AIR QUALITY IMPACT ASSESSMENT
TYRECYCLE ERSKINE PARK

Tyrecycle Pty Ltd

4 September 2020

Job Number 20051123

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 Impact Assessment
Tyrecycle Erskine Park

DOCUMENT CONTROL

Report Version	Date	Prepared by	Reviewed by
DRAFT - 001	06/08/2020	E Aragnou & P Henschke	
FINAL - 001	14/08/2020	E Aragnou & P Henschke	
FINAL - 002	04/09/2020	P Henschke	

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Todoroski Air Sciences has prepared this report to support a development application by Tyrecycle Pty Ltd (Tyrecycle) for a proposed tyre recycling facility at 1-21 Grady Crescent, Erskine Park, New South Wales (NSW) (hereafter referred to as the Project).

The proposed operations include the receival and storage of tyres for shredding and granulating which would all occur within the industrial building. The tyres are processed at an annual production rate of approximately 29,000 tonnes per annum (tpa).

The report presents an assessment of potential air quality impacts associated with the Project. This air quality impact assessment has been prepared in general accordance with the New South Wales (NSW) Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2017**).

To assess the potential air quality impacts associated with the Project, this report comprises:

- A background to the Project and description of the proposed site and operations;
- A review of the existing meteorological and air quality environment surrounding the site;
- A description of the dispersion modelling approach and emission estimations used to assess potential air quality impacts; and,
- Presentation of the predicted results and discussion of the potential air quality impacts and associated mitigation and management measures.

2 PROJECT SETTING AND DESCRIPTION

2.1 Project setting

The Project site is located at 1-21 Grady Crescent, Erskine Park, approximately 10.8 kilometres (km) southwest of Blacktown and approximately 5.6km southeast of St Marys. The area surrounding the Project site is predominantly comprised of industrial operations with an electrical powerline easement separating the residential land to the north.

Figure 2-1 presents the location of the Project with reference to the assessment locations considered in this assessment. **Table 2-1** identifies the approximate address for each of the assessment locations. These locations represent the nearest locations likely to experience any air quality effects due to the Project.

Table 2-1: Assessment locations

Assessment location ID	Address
R1	22 Regulus Street
R2	28 Shaula Crescent
R3	116 Weaver Street

Figure 2-2 presents a pseudo three-dimensional visualisation of the topography in the general vicinity of the Project. The local topography is gently undulating with elevation increasing to the southeast of the site.

Figure 2-1: Project setting

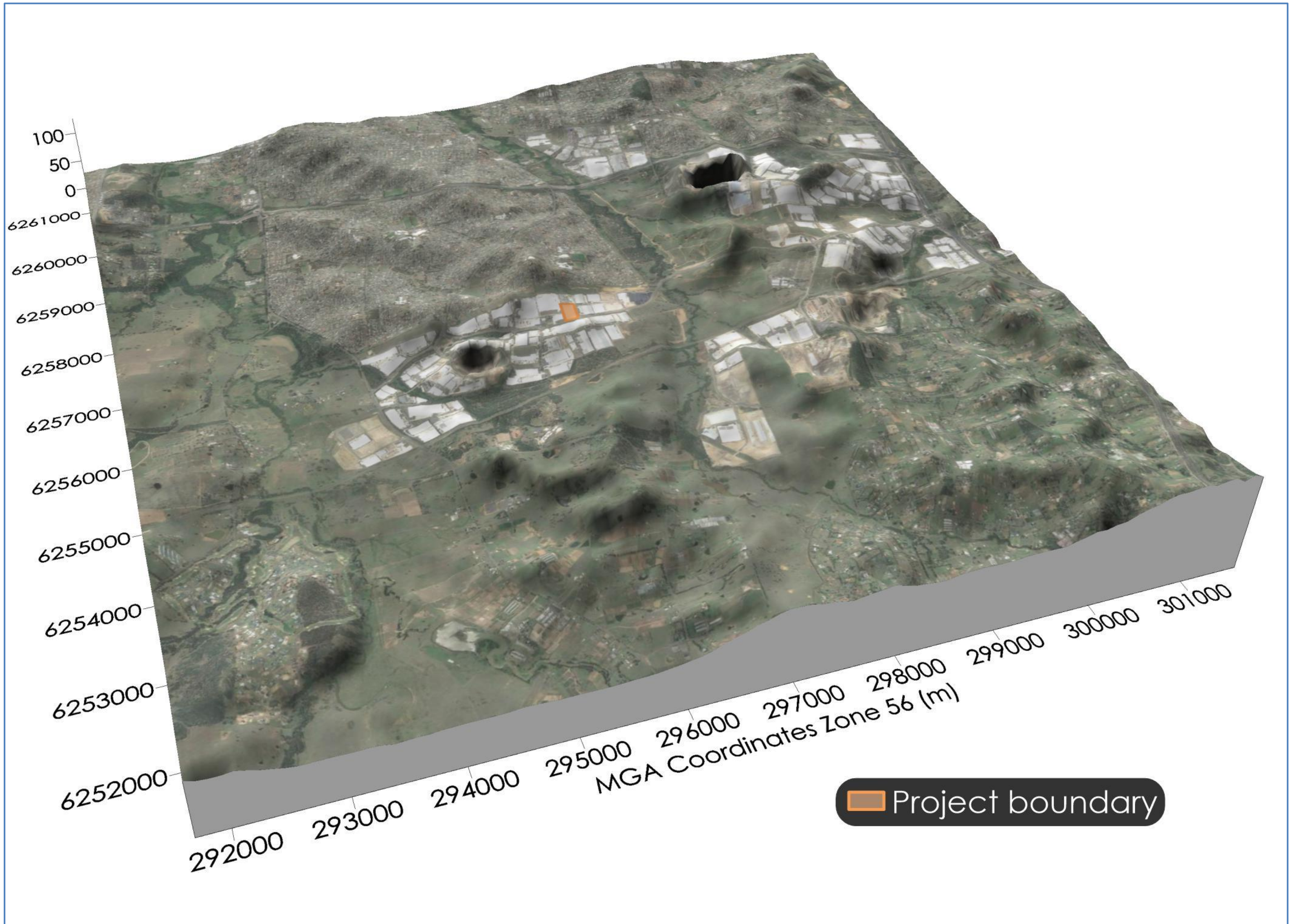

Figure 2-2: Representative visualisation of topography in the area surrounding the Project

2.2 Project description

Tyrecycle propose to process approximately 29,000 tonnes per annum (tpa) of passenger and four wheel drive tyres into either two or six inch pieces (known as Tyre Derived Fuel (TDF)), as well as Tyre Derived Products (TDP) through a shredding operation. The TDF are used for either energy recovery (i.e. co-processing for use within cement kilns) or for energy generation within export markets. The TDP associated with the operation includes granules (1 millimetre (mm) diameter), which are commonly applied to sporting fields and playgrounds, along with rubber crumb products (0.74 mm diameter) which are used in tile manufacturing and road sectors. The activities at the Project would largely be contained within the northern section of the existing warehouse building, which has capacity to house new plant and equipment infrastructure to process the proposed material.

The facility would also act as a transfer station to sort and transport tyres interstate (primarily to Tyrecycle's Somerton facility) for further processing if required.

Table 2-2 presents the proposed operating hours per activity for the Project.

Table 2-2: Proposed operating hours

Activity	Monday to Friday	Saturday	Sunday
Trucks – Collection	4:00am to 1:00am	4:00am to 6:00pm (as required)	-
Plant operation – Shredding	7:00am (start)	7:00am (finish)	-
Plant operation - Crumbing	24 hours	24 hours	24 hours
Deliveries - Containers	8:00am to 5:00pm	8:00am to 6:00pm (as required)-	-

Figure 2-3 provides an indicative layout of equipment at the Project.

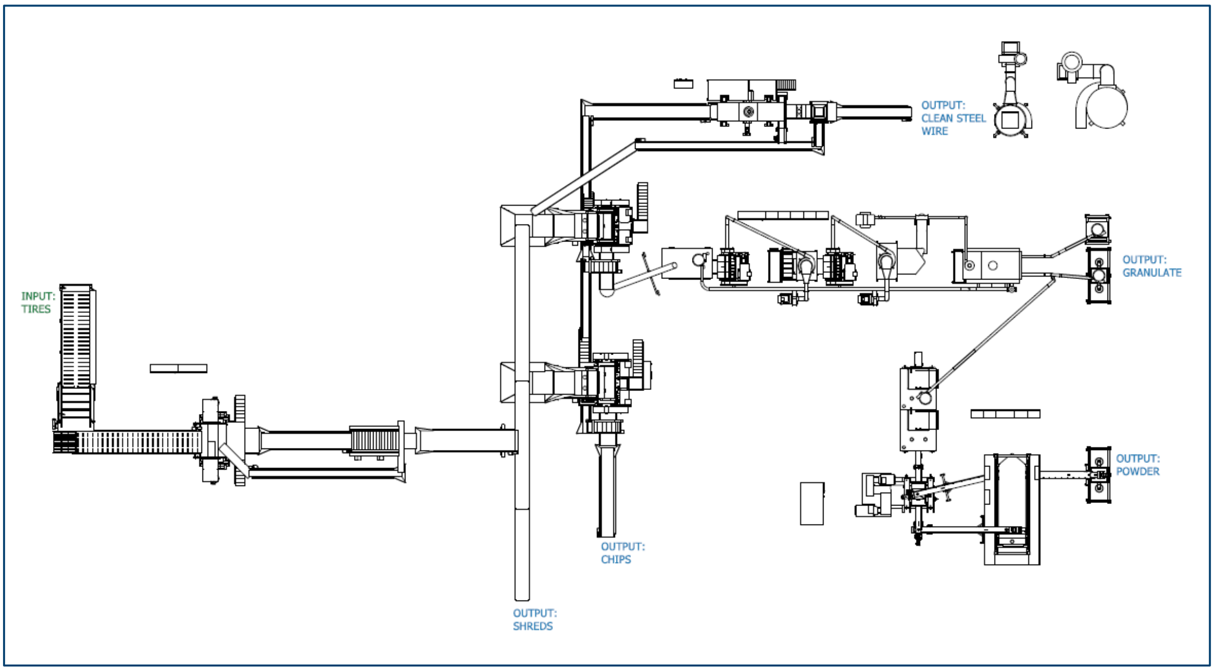

Figure 2-3: Equipment layout for the Project

3 AIR QUALITY 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 Project and the applicable air quality criteria.

3.1 Particulate matter

Table 3-1 summarises the air quality goals that are relevant to this assessment as outlined in the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2017**).

The air quality goals for key pollutants relate to the total pollutant burden in the air and not just the contribution from the Project. Consideration of background pollutant levels needs to be made when using these goals to assess potential impacts.

Table 3-1: NSW EPA air quality impact assessment criteria

Pollutant	Averaging Period	Criterion	Assessment location
TSP	Annual	90 µg/m³	Receptor
PM_{10}	Annual	25 µg/m³	Receptor
	24 hour	50 µg/m³	Receptor
$PM_{2.5}$	Annual	8 µg/m³	Receptor
	24 hour	25 µg/m³	Receptor
Deposited dust	Annual	2 g/m²/month	Receptor
		4 g/m²/month	Receptor

Source: **NSW EPA, 2017**

µg/m³ = micrograms per cubic metre

g/m²/month = grams per square metre per month

3.2 Other air pollutants

Emissions of other air pollutants will also potentially arise from operations and equipment used on-site. Emissions from diesel powered equipment generally include carbon monoxide (CO), nitrogen dioxide (NO_2) and other pollutants, such as sulphur dioxide (SO_2). The amount of emissions of CO, NO_2 and SO_2 generated from diesel powered equipment at the Project site is generally considered to be too low to generate any significant off-site pollutant concentrations and have not been assessed further in this study.

Odour may also arise from the materials processed at the site. However, as the storage and processing of the material would all occur within the warehouse enclosure the potential for any off-site odour impacts are not considered to significant to cause any off-site impacts and have not been assessed further in this study.

4 EXISTING ENVIRONMENT

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

4.1 Local climatic conditions

Long-term climatic data from the closest Bureau of Meteorology (BoM) weather station at Horsley Park Equestrian Centre AWS (Site No. 067119) were analysed to characterise the local climate in the proximity of the Project. Horsley Park Equestrian Centre AWS is located approximately 2.1km west-southwest of the Project.

Table 4-1 and **Figure 4-1** present a summary of data from the Horsley Park Equestrian Centre AWS collected over a 13 to 23 year period for the various meteorological parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 30.1 degrees Celsius (ºC) and July is the coldest month with a mean minimum temperature of 5.8ºC.

Rainfall decreases during the second half of the year, with an annual average rainfall of 748.4 millimetres (mm) over 74.1 days. The data indicate that February is the wettest month with an average rainfall of 119.2mm over 7.2 days and July is the driest month with an average rainfall of 35.2mm over 5.0 days.

Relative humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9am relative humidity ranges from 61% in October to 81% in March. Mean 3pm relative humidity levels range from 42% in August and September to 55% in June.

Wind speeds exhibit seasonal variations with a greater spread between 9am and 3pm conditions in the warmer months. Mean 9am wind speeds range from 8.9 kilometres per hour (km/h) in March to 12.5km/h in October. Mean 3pm wind speeds range from 12.9km/h in June to 19.9km/h in December.

Table 4-1: Monthly climate statistics summary – Horsley Park Equestrian Centre AWS

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temp. (ºC)	30.1	28.8	26.8	23.9	20.6	17.6	17.4	19.1	22.4	24.8	26.6	28.5	23.9
Mean min. temp. (ºC)	18.0	17.8	16.1	12.9	9.0	7.2	5.8	6.4	9.2	11.8	14.4	16.2	12.1
Rainfall													
Rainfall (mm)	73.7	119.2	84.8	69.5	42.7	72.6	35.2	36.8	37.6	57.6	76.1	63.6	748.4
No. of rain days (≥1mm)	7.6	7.2	8.1	6.7	5.1	6.2	5.0	4.0	4.8	5.7	6.8	6.9	74.1
9am conditions													
Mean temp. (ºC)	22.0	21.5	19.4	17.5	13.8	11.1	10.3	12.0	15.6	18.1	19.2	20.9	16.8
Mean R.H. (%)	73	77	81	76	77	80	78	70	65	61	70	71	73
Mean W.S. (km/h)	10.1	9.7	8.9	10.5	10.7	10.3	10.8	11.7	12.2	12.5	11.8	10.7	10.8
3pm conditions													
Mean temp. (ºC)	28.2	27.1	25.3	22.2	19.2	16.6	16.1	17.8	20.8	22.5	24.2	26.5	22.2
Mean R.H. (%)	49	53	54	53	52	55	50	42	42	45	50	48	49
Mean W.S. (km/h)	19.4	17.0	14.8	14.4	13.0	12.9	13.9	16.1	18.1	19.8	19.5	19.9	16.6

Source: **Bureau of Meteorology, 2020 (July 2020)**

R.H. – Relative Humidity, W.S. – wind speed

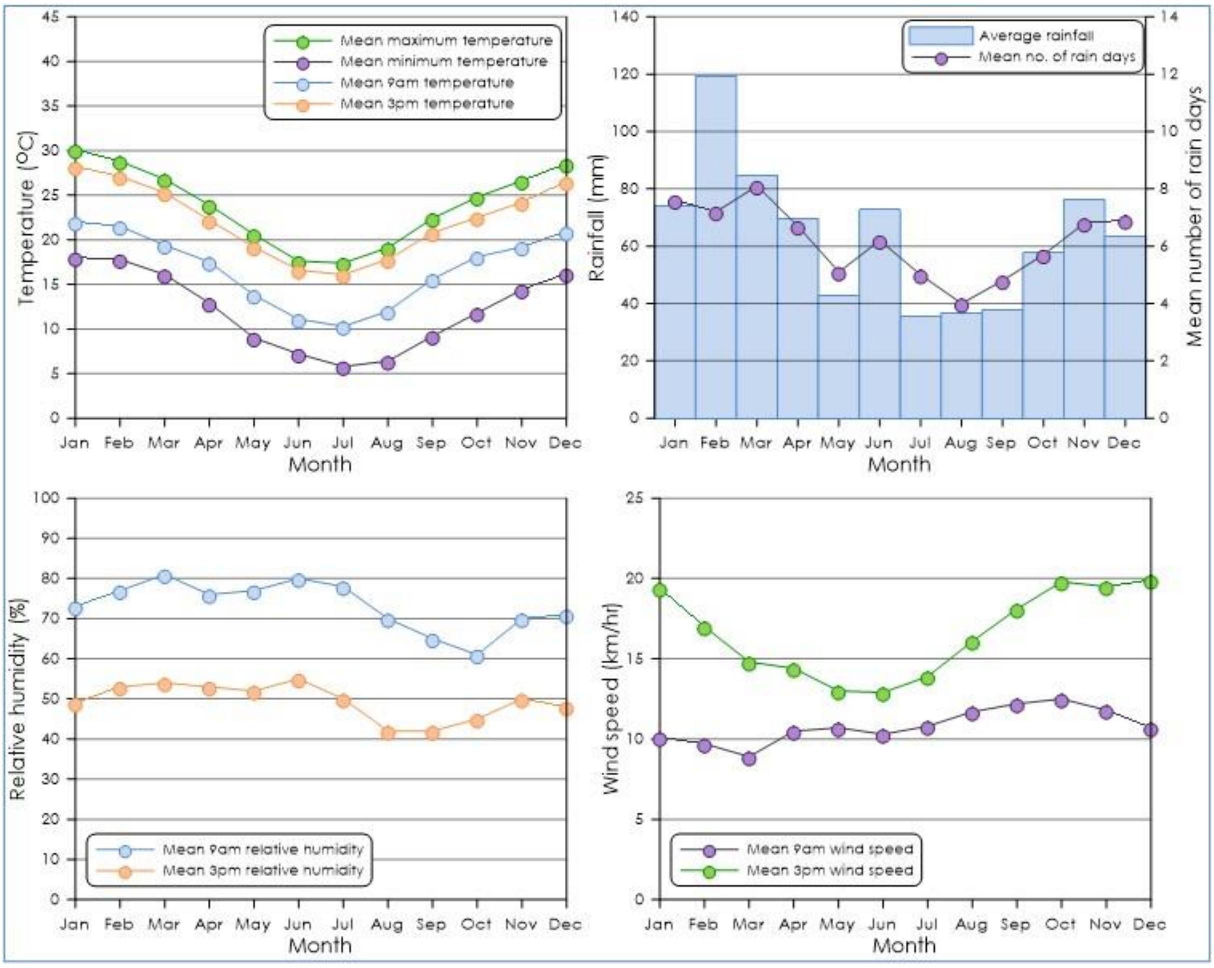

Figure 4-1: Monthly climate statistics summary – Horsley Park Equestrian Centre AWS

4.2 Local meteorological conditions

Annual and seasonal windroses for the Horsley Park Equestrian Centre AWS during the 2015 calendar period are presented in **Figure 4-2**.

The 2015 calendar period corresponds to the period of meteorological modelling based on an analysis of data trends in meteorological data and appropriate monitoring data recorded for the area as outlined in **Appendix A**.

Analysis of the annual windrose shows that the wind directions are predominately from the southwest with variable winds from the other directions. The summer windrose shows winds are mostly variable with stronger winds from the south-southeast, southeast and east. During winter, winds from the southwest and west-southwest quadrants are most frequent. In autumn and spring, wind directions follow a similar distribution to the annual windrose with winds predominately from the southwest with variable winds from the other directions.

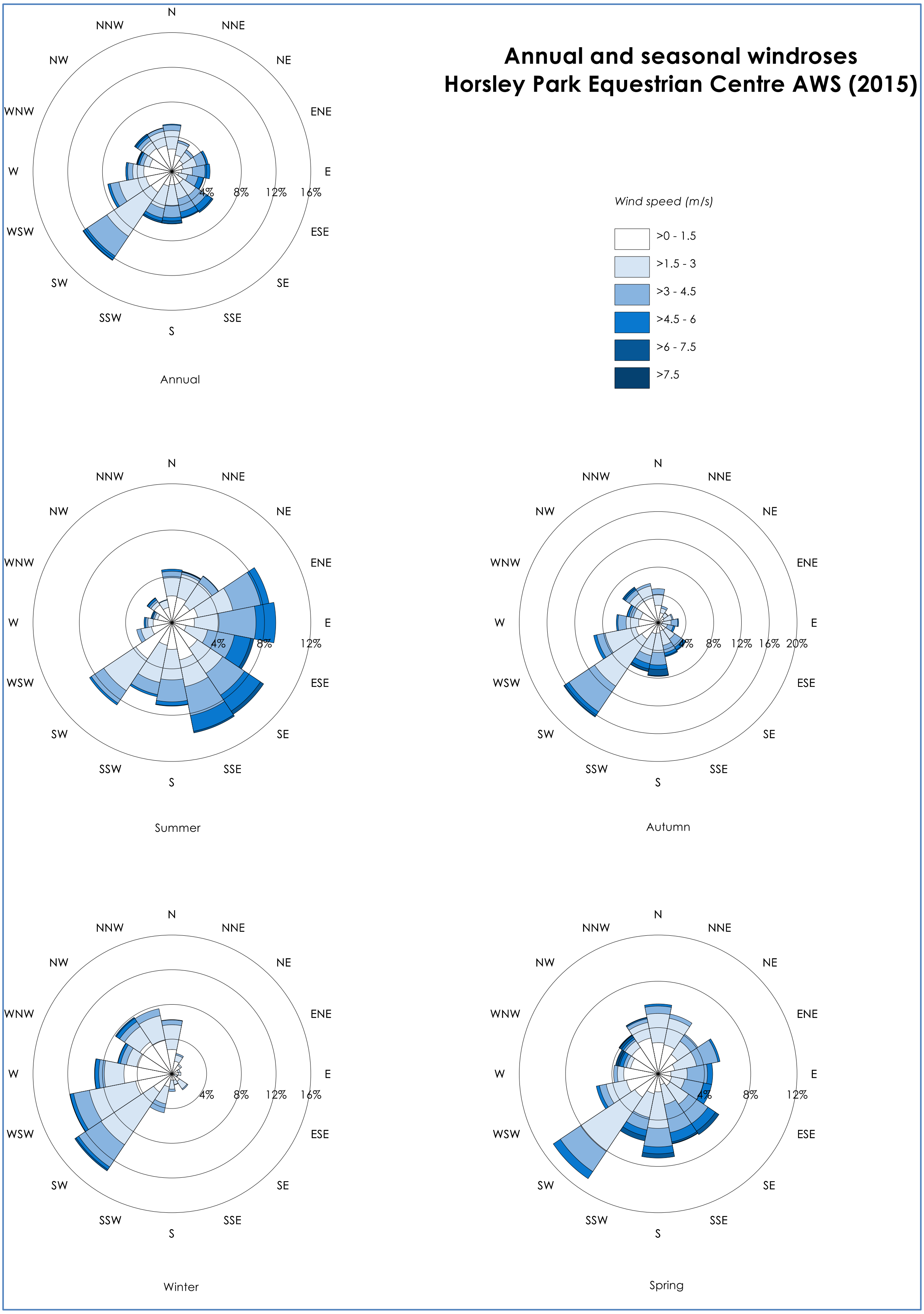

Figure 4-2 : Annual and seasonal windroses – Horsley Park Equestrian Centre AWS (2015)

4.3 Local air quality monitoring

The main sources of air pollutants in the area surrounding the Project would include emissions from surrounding industrial operations, the Cleanaway Erskine Park Landfill and from other anthropogenic activities such as wood heaters and motor vehicle exhaust.

Ambient air quality monitoring data from the nearest air quality monitors operated by the NSW Department of Planning, Industry and Environment (DPIE) at St Marys (located approximately 3.7km to the northwest of the Project) and Prospect (located approximately 10.6km to the east-northeast of the Project) were used to characterise the background levels for the Project site.

4.3.1 PM_{10} monitoring

A summary of the available PM_{10} monitoring data from 2015 to 2020 for the St Marys and Prospect monitoring stations is presented in **Table 4-2**. Recorded 24-hour average PM_{10} concentrations are presented in **Figure 4-3**.

A review of **Table 4-2** indicates that the annual average PM_{10} concentrations for the St Marys monitoring station were below the relevant criterion of 25µg/m^3 for all years. The Prospect monitoring station recorded levels above the criterion in 2019.

The maximum 24-hour average PM_{10} concentrations were found on occasion to exceed the relevant criterion of 50µg/m^3 for all years of the review period at each monitoring station with the exception of St Mary's in 2017.

A review of **Figure 4-3** shows anomalously high PM_{10} concentrations were recorded at each monitoring stations during October 2019 to February 2020 which are attributed to widespread bushfires occurring in NSW during this period.

Table 4-2: Summary of PM_{10} levels from monitoring stations (µg/m^3)

Year	St Marys	Prospect	Criterion
	Annual average		
2015	15.0	17.6	**25**
2016	16.1	18.9	**25**
2017	16.2	18.9	**25**
2018	19.4	21.9	**25**
2019	24.7	**26.0**	**25**
2020	-	-	**25**
Year	**Maximum 24-hour average**		**Criterion**
2015	**53.0**	**68.7**	**50**
2016	**100.2**	**110.1**	**50**
2017	49.8	**61.1**	**50**
2018	**100.5**	**113.3**	**50**
2019	**159.8**	**182.8**	**50**
2020	**260.3**	**245.8**	**50**

- No Data

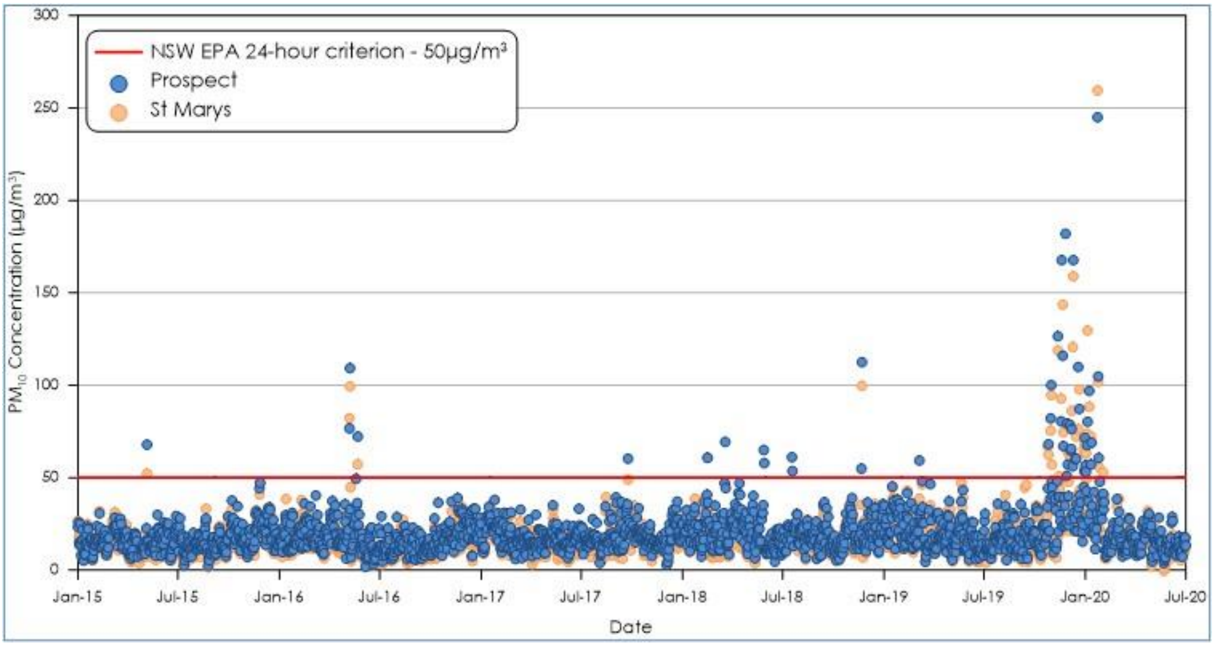

Figure 4-3: 24-hour average PM_{10} concentrations

4.3.2 $PM_{2.5}$ monitoring

A summary of the available data for the 2015 to 2020 for the St Marys and Prospect monitoring stations is presented in **Table 4-3**. Recorded 24-hour average $PM_{2.5}$ concentrations are presented in **Figure 4-4**.

Table 4-3 indicates that the annual average $PM_{2.5}$ concentrations for the St Marys monitoring station were above the relevant criterion of 8µg/m³ in 2019 and 2020. Prospect recorded levels above the criterion for all years of the review period with the exception of 2017.

The maximum 24-hour average $PM_{2.5}$ concentrations were found on occasion to exceed the relevant criterion of 25µg/m³ for all years of the review period at each monitoring station. Similar to the PM_{10} monitoring data, the widespread bushfires affecting NSW in late 2019 and early 2020 are seen in the $PM_{2.5}$ monitoring data.

Table 4-3: Summary of $PM_{2.5}$ levels from monitoring stations (µg/m³)

Year	St Marys	Prospect	Criterion
	Annual average		
2015	-	**8.2**	**8**
2016	7.8*	**8.7**	**8**
2017	7.0	7.7	**8**
2018	7.8	**8.5**	**8**
2019	**9.8**	**11.9**	**8**
2020	-	-	**8**
Year	**Maximum 24-hour average**		**Criterion**
2015	-	**29.6**	**25**
2016	**93.2**	**84.9**	**25**
2017	**38.2**	**30.1**	**25**
2018	**80.5**	**47.5**	**25**
2019	**88.3**	**134.1**	**25**
2020	**82.5**	**70.8**	**25**

- No Data * Data available from 15 March 2016

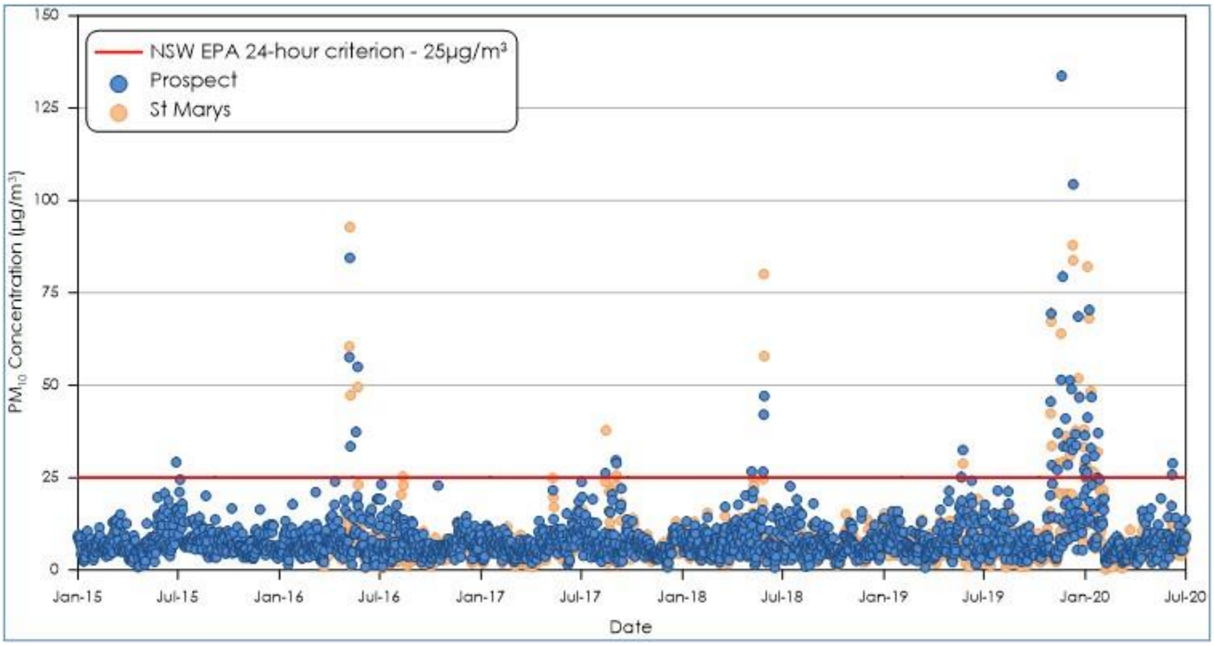

Figure 4-4: 24-hour average $PM_{2.5}$ concentrations

4.3.3 Estimated background levels

There are no readily available site-specific monitoring data, and therefore the background air quality levels from the closest monitor (the St Marys monitor) for the 2015 calendar year were used to represent the background levels for the Project.

The 2015 calendar period corresponds to the period of meteorological modelling based on an analysis of data trends in meteorological data and appropriate monitoring data recorded for the area as outlined in **Appendix A**.

In the absence of available data, estimates of the annual average background TSP and deposited dust concentrations can be determined from a relationship between PM_{10}, TSP and deposited dust concentrations and the measured PM_{10} levels.

This relationship assumes that an annual average PM_{10} concentration of 25µg/m^3 corresponds to a TSP concentration of 90µg/m^3 and a dust deposition value of 4g/m^2/month. This assumption is based on the NSW EPA air quality impact criteria.

Applying this relationship with the measured annual average PM_{10} concentration of 15.0µg/m^3 indicates an approximate annual average TSP concentration and deposition value of 53.9µg/m^3 and 2.4g/m^2/month, respectively.

It is noted that there are no readily available data for $PM_{2.5}$ background levels at the St Mary's monitor during 2015, however there are data available for the 2016 to 2019 calendar year. To estimate background $PM_{2.5}$ concentrations for the Project, we have assumed the average of the $PM_{2.5}$ / PM_{10} ratio of the annual average values recorded for 2016 to 2019 are equivalent to the ratio experienced in 2015. The ratio of 0.43 is multiplied by measured maximum 24-hour average and annual average PM_{10} values in 2015, this results in an estimated maximum 24-hour and annual average background $PM_{2.5}$ concentrations of 22.6µg/m^3 and 6.4µg/m^3, respectively.

The background air quality levels applied in this assessment are summarised in **Table 4-4**.

Table 4-4: Summary of background levels

Pollutant	Background level	Units
24-hour average $PM_{2.5}$	22.6	µg/m³
Annual average $PM_{2.5}$	6.4	µg/m³
24-hour average PM_{10}	Daily varying	-
Annual average PM_{10}	15.0	µg/m³
Annual average TSP	53.9	µg/m³
Annual average deposited dust	2.4	g/m²/month

5 DISPERSION MODELLING APPROACH

5.1 Introduction

The following sections are included to provide the reader with an understanding of the model and modelling approach applied for the assessment. The CALPUFF is an advanced air dispersion model which can deal with the effects of complex local terrain on the dispersion meteorology over the modelling domain in a three-dimensional, hourly varying time step.

The model was setup in general accord with the methods provided in the NSW EPA document *Generic Guidance and Optimum Model Setting for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (**TRC**, **2011**).

5.2 Modelling methodology

The meteorological modelling methodology applied a 'hybird' approach which includes a combination of prognostic model data from TAPM with surface observations.

Modelling was undertaken using a combination of the CALPUFF Modelling System and The Air Pollution Model (TAPM). The CALPUFF Modelling System includes three main components: CALMET, CALPUFF and CALPOST and a large set of pre-processing programs designed to interface the model to standard, routinely available meteorological and geophysical datasets.

5.2.1 Meteorological modelling

The TAPM model was applied to the available data to generate a three-dimensional upper air data file for use in CALMET. The centre of analysis for the TAPM modelling used is 33deg 48min south and 150deg 48min east. The simulation involved an outer grid of 30km, with three nested grids of 10km, 3km and 1km with 35 vertical grid levels.

The CALMET domain was run on a domain of 10 x 10km with a 0.1km grid resolution. The available meteorological data for January 2015 to December 2015 from the Horsley Park Equestrian Centre AWS (BoM), the Badgerys Creek AWS (BoM) and the St Marys DPIE monitor were included in the simulation.

Local land use and detailed topographical information was included to produce realistic fine scale flow fields (such as terrain forced flows) in surrounding areas, as shown in **Figure 5-1**.

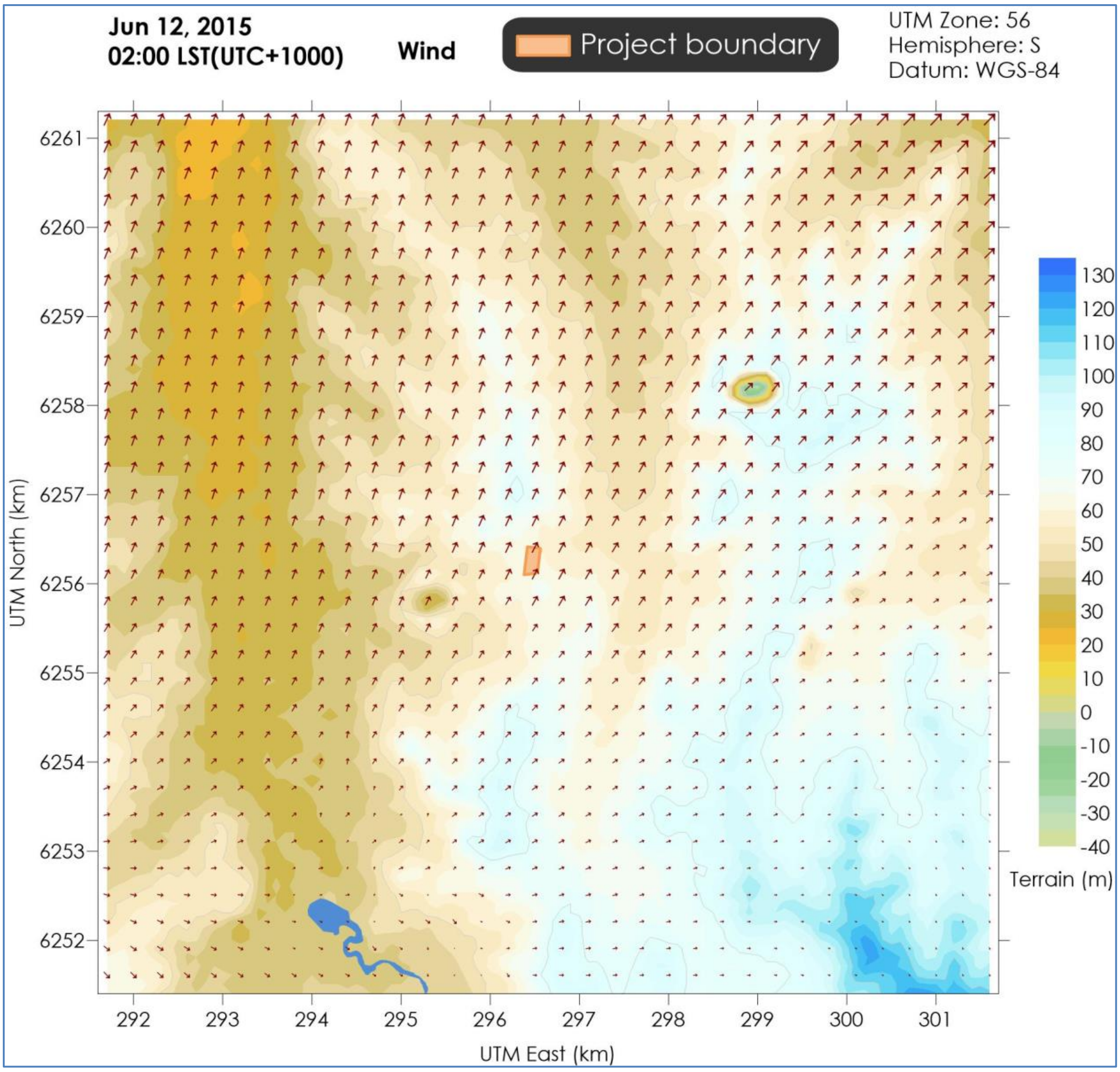

Figure 5-1: Representative 1-hour average snapshot of wind field for the Project

CALMET generated meteorological data were extracted from a point within the CALMET domain and are graphically represented in **Figure 5-2** and **Figure 5-3**.

Figure 5-2 presents the annual and seasonal windroses from the CALMET data. Overall, the windroses generated in the CALMET modelling reflect the expected wind distribution patterns of the area as determined based on the available measured data and the expected terrain effects on the prevailing winds. **Figure 5-3** includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period and shows sensible trends considered to be representative of the area.

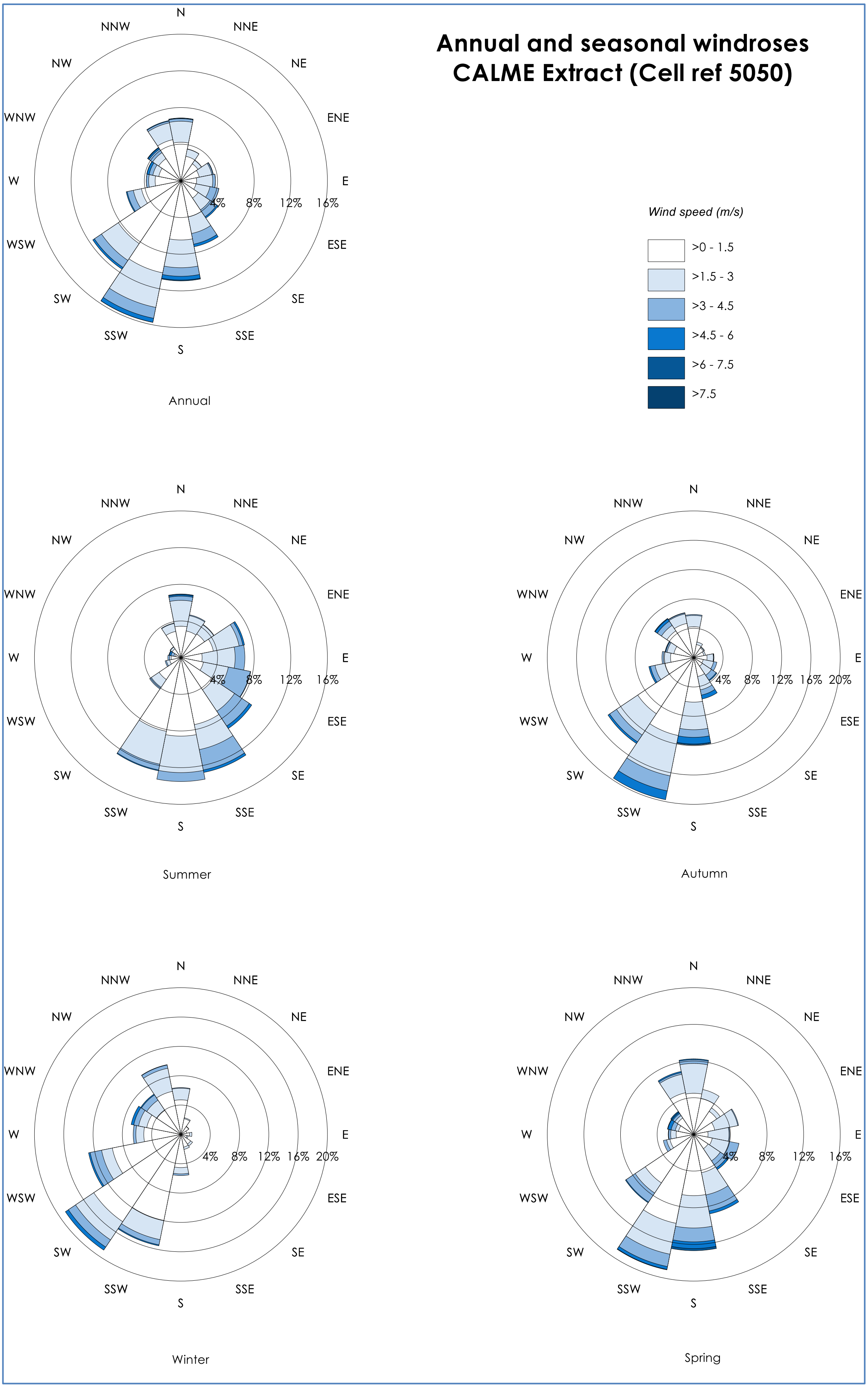

Figure 5-2: Annual and seasonal windroses from CALMET (Cell ref 5050)

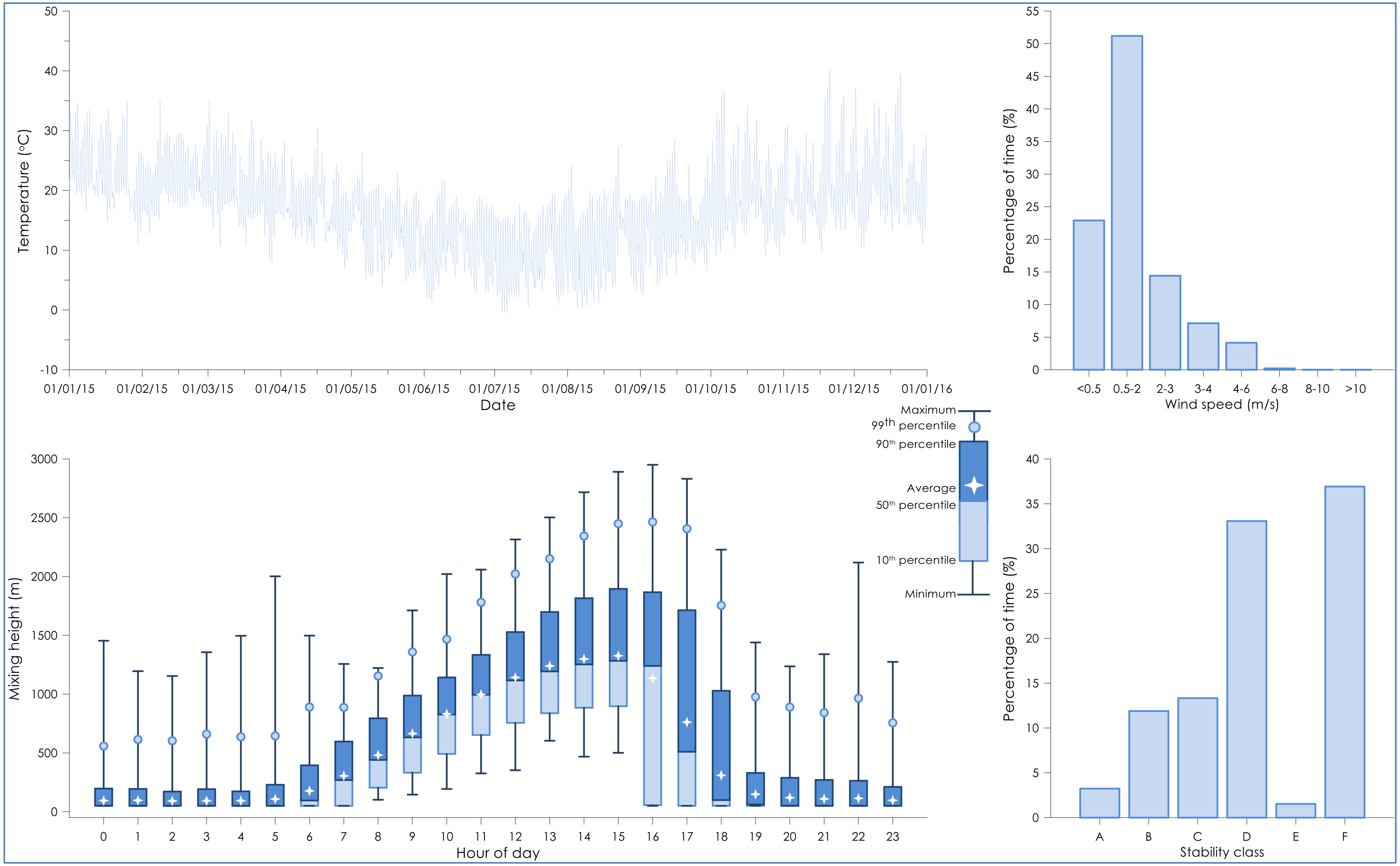

Figure 5-3: Meteorological analysis of CALMET (Cell REF 5050)

5.2.2 Dispersion modelling

The CALPUFF dispersion model, in conjunction with a CALMET generated meteorological data file, was applied to provide predictions of the ground level concentrations of potential pollutant concentrations associated with the operation of the Project.

Ground based operational activity of the Project were represented by a series of volume sources and were 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.

As most of the activity at the site would occur within the warehouse, potential for dust emissions emanating from the site are expected to be low. For the purposes of this assessment it is conservatively assumed that the activities occur out in the open and would overestimate the potential emissions released.

Two cyclone filters would be operated at the Project and have been modelled as point sources with parameters outlined in **Table 5-1**. The cyclone filters would be positioned in the warehouse and as such the outlets would be installed through the warehouse roof.

Table 5-1: Modelled stack parameters

ID	Parameter				
	Stack height (m)	Stack diameter (m)	Temperature (°C)	Exit velocity (m/sec)	Concentration (mg/m³)
BH1	14	1.2	25	22	10
BH2	14	1.2	25	22	10

The modelled stack source locations for the Project are shown in **Figure 5-4**. The model included consideration of potential "building" wake effects on air dispersion which arise due to the effect of winds passing over the buildings surrounding the Project site.

Figure 5-4: Stack source locations

5.2.3 Emission estimation

The dust generating activities associated with operation of the Project are identified as the handling and processing of the material and vehicles travelling on-site. The vehicles also have the potential to generate particulate emissions from the diesel exhaust. Dust emission estimates have been calculated by analysing the place and utilising suitable emissions sourced from both locally developed and United States various types of activities taking Environmental Protection Agency (US EPA) developed documentation.

A summary of the estimated annual TSP, PM_{10} and $PM_{2.5}$ emissions are presented in **Table 5-2**. Detailed calculations of the dust emission estimates are provided in **Appendix B**.

Table 5-2: Summary of estimated emissions for the Project (kg/year)

Activity	TSP Emissions	PM_{10} emissions	$PM_{2.5}$ emissions
Delivering material to site	98	19	5
Unloading material in building	22	10	2
Rehandle material at stockpile (within warehouse)	22	10	2
Loading material to shredder	22	10	2
Shredding material	78	35	6
Granulating material	363	125	8
Granulating material	363	125	8
Unloading processed material to stockpile (within warehouse)	22	10	2
Rehandle material at stockpile	22	10	2
Loading processed material to truck	22	10	2
Hauling processed material offsite	99	19	5
Exhaust emissions	98	98	95
Total dust emissions (kg/yr.)	**1,232**	**483**	**137**

6 DISPERSION MODELLING RESULTS

The dispersion model predictions presented in this section include those for the operation of the Project in isolation (incremental impact) and the operation of the Project with consideration of other sources (total impact). The results show the predicted:

- Maximum 24-hour average $PM_{2.5}$ and PM_{10} concentrations;
- Annual average $PM_{2.5,}$ PM_{10} and 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 levels, these predictions are based on the highest predicted 24-hour average concentrations which were modelled at each point within the modelling domain for the worst day (i.e. a 24-hour period) during the one year long modelling period.

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

The total (cumulative) impact is defined as the operation of the Project combined with the estimated ambient background levels in **Section 5.3.**

Table 6-1 presents the predicted incremental and cumulative particulate dispersion modelling results at each of the assessed receptor locations.

The predicted incremental results show that minimal incremental effects would arise at the closest residential receptor locations due to the Project. The predicted cumulative results indicate that the residential receptor locations are predicted to experience levels below the relevant criteria for each of the assessed dust metrics.

Table 6-1: Dust dispersion modelling results for sensitive receptors

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)
	Incremental						Cumulative			
	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									
	-	-	-	-	-	2	8	25	90	4
R1	1.3	0.2	2.8	0.5	0.6	<0.1	6.6	15.5	54.5	2.4
R2	1.5	0.3	3.5	0.8	1.0	<0.1	6.7	15.8	54.9	2.4
R3	0.5	0.1	1.1	0.2	0.3	<0.1	6.5	15.2	54.2	2.4

*Deposited dust

6.1 Assessment of Cumulative 24-hour average $PM_{2.5}$ and PM_{10} Concentrations

The results for incremental 24-hour average $PM_{2.5}$ and PM_{10} concentrations indicate there are no predicted exceedances of the relevant criteria at the assessed receptors.

When assessing the cumulative 24-hour average impacts based on model predictions, an assessment of cumulative 24-hour average $PM_{2.5}$ and PM_{10} impacts was undertaken in accordance with Section 11.2

of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA**, **2017**).

A "Level 1 assessment – Maximum impact" has been applied to assess the potential cumulative 24-hour average $PM_{2.5}$ impacts and a "Level 2 assessment - Contemporaneous impact and background approach" was applied to assess potential impacts for PM_{10}.

In simple terms, the Level 1 assessment involves adding maximum background level with the maximum predicted Project only level and the Level 2 assessment involves matching one year of ambient air quality monitoring data with the corresponding Project only level predicted using the same day's weather data to account for the spatial and temporal variation in background levels on a given day.

Table 6-2 provides a summary of the findings from the Level 1 and Level 2 assessments for the assessment locations.

The results in **Table 6-2** indicate that the Project does not increase the number of days above the 24-hour average criterion at the assessed receptors for $PM_{2.5}$ and PM_{10}. Based on this result it can be inferred that the Project does not increase the number of days above the 24-hour average $PM_{2.5}$ and PM_{10} criterion at any location surrounding the Project.

Detailed tables of the contemporaneous assessment results are provided in **Appendix D**.

Table 6-2: NSW EPA contemporaneous assessment - maximum number of additional days above 24-hour average criterion

Receptor ID	$PM_{2.5}$	PM_{10}
R1	0	0
R2	0	0
R3	0	0

7 MITIGATION AND MANAGEMENT

The proposed operations of the Project have the potential to generate dust emissions. To ensure that activities associated with the Project have a minimal effect on the surrounding environment, it is recommended that all reasonable and practicable dust mitigation measures be utilised.

Suggested reasonable and practicable dust mitigation measures for the Project are listed in **Table 7-1**.

Table 7-1: Potential operational dust mitigation measures

Source	Mitigation Measure
General	Engines of on-site vehicles and plant to be switched off when not in use.
	Vehicles and plant are to be fitted with pollution reduction devices where practicable.
	Vehicles are to be maintained and serviced according to manufacturer's specifications.
	Visual monitoring of activities is to be undertaken to identify dust generation.
	Cyclones to be maintained and operated in accordance with manufacturer's specification.
Material handling	Reduce drop heights from loading and handling equipment where practical.
Hauling activities	Spills on trafficked areas to be cleaned immediately.
	Driveways and hardstand areas to be swept/cleaned regularly as required etc.
	Vehicle traffic is to be restricted to designated routes.
	Co-ordinate the delivery schedule to avoid a queue of the incoming or outgoing trucks for extended periods of time.
	Speed limits are to be enforced.
	Vehicle loads are to be covered/ secured when travelling off-site to prevent spillage.
	Regularly inspect roads and maintain surfaces to remove potholes or depressions.

8 SUMMARY AND CONCLUSIONS

This study has examined the likely air quality effects associated with the proposed operations of a tyre recycling facility at Erskine Park.

Air dispersion modelling was used to predict the potential for off-site dust impacts in the surrounding area due to the operation of the Project with generally conservative assumptions.

It is predicted that all the assessed air pollutants generated by the operation of the Project would comply with the applicable assessment criteria at the assessed receptors and therefore would not lead to any unacceptable level of environmental harm or impact in the surrounding area. The Project would not result in air pollution that would significantly impact upon the amenity of residential land uses.

Nevertheless, the site would apply appropriate dust management measures to ensure it minimises the potential occurrence of excessive air emissions from the site.

Overall, the assessment demonstrates that even using conservative assumptions, the Project can operate without causing any significant air quality impact at receptors in the surrounding environment.

9 REFERENCES

Bureau of Meteorology (2020)

Climate statistics for Australian locations, Bureau of Meteorology website, accessed July 2020. http://www.bom.gov.au/climate/averages

NSW EPA (2017)

"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales", NSW Environment Protection Authority, January 2017.

TRC (2011)

"Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia", Prepared for the NSW Office of Environment and Heritage by TRC Environmental Corporation.

US EPA (1985 and update)

"Compilation of Air Pollutant Emission Factors", AP-42, Fourth Edition United States Environmental Protection Agency, Office of Air and Radiation Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711.

Appendix A

Selection of Meteorological Year

Selection of meteorological year

A statistical analysis of the latest five contiguous years of meteorological data from the nearest BoM weather station with suitable available data, Horsley Park Equestrian Centre AWS weather station, is presented in **Table A-1**.

The standard deviation of the latest five years of meteorological data spanning 2015 to 2019 was analysed against the available measured wind speed, temperature and relative humidity. The analysis indicates that the 2018 dataset is closest to the mean for wind speed and 2015 is closest for temperature and relative humidity. Therefore, based on this analysis it was determined that 2015 is generally representative of the long-term trends compared to other years and is thus suitable for the purpose of modelling.

Table A-1: Statistical analysis results for Horsley Park Equestrian Centre AWS

Year	Wind speed	Temperature	Relative humidity
2015	0.9	0.7	2.6
2016	0.8	0.9	5.0
2017	0.7	0.8	5.2
2018	0.6	0.9	7.0
2019	0.8	0.9	5.5

Figure A-1 shows the frequency distributions for wind speed, wind direction, temperature and relative humidity for the 2018 year compared with the mean of the 2015 to 2019 data set. The 2015 year data appear to be reasonably well aligned with the mean data.

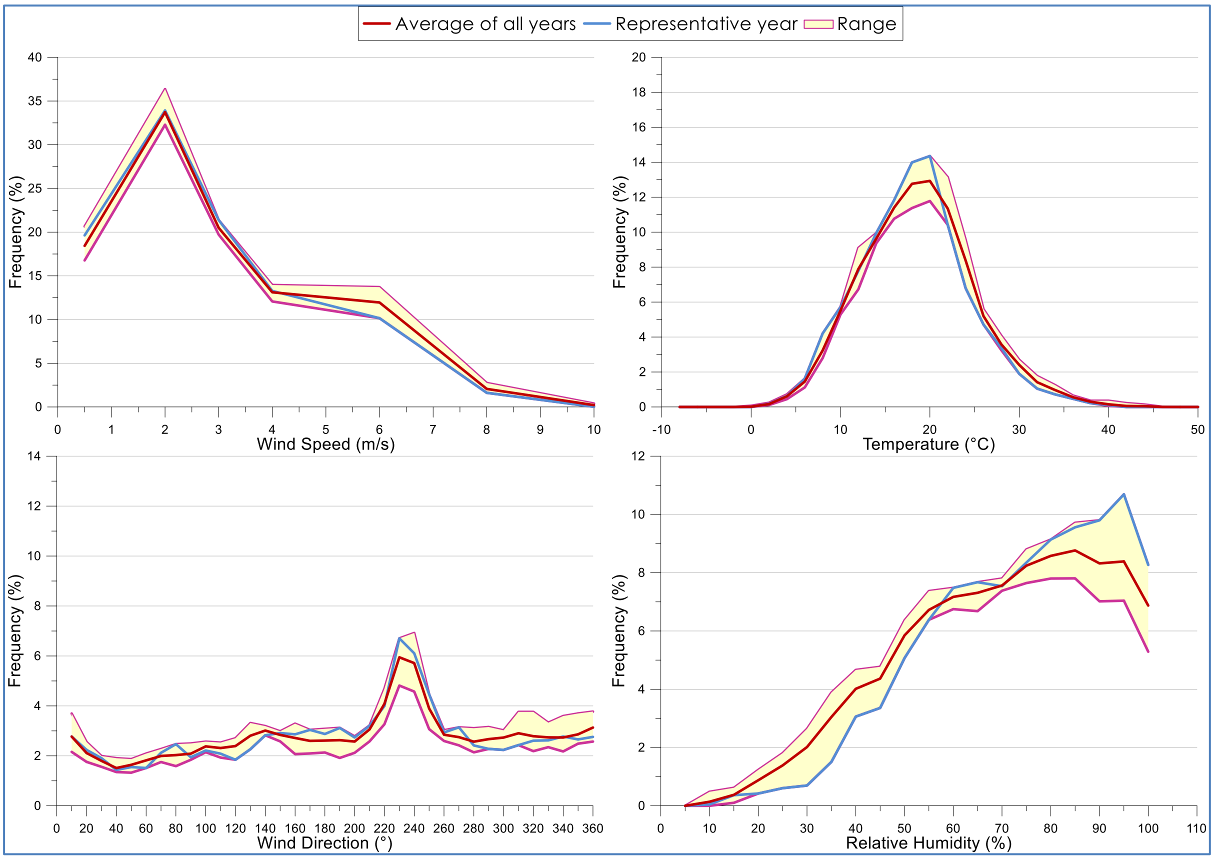

Figure A-1: Frequency distributions for wind speed, wind direction, temperature and relative humidity

Appendix B

Emission Calculations

Emission Calculation

The dust emissions from the Project have been estimated from the operational description of the proposed activities provided by the Proponent and have been combined with emissions factor equations and utilising suitable emission and load factors which 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 United States (US) EPA AP42 Emission Factors (**US EPA, 1985 and Updates**).

The emission factor equations used for each dust generating activity are outlined in **Table B-1** below. A detailed dust emission inventory for the modelled scenario is presented in **Table B-2**.

Table B-1: Emission factor equations

Activity	Emission factor equation		
	TSP	PM_{10}	$PM_{2.5}$
Loading / emplacing material	$EF = 0.74 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M}{2}^{1.4}\right) kg/tonne$	$EF = 0.35 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M}{2}^{1.4}\right) kg/tonne$	$EF = 0.053 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M}{2}^{1.4}\right) kg/tonne$
Hauling on sealed surfaces	$EF = 3.23 \times s.L.^{0.91} \times (1.1023 \times W)^{1.02} kg/VKT$	$EF = 0.62 \times s.L.^{0.91} \times (1.1023 \times W)^{1.02} kg/VKT$	$EF = 0.15 \times s.L.^{0.91} \times (1.1023 \times W)^{1.02} kg/VKT$
Shredding material	$EF = 0.0027\ kg/tonne$	$EF = 0.0012\ kg/tonne$	$EF = 0.0002\ kg/tonne$
Granulating material	$EF = 0.0125\ kg/tonne$	$EF = 0.0043\ kg/tonne$	$EF = 0.0003\ kg/tonne$

EF = emission factor, U = wind speed (m/s), s.L. = silt loading (g/m^2), W = average weight of vehicle (tonne), VKT = vehicle kilometres travelled (km)

Table B-2: Dust Emissions Inventory

Activity	TSP emission	PM10 emission	PM25 emission	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Var. 1	Units	Var. 2	Units	Var. 3 (TSP/ PM10/ PM25)	Units	Var. 4	Units	Var. 5	Units
Delivering material to site	98	19	5	29,000	t/yr	0.0034	0.00065	0.000158	kg/t	9	t/load	0.4	km	0.07 / 0.01 / 0.003	kg/VKT	2	S.L g/m^2	9	Ave GMV (t)
Unloading material in building	22	10	2	29,000	t/yr	0.00076	0.00036	0.00005	kg/t	0.644	ave. $(WS/2.2)^{1.3}$	2	M.C. %						
Rehandle material at stockpile	22	10	2	29,000	t/yr	0.00076	0.00036	0.00005	kg/t	0.644	ave. $(WS/2.2)^{1.3}$	2	M.C. %						
Loading material to shredder	22	10	2	29,000	t/yr	0.00076	0.00036	0.00005	kg/t	0.644	ave. $(WS/2.2)^{1.3}$	2	M.C. %						
Shredding material	78	35	6	29,000	t/yr	0.0027	0.0012	0.0002	kg/t										
Granulating material	363	125	8	29,000	t/yr	0.0125	0.0043	0.0003	kg/t										
Granulating material	363	125	8	29,000	t/yr	0.0125	0.0043	0.0003	kg/t										
Unloading processed material to stockpile	22	10	2	29,000	t/yr	0.00076	0.00036	0.00005	kg/t	0.644	ave. $(WS/2.2)^{1.3}$	2	M.C. %						
Rehandle material at stockpile	22	10	2	29,000	t/yr	0.00076	0.00036	0.00005	kg/t	0.644	ave. $(WS/2.2)^{1.3}$	2	M.C. %						
Loading processed material to truck	22	10	2	29,000	t/yr	0.00076	0.00036	0.00005	kg/t	0.644	ave. $(WS/2.2)^{1.3}$	2	M.C. %						
Hauling processed material offsite	99	19	5	29,000	t/yr	0.0034	0.00066	0.000159	kg/t	14	t/load	0.4	km	0.11 / 0.02 / 0.01	kg/VKT	2	S.L g/m^2	15	Ave GMV (t)
Exhaust emissions	98	98	95																
Total emissions (kg/yr.)	**1,232**	**483**	**137**																

Appendix C

Isopleth Diagrams

Figure C-1: Predicted incremental maximum 24-hour average $PM_{2.5}$ concentrations (µg/m³)

Figure C-2: Predicted incremental annual average $PM_{2.5}$ concentrations (µg/m³)

Figure C-3: Predicted incremental maximum 24-hour average PM_{10} concentrations (µg/m³)

Figure C-4: Predicted incremental annual average PM_{10} concentrations (µg/m³)

Figure C-5: Predicted incremental annual average TSP concentrations (µg/m³)

Figure C-6: Predicted incremental annual average dust deposition levels (g/m²/month)

Figure C-8: Predicted cumulative annual average $PM_{2.5}$ concentrations (µg/m³)

Figure C-10: Predicted cumulative annual average PM_{10} concentrations (µg/m³)

Figure C-11: Predicted cumulative annual average TSP concentrations (µg/m³)

Figure C-12: Predicted cumulative annual average dust deposition levels (g/m²/month)

Appendix D

Further detail regarding 24-hour PM_{10} analysis

Further detail regarding 24-hour average PM_{10} analysis

The analysis below provides a cumulative 24-hour PM_{10} impact assessment in accordance with the NSW EPA Approved Methods; refer to the worked example on Page 46 to 47 of the Approved Methods.

The background level is the ambient level at the St Marys monitoring station.

The predicted increment is the predicted level to occur at the receptor due to the Project.

The total is the sum of the background level and the predicted level. The totals may have minor discrepancies due to rounding.

Table D-1 to **Table D-3** assess receptors R1, R2, and R3.

The left half of the table examines the cumulative impact during the periods of highest background levels and the right half of the table examines the cumulative impact during the periods of highest contribution from the project.

The green shading represents days ranked per the highest background level but below the criteria.

The blue shading represents days ranked per the highest predicted increment level but below the criteria.

The orange shading represents days where the measured background level is already over the criteria.

Any value above the PM_{10} criterion of 50µg/m³ is shown in **bold red.**

Table D-1: Cumulative 24-hour average PM_{10} concentration (µg/m³) – Receptor R1

Ranked by Highest to Lowest Background Concentrations				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
6/05/2015	**53.0**	0.0	**53.0**				
27/11/2015	48.3	0.3	48.6	27/01/2015	6.1	2.8	8.9
26/11/2015	41.7	0.8	42.5	19/01/2015	20.1	2.6	22.7
17/10/2015	35.4	1.7	37.1	14/11/2015	10.3	2.4	12.7
12/12/2015	34.6	0.6	35.2	15/11/2015	12.0	2.4	14.4
21/08/2015	34.0	0.3	34.3	7/10/2015	33.6	2.2	35.8
7/10/2015	33.6	2.2	35.8	3/11/2015	0.0	2.2	2.2
9/02/2015	32.7	1.4	34.1	4/04/2015	6.5	2.1	8.6
9/03/2015	32.1	1.1	33.2	24/02/2015	17.1	2.1	19.2
13/12/2015	30.6	0.1	30.7	13/10/2015	12.7	2.1	14.8
17/12/2015	30.3	0.3	30.6	11/01/2015	6.2	2.1	8.3

Table D-2: Cumulative 24-hour average PM_{10} concentration (µg/m³) – Receptor R2

Ranked by Highest to Lowest Background Concentrations				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
6/05/2015	53.0	0.1	53.1				
27/11/2015	48.3	1.0	49.3	3/04/2015	17.0	3.5	20.5
26/11/2015	41.7	0.2	41.9	3/05/2015	8.3	3.1	11.4
17/10/2015	35.4	0.5	35.9	1/05/2015	7.9	2.7	10.6
12/12/2015	34.6	0.5	35.1	2/02/2015	14.1	2.7	16.8
21/08/2015	34.0	0.5	34.5	26/01/2015	18.2	2.5	20.7
7/10/2015	33.6	1.4	35.0	2/05/2015	9.7	2.4	12.1
9/02/2015	32.7	0.9	33.6	28/01/2015	6.3	2.4	8.7
9/03/2015	32.1	0.7	32.8	16/05/2015	11.1	2.3	13.4
13/12/2015	30.6	0.2	30.8	10/06/2015	15.2	2.3	17.5
17/12/2015	30.3	0.2	30.5	22/03/2015	12.4	2.3	14.7

Table D-3: Cumulative 24-hour average PM_{10} concentration (µg/m³) – Receptor R3

Ranked by Highest to Lowest Background Concentrations				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
6/05/2015	53.0	0.9	53.9				
27/11/2015	48.3	0.0	48.3	27/07/2015	9.0	1.1	10.1
26/11/2015	41.7	0.0	41.7	13/08/2015	7.9	1.1	9.0
17/10/2015	35.4	0.2	35.6	17/07/2015	4.9	1.0	5.9
12/12/2015	34.6	0.1	34.7	25/08/2015	2.3	1.0	3.3
21/08/2015	34.0	0.2	34.2	13/05/2015	8.2	0.9	9.1
7/10/2015	33.6	0.0	33.6	6/05/2015	53.0	0.9	53.9
9/02/2015	32.7	0.0	32.7	3/06/2015	9.1	0.8	9.9
9/03/2015	32.1	0.2	32.3	18/06/2015	6.9	0.8	7.7
13/12/2015	30.6	0.0	30.6	29/08/2015	6.1	0.8	6.9
17/12/2015	30.3	0.0	30.3	6/07/2015	14.5	0.8	15.3