

**AIR QUALITY IMPACT ASSESSMENT
PREPARED FOR
COBRA WASTE SOLUTIONS PTY LTD
30 LOFTUS ROAD, YENNORA NSW 2161**

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Benbow
ENVIRONMENTAL

Engineering a Sustainable Future for Our Environment

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EXECUTIVE SUMMARY

Benbow Environmental has been engaged by Cobra Waste Solutions Pty Ltd to undertake an Air Quality Impact Assessment (AQIA) for the proposed resource recovery facility at 30 Loftus Road, Yennora NSW 2161. The facility will accept up to 150,000 tonnes per year of construction and demolition (C&D) and commercial and industrial (C&I) waste.

The assessment determines the predicted dust and particulate matter contribution from the proposed site operations. The assessment does not include an assessment of odour impacts, as no odour is expected to be generated from the proposed development.

This AQIA has been prepared in accordance with the NSW EPA *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (2016) (Approved Methods).

The proposed development will include the following dust generating activities:

- Unloading and loading of C&D waste materials;
- Processing of C&D waste including: shredding, screening, crushing, conveying, handling via front end loader and/or excavator; and
- Material storage in enclosed waste storage bays.

The following control measures will be implemented to reduce dust impacts:

- Dust emitting activities limited to inside the building;
- Automatic closing roller shutter doors;
- Roller shutter doors closed during evening and night activities; and
- Dust suppression water sprays used within building.

This AQIA uses existing air quality data to establish the background levels of dust and particulates. This background data is then combined with the predicted levels resulting from the site operations of the resource recovery facility to assess the cumulative air quality impacts.

Air quality impacts were determined using the AERMOD dispersion model.

The maximum impacts for annual TSP and PM₁₀ emissions at all sensitive receptors are predicted to comply with the *Approved Methods* for the criteria annual averaging period.

The maximum predicted impacts for PM₁₀ and PM_{2.5} for the 24-hour period and PM_{2.5} for the annual period are predicted to exceed the *Approved Methods* for the criteria due to elevated background concentrations.

In cases of elevated background concentrations, the NSW EPA requires a demonstration that no additional exceedances of the impact assessment criteria will occur as a result of the proposed site activities. Contemporaneous addition of the predicted daily increments of PM₁₀ and PM_{2.5} with daily measured background levels for 2017 showed no additional days of exceedance.

It is considered that the predicted impacts are negligible and unlikely to cause harm to human health or the environment. No further controls are recommended at this stage.

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1. INTRODUCTION

Benbow Environmental has been engaged by Cobra Waste Solutions Pty Ltd to undertake an Air Quality Impact Assessment (AQIA) for the proposed resource recovery facility at 30 Loftus Road, Yennora NSW 2161. The facility will accept up to 150,000 tonnes per year of construction and demolition (C&D) and commercial and industrial (C&I) waste.

The assessment determines the predicted dust and particulate matter contribution from the proposed site operations. The assessment does not include an assessment of odour impacts, as no odour is expected to be generated from the proposed development.

This AQIA has been prepared in accordance with the NSW EPA *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2016)* (Approved Methods).

This AQIA uses existing air quality data to establish the background levels of dust and particulates. This background data is then combined with the predicted levels resulting from the current and proposed operations of the C&D facility to assess the cumulative air quality impacts.

2. PROPOSED DEVELOPMENT

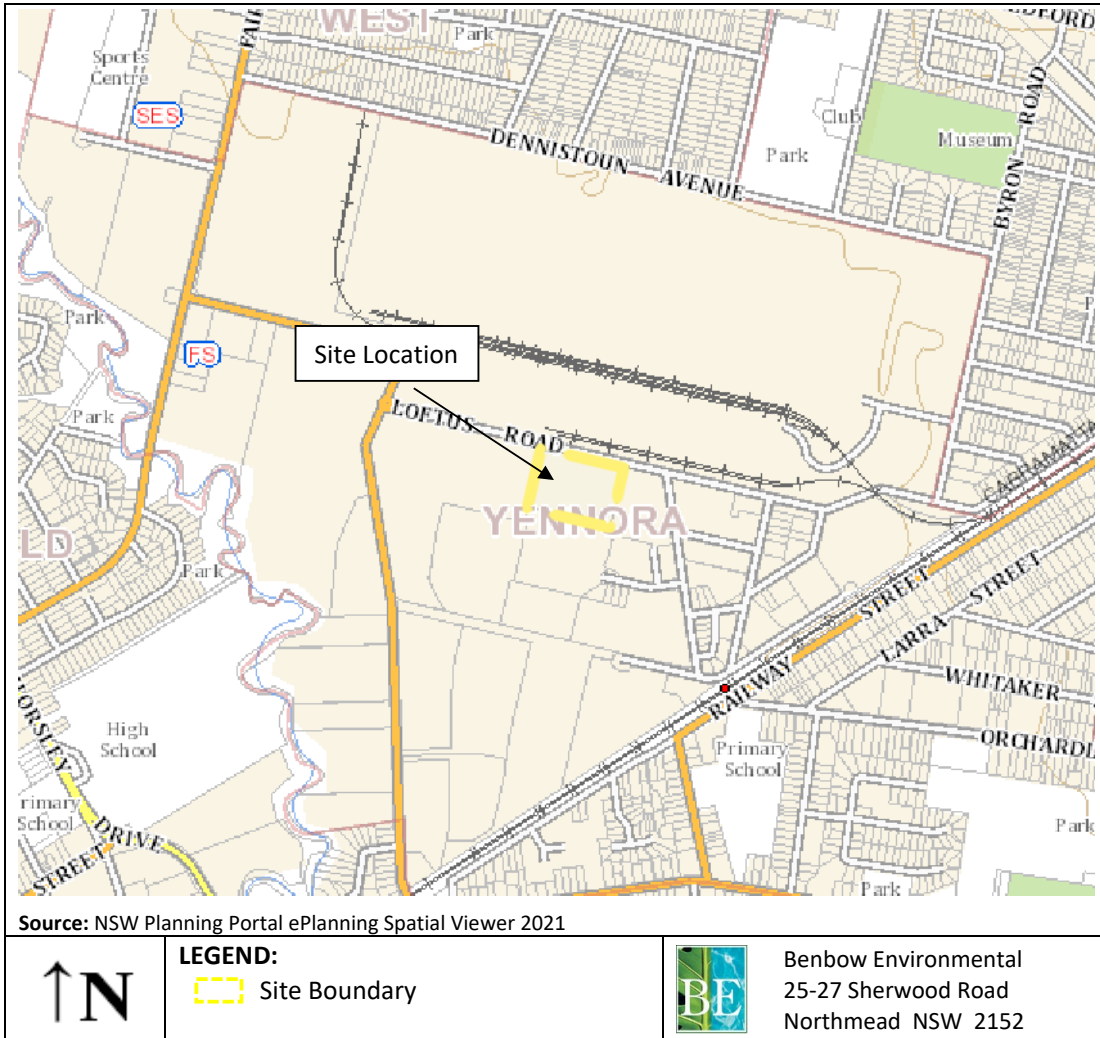
2.1 SITE LOCATION

The proposed development is to be located at 30 Loftus Road, Yennora NSW 2161 (legally described as Lot 8 DP 1233715). The location of the subject site as an aerial view is shown in Figure 2-1 and its location in a local context is shown in Figure 2-2.

Figure 2-1: Site Location (Aerial View)



Figure 2-2: Site Location (Local Context)

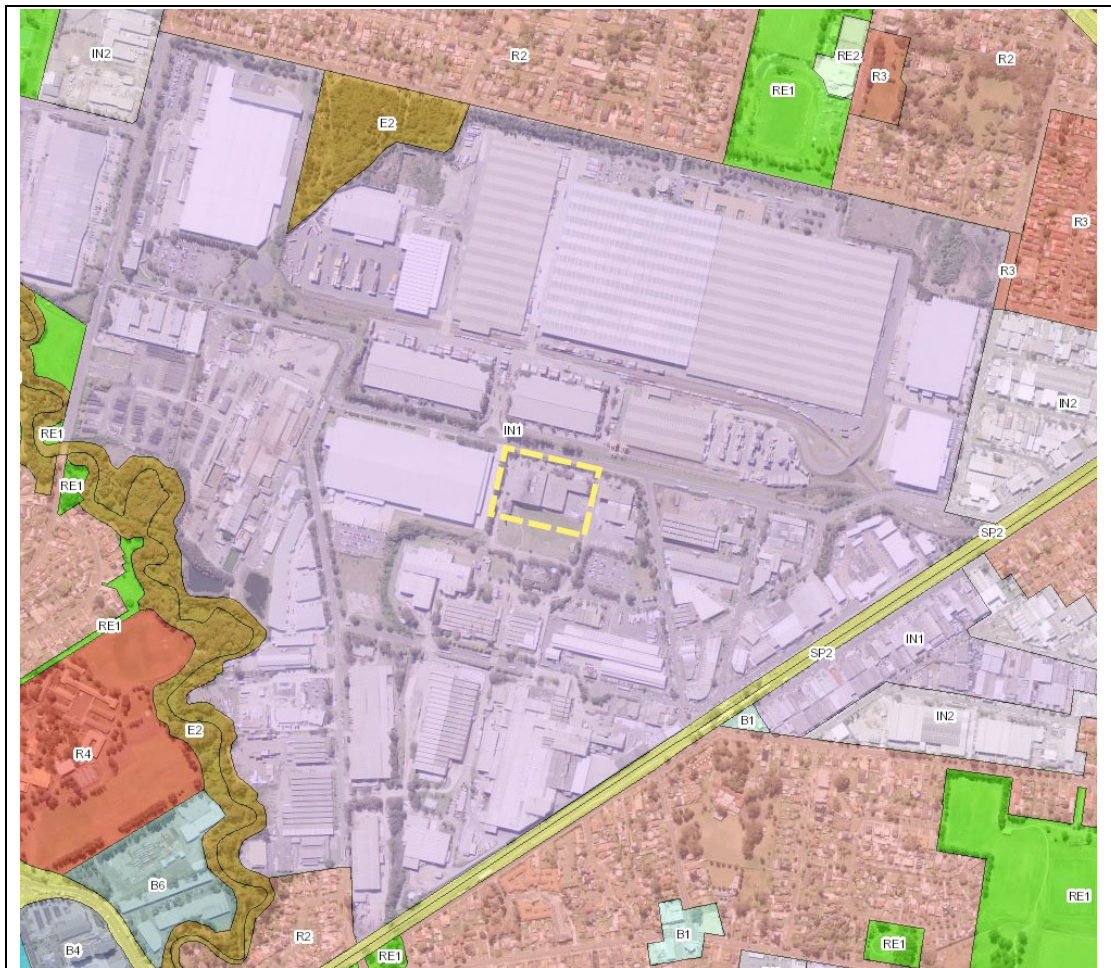


2.2 LAND USE

The site is situated in IN1 – General Industrial land use zoning under the Holroyd Local Environmental Plan 2013 as shown in the land zoning map in in Figure 2-3. The site is surrounded on all sides by IN1 – General Industrial zoned land.

Beyond the immediate surrounds a is SP2 – Special Infrastructure zoned land (South Western Motorway) further south, areas of R2 – Low Density Residential and RE1 — Public Recreation zoning to the south-west, west, north and east. Approximately 610 m west of the site is Prospect Creek, E2 – Environmental Conservation zoned land.

Figure 2-3: Land Zoning Map



Source: NSW Planning Portal ePlanning Spatial Viewer 2021

 Not to scale	LEGEND:		Benbow Environmental 25-27 Sherwood Street, Northmead NSW 2152
	<ul style="list-style-type: none"> Site Boundary B1 Neighbourhood Centre B2 Local Centre B4 Mixed Use B5 Business Development B6 Enterprise Corridor B7 Business Park E2 Environmental Conservation E3 Environmental Management E4 Environmental Living IN1 General Industrial IN2 Light Industrial 	<ul style="list-style-type: none"> R1 General Residential R2 Low Density Residential R3 Medium Density Residential R4 High Density Residential RE1 Public Recreation RE2 Private Recreation RU6 Transition SP2 Infrastructure 	



2.3 HOURS OF OPERATIONS

The proposed facility is requesting approval to operate 24 hours per day, 365 days per year. Two eight (8) hour shifts – day and afternoon shifts would operate on Monday to Saturdays with the remaining hours and Sundays being for general maintenance. Vehicle deliveries will be restricted to 6am-6pm. This will allow for roller shutter doors to remain closed during evening and night.

A typical daily schedule of activities and their hours of operation is provided below.

Table 2-1: Proposed Hours of Operation

Activity	Day	Time
Waste Processing	Monday to Saturday	7:00am to 11:00pm
	Sundays & Public Holidays	Nil
Cleaning and Maintenance (as required)*	Monday to Sunday	24 hours
	Public Holidays	Nil
Incoming and outgoing truck loads	Monday to Saturday	6:00am to 6:00pm
	Sundays & Public Holidays	Nil

*Staff to work as required – maintenance staff from day or afternoon shift as overtime).

2.4 PROPOSED DEVELOPMENT DESCRIPTION

The proposed development is for the establishment and operation of a resource recovery facility that would accept, process and store construction and demolition (C&D) and commercial and industrial (C&I) waste. All resource recovery activities and storage of waste would be undertaken within an existing building.

A technologically advanced resource recovery system has been developed specifically for this facility with components to be pre-fabricated off site for installation. A designated pre-sorting and materials inspection area would be located at the start point of the system. The system would consist of a feeder (feed hopper), a waste screen, a series of waste/flip flow screens (3) for sorting heavy and light material, conveyors, air separators, an enclosed picking station and three (3) magnets to enable efficient recovery and separation of material. Separated material would be captured in bays or bins at various points on the line and then transferred to storage bunkers within the building. A small crusher would be located at the end of the system for crushing of any larger materials.

Storage bunkers for waste would be established inside the building and would be constructed of structural steel walls. There would be storage bunkers and bins located along the processing line to capture recovered material at various points. These storage bunkers and bins are expected to store a maximum of 2,600 m³ of waste wholly within the building at any one time. The layout of the system would facilitate a regular turnover of waste through the system therefore requiring limited storage space.



The site contains existing infrastructure that would be utilised for the proposed development. This includes extensive fire protection equipment and a sprinkler system that has recently been installed within the building by the owner of the property under a separate modification application. On-site car parking would be established in the rear hardstand area with consideration given to ease of on-site vehicle movements. Two weighbridges would also be installed on the eastern driveway of the site.

The following process steps would be undertaken:

1. All trucks arriving at the site would enter via the existing driveway access on Loftus Road and be directed over the weighbridge along the western driveway. This would be the first inspection point where the contents of the truck would be inspected and paperwork regarding the waste load would be reviewed. Trucks with conforming loads would be weighed on the weighbridge then directed inside the building. Non-conforming loads would be turned away. Records of all truck loads entering the facility would be maintained at the weighbridge.
2. Loads of waste material would be unloaded in the pre-sort inspection area inside the building for initial separation. This would be the second inspection point in the process. Any non-conforming material would be reloaded onto the truck and removed in accordance with a waste inspection procedure. Conforming loads would be moved to the feedstock area for processing or to the C&I bunker for storage depending on the shift. At this point, large items can be manually removed and stored in the appropriate storage bunker. A quarantine area (reject bunker) on site would be established to deal with non-conforming wastes that inadvertently are not picked up at the inspection points.
3. A front end loader would transfer the pre-sorted material to the feedstock area and load it into the infeed hopper/shredder at the start of the process.
4. The material would be fed into the system and conveyed to long items separator for removal of any over-size material. Long items fall into the bunker and be manually sorted into appropriate storage bunkers.
5. A magnet would remove ferrous material which would fall into a separate storage bin and the remaining material would be sent through a waste screen).
6. At this point lighter material (Under -70) is directed down a separate line where an electrical magnet would remove ferrous material which would fall into a storage bin.
7. This lighter material line would pass through a flip flow screen where (-10mm soil) would fall into a bunker. The remaining material would sent through an NIHOT DDS air separator where light material would be removed then two further flip flow screens for separation of under -22mm material and for separation of under -32mm material that would fall into separate bunkers.
8. The overs (32+ mm) material would be put through a crusher. Crushed aggregates would be stored in a bunker.



9. The heavier material waste stream would be conveyed from the waste screen to an ABP air separator where light material would be removed and fall into a bunker. The heavier material would then pass through an enclosed manual picking station where it is separated into paper/cardboard, wood, plastic and other recyclable material. This material would be stored in bins below the picking station.

10. Recovered waste would be transferred to designated storage bunkers within the building as required then loaded into trucks for transport to various facilities for reuse or further processing. General non-recyclable waste would be transferred to a designated storage bunker for removal to landfill.

2.5 NEAREST SENSITIVE RECEIVERS

Residential areas are located approximately 670 m to the west in the suburb of Fairfield, 500 m to the south east along Railway Street, Yennora and 600 m north along Dennistoun Avenue in Guildford West.

Yennora Primary School is over 500 metres to the south east. Fairfield High School is over 700 m south west and Fairfield Public School further south west.

The closest industrial receivers are XL Group (east), DB Schenker (west) and Cope Sensitive Freight Warehouse (north) of the site.

The nearest receivers are described in Table 2-2 and shown in Figure 2-4.

Table 2-2: Nearest Sensitive Receivers

Receiver ID	Street Address	Lot & DP	Distance from Site (m)	Direction from Site	Type of Receiver
R1	2A Ellis Parade, Yennora	1 DP 553522	520	SE	Residential
R2	45 Railway Street, Yennora	3 DP 574732	775	E	Residential
R3	66 Byron Road, Guildford	2 DP 975284	875	NE	Residential
R4	58 Tamplin Road, Guildford	7 DP 31391	775	NNE	Residential
R5	45 Dennistoun Avenue, Guildford West	118 DP 10981	76	NNW	Residential
R6	89 Dennistoun Avenue, Guildford West	50 DP 39199	940	NW	Residential
R7	28 Ace Avenue, Fairfield	30 DP 539236	850	WSW	Residential
R8	17 Pine Road, Fairfield	39 DP 13605	800	SW	Residential
R9	104 Railway Street, Yennora	5 DP 812983	630	S	Residential
R10	1-9 Orchardleigh Street, Yennora	1 DP 447926	505	SW	School
R11	16 Junction Street, Old Guildford	1 DP 509537	1,005	E	Childcare Centre
R12	405 The Horsley Drive, Fairfield	1 DP 1063605	750	WSW	School
R13	198 Fairfield Rd, Yennora NSW 2161 (Fairfield Road Park)	23 DP 610787	880	E	Active Recreation
R14	30 A Loftus Road, Yennora	9 DP 1233715	Adjacent	E	Industrial



Table 2-2: Nearest Sensitive Receivers

Receiver ID	Street Address	Lot & DP	Distance from Site (m)	Direction from Site	Type of Receiver
R15	38 Pine Road, Yennora	200 DP 105758	Adjacent	W	Industrial
R16	14-54 Dennistoun Avenue, Yennora	21 DP 1171076	Adjacent	N	Industrial
R17	7 Kiora Crescent Yennora	7 DP1233715	Adjacent	S	Industrial

Figure 2-4: Nearest Sensitive Receivers





3. AIR QUALITY CRITERIA AND GUIDELINES

3.1 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) applies the following definitions relating to air pollution:

“Air pollution” means the emission into the air of any air impurity.

While “air impurity” includes smoke, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, mists odours, and radioactive substances’

The following sections of this Act have most relevance to the site:

- Section 124 Operation of Plant - other than domestic plant

The occupier of any premises who operates any plant in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier’s failure:

(a) to maintain the plant in an efficient condition, or

(b) to operate the plant in a proper and efficient manner.

- Section 126 Dealing with Materials

(1) The occupier of any premises who deals with materials in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupiers failure to deal with those materials in a proper and efficient manner.

(2) In this section:

***deal** with materials means process, handle, move, store or dispose of the materials.*

***Materials** includes raw materials, materials in the process of manufacture, manufactured materials, by-products or waste materials.*

- Section 128 Standards of air impurities not to be exceeded

(1) The occupier of any premises must not carry on any activity, or operate any plant, in or on the premises in such a manner as to cause or permit the emission at any point specified in or determined in accordance with the regulations of air impurities in excess of:

(a) The standard of concentration and the rate, or

(b) The standard of concentration or the rate.



Prescribed by the regulations in respect of any such activity or any such plant.

(2) Where neither such a standard nor rate has been so prescribed, the occupier of any premises must carry on any activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

- Section 129 Standards of air impurities not to be exceeded

(1) The occupier of any premises at which scheduled activities are carried on under the authority conferred by a licence must not cause or permit the emission of any offensive odour from the premises to which the licence applies.

(2) It is a defence in proceedings against a person for an offence against this section if the person establishes that:

(a) The emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of the licence directed at minimising the odour, or

(b) The only persons affected by the odour were persons engaged in the management or operation of the premises.

(3) A person who contravenes this section is guilty of an offence.

The proposed development is required to comply with this Act.

3.2 PROTECTION OF ENVIRONMENT OPERATIONS (CLEAN AIR) REGULATION 2010

In accordance with Part 5 of the *Protection of the Environment Operations (Clean Air) Regulation 2010* (herein referred to as the Clean Air Regulation), the proposed waste recycling facility would belong to Group 6 (Standards for scheduled premises) as the activity is to be “*commenced to be carried on, or to operate, on or after 1 September 2005 as a result of an environment protection licence granted under the Protection of the Environment Operations Act 1997 pursuant to an application made on or after 1 September 2005*”.

Schedule 4 of the Clean Air Regulation provides standards of concentration for scheduled premises general activities and plant, any crushing, grinding, separating or materials handling activity:

Solid Particles (total) = 20 mg/m³

The facility would be required to meet the above standard of concentration.

3.3 ADOPTED ASSESSMENT CRITERIA

The Australian Government *National Environment Protection (Ambient Air Quality) Measure (2016)* (NEPM) and the NSW EPA *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2016)* (Approved Methods) provide guidance on methodology and thresholds that are to be used for the air impact assessment of a proposed development. This air impact assessment has been conducted in accordance with this guideline.

Relevant assessable pollutant criteria for the NEPM and the Approved Methods are displayed in Table 3-1 and Table 3-2 respectively. These criteria are applied at the nearest existing or likely future off-site sensitive receiver.

3.3.1 National Environment Protection (Ambient Air Quality) Measure

Table 3-1: NEPM Criteria for Relevant Assessable Pollutants

Pollutant	Averaging Period	Maximum Concentration Standard ($\mu\text{g}/\text{m}^3$)	Maximum Allowable Exceedances
Particles as $\text{PM}_{2.5}$	1 day	25	None
	1 year	8	None
Particles as PM_{10}	1 day	50	None
	1 year	25	None

3.3.2 Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales

Table 3-2: Approved Methods Criteria for Relevant Assessable Pollutants

Pollutant	Averaging Period	Concentration	
		<i>pphm</i>	$\mu\text{g}/\text{m}^3$
$\text{PM}_{2.5}$	24 hours	-	25
	Annual	-	8
PM_{10}	24 hours	-	50
	Annual	-	25
Total Suspended Particulates (TSP)	Annual	-	90

4. METEOROLOGY AND LOCAL AIR QUALITY

4.1.1 Representative Meteorological Year

The nearest weather monitoring station within proximity to the subject site is the Bankstown Airport AWS (Automatic Weather Station) operated by the Bureau of Meteorology (BoM). This monitoring station is located approximately 6.4 km south-southeast of the site and is considered suitable for reference to general climate conditions in the local area.

Available long term meteorological trends from Bankstown Airport AWS were compared to annual data for each of the five most recent years (2016-2020). Comparative weather and climate parameters included:

- Mean maximum temperature (°C);
- Mean minimum temperature (°C);
- Mean rainfall (mm);
- Mean daily wind run (km); and
- Mean daily solar exposure (MJ/m²).

The year 2017 was selected as the most representative year after review and analysis of the above weather and climate parameters (comparison data is available on request). A 2017 no-obs prognostic meteorological data file was created by Lakes Environmental using the WRF model as discussed in the following section.

4.1.2 WRF and AERMET

The Weather Research and Forecasting (WRF) Model is a next-generation mesoscale numerical weather prediction system designed as a collaborative effort between the American National Centre for Atmospheric Research and other meteorological specialist organisations. It was created for both atmospheric research and operational forecasting applications and serves a wide range of meteorological applications across scales from tens of meters to thousands of kilometres.

AERMET is a meteorological pre-processor that organises data and estimates the necessary boundary layer parameters for dispersion calculations in AERMOD.

A 2017 prognostic meteorological data file was produced for inclusion in the air dispersion model using AERMET ver. 19191. The WRF prognostic data was entered into AERMET as onsite and upper air data.

4.2 WIND ROSE PLOTS

Wind rose plots show the direction from which the wind is coming with triangles known as “petals”. The petals of the plots summarise wind direction data into 8 compass directions ie. north, north-east, east, south-east, etc.



The length of the triangles, or “petals”, indicates the frequency that the wind blows from the direction presented. Longer petals for a given direction indicate a higher frequency of wind from that direction. Each petal is divided into segments, with each segment representing one of the six wind speed classes. Thus, the segments of a petal show what proportion of wind for a given direction falls into each class.

The proportion of time for which wind speed is equal to or less than 0.5 m/s, when speed is negligible, is referred to as calm hours or “calms”. Calms are not shown on a wind rose as they have no direction, but they are noted under each wind rose as a temporal percentage.

The concentric circles in each wind rose are the axes that denote wind frequencies. In comparing the plots it should be noted that the axis varies between wind roses, although all wind roses are the same size. The frequencies shown in the first quadrant (top-left quarter) of each wind rose are stated beneath the wind rose.

4.2.1 Local Wind Trends

Seasonal wind rose plots for this site using Bankstown Airport AWS data from 2017 have been included in Figure 4-1. Annual average wind speeds of 3.14 m/s and a calms frequency of 14.13% were estimated.

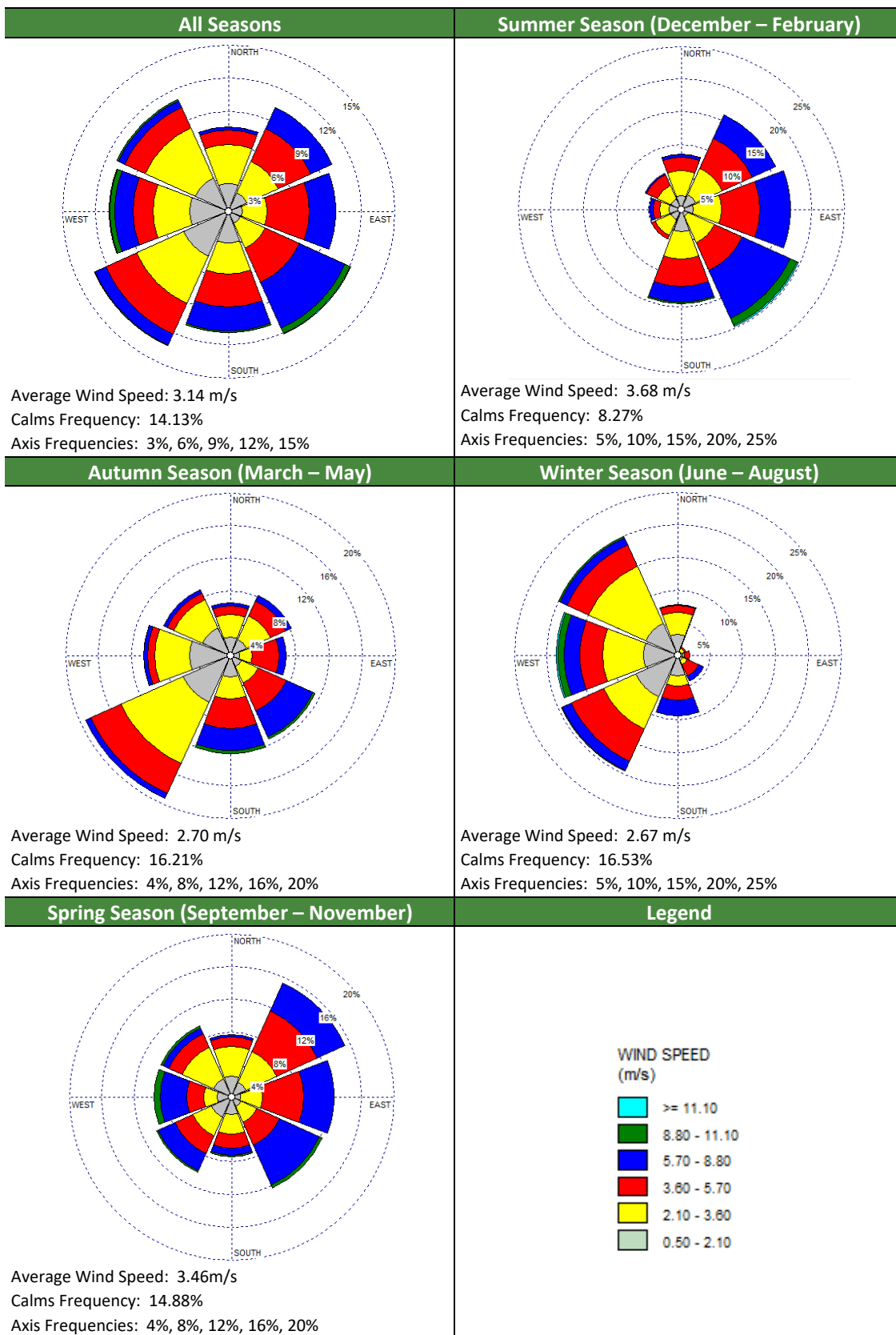
The average summer wind speed was estimated to be the highest of the seasons at 3.68 m/s, with the lowest calms frequency of 8.27%. South-easterly winds were found to be dominant followed by those from the east and north-east at a frequency of 20%, 17% and 16% respectively.

In autumn, dominant winds blew from the south-west (~19%). The average autumn wind speed was 2.70 m/s with a calms frequency of 16.21%.

The winter season data showed the prevalence of winds from the north-western, southwestern and western directions at frequencies of 18-20%. The average winter wind speed was the lowest of all the seasons at 2.67 m/s with the highest calms frequency of 16.53%.

In the spring time, average wind speeds of 3.46 m/s were recorded. Dominant winds were from the east (13%) and south-east (12%). The spring calms frequency was 14.88%.

Figure 4-1: Wind Rose Plots for the Referenced Meteorological Station – Bankstown Airport AWS (BoM, 2017)



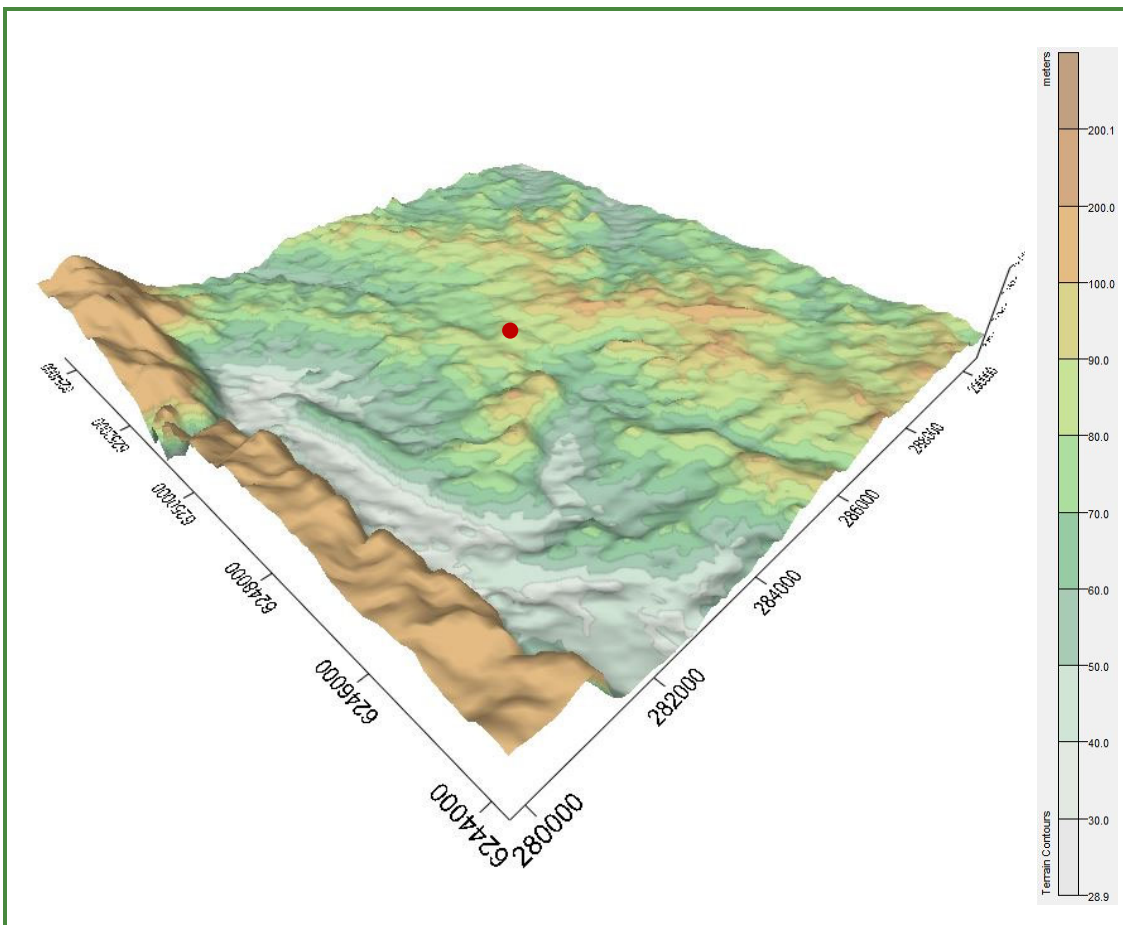
4.3 TERRAIN AND STRUCTURAL EFFECTS ON DISPERSION

The meteorological condition known as katabatic flow (or katabatic drift) is often identified as the condition under which maximum environmental impacts from primarily ground-based sources are likely to occur. Katabatic flow is simply the movement of cold air down a slope, generally under stable atmospheric conditions. Under such circumstances, dispersion of airborne pollutants is generally slow and the associated impacts can reach their peak.

Katabatic flow is unlikely to affect emissions from the site's activities as the site is at a low elevation and is relatively flat in an industrial area.

Figure 4-2 shows the terrain with the z-axis (i.e. vertical axis) exaggerated by a factor of 10 (i.e. a given distance on the x-axis or y-axis appears three times as great on the z-axis) in order to provide a clearer description of the topography. A coloured scale bar shows elevations corresponding to the colours used in the figures. It should be noted that these figures are an approximation of the actual terrain, based on terrain information from NASA SRTM 1-arc second digital elevation models.

Figure 4-2: Local Topography of Site with a Factor of 10 Vertical Exaggeration



4.4 LOCAL AIR QUALITY

No air quality measurements have been undertaken specifically for this project. The nearest available air quality monitoring data was used to gain an understanding of what current pollutant levels may be around the site, and provide background air quality parameters for the assessment.

Ambient air quality data for PM_{2.5} and PM₁₀ was obtained from the NSW EPA Chullora air quality monitoring station, located approximately 8 km south-east of the subject site. This station is the nearest to the site and considered indicative of the local air quality on site.

Due to numerous exceedances to the *Approved Methods* 24-hour criteria for both PM_{2.5} and PM₁₀, the highest maximum 24-hour averages per pollutant are displayed until results are below the *Approved Methods* criteria. Relevant pollutant data is summarised in Table 4-1.

Table 4-1: Summary of 2017 Data for PM_{2.5} and PM₁₀ from Chullora Air Quality Monitoring Station

Pollutant	Averaging Period	Date	Concentration (µg/m ³)
PM _{2.5}	Maximum 24 hr average	08/03/2017	44.7
	2 nd highest 24 hr average	14/08/2017	39.0
	3 rd highest 24 hr average	02/09/2017	35.7
	4 th highest 24 hr average	09/03/2017	33.3
	5 th highest 24 hr average	27/08/2017	32.6
	6 th highest 24 hr average	12/03/2017	27.9
	7 th highest 24 hr average	12/09/2017	27.5
	8 th highest 24 hr average	07/03/2017	25.8
	9 th highest 24 hr average	15/08/2017	24.7
	Annual average	2017	9.5
PM ₁₀	Maximum 24 hr average	12/10/2017	63.0
	2 nd highest 24 hr average	08/03/2017	54.6
	3 rd highest 24 hr average	14/08/2017	51.9
	4 th highest 24 hr average	24/09/2017	51.3
	5 th highest 24 hr average	09/03/2017	47.9
	Annual average	2017	20.1

Note: Bold values exceed the *Approved Methods* criteria

No ambient air quality data for Total Suspended Particulates (TSP) is available from the referenced monitoring station. Therefore, worst-case particle size distribution data from the US EPA *Compilation of Air Pollutant Emissions Factors (AP-42)* (1995) – a PM₁₀-to-TSP ratio of 0.51 – was used to estimate the TSP background concentration level of 39.4 µg/m³ for an annual averaging period.

The data collected from Chullora air quality monitoring station shows elevated background concentrations of both PM_{2.5} and PM₁₀ that are above the *Approved Methods* 24-hour average criterion of 25 µg/m³ for PM_{2.5} and 50 µg/m³ for PM₁₀. Although, the annual average of PM₁₀ was within the criteria of 25 µg/m³, the annual average of PM_{2.5} exceeded the criteria of 8 µg/m³.



In cases of elevated background concentrations, the *Approved Methods* states:

In some locations, existing ambient air pollutant concentrations may exceed the impact assessment criteria from time to time. In such circumstances, a licensee must demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical.

This has been addressed in the modelling results and discussion in Section 6.5.



5. AIR QUALITY IMPACTS

The proposed development will conduct activities that may cause dust impacts at offsite receptors.

These dust generating activities will include the following

- Unloading and loading of C&D waste materials;
- Processing of C&D waste including: shredding, screening, crushing, conveying, handling via front end loader and/or excavator; and
- Material storage in enclosed waste storage bays.

5.1 CONTROL MEASURES

The following control measures will be implemented to reduce dust impacts:

- Dust emitting activities limited to inside the building;
- Automatic closing roller shutter doors;
- Roller shutter doors closed during evening and night activities; and
- Dust suppression water sprays used within building.

6. AIR IMPACT ASSESSMENT & MODELLING

This section assesses the effects of potential emissions on the existing ambient air quality as a direct result of the proposal. The assessment methodology, modelling configurations, results and discussion of the potential impacts as well as any recommendations on mitigation measures are described in detail, as follows.

6.1 EMISSION SOURCES

The main air emissions typical of a resource recovery facility include dust and particulates (PM₁₀, PM_{2.5}, and total suspended particulates (TSP)). There are no odour emissions associated with the facility as none of the materials stored or processed on-site and none of the processes undertaken are odour-generating. Therefore, odour does not warrant any further assessment. This is discussed in section 6.1.1 below.

The main air emission sources associated with the facility are listed below.

- Unloading materials;
- Front end loader and excavator handling of materials;
- Shredding and crushing materials; and
- Screening.

Wheel generated dust has not been considered as a significant source of emissions as all vehicle paths are fully sealed.

The following mitigation measures are to be implemented at the subject site and are considered in the dispersion modelling:

- All dust generating activities including unloading, screening and sorting of materials are conducted within a building; and
- Dust suppression sprinklers will be used in the building.

6.1.1 Odour

Odorous compounds in waste include sulfur-containing compounds, nitrogen-containing compounds as well as aldehydes, carboxylic acids, terpenes, and many others. These compounds are typically produced from degradation and anaerobic breakdown of organic waste.

The EIS outlines in Section 5.4.3, that two waste streams would be accepted at the facility and these include:

1. Commercial and Industrial (C&I) waste; and
2. Construction and Demolition (C&D) waste.

It is expected that waste types accepted at the site would generally include mixed waste, which would be a combination of the following:

- AGG – Aggregate, road base or ballast
- AL – Aluminium (non-ferrous)



ASPH – Asphalt
BC – Bricks or concrete
CER – Ceramics, tiles, pottery
COMM – Comingled recyclables
FE – Ferrous (iron or steel)
NFE – Non-ferrous (metals, not iron steel or aluminium)
PAPER – Paper or cardboard
PB – Plasterboard
PL – Plastic
WOOD – Wood, trees or timber

All in coming waste is classified as general solid waste (non-putrescible) waste (as per *Waste Classification Guidelines* (2014)).

The Waste Classification Guidelines (2014) describe non-putrescible materials as those that “typically do not: readily decay under standard conditions, emit offensive odours, attract vermin or other vectors (such as flies, birds and rodents)”.

The incoming waste types described in the EIS and re-listed above do not include any putrescible materials that are likely to decay under standard condition and are unlikely to emit offensive odour or odours compounds found in other types of waste.

There are no odour emissions sources associated with the facility as none of the materials stored or processed on-site and none of the processes undertaken are odour-generating. Therefore, odour does not warrant any further assessment.

6.2 ADOPTED EMISSION FACTORS

The below emission factors from the NPI EETM for Mining (2012), Mining and Processing of Non-Metallic Minerals (2014) (crushed stone processing data) were utilised in this assessment to represent C&D activities on site.

As the emission factor acquired from the NPI EETM only provides the emission factor for PM₁₀, further calculations were required to estimate the emission factors for Total Suspended Particulates (TSP) and PM_{2.5}. For this purpose, the generalised particle size distribution for mechanically generated aggregate and unprocessed ores from the US EPA *Compilation of Air Pollutant Emissions Factors (AP-42)* (1995) database was used to estimate the proportion of PM₁₀ to TSP and also for PM₁₀ to PM_{2.5}. These ratios were then used to derive the emission factors for PM_{2.5} and TSP (Aggregates).

Table 6-1 displays an excerpt for generalised particle size distribution. Table 6-2: Emission Factors for PM₁₀ from NPI EETM for Mining and Processing of Non-Metallic Minerals (2014) and Mining (2012) displays the adopted emission factors per activity on site.

Table 6-1: US EPA AP-42 Generalised Particle Size Distribution for Mechanically Generated Aggregate, Unprocessed Ores

Particle Size (µm)	Cumulative % ≤ Stated Size (Uncontrolled)	Minimum Value	Maximum Value	Standard Deviation
2.5	15	3	35	7
10.0	51	23	81	14

Table 6-2: Emission Factors for PM₁₀ from NPI EETM for Mining and Processing of Non-Metallic Minerals (2014) and Mining (2012)

Reference (NPI EETM)	Source	PM _{2.5} Emission Factor (kg/tonne)	PM ₁₀ Emission Factor (kg/tonne)	TSP Emission Factor (kg/tonne)
Mining and Processing of Non-Metallic Minerals	Screening	0.00151	0.0043	0.0125
Mining and Processing of Non-Metallic Minerals	Screening (fines)	0.0054	0.036	0.15
Mining and Processing of Non-Metallic Minerals	Trucks Unloading	0.000001	0.000008	¹ 0.00002
Mining (Overburden)	Front End Loader/ Excavator	0.0018	0.012	0.025
Mining	Wind Erosion from Stockpiles	0.03 kg/ha/hr	0.2 kg/ha/hr	0.4 kg/ha/hr
Mining	Conveyors	0.03 kg/ha/hr	0.2 kg/ha/hr	0.4 kg/ha/hr
Mining and Processing of Non-Metallic Minerals	Crushing/Shredding	0.00018	0.0012	0.0027

Note: ¹NPI EETM not available, estimated using US EPA's AP-42 database.

6.2.1 Reduction Factors

Reduction factors for the facility have been based on the *Emission Estimation Technique Manual for Concrete Batching and Concrete Product Manufacturing* (NPI DEH, 1999) which are shown in Table 6-3.

Table 6-3: Reduction Factors for PM₁₀ for Concrete Batching Activities from NPI EETM for Concrete Batching and Concrete Products

Control	Reduction Factor (Materials Handling)	Reduction Factor (Materials Storage)
Default	-	0.3
Wind Breaks	0.7	0.7
Water Sprays	0.5	0.5
Chemical Suppression	0.2	0.2
Enclosure (2-3 walls)	0.1	0.1
Covered Stockpiles	0.0	0.0
Enclosed	0.0	-

Reduction factors shown in Table 6-3 were applied to the NPI EETM emission factors shown below in Table 6-4. These reduction factors were applied to the final building source, aka applied to all sources.

Table 6-4: Emission Reduction Factors Applied to NPI EETM Emission Factors

Processes at Proposed Site	Control in Place	Reduction Factor(s) Applied	Comments
Building Source	Enclosure (2-3 walls), water sprays	0.1, 0.5	All resource recovery activities undertaken within building; and Dust suppression water sprays operating within building.

6.3 SOURCE CONFIGURATIONS AND PARAMETERS

6.3.1 Assumptions and Emission Sources Modelled

Emission rates per process are outlined in Table 6-5. Figure 6-1 shows the source model configuration for all dust emission sources.

The following assumptions for modelled dust generating activities are:

- A total of 150,000 tonnes per annum of C&D and C&I waste processing activities was used to estimate emissions from the facility;
- The maximum peak daily processed material usage of 1,000 tonnes of materials was used to estimate emissions from the facility;
- Waste processing activities include truck unloading, truck loading, front end loading, excavator use, crushing, shredding, waste screening and waste stockpiling sources;
- Emission rates were calculated based on operations of 24 hours per day, 365 days per year.
- As roller shutter doors will be closed during evening and night, a variable emission file was input in the model such that emissions only occur between 6am-6pm.



- All doors on the building are assumed open 100% of the time between 6am-6pm Mon-Sun with a release height of 6 m;
- All processing activities in the building are as a single volume source modelled with a release height of 6m and an area of 4,100 sqm sources with reduction factors: 0.5 (water sprays), 0.1 (enclosed 2-3 walls).



Table 6-5: Summary of Emission Sources

Source Name	PM ₁₀ Emission Factor	Annual Tonnage ¹	Daily Tonnage ²	Area (m) ³	24-hour Emission Rate (g/s)		Annual Emission Rate (g/s)		
					PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	TSP
Truck Unloading Inside Building	0.000008 kg/t;	150,000	1,000	Not relevant	1.39E-05	9.26E-05	5.71E-06	3.81E-05	7.46E-05
Receival Stockpiles	0.2 kg/ha/hr	Not relevant	Not relevant	150	5.21E-06	3.47E-05	5.21E-06	3.47E-05	6.94E-05
Excavator Bucket #1	0.012 kg/t	150,000	1,000	Not relevant	2.08E-02	1.39E-01	8.56E-03	5.71E-02	1.19E-01
Excavator Bucket #2	0.012 kg/t	150,000	1,000	Not relevant	2.08E-02	1.39E-01	8.56E-03	5.71E-02	1.19E-01
Internal Bunkers	0.2 kg/ha/hr	Not relevant	Not relevant	125	4.34E-06	2.89E-05	4.34E-06	2.89E-05	5.79E-05
Machine Line Bunkers	0.2 kg/ha/hr	Not relevant	Not relevant	150	5.21E-06	3.47E-05	5.21E-06	3.47E-05	6.94E-05
FEL Bucket #1	0.012 kg/t	150,000	1,000	Not relevant	2.08E-02	1.39E-01	8.56E-03	5.71E-02	1.19E-01
FEL Bucket #2	0.012 kg/t	150,000	1,000	Not relevant	2.08E-02	1.39E-01	8.56E-03	5.71E-02	1.19E-01
Shredder	0.0012 kg/t	150,000	1,000	Not relevant	2.08E-03	1.39E-02	8.56E-04	5.71E-03	1.28E-02
Conveyors	0.2 kg/ha/hr	Not relevant	Not relevant	120	4.17E-06	2.78E-05	4.17E-06	2.78E-05	5.56E-05
Crusher	0.0012 kg/t	37,500	250	Not relevant	5.21E-04	3.47E-03	2.14E-04	1.43E-03	3.21E-03
Air Separator #1	0.0043 kg/t	150,000	1,000	Not relevant	7.47E-03	4.98E-02	3.07E-03	2.05E-02	5.95E-02
Air Separator #2	0.0043 kg/t	150,000	1,000	Not relevant	7.47E-03	4.98E-02	3.07E-03	2.05E-02	5.95E-02
Flip Flow Screen #1	0.0043 kg/t	150,000	1,000	Not relevant	7.47E-03	4.98E-02	3.07E-03	2.05E-02	5.95E-02
Flip Flow Screen #2	0.0043 kg/t	150,000	1,000	Not relevant	7.47E-03	4.98E-02	3.07E-03	2.05E-02	5.95E-02
Flip Flow Screen #3 (Fines)	0.0043 kg/t	150,000	1,000	Not relevant	6.25E-02	4.17E-01	2.57E-02	1.71E-01	7.13E-01
Trommel Screen	0.0043 kg/t	150,000	1,000	Not relevant	7.47E-03	4.98E-02	3.07E-03	2.05E-02	5.95E-02
Building Volume Source				4,100	9.29E-03	6.19E-02	3.82E-03	2.55E-02	7.51E-02

Figure 6-1: Arrangement of Modelled Volume Source



6.4 AIR IMPACT MODELLING

6.4.1 Dispersion Model

The new generation air dispersion model, AERMOD ver. 9.9.5, was used for the prediction of off-site impacts associated with the air emissions from the proposed operations. AERMOD uses air dispersion based on planetary boundary layer turbulence structure and scaling concepts. The AERMOD model replaced AUSPLUME as the air dispersion model accepted by the Victorian EPA in January 2014 and is a suitable model to use for this air assessment.

The model was used to estimate the concentration impacts on receptors for each hour of input meteorology. Terrain was assumed to be elevated.

6.4.1.1 Meteorological Data

Prognostic meteorological data for the year 2017 was obtained from Lakes Environmental Services and pre-processed using AERMET, as described in Sections 4.1.1 and 4.1.2. The resultant upper air and surface data files were input to AERMOD.

6.4.2 Air Impact Modelling Results

Table 6-6 to Table 6-10 provide the results of the maximum modelled impacts for each identified sensitive receptor. Isoleths for each averaging period are provided in Figure 6-2 to Figure 6-6. Background concentrations that exceed the relevant *Approved Methods* criterion are marked with red text.

Table 6-6: TSP Annual Averaging Period Modelling Results

Receptor ID	Incremental Impact ($\mu\text{g}/\text{m}^3$)	Background ($\mu\text{g}/\text{m}^3$)	Cumulative Impact ($\mu\text{g}/\text{m}^3$)	Criteria ($\mu\text{g}/\text{m}^3$)
R1	0.03	39.4	39.43	90
R2	0.02		39.42	
R3	0.02		39.42	
R4	0.02		39.42	
R5	0.02		39.42	
R6	0.01		39.41	
R7	0.02		39.42	
R8	0.02		39.42	
R9	0.02		39.42	
R10	0.02		39.42	
R11	0.01		39.41	
R12	0.02		39.42	
R13	0.02		39.42	
R14	2.03		41.43	
R15	1.46		40.86	
R16	0.96		40.36	
R17	0.57		39.97	

Note: Complies / Non-compliance

Figure 6-2: TSP Annual Averaging Period Modelling Results

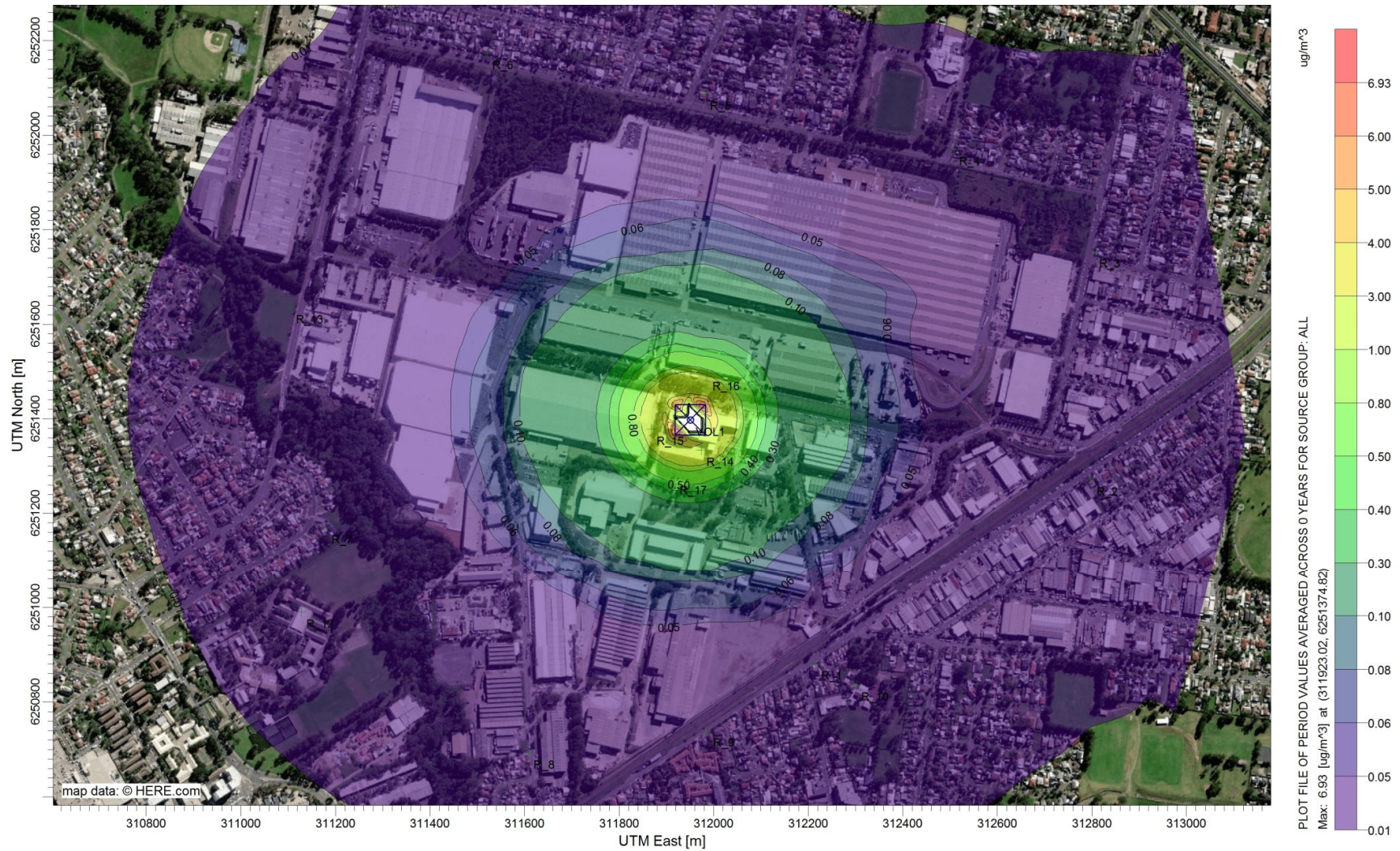




Table 6-7: PM₁₀ Annual Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m ³)	Background (µg/m ³)	Cumulative Impact (µg/m ³)	Criteria (µg/m ³)
R1	0.010	20.1	20.11	25
R2	0.007		20.11	
R3	0.006		20.11	
R4	0.007		20.11	
R5	0.007		20.11	
R6	0.005		20.10	
R7	0.007		20.11	
R8	0.006		20.11	
R9	0.008		20.11	
R10	0.007		20.11	
R11	0.004		20.10	
R12	0.005		20.11	
R13	0.006		20.11	
R14	0.688		20.79	
R15	0.496		20.60	
R16	0.327		20.43	
R17	0.192		20.29	

Note: **Complies** / **Non-compliance**



Table 6-8: PM_{2.5} Annual Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m ³)	Background (µg/m ³)	Cumulative Impact (µg/m ³)	Criteria (µg/m ³)
R1	0.001	9.5	9.50	8
R2	0.001		9.50	
R3	0.001		9.50	
R4	0.001		9.50	
R5	0.001		9.50	
R6	0.001		9.50	
R7	0.001		9.50	
R8	0.001		9.50	
R9	0.001		9.50	
R10	0.001		9.50	
R11	0.001		9.50	
R12	0.001		9.50	
R13	0.001		9.50	
R14	0.103		9.60	
R15	0.074		9.57	
R16	0.049		9.55	
R17	0.029		9.53	

Note: **Complies** / **Non-compliance**

Figure 6-4: PM_{2.5} Annual Averaging Period Modelling Results

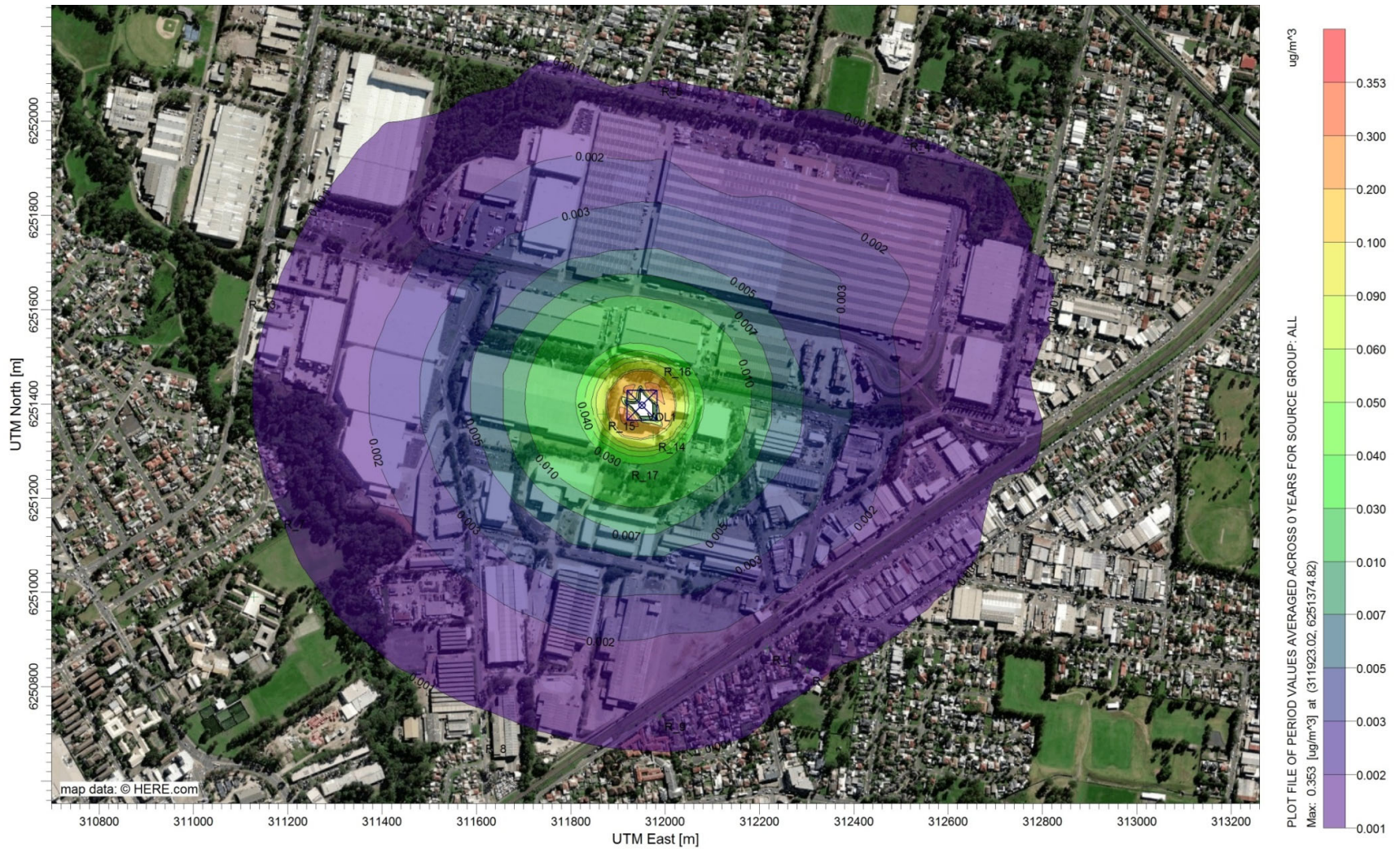




Table 6-9: PM₁₀ 24 Hour Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m ³)	Background (µg/m ³)	Cumulative Impact (µg/m ³)	Criteria (µg/m ³)
R1	0.35	63.0	63.35	50
R2	0.30		63.30	
R3	0.11		63.11	
R4	0.56		63.56	
R5	0.18		63.18	
R6	0.16		63.16	
R7	0.12		63.12	
R8	0.12		63.12	
R9	0.30		63.30	
R10	0.32		63.32	
R11	0.35		63.35	
R12	0.10		63.10	
R13	0.16		63.16	
R14	6.64		69.64	
R15	4.16		67.16	
R16	2.90		65.90	
R17	1.85		64.85	

Note: **Complies** / **Non-compliance**

Figure 6-5: PM₁₀ 24 Hour Averaging Period Modelling Results





Table 6-10: PM_{2.5} 24 Hour Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m ³)	Background (µg/m ³)	Cumulative Impact (µg/m ³)	Criteria (µg/m ³)
R1	0.05	44.7	44.75	25
R2	0.05		44.74	
R3	0.02		44.72	
R4	0.08		44.78	
R5	0.03		44.73	
R6	0.02		44.72	
R7	0.02		44.72	
R8	0.02		44.72	
R9	0.05		44.75	
R10	0.05		44.75	
R11	0.05		44.75	
R12	0.01		44.71	
R13	0.02		44.72	
R14	1.00		45.70	
R15	0.62		45.32	
R16	0.44		45.14	
R17	0.28		44.98	

Note: **Complies** / **Non-compliance**

Figure 6-6: PM_{2.5} 24 Hour Averaging Period Modelling Results



6.4.2.1 Predicted Days of Cumulative Exceedance

Due to the high background levels of PM_{2.5} and PM₁₀ at the site, the *Approved Methods* require a demonstration that no additional exceedances of the impact assessment criteria will occur as a result of the proposed site activities. Industrial receptor R14 (30 A Loftus Road, Yennora) was selected for contemporaneous impacts as it demonstrates the effectiveness of additional controls on the highest impacted receptor.

Table 6-11 and Table 6-12 summarise the contemporaneous impact and background of the top eight days of highest background concentrations and the top ten days of highest predicted increment for PM_{2.5} and PM₁₀ for the highest impacted receptor (R14).

Table 6-11: Summary of Top Eight Days of Contemporaneous PM_{2.5} Impact and Background at Receptor R14 (*Approved Methods* Criterion = 25 µg/m³)

Date	PM _{2.5} 24-hour Average (µg/m ³)			Date	PM _{2.5} 24-hour Average (µg/m ³)		
	Highest Background	Predicted Increment	Total		Background	Highest Predicted Increment	Total
25/04/2017	44.7	0.32	45.0	14/07/2017	9.7	1.00	10.7
2/02/2017	39	0.20	39.2	25/07/2017	8.3	0.85	9.2
23/01/2017	35.7	0.19	35.9	26/06/2017	4	0.84	4.8
8/04/2017	33.3	0.32	33.6	6/05/2017	3.6	0.79	4.4
11/08/2017	32.6	0.19	32.8	10/07/2017	N/A	0.73	-
21/09/2017	27.9	0.32	28.2	12/09/2017	N/A	0.73	-
2/06/2017	27.5	0.18	27.7	5/06/2017	4.6	0.70	5.3
11/05/2017	25.8	0.32	26.1	19/04/2017	6	0.64	6.6
5/01/2017	24.7	0.20	24.9	28/05/2017	9.3	0.63	9.9
24/03/2017	22.7	0.19	22.9	16/06/2017	9.8	0.60	10.4

✓Complies ✗ Non-compliance

Table 6-12: Summary of Top Eight Days of Contemporaneous PM₁₀ Impact and Background at Receptor R14 (*Approved Methods* Criterion = 50 µg/m³)

Date	PM ₁₀ 24-hour Average (µg/m ³)			Date	PM ₁₀ 24-hour Average (µg/m ³)		
	Highest Background	Predicted Increment	Total		Background	Highest Predicted Increment	Total
5/03/2017	63	1.09	64.1	14/07/2017	20	6.64	26.6
25/04/2017	54.6	2.12	56.7	25/07/2017	17.2	5.70	22.9
2/02/2017	51.9	1.32	53.2	26/06/2017	13	5.59	18.6
30/12/2017	51.3	1.17	52.5	6/05/2017	11.5	5.26	16.8
8/04/2017	47.9	2.12	50.0	10/07/2017	10.8	4.87	15.7
2/06/2017	46.3	1.21	47.5	12/09/2017	11.4	4.84	16.2
21/09/2017	45.1	2.10	47.2	5/06/2017	12.3	4.64	16.9
18/07/2017	40.3	2.10	42.4	19/04/2017	16.8	4.26	21.1
11/05/2017	39.9	2.13	42.0	28/05/2017	27.6	4.18	31.8
27/10/2017	38.6	0.74	39.3	16/06/2017	21.6	4.02	25.6

✓Complies ✗ Non-compliance



6.5 DISCUSSION OF MODELLING RESULTS

The maximum impacts for annual TSP and PM₁₀ emissions at all sensitive receptors are predicted to comply with the *Approved Methods* for the criteria annual averaging period.

The maximum predicted impacts for PM₁₀ and PM_{2.5} for the 24-hour period and PM_{2.5} for the annual period are predicted to exceed the *Approved Methods* for the criteria due to elevated background concentrations.

In cases of elevated background concentrations, the NSW EPA requires a demonstration that no additional exceedances of the impact assessment criteria will occur as a result of the proposed site activities. Contemporaneous addition of the predicted daily increments of PM₁₀ and PM_{2.5} with daily measured background levels for 2017 showed no additional days of exceedance.

The proposed site operations, with dust controls in place, are unlikely to cause harm to human health or the environment.



7. STATEMENT OF POTENTIAL AIR QUALITY IMPACTS

Benbow Environmental has been engaged by Cobra Waste Solutions Pty Ltd to undertake an Air Quality Impact Assessment (AQIA) for the proposed resource recovery facility at 30 Loftus Road, Yennora NSW 2161. The facility would receive, handle and process Construction and Demolition (C&D) and Commercial and Industrial (C&I) waste. The amount of waste to be received and processed is estimated to be up to 150,000 tonnes per year. The proposed maximum storage capacity for waste at the site at any one time is expected to be 1,500 tonnes.

The assessment determines the predicted dust and particulate matter contribution from the proposed site operations. The assessment does not include an assessment of odour impacts, as no odour is expected to be generated from the proposed development.

This AQIA has been prepared in accordance with the NSW EPA *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (2016) (Approved Methods).

This AQIA uses existing air quality data to establish the background levels of dust and particulates. This background data is then combined with the predicted levels resulting from the site operations of the resource recovery facility to assess the cumulative air quality impacts.

The maximum impacts for annual TSP and PM₁₀ emissions at all sensitive receptors are predicted to comply with the *Approved Methods* for the criteria annual averaging period.

The maximum predicted impacts for PM₁₀ and PM_{2.5} for the 24-hour period and PM_{2.5} for the annual period are predicted to exceed the *Approved Methods* for the criteria due to elevated background concentrations.

In cases of elevated background concentrations, the NSW EPA requires a demonstration that no additional exceedances of the impact assessment criteria will occur as a result of the proposed site activities. Contemporaneous addition of the predicted daily increments of PM₁₀ and PM_{2.5} with daily measured background levels for 2017 showed no additional days of exceedance.

It is considered that the predicted impacts are negligible and unlikely to cause harm to human health or the environment. No further controls are recommended at this stage.

Handwritten signature of Kate Barker in black ink.

Kate Barker
Senior Environmental Scientist

Handwritten signature of Emma Hansma in blue ink.

Emma Hansma
Senior Engineer

Handwritten signature of R T Benbow in black ink.

R T Benbow
Principal Consultant



8. REFERENCES

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9. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Cobra Waste Solutions Pty Ltd, as per our agreement for providing environmental services. Only Cobra Waste Solutions Pty Ltd is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Cobra Waste Solutions Pty Ltd for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.