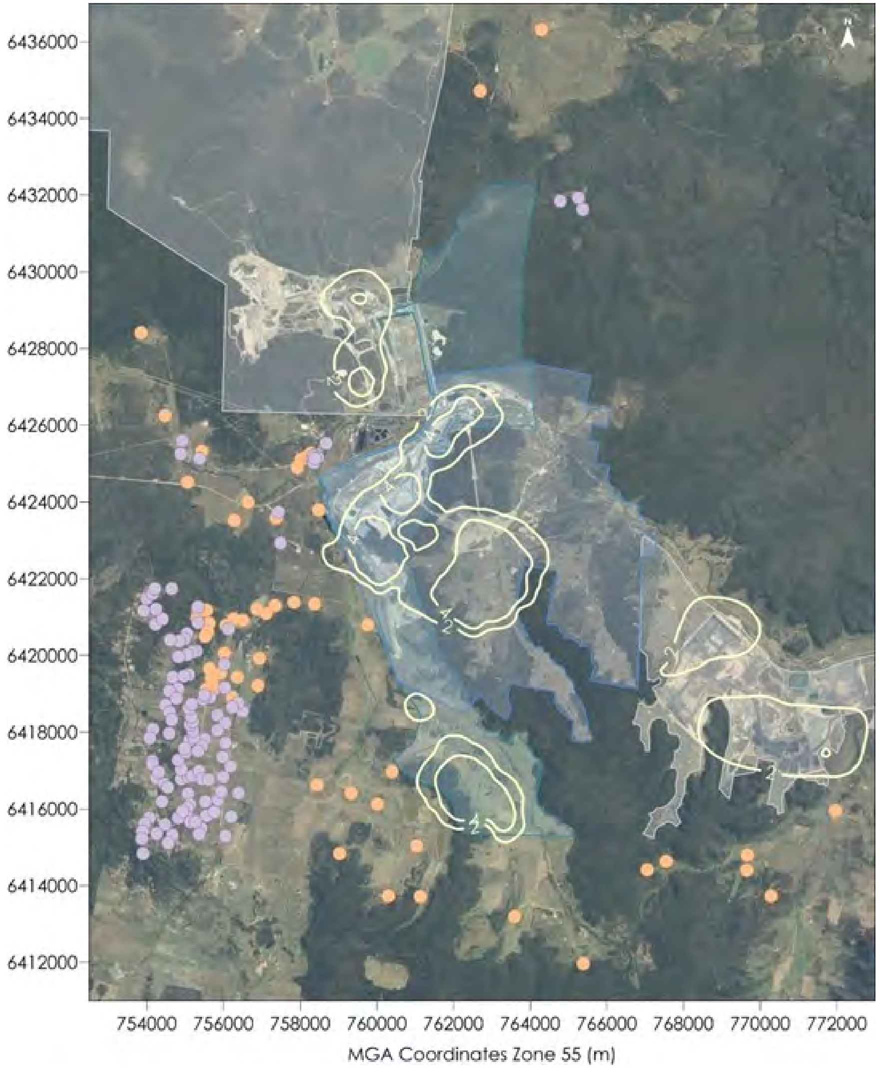

Figure E-20: Predicted annual average dust deposition levels due to emissions from the Modification and other sources in 2021 (g/m²/month)

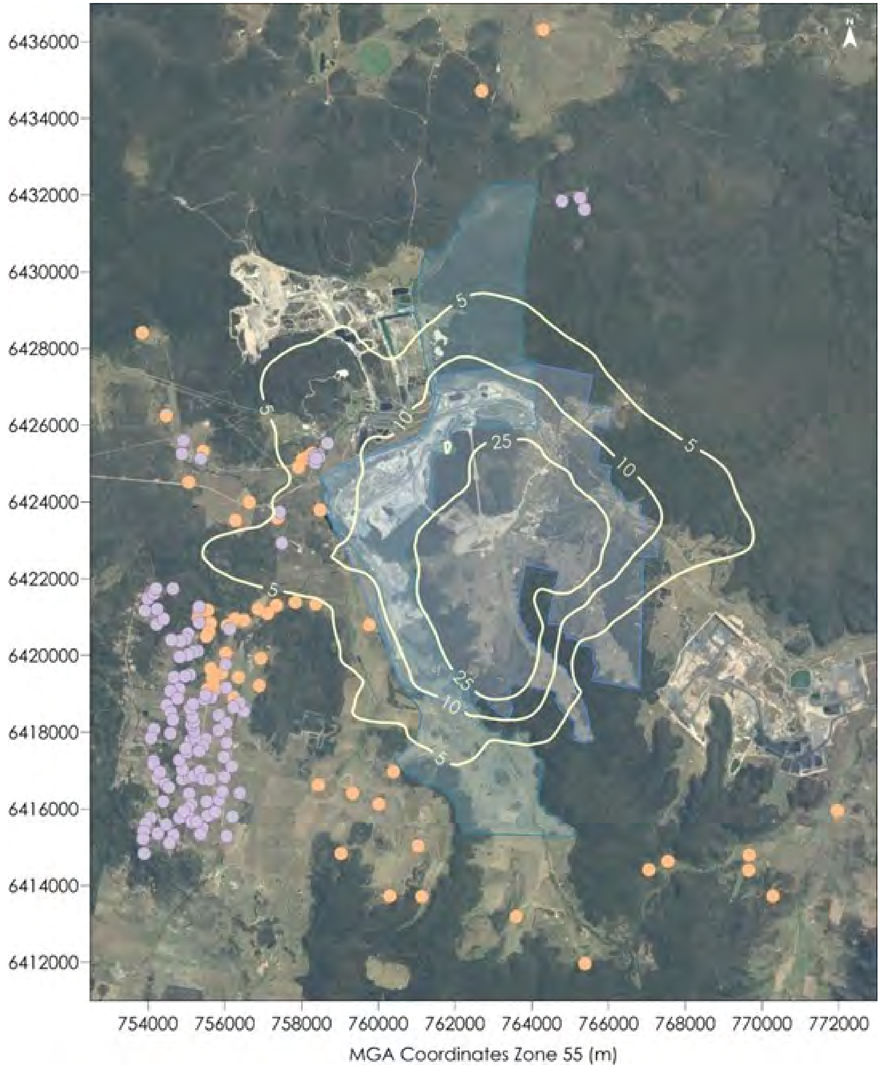

Figure E-21: Predicted maximum 24-hour average $PM_{2.5}$ concentrations due to emissions from the Modification in 2026 (µg/m³)

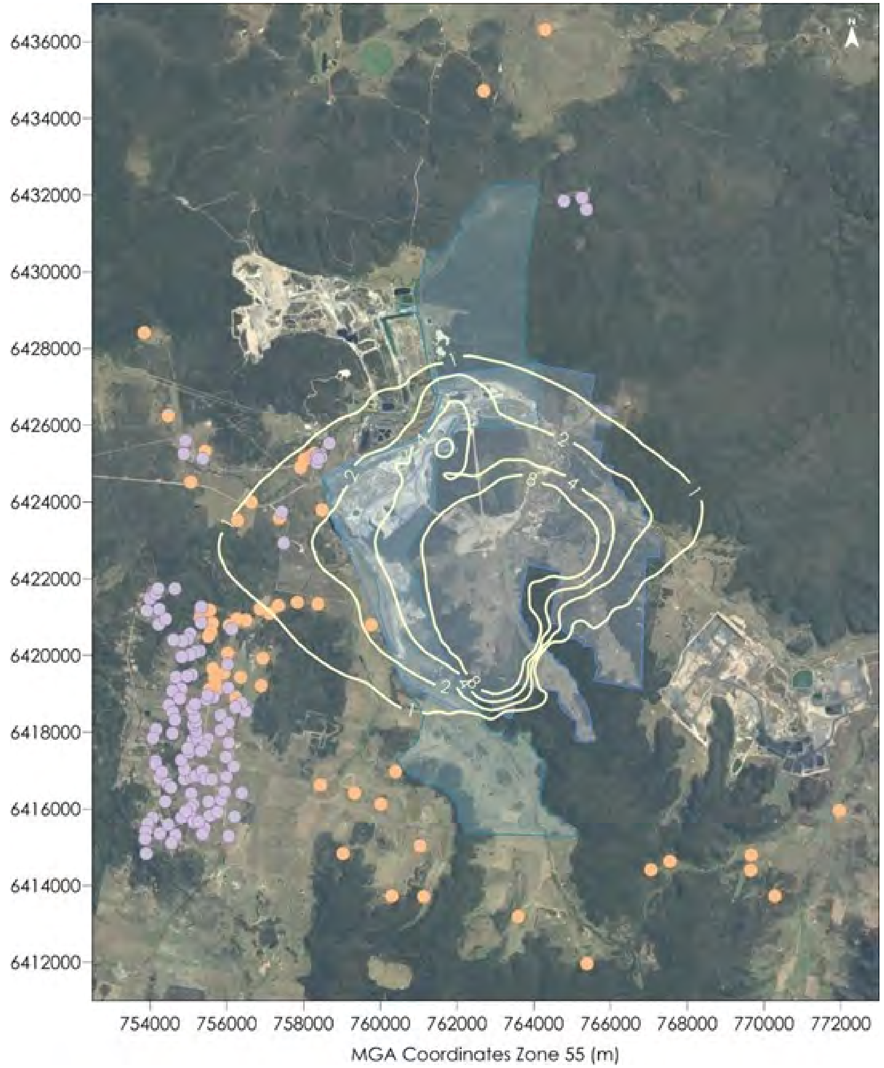

Figure E-22: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Modification in 2026 (µg/m³)

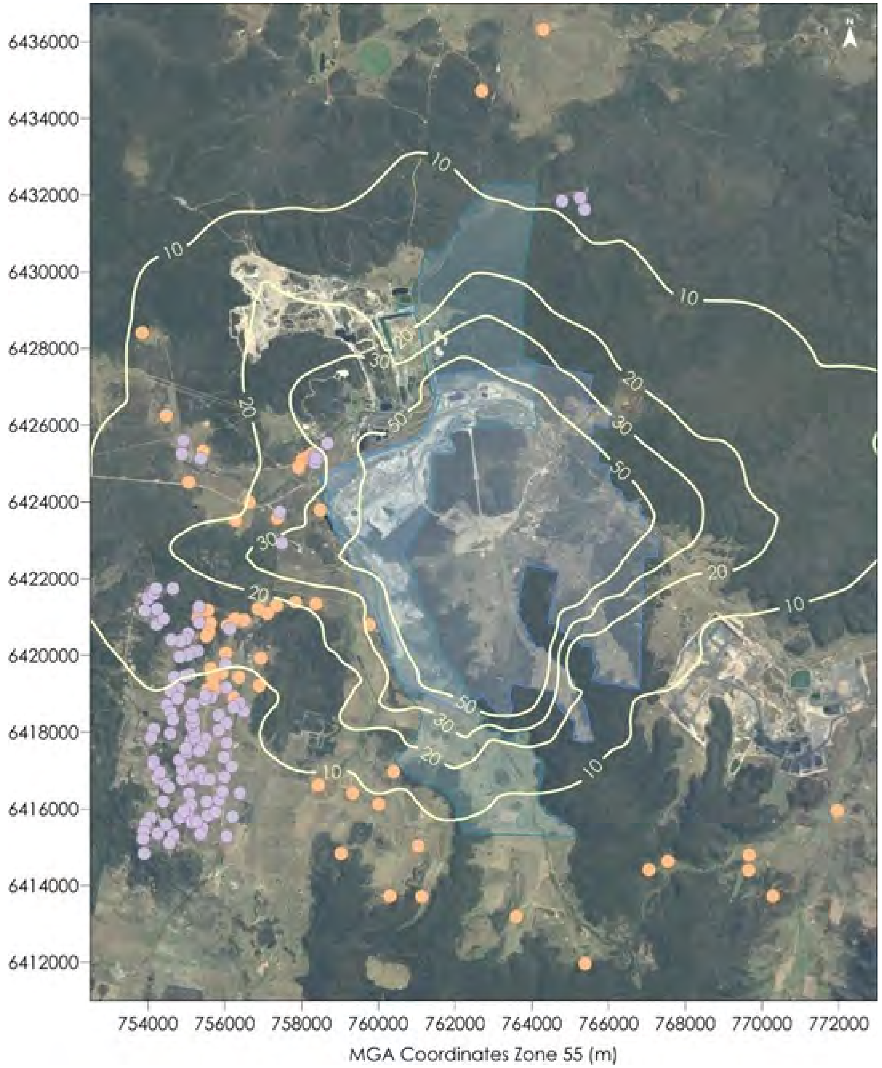

Figure E-23: Predicted maximum 24-hour average PM_{10} concentrations due to emissions from the Modification in 2026 (µg/m³)

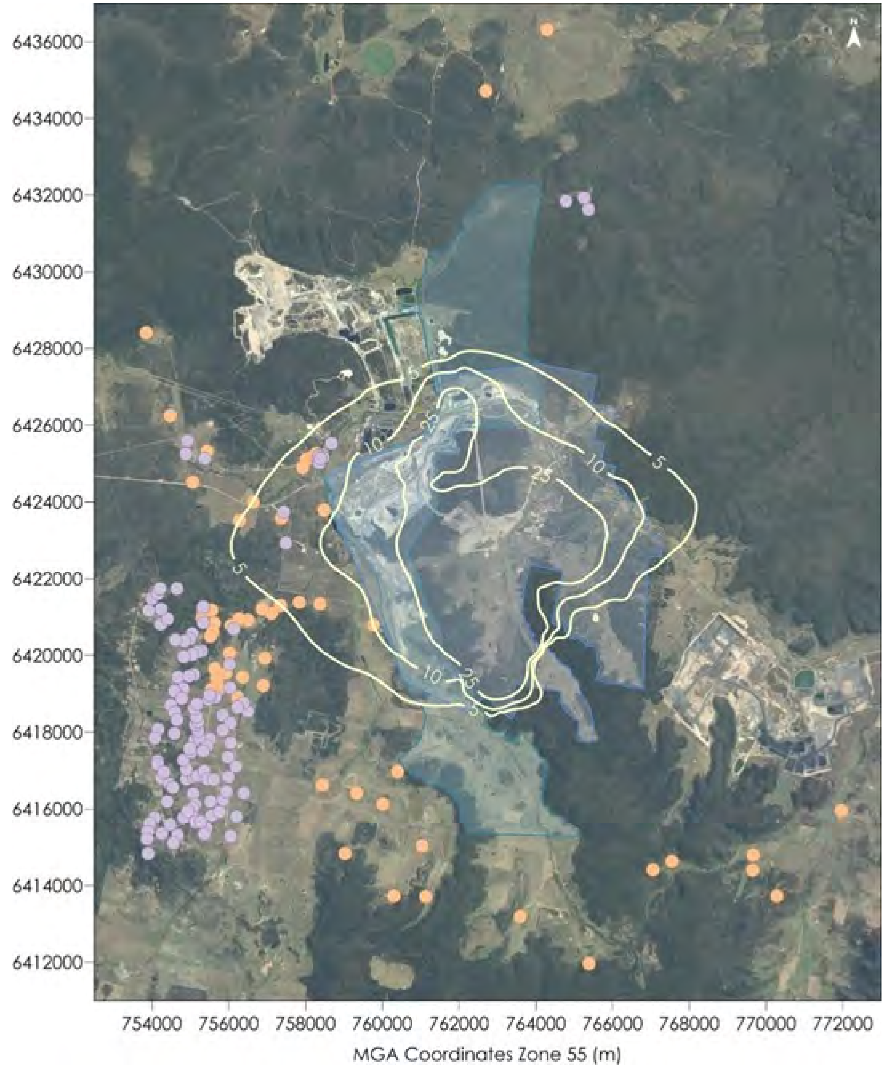

Figure E-24: Predicted annual average PM_{10} concentrations due to emissions from the Modification in 2026 (µg/m³)

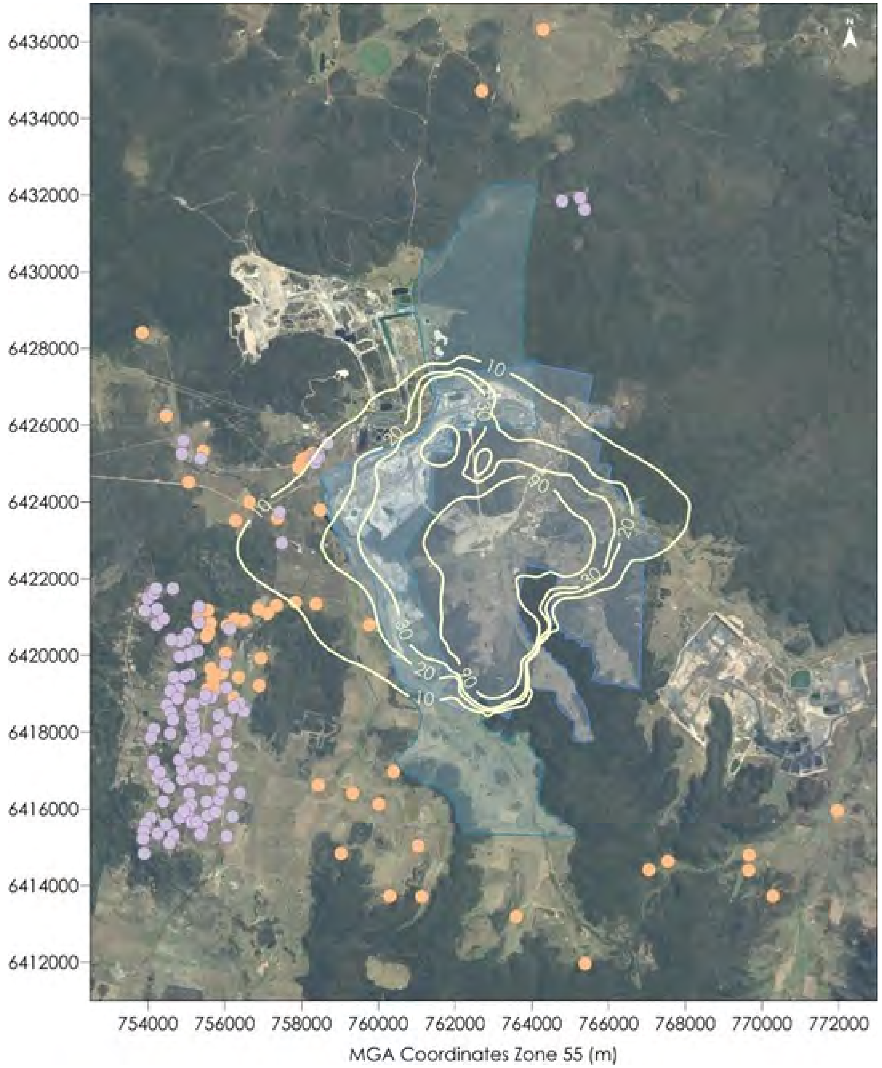

Figure E-25: Predicted annual average TSP concentrations due to emissions from the Modification in 2026 (µg/m³)

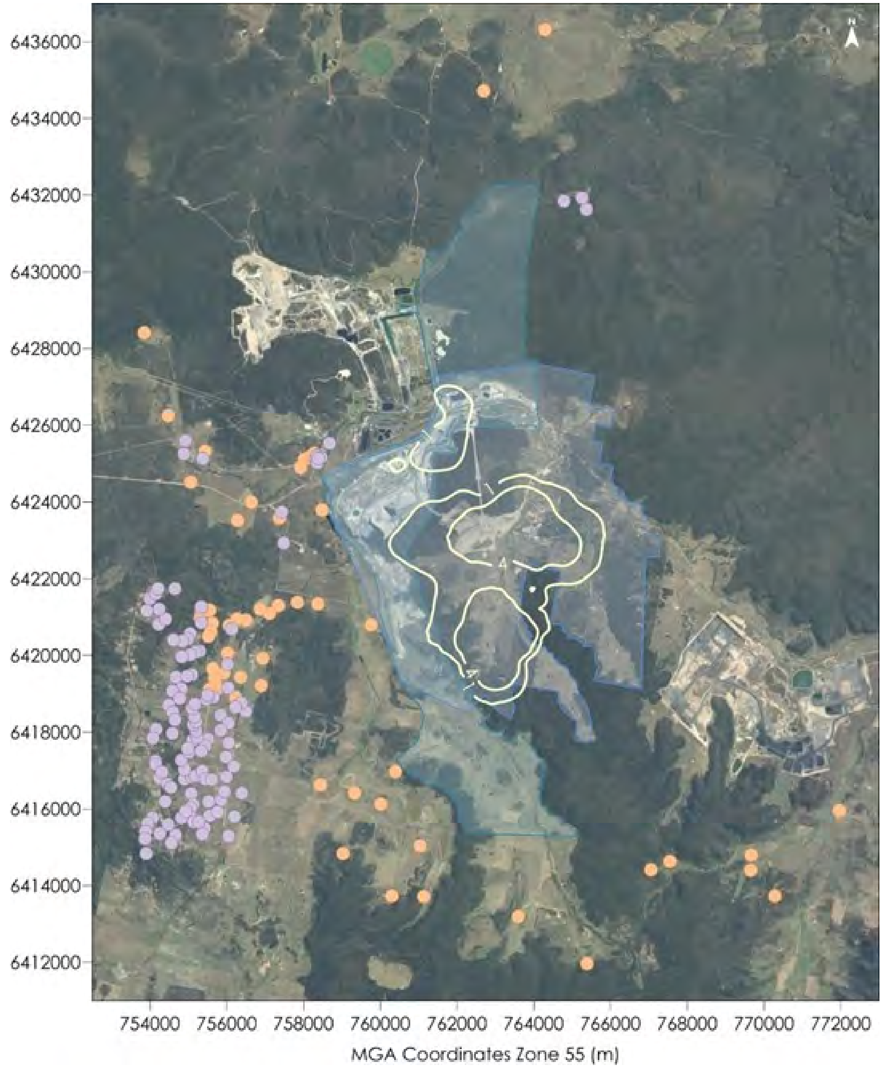

Figure E-26: Predicted annual average dust deposition levels due to emissions from the Modification in 2026 (g/m²/month)

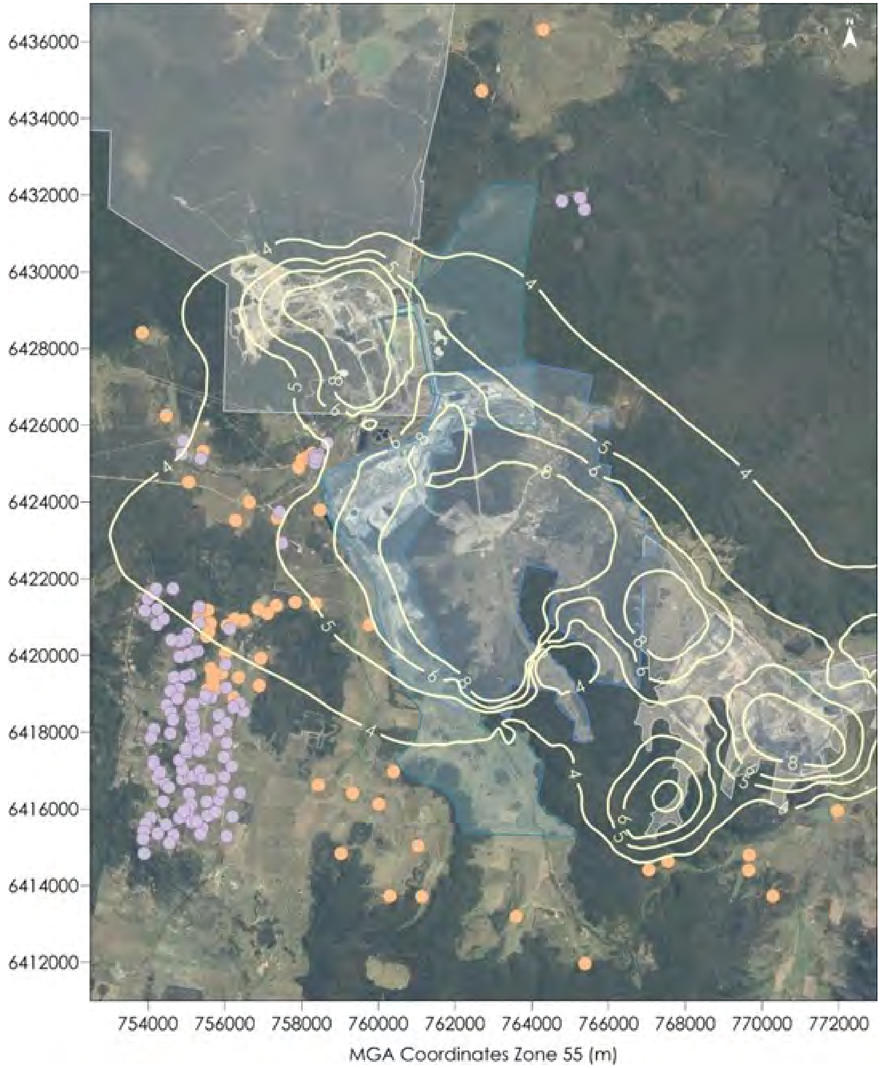

Figure E-27: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Modification and other sources in 2026 (µg/m³)

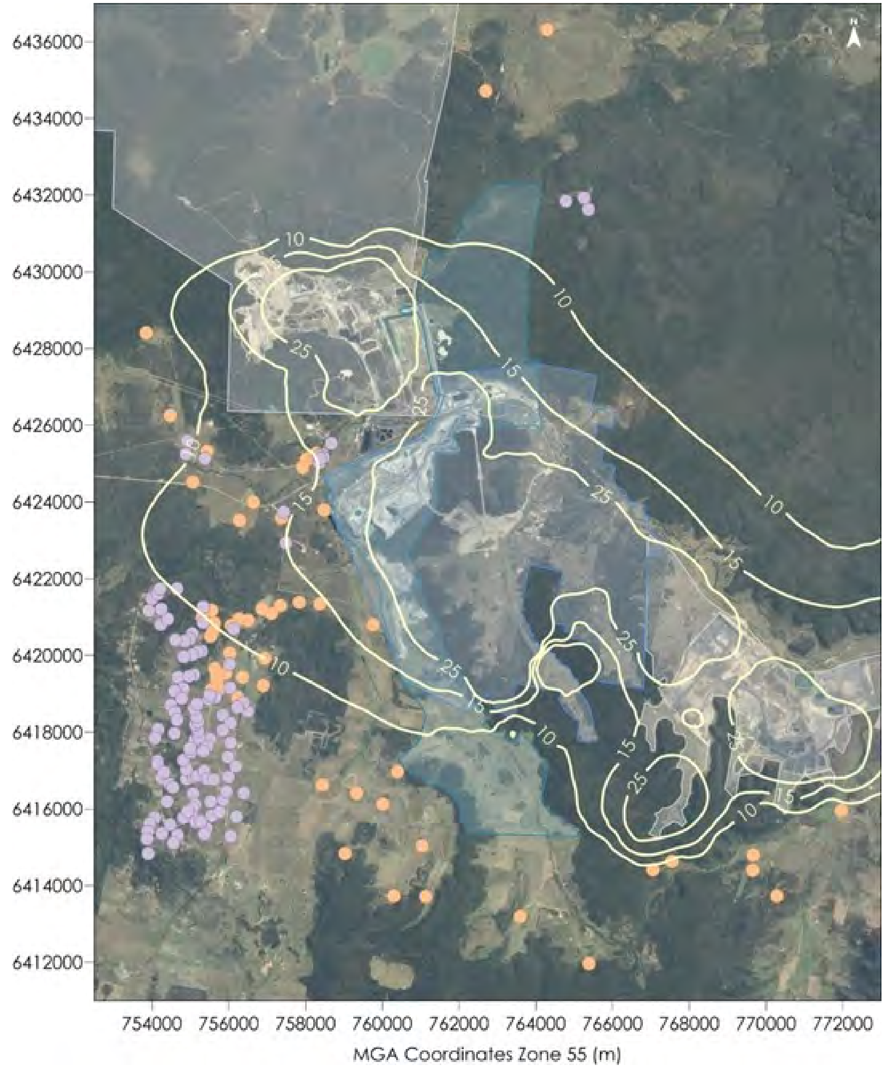

Figure E-28: Predicted annual average PM_{10} concentrations due to emissions from the Modification and other sources in 2026 (µg/m³)

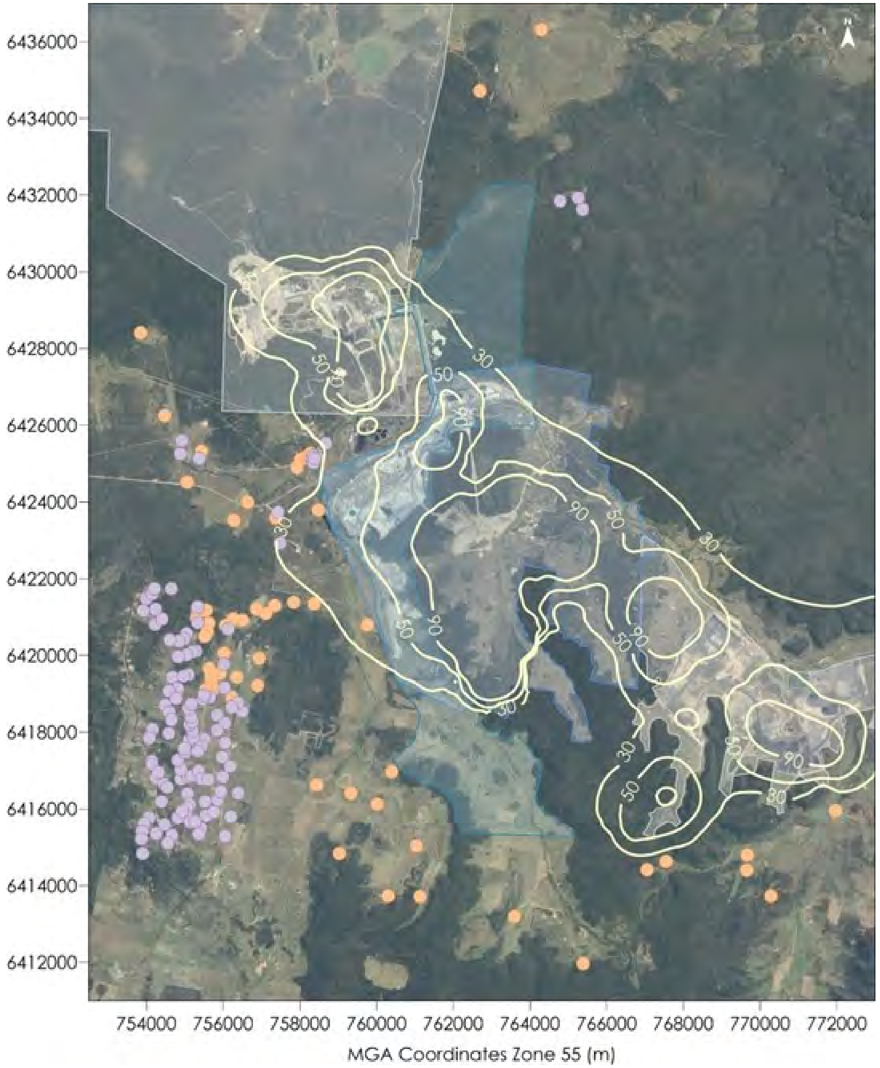

Figure E-29: Predicted annual average TSP concentrations due to emissions from the Modification and other sources in 2026 (µg/m³)

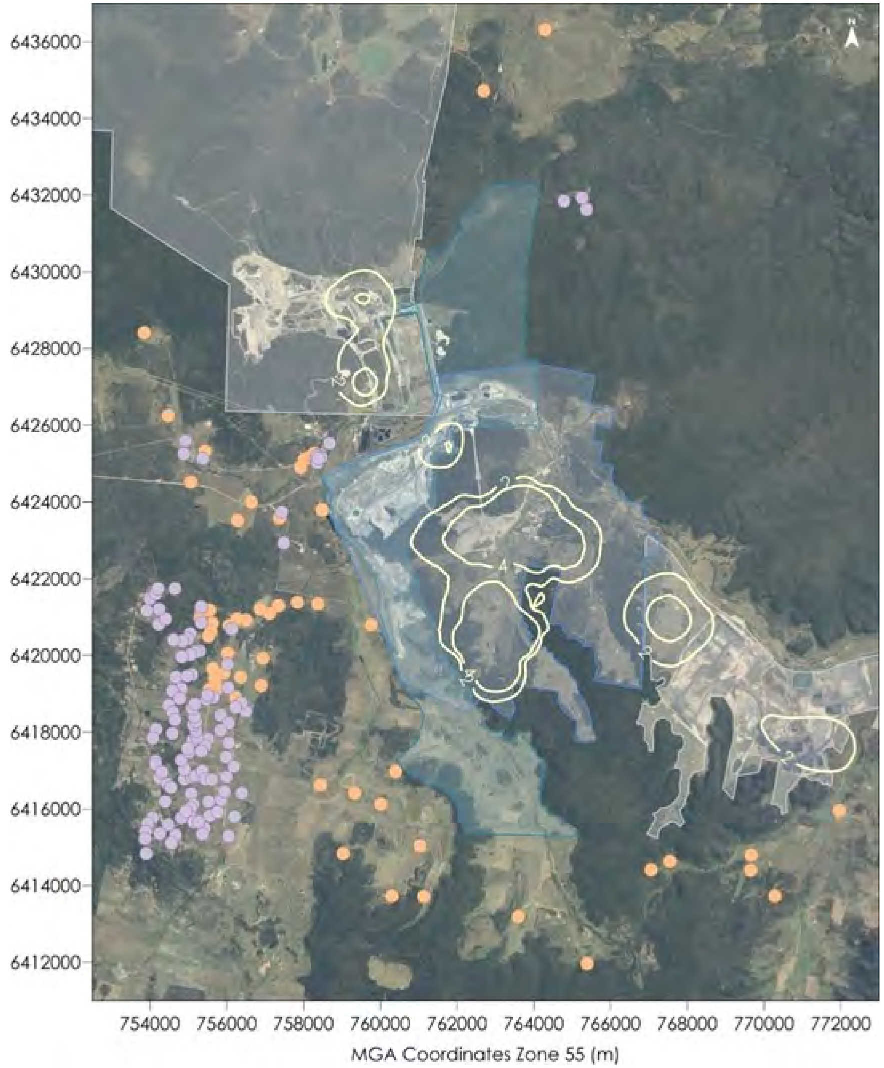

Figure E-30: Predicted annual average dust deposition levels due to emissions from the Modification and other sources in 2026 (g/m²/month)

Appendix F

Further detail regarding 24-hour PM_{10} analysis

Table F-1: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R9 in 2019

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	15.1	**60.8**	27/04/2011	8.2	21.9	30.1
4/04/2011	32.7	9.8	42.5	29/06/2011	9.6	20.1	29.7
20/05/2011	32.2	2.3	34.5	30/06/2011	11.4	18.8	30.2
27/06/2011	29.9	2.8	32.7	20/03/2011	7.9	18.7	26.6
14/07/2011	29.1	1.3	30.4	5/04/2011	16.2	17.5	33.7
28/01/2011	27.6	7.3	34.9	16/04/2011	5.6	17.5	23.1
2/06/2011	27	16.7	43.7	6/04/2011	9.5	17.1	26.6
19/05/2011	26.8	-0.6	26.2	26/04/2011	7.6	16.8	24.4
29/01/2011	26.7	0.0	26.7	2/06/2011	27	16.7	43.7
19/09/2011	26.3	0.9	27.2	17/04/2011	8.1	16.3	24.4

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.

Table F-2: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R26 in 2019

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	-3.0	42.7	14/06/2011	5.8	8.6	14.4
4/04/2011	32.7	-6.0	26.7	21/08/2011	ND	7.8	7.8
20/05/2011	32.2	-3.6	28.6	22/08/2011	ND	7.7	7.7
27/06/2011	29.9	-2.4	27.5	13/06/2011	2.7	7.6	10.3
14/07/2011	29.1	-4.7	24.4	20/08/2011	ND	7.4	7.4
28/01/2011	27.6	-14.5	13.1	1/06/2011	10.5	6.8	17.3
2/06/2011	27	3.1	30.1	11/06/2011	8.2	6.7	14.9
19/05/2011	26.8	-6.1	20.7	16/04/2011	5.6	6.3	11.9
29/01/2011	26.7	-19.1	7.6	25/09/2011	2.1	6.3	8.4
19/09/2011	26.3	-10.1	16.2	15/06/2011	4.4	5.7	10.1

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.
ND – No Data

Table F-3: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R37 in 2019

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	7.4	**53.1**	16/07/2011	ND	14.5	14.5
4/04/2011	32.7	5.9	38.6	29/01/2011	26.7	13.4	40.1
20/05/2011	32.2	3.4	35.6	29/03/2011	10.6	12.8	23.4
27/06/2011	29.9	2.0	31.9	14/10/2011	9.1	12.3	21.4
14/07/2011	29.1	2.4	31.5	26/10/2011	3.4	12.1	15.5
28/01/2011	27.6	8.9	36.5	25/11/2011	ND	12.1	12.1
2/06/2011	27	8.1	35.1	8/01/2011	10.7	12.0	22.7
19/05/2011	26.8	5.7	32.5	29/05/2011	9.3	11.7	21.0
29/01/2011	26.7	13.4	40.1	20/03/2011	7.9	11.5	19.4
19/09/2011	26.3	5.4	31.7	13/10/2011	11.6	11.4	23.0

ND – No Data

Table F-4: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R40 in 2019

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
15/03/2011	45.7	9.9	**55.6**	26/10/2011	3.4	18.5	21.9
28/02/2011	32.7	0.2	32.9	24/11/2011	1.8	13.6	15.4
19/06/2011	32.2	0.0	32.2	23/11/2011	ND	13.4	13.4
24/07/2011	29.9	2.0	31.9	27/10/2011	7.4	13.2	20.6
13/06/2011	29.1	1.0	30.1	26/04/2011	7.6	12.0	19.6
22/01/2011	27.6	5.4	33.0	9/12/2011	6.7	11.9	18.6
17/08/2011	27	8.7	35.7	19/03/2011	5.9	11.6	17.5
17/06/2011	26.8	0.7	27.5	18/03/2011	13.6	11.6	25.2
4/03/2011	26.7	1.1	27.8	9/01/2011	12.2	11.3	23.5
3/07/2011	26.3	2.3	28.6	29/01/2011	26.7	11.3	38.0

ND – No Data

Table F-5: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R70 in 2019

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	14.2	59.9	2/06/2011	27	15.4	42.4
4/04/2011	32.7	8.5	41.2	31/12/2011	10.3	14.7	25.0
20/05/2011	32.2	6.4	38.6	3/09/2011	4.6	14.6	19.2
27/06/2011	29.9	4.5	34.4	17/11/2011	3.8	14.5	18.3
14/07/2011	29.1	3.9	33.0	29/06/2011	9.6	14.3	23.9
28/01/2011	27.6	7.2	34.8	30/06/2011	11.4	14.3	25.7
2/06/2011	27	15.4	42.4	28/06/2011	45.7	14.2	59.9
19/05/2011	26.8	7.4	34.2	6/04/2011	9.5	14.1	23.6
29/01/2011	26.7	6.2	32.9	8/04/2011	11.4	13.7	25.1
19/09/2011	26.3	4.9	31.2	16/08/2011	ND	13.7	13.7

ND – No Data

Table F-6: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R168 in 2019

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	-4.2	41.5	19/09/2011	31.3	1.3	32.6
4/04/2011	32.7	-3.0	29.7	21/12/2011	10.8	1.2	12.0
20/05/2011	32.2	-3.7	28.5	30/05/2011	6.9	1.1	8.0
27/06/2011	29.9	0.1	30.0	6/02/2011	5.8	0.9	6.7
14/07/2011	29.1	-1.1	28.0	17/12/2011	12.8	0.7	13.5
28/01/2011	27.6	-5.1	22.5	19/08/2011	2.3	0.6	2.9
2/06/2011	27	-5.3	21.7	2/04/2011	13.1	0.6	13.7
19/05/2011	26.8	-3.2	23.6	1/07/2011	13	0.6	13.6
29/01/2011	26.7	-1.7	25.0	4/05/2011	10.3	0.4	10.7
19/09/2011	26.3	1.3	27.6	30/11/2011	14.3	0.3	14.6

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.

Table F-7: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R9 in 2021

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	29.6	**75.3**	27/04/2011	8.2	38.6	46.8
4/04/2011	32.7	14.9	47.6	29/06/2011	9.6	36.1	45.7
20/05/2011	32.2	7.6	39.8	20/03/2011	7.9	34.6	42.5
27/06/2011	29.9	7.1	37.0	30/06/2011	11.4	32.4	43.8
14/07/2011	29.1	5.2	34.3	26/04/2011	7.6	32.1	39.7
28/01/2011	27.6	11.3	38.9	8/12/2011	3.8	30.0	33.8
2/06/2011	27	29.3	**56.3**	16/07/2011	ND	30.0	30.0
19/05/2011	26.8	5.2	32.0	28/06/2011	45.7	29.6	75.3
29/01/2011	26.7	2.0	28.7	5/04/2011	16.2	29.6	45.8
19/09/2011	26.3	0.7	27.0	2/06/2011	27	29.3	**56.3**
23/09/2011	25.8	0.4	26.2	8/04/2011	11.4	29.1	40.5
22/01/2011	25.4	-4.8	20.6	24/04/2011	15	28.6	43.6
5/03/2011	24.4	18.9	43.3	6/04/2011	9.5	28.1	37.6
19/01/2011	23.5	24.7	48.2	25/04/2011	9.3	27.6	36.9
24/09/2011	23.5	-7.7	15.8	17/04/2011	8.1	27.4	35.5
17/05/2011	22.8	4.1	26.9	23/02/2011	9	27.0	36.0

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.
ND – No Data

Table F-8: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R26 in 2021

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	6.3	**52.0**	21/08/2011	ND	21.9	21.9
4/04/2011	32.7	-3.5	29.2	1/06/2011	10.5	19.7	30.2
20/05/2011	32.2	1.0	33.2	13/06/2011	2.7	19.5	22.2
27/06/2011	29.9	1.1	31.0	28/04/2011	6.5	17.6	24.1
14/07/2011	29.1	-2.2	26.9	16/04/2011	5.6	16.3	21.9
28/01/2011	27.6	-14.6	13.0	2/06/2011	27	16.1	43.1
2/06/2011	27	16.1	43.1	25/09/2011	2.1	15.8	17.9
19/05/2011	26.8	-1.0	25.8	20/08/2011	ND	15.3	15.3
29/01/2011	26.7	-19.4	7.3	17/04/2011	8.1	13.9	22.0
19/09/2011	26.3	-11.6	14.7	22/08/2011	ND	12.9	12.9

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.
ND – No Data

Table F-9: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R37 in 2021

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	9.9	**55.6**	29/03/2011	10.6	14.4	25.0
4/04/2011	32.7	5.9	38.6	16/07/2011	ND	12.9	12.9
20/05/2011	32.2	3.5	35.7	20/03/2011	7.9	11.7	19.6
27/06/2011	29.9	2.5	32.4	14/10/2011	9.1	11.5	20.6
14/07/2011	29.1	2.3	31.4	29/01/2011	26.7	11.5	38.2
28/01/2011	27.6	5.3	32.9	29/06/2011	9.6	11.4	21.0
2/06/2011	27	11.1	38.1	27/04/2011	8.2	11.3	19.5
19/05/2011	26.8	3.7	30.5	2/06/2011	27	11.1	38.1
29/01/2011	26.7	11.5	38.2	4/01/2011	4.8	11.0	15.8
19/09/2011	26.3	3.2	29.5	30/06/2011	11.4	10.4	21.8

ND – No Data

Table F-10: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R40 in 2021

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
15/03/2011	45.7	6.0	**51.7**	26/10/2011	3.4	18.4	21.8
28/02/2011	32.7	0.2	32.9	16/07/2011	ND	16.2	16.2
19/06/2011	32.2	0.0	32.2	29/01/2011	26.7	15.6	42.3
24/07/2011	29.9	1.9	31.8	14/10/2011	9.1	14.6	23.7
13/06/2011	29.1	1.4	30.5	8/01/2011	10.7	14.2	24.9
22/01/2011	27.6	4.3	31.9	25/11/2011	ND	13.6	13.6
17/08/2011	27	8.0	35.0	27/10/2011	7.4	13.3	20.7
17/06/2011	26.8	0.5	27.3	20/03/2011	7.9	13.2	21.1
4/03/2011	26.7	1.1	27.8	29/03/2011	10.6	12.8	23.4
3/07/2011	26.3	2.3	28.6	20/01/2011	20.1	12.8	32.9

ND – No Data

Table F-11: 24-hour average PM_{10} concentration (μg/m³) – Sensitive receptor location R70 in 2021

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	5.2	**50.9**	17/11/2011	3.8	15.2	19.0
4/04/2011	32.7	4.3	37.0	15/03/2011	8.2	11.9	20.1
20/05/2011	32.2	4.5	36.7	24/12/2011	7.6	11.0	18.6
27/06/2011	29.9	2.7	32.6	24/09/2011	23.5	10.9	34.4
14/07/2011	29.1	2.3	31.4	21/12/2011	12	10.7	22.7
28/01/2011	27.6	9.0	36.6	17/12/2011	10.4	10.6	21.0
2/06/2011	27	5.4	32.4	4/01/2011	4.8	9.8	14.6
19/05/2011	26.8	5.4	32.2	17/03/2011	16.4	9.4	25.8
29/01/2011	26.7	7.9	34.6	26/09/2011	4.5	9.2	13.7
19/09/2011	26.3	3.5	29.8	15/08/2011	ND	9.0	9.0

ND – No Data

Table F-12: 24-hour average PM_{10} concentration (μg/m³) – Sensitive receptor location R168 in 2021

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	-1.9	43.8	30/05/2011	6.9	4.8	11.7
4/04/2011	32.7	-1.0	31.7	28/04/2011	8.7	4.3	13.0
20/05/2011	32.2	-2.6	29.6	1/07/2011	13	4.2	17.2
27/06/2011	29.9	1.5	31.4	12/06/2011	7.3	2.5	9.8
14/07/2011	29.1	0.1	29.2	6/02/2011	5.8	2.1	7.9
28/01/2011	27.6	-5.6	22.0	3/05/2011	10.9	1.9	12.8
2/06/2011	27	-1.2	25.8	26/09/2011	8.9	1.8	10.7
19/05/2011	26.8	-1.5	25.3	4/05/2011	10.3	1.7	12.0
29/01/2011	26.7	-2.4	24.3	23/07/2011	4	1.7	5.7
19/09/2011	26.3	1.2	27.5	27/06/2011	14.5	1.5	16.0

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.

Table F-13: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R9 in 2026

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	8.7	**54.4**	16/07/2011	ND	30.6	30.6
4/04/2011	32.7	5.2	37.9	27/10/2011	7.4	18.9	26.3
20/05/2011	32.2	-5.2	27.0	9/01/2011	12.2	18.7	30.9
27/06/2011	29.9	-2.2	27.7	26/10/2011	3.4	18.6	22.0
14/07/2011	29.1	-5.9	23.2	23/02/2011	9	18.0	27.0
28/01/2011	27.6	1.9	29.5	24/11/2011	1.8	17.7	19.5
2/06/2011	27	8.5	35.5	25/11/2011	ND	17.6	17.6
19/05/2011	26.8	-7.3	19.5	7/12/2011	6.5	17.5	24.0
29/01/2011	26.7	4.3	31.0	5/12/2011	9.6	16.9	26.5
19/09/2011	26.3	-2.7	23.6	27/03/2011	9.8	16.8	26.6

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.
ND – No Data

Table F-14: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R26 in 2026

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	-3.2	42.5	29/06/2011	9.6	8.0	17.6
4/04/2011	32.7	-11.0	21.7	13/06/2011	2.7	7.6	10.3
20/05/2011	32.2	-9.4	22.8	15/06/2011	4.4	6.9	11.3
27/06/2011	29.9	-6.0	23.9	20/03/2011	7.9	6.5	14.4
14/07/2011	29.1	-10.8	18.3	22/08/2011	ND	5.5	5.5
28/01/2011	27.6	-16.9	10.7	8/12/2011	3.8	5.3	9.1
2/06/2011	27	-5.9	21.1	27/04/2011	8.2	3.9	12.1
19/05/2011	26.8	-10.2	16.6	2/10/2011	2.3	3.7	6.0
29/01/2011	26.7	-19.1	7.6	26/04/2011	7.6	3.5	11.1
19/09/2011	26.3	-14.0	12.3	20/08/2011	ND	3.2	3.2

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.
ND – No Data

Table F-15: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R37 in 2026

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	0.8	46.5	17/11/2011	3.8	8.5	12.3
4/04/2011	32.7	0.2	32.9	21/12/2011	12	4.6	16.6
20/05/2011	32.2	0.7	32.9	24/09/2011	23.5	4.3	27.8
27/06/2011	29.9	0.0	29.9	4/11/2011	9.2	3.8	13.0
14/07/2011	29.1	0.5	29.6	23/11/2011	ND	3.6	3.6
28/01/2011	27.6	1.5	29.1	18/03/2011	13.6	3.5	17.1
2/06/2011	27	0.1	27.1	2/07/2011	10.2	3.4	13.6
19/05/2011	26.8	1.7	28.5	3/11/2011	8.8	3.2	12.0
29/01/2011	26.7	1.1	27.8	27/12/2011	6.4	3.2	9.6
19/09/2011	26.3	2.6	28.9	14/12/2011	9.9	3.2	13.1

ND – No Data

Table F-16: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R40 in 2026

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
15/03/2011	45.7	2.1	47.8	17/11/2011	3.8	7.7	11.5
28/02/2011	32.7	0.0	32.7	23/11/2011	ND	4.7	4.7
19/06/2011	32.2	0.0	32.2	24/09/2011	23.5	3.8	27.3
24/07/2011	29.9	0.0	29.9	18/03/2011	13.6	3.5	17.1
13/06/2011	29.1	0.0	29.1	22/11/2011	ND	3.5	3.5
22/01/2011	27.6	0.8	28.4	4/11/2011	9.2	3.3	12.5
17/08/2011	27	1.3	28.3	21/12/2011	12	3.3	15.3
17/06/2011	26.8	0.0	26.8	14/12/2011	9.9	3.0	12.9
4/03/2011	26.7	0.1	26.8	2/07/2011	10.2	2.9	13.1
3/07/2011	26.3	0.2	26.5	17/12/2011	10.4	2.9	13.3

ND – No Data

Table F-17: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R70 in 2026

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	3.8	49.5	26/10/2011	3.4	13.7	17.1
4/04/2011	32.7	4.1	36.8	29/01/2011	26.7	12.2	38.9
20/05/2011	32.2	1.2	33.4	17/11/2011	3.8	12.0	15.8
27/06/2011	29.9	0.3	30.2	25/11/2011	ND	11.9	11.9
14/07/2011	29.1	0.5	29.6	8/01/2011	10.7	11.8	22.5
28/01/2011	27.6	7.6	35.2	14/10/2011	9.1	11.8	20.9
2/06/2011	27	2.4	29.4	27/10/2011	7.4	11.7	19.1
19/05/2011	26.8	2.9	29.7	4/01/2011	4.8	11.6	16.4
29/01/2011	26.7	12.2	38.9	9/12/2011	6.7	11.0	17.7
19/09/2011	26.3	3.0	29.3	21/03/2011	14.3	10.9	25.2

ND – No Data

Table F-18: 24-hour average PM_{10} concentration (µg/m³) – Sensitive receptor location R168 in 2026

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
28/06/2011	45.7	2.2	47.9	28/04/2011	8.7	9.1	17.8
4/04/2011	32.7	-2.7	30.0	21/08/2011	12.8	8.2	21.0
20/05/2011	32.2	-6.2	26.0	1/07/2011	13	7.4	20.4
27/06/2011	29.9	0.7	30.6	2/06/2011	21.5	6.6	28.1
14/07/2011	29.1	-0.7	28.4	13/06/2011	8.3	6.2	14.5
28/01/2011	27.6	-5.3	22.3	25/09/2011	4.2	6.1	10.3
2/06/2011	27	6.6	33.6	29/04/2011	5.4	5.6	11.0
19/05/2011	26.8	-3.0	23.8	22/08/2011	8.2	4.6	12.8
29/01/2011	26.7	-5.4	21.3	16/04/2011	5.3	4.3	9.6
19/09/2011	26.3	-2.8	23.5	12/06/2011	7.3	4.2	11.5

Note – A negative predicted increment indicates that modelled impacts of mining operations in 2011 are greater than the modelled impacts of the Modification for that receiver. The derivation of these results in discussed in Section 7.3.2.