[redacted]

Air Quality Impact Technical Report

Elizabeth Drive Landfill Expansion Environmental Impact Statement

Prepared for:
SUEZ Recycling and Recovery Pty Ltd

July 2019

Document control

Project title	Elizabeth Drive Landfill Expansion EIS
Prepared for	SUEZ Recycling and Recovery Pty Ltd
Document title	Air Quality Impact Technical Report
Document status	Final
Date	12 July 2019

Contents

Glossary of terms and abbreviations

Term	Definition
Deposited dust	Dust that has fallen out of suspension in the air and which has settled onto a surface.
PM_{10}	Airborne particulate matter with an aerodynamic diameter of less than 10 µm.
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of less than 2.5 µm.
TSP	Total Suspended Particulate - particles with an aerodynamic diameter of less than or equal to 50 µm.

Executive Summary

An Air Quality Impact Assessment has been undertaken for a proposed increase in capacity of SUEZ's existing landfill at Elizabeth Drive, Badgerys Creek, by raising the currently approved finished cap height by 15 meters, from a reduced level (RL) of 80 metres to 95 metres (the Project). The increase in the landfill height will be associated with landfilling of non-putrescible general solid waste and restricted solid waste in accordance with approved consent and EPA licence requirements. This proposed increase would provide an additional airspace capacity of approximately 4.8 million cubic meters and extend the life of the landfill by approximately five and a half years at an increased disposal rate of 950,000 tpa (compared to the current disposal rate of 750,000 tpa).

The existing environment in the Project area was described in terms of meteorology, terrain, land use and existing air pollutant concentrations. Dust emissions due to the Project were assessed by means of the CALPUFF air dispersion model with a "worst-case" modelling scenario developed which examined the operations assuming 100% of the landfilling activities occurring in a section abutting the eastern landfill boundary. Dust emission rates were estimated based on forecast waste delivery volumes, plant utilisation and emission factors for landfilling activities. The following is a summary of the modelling results:

- Predicted cumulative TSP concentrations were below the criterion at all receptors. The highest Project contribution was 7.0 $\mu g/m^3$, or about 8 % of the criterion.
- A single exceedance of the 24-hour PM_{10} criterion was predicted (at Receptor 1). The exceedance was due to an elevated background concentration which was already above the criteria. No additional exceedances of the criterion were predicted at any receptor. The highest Project contribution was 18.1 $\mu g/m^3$, or about 36 % of the criterion.
- Two exceedances of the 24-hour $PM_{2.5}$ criterion were predicted for cumulative concentrations. One exceedance was due to a background concentration above the criterion. The second exceedance was primarily due to a background concentration which was at 99 % of the criterion. No further exceedances of the criterion were predicted at any receptor. The highest Project contribution was 3.1 $\mu g/m^3$, or about 12 % of the criterion.
- Cumulative annual average PM_{10} concentrations were predicted to be below the criterion at all receptors. The highest Project contribution was 4.0 $\mu g/m^3$, or about 16 % of the criterion.
- The background annual average $PM_{2.5}$ concentration was above the criterion and therefore all cumulative predictions at receptors were also above the criterion. The highest Project contribution was 0.7 $\mu g/m^3$, or about 9 % of the criterion.
- Predicted incremental rates of deposited dust were below the criteria at all modelled sensitive receptors.

Emissions in the model were based on all accepted waste being handled in a small area adjacent to the eastern boundary. In reality, some waste will be handled elsewhere, and over the course of a year the active landfilling area will move away from the nearest receptor. As a result annualised PM_{10} and $PM_{2.5}$ are therefore likely to be lower than those predicted in this assessment. Overall, predicted project contribution dust concentrations at sensitive receptors were relatively low compared with the criteria. However, the Project is located is western Sydney and as such, background particulate concentrations can be elevated, which makes it important that Project dust emissions are appropriately managed.

Potential odour emissions due to the acceptance and handling of solid waste are be managed by covering delivery truck loads and covering waste in the landfill cells immediately upon receipt. In this manner, exposure to air of any odorous materials and potential odour impacts off site would be minimised. Fugitive landfill gas emissions would be managed via the LFG extraction system. LFG is combusted to produce electricity, and excess LFG is flared, adjacent to the SAWT. The combination of restricted waste receipt and handling practices and the LFG extraction system are expected to keep odour emissions due to the Project to a minimum. Odour emissions are therefore not expected to be a cause for concern.

Management of dust and odour for the landfill is detailed in the Elizabeth Drive Landfill Environmental Management Plan (EMP) (SUEZ, 2016). Kay management strategies that are implemented at site of relevance to dust and odour are:

- wetting down unsealed access roads and manoeuvring areas, as required
- utilising a street sweeper to keep sealed roads free of dust
- automated wheel washing for all vehicles leaving site
- stockpiles operated to minimise dust generation
- revegetation of old stockpiles to minimise dust generation
- ensuring the immediate deposition of waste upon delivery
- covering of received waste as soon as practicable
- regular review of LFG infrastructure performance
- periodical maintenance of LFG infrastructure, as required, and
- sourcing of odour neutralising systems, as required.

With these mitigation measures in place, the Project is not expected to result in significant impacts on nearby sensitive receptors in terms of dust or odour.

.

1.0 Introduction

1.1 Overview

AECOM Australia Pty Ltd (AECOM) was engaged to undertake an Air Quality Impact Assessment for a proposed increase in capacity of SUEZ's existing landfill at Elizabeth Drive, Badgerys Creek, by raising the currently approved finished cap height by 15 meters, from a reduced level (RL) of 80 metres to 95 metres (the Project). The increase in the landfill height will be associated with landfilling of non-putrescible general solid waste and restricted solid waste in accordance with approved consent and EPA licence requirements. This proposed increase would provide an additional airspace capacity of approximately 4.8 million cubic meters and extend the life of the landfill by approximately five and a half years at an increased disposal rate of 950,000 tpa (from the current disposal rate of 750,000 tpa).

The scope of the assessment included the following:

- Identification of relevant ambient air quality criteria
- Discussion of existing air quality based on available Office of Environment and Heritage (OEH) data
- Discussion of local meteorology and climate conditions based on available Bureau of Meteorology (BoM) data
- Identification of potential sources of air emissions from surrounding land uses
- A quantitative assessment of particulate emissions from onsite operations through appropriate dispersion modelling, and
- Provision of recommendations including suggestion of potential safeguards.

The AQIA has been prepared with consideration given to the following guidelines:

- *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, 2016*. This document was generally referenced as a source of factors needing to be considered when assessing air quality impacts.

1.2 Purpose of this technical report

The purpose of this report is to identify potential air quality issues associated with the project, assess their impact on surrounding sensitive receptors, and identify appropriate mitigation and management measures to minimise pollutant concentrations at nearby sensitive receptors.

This technical report has been prepared in accordance with the revised Secretary's Environmental Assessment Requirements (SEARs) issued for the project on 19 April 2018 by the Secretary of the NSW Department of Planning and Environment (DPE).

The SEARs relevant to this technical assessment that are addressed in this report are presented in **Table 1.1**.

Table 1.1 SEARs applicable to air quality

SEARs		Where addressed
Air quality	• a description of all potential sources of air and odour emissions	Section 4.0
	• an air quality impact assessment in accordance with relevant Environmental Protection Authority guidelines	Section 5.0 and Section 6.0
	• a description and appraisal of air quality impact mitigation, management and monitoring measures.	Section 7.0

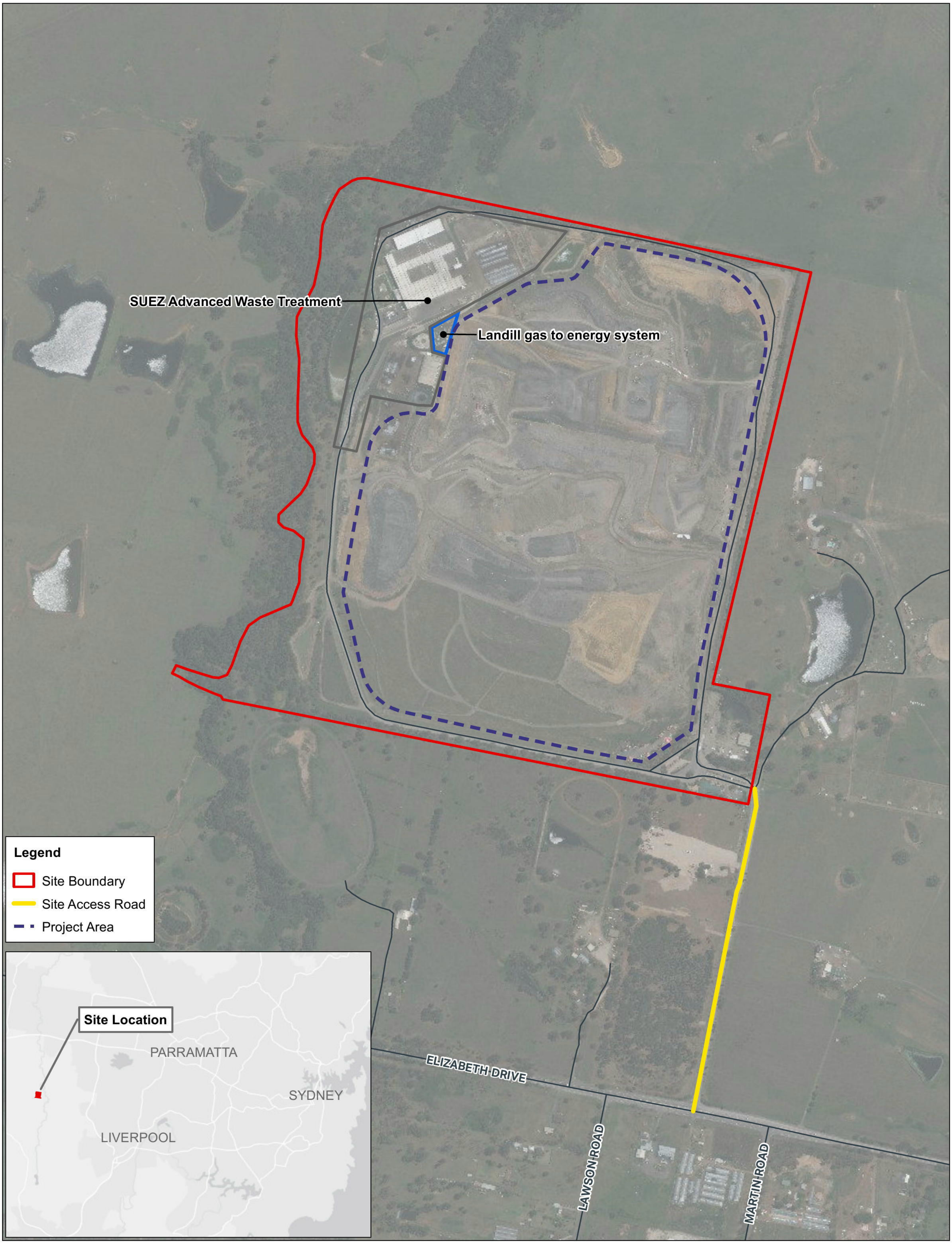
2.0 Project description

The Project involves re-profiling the currently approved finished landform height of the landfill from RL 80 to RL 95. The re-profiling would occur fully within the existing Project Area. Specific aspects of the Project are described further below.

If approved, the DA would replace elements of DA 451/89 (as modified). The Project would not alter of affect the continuing operation of the separate consents that apply to the Site for the landfill gas to energy system (DA 12/0515); or the consent for the SAWT (approved in 2008 (MP 06_0185), and modified three times).

2.1 Location

The Site is located approximately 40 kilometres west of the Sydney CBD and 22 kilometres west of Parramatta. The Site is bound by Elizabeth Drive to the south with an unnamed access road adjoining the site to the southeast. The closest residential property to the Site is located approximately 130 metres to the east (Kingsfield Stud), with other residential receptors present to the south (~400 m) and north (~850 m) of the Site. The location of the Site is presented in **Figure 2.1**. The locations of sensitive receptors in relation to the site are presented in **Figure 5.1** in **Section 5.4**.



SUEZ ELIZABETH DRIVE LANDFILL

FIGURE 2.1: SITE LOCATION

AECOM suez

0 50 100 200 m

N

Disclaimer Spatial data used under licence from Land and Property Management Authority, NSW © 2018. Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar

DATE	10/07/2019
SCALE	1:8,604
PROJECT	60571292
DRAWN	CP

2.2 Landfill Re-profiling

The landfill is classified as a regional landfill, accepts non-putrescible general solid waste and restricted solid waste. These activities operate under consent DA 451/1989, as modified. This consent allows SUEZ to landfill to a height of RL 80.

The Project involves re-profiling the approved final cap height of the landfill to RL 95 within the current landfill footprint, utilising 1:4 final batter slopes and benches (post-settlement). This 15 metre increase in final cap height would provide an additional landfill airspace capacity and extend the life of the landfill. The landfill would continue to accept only non-putrescible general solid waste and restricted solid waste.

Excavation (quarrying) of the site is expected to cease within the next 12 months. As such quarrying has not been considered to be part of the ongoing air emissions and therefore not included in this assessment.

2.3 Landfill operation

Landfilling operations as part of the Project would generally be undertaken in a manner consistent with the current practices and as outlined in the existing LEMP for the Site.

The existing landfill has historically accepted approximately 750,000 tonnes per annum (tpa) of non-putrescible general solid waste and restricted solid waste (e.g. dry building waste, CSI waste, contaminated soil, etc.) It is envisaged that the rate of filling would increase slightly to take into account changes in the volume of waste being generated and disposed of in NSW and the industry capacity to receive the waste. Under the Project a maximum of 950,000 tpa of non-putrescible general solid waste and restricted solid waste would be received during the proposed extended life of the landfill.

Waste would continue to be deposited, spread and compacted in layers. Each layer would be compacted to achieve a compacted lift thickness of 2 m. At the end of each working day, exposed waste surfaces would be covered with tarps, foam, or compacted soil as daily cover to reduce environmental impacts such as the escape of litter.

Intermediate cover would be provided to control vermin and manage odour in areas which would remain inactive for more than 90 days. It would comprise approximately 300 millimetres of virgin excavated natural material or a suitable alternative.

To optimise the use of landfill space and facilitate efficient leachate drainage, cover material would be removed as far as practicable prior to the placement of waste. This would be stockpiled for reuse as required.

2.4 Operating hours

The Project would continue to operate within the hours outlined in the current Environmental Protection Licence (EPL) number 4068. For the purpose of this assessment, receipt of waste was modelled for the hours 6 am to 6 pm Monday to Friday, and 7 am to 2 pm Saturday. .

3.0 Air Quality Criteria

3.1 Principal Pollutants of Concern

Given the nature of the local area and the activities to be undertaken, the principal pollutant of concern included in this assessment is fine particulate matter.

Only non-putrescible waste is proposed to be accepted at the Site as part of the Project. Based on this, the potential for odour generation is expected to be minimal. However, a qualitative odour impact assessment was included as part of this assessment for completeness.

3.1.1 Dust (TSP, PM_{10}, $PM_{2.5}$ and deposited dust)

The primary pollutants of concern for the project would be suspended particulate matter and deposited dust. Dust would be generated as a result of any activities that disturb the soil of waste material, resulting in suspended particulates (dust suspended in the air) and deposited dust (dust settled on surfaces). Activities with the greatest potential to generate dust are wheel-generated dust on haul roads, emplacing waste material on active landfill cells, landfill cell forming, and wind erosion.

Particulate matter refers to the many types and sizes of particles suspended in the air we breathe. Particulate matter can be emitted from natural sources (bushfires, dust storms and pollens) or as a result of human activities such as combustion activities (motor vehicle emissions, power generation and incineration), excavation works, bulk material handling, crushing operations, wheels on unpaved roads and use of wood heaters.

Particulate matter is often classified according to the following size fractions:

- Total suspended particulates (TSP). Particles with an aerodynamic diameter of less than or equal to 30 micrometres (µm) are collectively referred to as TSP.
- Particles with an aerodynamic diameter less than or equal to ten µm (referred to as PM_{10}).

PM_{10} tends to remain suspended in the air for longer periods than larger particles and can penetrate into human lungs.

Particles with a diameter of less than 2.5 µm (referred to as $PM_{2.5}$) are typically associated more with combustion emissions but are also produced by mechanical disturbance of dusty materials. Both plant exhaust emissions and material movement emission are sources of $PM_{2.5}$ for the Project.

Deposited dust (dust soiling) refers to dust particles of all sizes that have settled on exposed surfaces. Deposited dust causes aesthetic impacts associated with coarse particles settling on surfaces, which causes soiling and discolouration.

3.1.2 Assessment Criteria

3.1.2.1 Dust

In order to determine the potential effects of general air quality, ambient pollutant concentrations can be compared to relevant impact assessment criteria. In NSW, the criteria are specified in *Table 7.1; Impact assessment criteria* of the NSW Environment Protection Authority (EPA) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016) and represent maximum allowable pollution levels at the boundary of the premises. The criteria for the fine particulate matter are reproduced in **Table 3.1** below.

Table 3.1 Regulatory air quality criteria (µg/m^3)

Pollutant of Concern	Standard µg/m^3	Averaging Period
TSP	90	Annual
PM_{10}	50	24-hour
	25	Annual
$PM_{2.5}$	25	24 hour
	8	Annual

Pollutant of Concern	Standard µg/m³	Averaging Period
Deposited dust	2 g/m²/month[1]	Annual
	4 g/m²/month[2]	Annual

[1]Maximum increase in deposited dust level
[2]Maximum total deposited dust level

3.1.2.2 Odour

The EPA's odour assessment criteria for complex mixtures of odorous air pollutants (DEC, 2005a) are shown in **Table 3.2**. These criteria take into account individual sensitivity to odour in the community, and use a statistical approach for determining the appropriate criterion for a particular site based on the size of the surrounding population. As population size increases, the likelihood of sensitive individuals being within that population also increases; as such, areas with larger populations require more stringent criteria.

Table 3.2 EPA Impact Assessment Criteria – Complex Odours

Population	Criteria (OU)*
Urban (≥ ~2000) and/or schools and hospitals	2
~ 500	3
~ 125	4
~ 30	5
~ 10	6
Single residence (≤ ~2)	7

* 99th percentile nose response time

The local population in the mostly rural zoned land surrounding the site is likely to be somewhere between 30 and 125. An odour assessment criterion of 4 OU was therefore adopted for this assessment.

4.0 Existing Environment

A description of the existing environment in the area surrounding the Project is provided in this section for the following parameters:

- Meteorology
- Terrain
- Land use, and
- Air quality.

4.1 Meteorology

Local meteorological conditions heavily influence the direction of pollution transport along with the rate of mixing and hence dispersion in the atmosphere. An analysis of the local meteorological conditions aids in the understanding of whether pollution from a source is likely to influence a particular location.

The Bureau of Meteorology (BoM) operates a network of monitoring stations around the country. Local meteorological data for the Project was taken from the monitoring locations at Badgerys Creek and Horsley Park.

Historical average monthly meteorological data, obtained from the BoM website for the Badgerys Creek monitoring station and the Horsley Park monitoring station are shown in **Table 4.1** and **Table 4.2** respectively, with 9 am and 3 pm wind roses for selected months shown in **Figure 4.1** (Badgerys Creek) and **Figure 4.2 (**Horsley Park).

In summary, the meteorological data at Badgerys Creek/Horsley Park show the following:

- The warmest temperatures occur in summer, with the average maximum temperature recorded in January (30.1°C at Badgerys Creek and 30.0°C at Horsley Park)
- July is the coldest month with an average minimum temperature of 4.1°C at Badgerys Creek and 5.8°C at Horsley Park
- Rainfall is highest in February (mean rainfall of 98.5 mm at Badgerys Creek and 107.0 mm at Horsley Park) and lowest in July (mean rainfall of 23.6 mm) at Badgerys Creek and September (mean rainfall of 34.1 mm) at Horsley Park
- Annual average rainfall is 680.9 mm at Badgerys Creek and 765.0 mm at Horsley Park
- Wind data show the following patterns:
  - January (summer) - morning winds are variable at both Badgerys Creek and Horsley Park in January and February with increased south westerly winds at both stations in March, more pronounced at Badgerys Creek. Calm conditions range from 6 to 16% at Badgerys Creek and 5 to 13% at Horsley Park. Afternoon winds increase in strength changing to predominantly from the east in all months with low (up to 2%) calm conditions at both stations.
  - April (autumn) - morning winds are predominantly from the southwest at Badgerys Creek but variable at Horsley Park with calm conditions ranging from 12 to 20% at Badgerys Creek and 6 to 9% at Horsley Park. Afternoon winds increase in strength becoming variable in all months with calm conditions ranging from 1 to 4% at Badgerys Creek and 4 to 6% at Horsley Park.
  - July (winter) - morning winds are predominantly from the southwest at Badgerys Creek with higher levels of west and northwest winds at Horsley Park. Calm conditions range from 7 to 22% at Badgerys Creek and 3 to 9% at Horsley Park. Afternoon winds increase in strength becoming variable in all months with calm conditions ranging from 1 to 3% at Badgerys Creek and 1 to 5% at Horsley Park.
  - October (spring) - morning winds are variable a both stations with calm conditions ranging from 5 to 7% at Badgerys Creek and 4% at Horsley Park. Afternoon winds increase in

strength changing to predominantly from the east at Badgerys Creek and southeast at Horsley Park in all months with very low (up to 1%) calm conditions at both stations.

Table 4.1 Meteorological data at Badgerys Creek, 1995 – 2018

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature													
Mean maximum temperature (°C)	30.1	28.8	26.9	24.1	20.8	17.8	17.4	19.2	22.6	24.9	26.4	28.5	24.0
Mean minimum temperature (°C)	17.1	17.1	15.3	11.5	7.7	5.6	4.1	4.7	7.7	10.4	13.5	15.5	10.8
Rainfall													
Mean rainfall (mm)	79.4	98.5	81.3	49.4	37.0	61.4	23.6	36.8	32.3	51.4	69.0	57.1	680.9
Decile 5 (median) rainfall (mm)	55.0	85.6	56.4	29.0	18.4	52.4	20.0	20.5	27.9	42.9	50.5	45.8	664.6
Mean number of days of rain ≥ 1 mm	7.0	7.3	7.4	5.7	3.8	5.5	3.9	3.5	4.6	5.5	6.9	6.6	67.7
9am conditions													
Mean 9am temperature (°C)	21.8	21.2	19.0	17.3	13.7	10.5	9.8	11.7	15.5	18.1	19.1	20.9	16.6
Mean 9am relative humidity (%)	73	80	83	76	80	84	81	72	66	62	69	69	75
Mean 9am wind speed (km/h)	9.4	8.7	8.4	9.8	9.6	9.1	9.6	10.6	11.7	11.8	11.0	9.8	10.0
Mean 9am calms (%)	6	11	16	12	18	20	22	15	7	7	5	5	12
3pm conditions													
Mean 3pm temperature (°C)	28.1	26.9	25.3	22.4	19.4	16.7	16.1	17.9	21.0	22.8	24.3	26.5	22.3
Mean 3pm relative humidity (%)	49	55	56	52	53	56	50	44	44	45	50	48	50
Mean 3pm wind speed (km/h)	17.9	15.9	14.5	14.4	13.9	13.7	15.4	17.8	19.2	19.9	18.9	18.5	16.7
Mean 3pm calms (%)	<1	<1	1	1	2	4	3	1	1	<1	<1	<1	1

http://www.bom.gov.au/climate/averages/tables/cw_067108.shtml, accessed 27 July 2018

Table 4.2 Meteorological data at Horsley Park, 1997 – 2018

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature													
Mean maximum temperature (°C)	30.0	28.8	26.9	23.8	20.6	17.6	17.3	19.0	22.4	24.8	26.4	28.3	23.8
Mean minimum temperature (°C)	17.8	17.8	16.1	12.9	9.0	7.2	5.8	6.5	9.3	11.8	14.4	16.2	12.1
Rainfall													
Mean rainfall (mm)	75.7	107.0	78.0	73.1	43.5	75.7	37.5	39.2	34.1	54.6	78.5	63.3	765.0
Decile 5 (median) rainfall (mm)	64.2	92.2	53.8	59.0	21.6	52.2	30.4	26.7	22.1	48.4	57.2	61.4	724.7
Mean number of days of rain ≥ 1 mm	7.6	7.2	8.0	7.0	5.2	6.3	5.4	4.4	4.8	5.5	7.0	7.1	75.5
9am conditions													
Mean 9am temperature (°C)	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 9am relative humidity (%)	73	77	81	76	77	80	78	70	65	61	70	71	73
Mean 9am wind speed (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
Mean 9am calms (%)	5	8	13	9	6	8	9	3	4	4	4	4	6
3pm conditions													
Mean 3pm temperature (°C)	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 3pm relative humidity (%)	49	53	54	53	52	55	50	42	42	45	50	48	49
Mean 3pm wind speed (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
Mean 3pm calms (%)	1	1	2	4	4	6	5	1	2	1	1	1	2

http://www.bom.gov.au/climate/averages/tables/cw_067119.shtml, accessed 27 July 2018

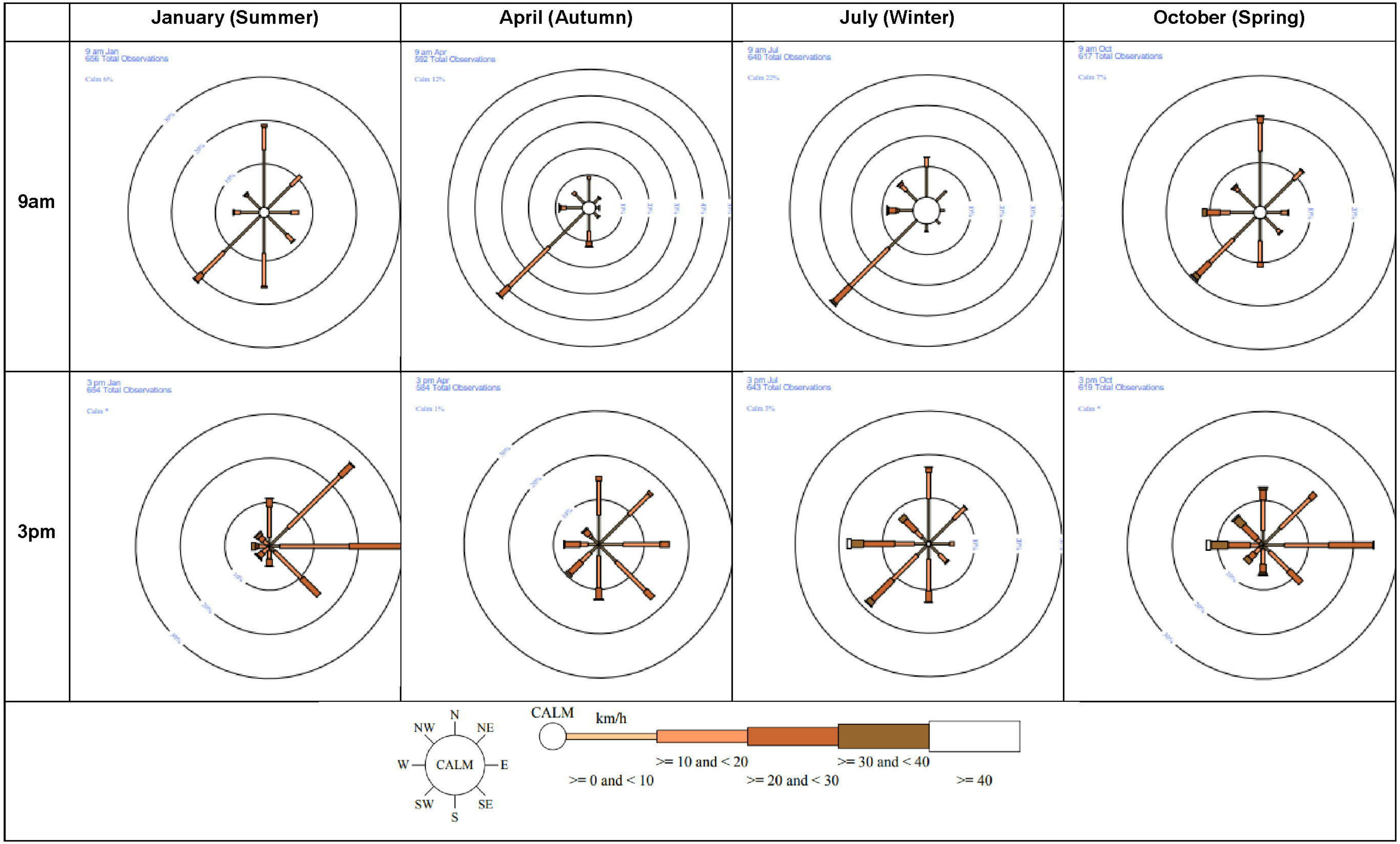


Figure 4.1 January to June 9 am and 3 pm Wind Roses – Badgerys Creek, 1995 – 2017

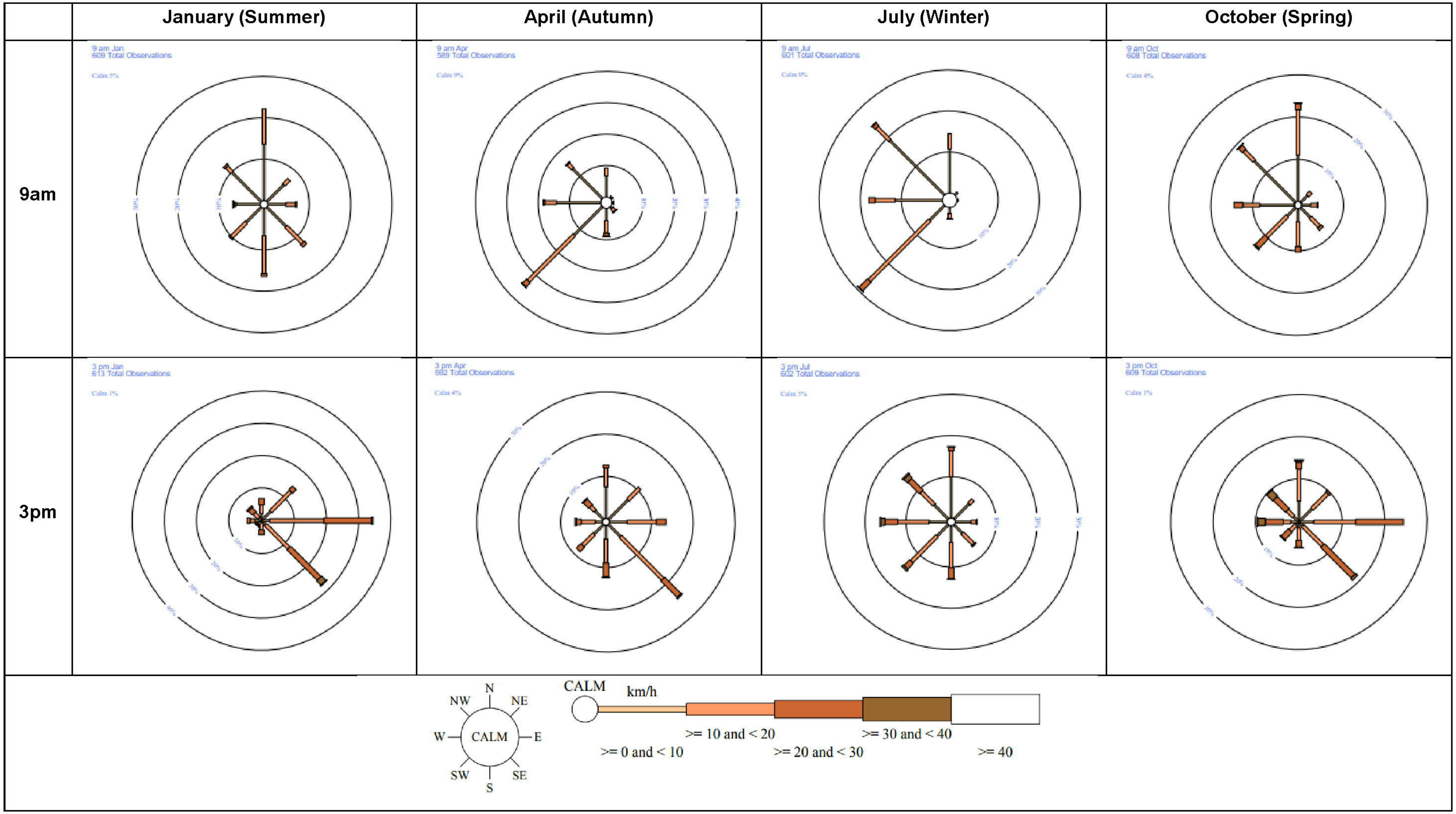


Figure 4.2 January to June 9 am and 3 pm Wind Roses – Horsley Park, 1997 – 2017

4.2 Terrain

The Site is situated in the western hinterland of the Sydney basin. The terrain is generally flat with a gentle downward slope towards the waterway of Badgerys Creek to the west. The Great Dividing Range is located approximately 15 kilometres to the west rising to an altitude of approximately 600 metres. The local surrounding relief is minor and is not expected to influence the dispersion of air pollutants possibly emitted during operational activities.

The physical presence of the landfill itself will affect wind flow, especially as its elevation progresses towards final Project elevation. Wind speeds will likely be higher at the top of the landform, which will be about 45 m above the surrounding land. Terrain data used in the model was modified to account for this.

4.3 Land Use

The Site is bounded at all sides by rural zoned land with widely spaced residential dwellings. The nearest residential zoned land is located approximately 630 metres to the north of the Site in the estate of Twin Creeks.

There is a quarry approximately 2.3 km to the east of the Site, a composting facility 2.2 km to the south, and another landfill 4.4 km to the east. These industrial sites will produce their own dust emissions but are far enough from the Site that cumulative impacts are not expected.

4.4 Existing Air Quality

The NSW EPA operates several ambient air quality monitoring locations across the Sydney region. The locations nearest to the Site are located at Bringelly (six kilometres to the south) and St Mary's (eight kilometres to the north). The data from these two locations for the four year period from 2014 to 2017 is summarised in the following sections. Note that $PM_{2.5}$ data was only available at these two stations for part of 2016 and all of 2017. Longer term (2014-2017) $PM_{2.5}$ data was therefore included from the Prospect EPA station (located 16 kilometres to the northeast) for completeness.

4.4.1 Particulate Matter (PM_{10})

Table 4.3 presents the PM_{10} data for the Bringelly air quality monitoring location for the years 2014 to 2017.

Table 4.3 Bringelly EPA monitoring location ambient PM_{10} concentrations, 2014-2017

Statistic	24 hour average PM_{10} Concentration - µg/m^3			
	2014	2015	2016	2017
Maximum 24 hour concentration	42.6	57.0	61.6	83.8
24 hour Criterion	50			
24 hour exceedance count	0	1	3	6
Statistic	Annual average PM_{10} Concentration - µg/m^3			
	2014	2015	2016	2017
Annual Average	16.6	15.8	16.9	19.8
Annual Average Criterion	25			

The data show no exceedances of the 24 hour criterion for 2014, one exceedance for 2015, three exceedances for 2016 and six exceedances for 2017. OEH *Annual Air Quality Statements* for 2015, 2016 and 2017 indicate that the 2015 and 2016 exceedances and three of the 2017 exceedances were due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms. The 2017 *Annual Air Quality Statement* also indicates that three of the exceedances were not due to exceptional events.

Annual average values show a range from 15.8 to 19.8 µg/m^3 concentrations with all years below the annual average criterion.

Table 4.4 presents the PM_{10} data for the St Mary's location for the years 2014 to 2017.

Table 4.4 St Mary's EPA monitoring location ambient PM_{10} concentrations, 2014-2017

Statistic	24 hour average PM_{10} Concentration - µg/m^3			
	2014	2015	2016	2017
Maximum 24 hour concentration	45.0	53.0	100.2	49.8
24 hour Criterion	50			
24 hour exceedance count	0	1	3	0
Statistic	Annual average PM_{10} Concentration - µg/m^3			
	2014	2015	2016	2017
Annual Average	16.7	15.0	16.1	16.2
Annual Average Criterion	25			

The data show no exceedances of the 24 hour criterion for 2014 and 2017, one exceedance for 2015 and three exceedances for 2016. OEH *Annual Air Quality Statements* for 2015 and 2016 indicate that the exceedances were all due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms.

Annual average values show a relatively small range of concentrations with all years below the annual average criterion.

4.4.2 Particulate Matter ($PM_{2.5}$)

Table 4.5 presents the $PM_{2.5}$ data for the Bringelly monitoring location for the years 2016 (the year of commencement of $PM_{2.5}$ monitoring at this location) to 2017. The data show no exceedances of the 24 hour criterion for 2016 and two exceedances for 2017. The OEH *Annual Air Quality Statement* for 2017 indicates that the exceedances were due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms.

Annual average values at Bringelly were slightly below the criterion for both years.

Table 4.5 Bringelly EPA Monitoring Location Ambient $PM_{2.5}$ Concentrations, 2016-2017

Statistic	24 hour average $PM_{2.5}$ Concentration - µg/m^3	
	2016	2017
Maximum 24 hour concentration	21.6	52.5
24 hour Criterion	25	
24 hour exceedance count	0	2
Statistic	Annual average $PM_{2.5}$ Concentration - µg/m^3	
	2016	2017
Annual Average	7.6	7.5
Annual Average Criterion	8	

Table 4.6 presents the $PM_{2.5}$ data for the St Mary's location for the years 2016 (the year of commencement of $PM_{2.5}$ monitoring at this location) to 2017. The data show five exceedances for 2016 and three exceedances for 2017. OEH *Annual Air Quality Statements* for 2016 and 2017 indicate that the four of the 2016 exceedances and all 2017 exceedances were due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms. The 2016 *Annual Air Quality Statement* also indicates that one of the exceedances was due to a non-exceptional

event. This means that the exceedance was likely due to local sources of pollution, such as traffic emissions in the greater Sydney area.

Annual average concentrations at St Marys were slightly below the criterion for both years.

Table 4.6 St Mary's EPA Monitoring Location Ambient $PM_{2.5}$ Concentrations, 2016-2017

Statistic	24 hour average $PM_{2.5}$ Concentration - µg/m^3	
	2016	2017
Maximum 24 hour concentration	93.2	38.2
24 hour Criterion	**25**	
24 hour exceedance count	5	3
Statistic	**Annual average $PM_{2.5}$ Concentration - µg/m^3**	
	2016	**2017**
Annual Average	7.8	7.0
Annual Average Criterion	**8**	

Table 4.7 presents the $PM_{2.5}$ data for the Prospect location for the years 2014 to 2017. The highest 24-hour average of 80.9 µg/m^3 was recorded in 2016. Similarly to the St Marys data, four of the exceedances in 2016 and all the exceedances in 2017 are attributable to exceptional events. The cause of the single exceedance in 2015 was not reported by the EPA and is unknown.

Annual averages are slightly higher at Prospect compared with St Marys, with 8.7 µg/m^3 (slightly above the criterion) measured in 2016.

Table 4.7 Prospect EPA monitoring location ambient $PM_{2.5}$ concentrations, 2015-2017

Statistic	24 hour average $PM_{2.5}$ Concentration - µg/m^3			
	2014	2015	2016	2017
Maximum 24 hour concentration	14[1]	29.6	80.9	30.1
24 hour Criterion	**25**			
24 hour exceedance count	0	1	5	3
Statistic	**Annual average $PM_{2.5}$ Concentration - µg/m^3**			
	2014	**2015**	**2016**	**2017**
Annual Average	7.6[1]	8.2	8.7	7.8
Annual Average Criterion	**8**			
[1]Data from 6 December to 31 December 2014				

4.4.3 TSP and Deposited Dust

No publicly available background TSP monitoring data is available for the Site at the time of this report. The background annual average TSP concentration was estimated as two times the annual average PM_{10} concentration.

Deposited dust is monitored at seven locations along the boundary of the Site, in accordance with the Site's current Environmental Protection Licence (EPL). However, these sites are located to provide an indication of peak deposition rates and do not provide a good indication of existing background deposition rates. No other background deposited dust monitoring data is available for the Project area at the time of this report and as a result the background concentration was estimated as discussed below.

4.4.4 Summary of background pollutant concentrations

A summary of background pollutant concentrations are presented in **Table 4.8**. Given the absence of representative background TSP data, an estimate was made based on the existing annual average PM_{10} concentration, as follows:

- Annual average TSP = 2 x annual average PM_{10} = 39.6 $\mu g/m^3$

As the maximum 24-hour PM_{10} and $PM_{2.5}$ background concentrations are well above the criteria at some monitoring locations in some years, these were assessed for the Project contemporaneously using 2015 monitoring data from the Bringelly monitoring station.

Table 4.8 Summary of existing background pollutant concentrations

Pollutant of Concern	Background Concentration $\mu g/m^3$	Averaging Period
TSP	39.6	Annual
PM_{10}	100.2[1]	24-hour
	19.8	Annual
$PM_{2.5}$	93.2[1]	24 hour
	8.7	Annual

[1]PM_{10} and $PM_{2.5}$ assessed contemporaneously due to high background concentrations

5.0 Dispersion Modelling Methodology

5.1 Model Selection

5.1.1 TAPM Meteorological Model

TAPM is a prognostic model that predicts three-dimensional meteorology, including terrain-induced circulation effects. TAPM is a PC-based interface that is connected to databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature, and synoptic-scale meteorological analyses for various regions around the world. This model is used to predict meteorological parameters at both ground level and at heights of up to 8,000 m above the surface; these data are required by the CALPUFF model used to measure air dispersion.

5.1.2 CALPUFF Air Dispersion Model Suite

CALPUFF is a Lagrangian puff model and is used for regulatory air quality dispersion assessments throughout Australia. The CALPUFF modelling system consists of three main components and a set of pre-processing and post-processing programs. The main components of the modelling system are CALMET (a diagnostic three-dimensional meteorological model), CALPUFF (an air quality dispersion model), and CALPOST (a post-processing package). The main CALPUFF related software package programs are:

- **CALMET:** CALMET is a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics and dispersion properties are also included in the file produced by CALMET. CALMET produces a meteorological file that is used within the CALPUFF model to predict the movement of pollution.
- **CALPUFF:** Prediction of ground level particulate concentrations and dust deposition rates was made using the CALPUFF air dispersion model. The site specific meteorological data set developed with TAPM and CALMET was used as input into CALPUFF. Sources were defined in CALPUFF in terms of location, size, and pollutant emission rates. Ground level concentrations were calculated by CALPUFF for each pollutant of interest across a sample grid covering the Site for each hour in the modelled period. The post processing tool CALPOST was used to calculate ground level concentrations for the relevant averaging periods at each grid point and sensitive receptor. Contour plots of ground level concentrations were created using interpolation of grid point values.

5.2 Modelled Meteorology

In the absence of site-specific meteorological observations, a meteorological dataset has been prepared using a combination of regional meteorological observations from BoM and NSW Office of Environment and Heritage (OEH) stations, databases of terrain and land use, as well as gridded meteorological data from the CSIRO TAPM prognostic meteorological model. The following sections provide an overview of each of the processes.

5.2.1 TAPM

Upper air data for the CALMET model was derived from The Air Pollution Model (TAPM). For this assessment, upper air data was extracted from the TAPM at four locations for input into the CALMET model. TAPM settings and the locations of the extracted upper air data are provided in **Table 5.1**.

Table 5.1 TAPM Settings

Parameter	Setting
TAPM Version	4.0.5
Grid centre coordinates (mX, mY)	292500, 6250500
Date parameters	2015 01 01 to 2015 12 31
Number of grid points	nx = 25

Parameter	Setting
	ny = 25
Outer grid spacing	dx1 = 30,000 m
	dy1 = 30,000 m
Number of grid domains	4
Grid spacing for CALTAPM	1,000 m
Number of vertical grid levels	nz = 25
Observation file	Not used
Locations of upper air data extracted for CALMET (mX, mY)	288500, 6249500 296500, 6248000 291500, 6255500

The modelling domains generated in the TAPM model provide prognostic data across four nested grids. The first outer grid covers an area of 562,500 km^2 at 30 km resolution. The nested grids step down progressively in dimensions, to the final innermost grid, which covers an area of 625 km^2 at a resolution of 1,000 m. In the vertical direction there are 25 levels (40 layers) from the surface to 100 hPa. The lowest layer is approximately 10 m above the ground.

5.2.2 CALMET

CALMET was used in this process to collectively process the TAPM and surface observation data in conjunction with terrain and land use data to produce hourly 3-dimensional gridded arrays of meteorological parameters.

The CALMET meteorological modelling domain has been configured to encompass the region surrounding the Site, covering nearby sensitive receptors and key terrain features.

Table 5.2 presents a summary of the domain settings along with key model parameters used within CALMET to generate the meteorological fields. Explanations of these parameters are available in the following guidance document:

- 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'.

Table 5.2 CALMET Modelling Parameters for Site Domain

Parameter	Value
Meteorological grid domain	20 km x 20 km
Meteorological grid resolution	150 metre resolution (133 x 133 grid cells)
Reference grid coordinate (SW corner)	282.500 km E, 6240.500 km S
Cell face heights in vertical grid (m)	0.,20.,40.,80.,160.,320.,640.,1200.,2000.,3000.,4000.
Simulation length	1 year (2015)
Surface meteorological stations	Horsley Park (BoM) Penrith Lakes (BoM) Badgerys Creek (BoM) St Marys (OEH) Bringelly (OEH)
Upper air meteorology	TAPM derived up.dat files
CALMET Modelling Mode	Observations mode
Terrain data	Terrain elevations were extracted from NASA Shuttle Radar Topography Mission Version 3 data set (SRTM1 30 metre resolution).

Parameter	Value
Land use Data	Site-specific creation based on OEH land use data set with 50 m horizontal resolution
TERRAD (Terrain radius of influence)	5 km
R1 (Distance from an observational station at which the observation and first guess field are equally weighted) - Surface RMAX1 (Radius of influence of meteorological stations) – Surface	3 km 5 km
R2 (Distance from an observational station at which the observation and first guess field are equally weighted) - Upper RMAX2 (Radius of influence of meteorological stations) - Upper	3 km 5 km
IEXTRP (Vertical extrapolation of surface wind observation)	- 4 (extrapolate using similarity theory, exclude upper air observations from layer 1)

An analysis of the 2015 CALMET data set is presented in Annexure A.

5.3 CALPUFF settings

General CALPUFF modelling parameters used in the assessment are presented in **Table 5.3**. The model was run in accordance with Barclay and Scire (2011).

Table 5.3 General CALPUFF input parameters

Parameter	Input
CALPUFF version	7.2.1
Sampling domain	4 km by 4 km
Refined modelling grid resolution	100 m
Dispersion algorithm	Turbulence computed from micrometeorology and PDF method
Hours modelled	8782 hours
Meteorological data period	1 January 2015 – 31 December 2015

5.4 Sensitive Receptors

Sensitive receptors in the vicinity of the Project Area are shown in **Figure 5.1**. Each receptor has been given a unique identifying number. The coordinates for each receptor are presented in **Table 5.4**.

Figure 5.1 Location of modelled sensitive receptors

Table 5.4 Receptor Coordinates

Receptor Number	Type	X (mE)	Y(mN)
1	Residential	293153	6250511
2	Residential	293147	6250182
3	Residential	292765	6249672
4	Residential	292434	6249642
5	Residential	291299	6250283
6	Residential	291454	6250678
7	Residential	292226	6251802
8	Residential	292376	6251790
9	Residential	292556	6251816
10	Residential	292744	6249439
11	Residential	292902	6249413
12	Residential	293001	6249414
13	Residential	293180	6249324
14	Residential	293226	6249740

Receptor Number	Type	X (mE)	Y(mN)
15	Residential	294073	6250513
16	Residential	292712	6249377
17	Residential	292659	6249332
18	Residential	291501	6249557

5.5 Modelling Scenario

A single realistic "worst-case" modelling scenario was developed based on proximity to the nearest sensitive receptor – Receptor 1. The scenario represented 100% of waste being delivered via a haul road along the eastern boundary of the Site, with 100% of plant and equipment working on the delivered waste in an area of active landfilling abutting the eastern boundary at a height of RL65. The haul road along the eastern boundary is currently unsealed, but would be sealed within 12-months of approval. Landfilling activates will be occurring along the boundary within about 150 m of Receptor 1. In comparison the second nearest receptor is Receptor 2, at about 190 m from the boundary. To the south, the nearest receptor is Receptor 3, which is about 400 m from the boundary. A general layout of the modelling scenario is presented in **Figure 5.2**.

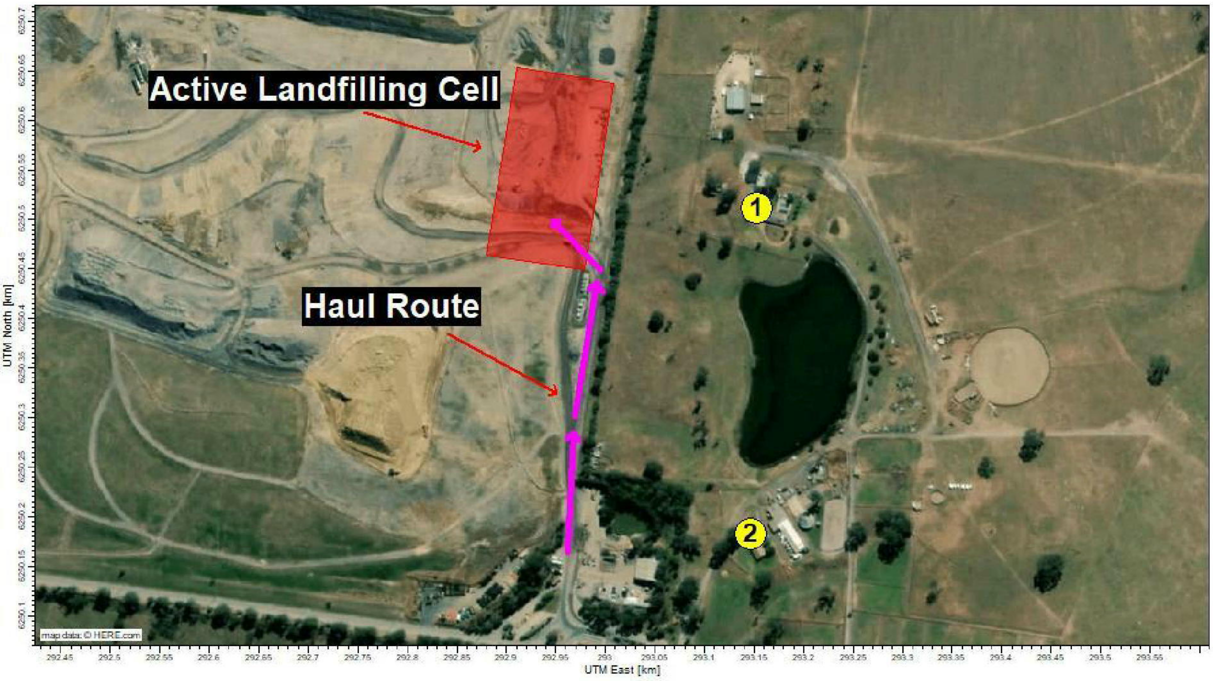


Figure 5.2 Layout of "worst-case" modelling scenario with proximity to Receptor 1 and 2

A summary of general parameters for the modelling scenario are presented in **Table 5.5**.

Table 5.5 Modelling scenario general parameters

Parameter	Value
Waste acceptance rate	950,000 tonnes/year
Landfilling stage	65 m RL

5.6 Emissions Inventory

A site specific emissions inventory for each pollutant of concern and was developed based on published emission factors listed in the National Pollutant Inventory Emission Estimation Manual for Mining (NPI 2012) and the USEPA AP-42 (USEPA 1998, USEPA 2006). The published emission factors were adopted due to the absence of site specific emissions data. Appropriate mitigation controls (such as watering haul roads and revegetating areas of bare earth) listed in relevant literature were applied to emission rates. These are discussed further below. Operational and fleet data were supplied by SUEZ. A summary of adopted emissions factors and mitigation controls for each activity is presented in **Table 5.6**. A summary of variables used in the emissions factor equations and emission inventory calculations is presented in **Table 5.7**. Assumptions were made where site-specific data was unavailable. PM_{10} to $PM_{2.5}$ correction factors were applied to $PM_{2.5}$ emission rates without published emission factors. The correction factors were taken from Cowherd et al (2006).

Excavator handling emission rates were used to estimate dust emission from the dumping of waste material from trucks. The bulk of material is not expected to be significantly dusty (concrete and building waste). The NPI emission factor for dumping emissions was not used as it is based on highly dusty overburden at mines and would grossly overestimate dumping emission for the Project.

The emission rates presented in this section represent emissions based on landfilling activities occurring as part of the “worst-case” modelling scenario, i.e. along the eastern boundary. Emissions for this scenario would be occurring only for a small fraction (perhaps 2 % or so) of the total Project lifespan. When landfilling activities are located further away from the receptors on the eastern side of the landfill, estimated emission rates would differ from those presented in this assessment.

Table 5.6 Adopted emission factors for the Project

Activity	Emission Factor	Source	Units	$PM_{10}/PM_{2.5}$ Correction	Variables	Mitigation Factors
Excavator – used to estimate trucks dumping waste onto active landfill	$EF_{TSP} \quad x \quad x\left(\frac{\left(\frac{U}{}\right)^{1\,3}}{\left(\frac{M}{}\right)^{1\,4}}\right)$ $EF_{PM10} \quad x \quad x\left(\frac{\left(\frac{U}{}\right)^{1\,3}}{\left(\frac{M}{}\right)^{1\,4}}\right)$	AP-42 Chapter 11.9 Table 11.9-4 (USEPA 1988)	kg/t	0.15	U = mean wind speed in m/s M = moisture content of material in %	NA
Bulldozer on landfill	$EF_{TSP} = 2.6 \times \left((s)^{1.2} / (M)^{1.3} \right)$ $EF_{PM_{10}} = 0.34 \times \left((s)^{1.5} / (M)^{1.4} \right)$	NPI (2012)	kg/h/vehicle	0.1	s = silt content of material in % M = moisture content of material in %	75% utilisation time (assumed)
Intermediate cover scraping	Default of 0.029 for TSP Default of 0.0073 for PM_{10}	NPI (2012)	kg/t	0.15	NA	NA
Grader	$EF_{TSP} = 0.0034 \times S^{2.5}$ $EF_{PM_{10}} = 0.0034 \times S^{2.0}$	NPI (2012)	kg/VKT	0.15	S = grader speed in km/h VKT = vehicle kilometres travelled	NA
Wheel generated dust from unpaved roads (waste haul)	$EF_{TSP} = \frac{0.4536}{1.6093} \times 4.9 \times \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$ $EF_{PM_{10}} = \frac{0.4536}{1.6093} \times 1.5 \times \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$	AP-42 (USEPA 2006) recommended in NPI (2012)	kg/VKT	0.1	s = material silt content in % W = weight of vehicle in t	Level 2 watering (>2 litres/m^2/hr) 75 %
Wheel generated dust from paved roads	PM 0 91 1 02	AP-42 Chapter 13.2.1 (USEPA 2011)	kg/VKT	NA	k = particle size multiplier sL = road surface silt loading (g/m^2) W = mean vehicle weight (tonnes)	NA
Wind erosion	Default of 0.4 for TSP Default of 0.2 for PM_{10}	NPI (2012)	kg/ha/hr	0.15	NA	Partial revegetation – 40% applied to all areas of intermediate cover – assumed temporary grass cover

Table 5.7 Variables used in the emissions inventory

Variable	Value	Units	Reference
Operational days per year	302	days	Assumed
Daily operating hours	7 - 12	hours	6 am to 6 pm Monday to Friday; 7 am to 2 pm Saturday
Operation days per week	6	days	Monday to Saturday
Waste delivery volume	950,000	t/year	Proposed
Area of active landfill	12,000	m^2	Estimated by SUEZ
Area of intermediate cover	200,000	m^2	Estimated
Bulldozer operation	75	%	Assumed
s – Silt content of unsealed haul roads	6.4	%	Disposal route mean for municipal solid waste landfills AP-42Table 13.2.2-1 (USEPA 2006)
s – Silt content of active landfill areas (for bulldozer emissions)	3	%	Assumed – dozers will be working primarily on waste material which is unlikely to be high in silt content
M – Moisture content of waste and surface material	10	%	From 2017-18 waste breakdown provided by SUEZ
U – mean wind speed	1.8	m/s	From 2015 CALMET data
Grader speed	3	km/h	Assumed

Wheel-generated dust emissions were based on the projected number of truck movements and truck weights. Truck numbers movements and average truck capacities were based on data provided in the Traffic and Transport Chapter of this EIS. A summary of the truck movements and capacity data used for the modelling are presented in **Table 5.8**. Note that on average trucks on Saturdays have slightly higher empty weight and carrying capacity that weekday trucks.

Table 5.8 Summary of truck movements

Vehicle Type	Weekday Trucks	Saturday Trucks	Dump Truck	SAWT Trucks[1]
Empty weight (tonnes)	9	11	24	8
Load capacity (tonnes)	12.7	14.9	27	12
Assumed Duty	Waste delivery	Waste delivery	Intermediate cover	SAWT waste delivery
Total Daily Trips	280	74	5	40
Annual Vehicles	70,553	3,826	1,556	10,400
Annual Throughput (t)	893,000	57,000	42,000	124,800

[1]Included as a background source

Hourly waste delivery truck movements were used to vary emission rates on the waste haul roads according to the hour of day. A summary of truck movements by hour of day for weekdays are presented in **Table 5.9**. Hour of day movement for Saturdays, and emission rates for Saturdays, were assumed to be constant.

Table 5.9 Hour of day truck movements for weekdays

Hour	Weekday heavy vehicles at 950,000 tpa	
	Hourly distribution	Percentage of daily vehicles
6am – 7am	13	5%
7am – 8am	29	10%
8am – 9am	31	11%
9am – 10am	34	12%
10am – 11am	30	11%
11am – 12pm	35	13%
12pm – 1pm	33	12%
1pm – 2pm	15	5%
2pm – 3pm	28	10%
3pm – 4pm	24	9%
4pm – 5pm	8	3%
Daily Total Vehicles	**280**	**100%**

A list of plant included in the modelling scenario and respective exhaust emission rates for PM_{10} and $PM_{2.5}$ are presented in **Table 5.10**. For plant models that were known, engine specifications were found online and the relevant European emission standards for particulate matter were applied. For models that were unknown, the more conservative Euro III A standards were applied.

Table 5.10 Plant exhaust emission rates

Plant	Num.	Utilisation (%)	Load Factor	Engine Power (kW)	EF (g/kWh)[1]		ER (g/s)	
					PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Excavator	2	50	0.5	150	0.2	0.2	0.004	0.004
Cat D7 Dozer	1	75	0.55	178	0.025	0.025	0.001	0.001
Cat D8 Dozer	1	75	0.5	120	0.2	0.2	0.003	0.003
Grader	1	25	0.5	149	0.2	0.2	0.001	0.001
Cat 836 Waste compactor	2	75	0.5	419	0.025	0.025	0.002	0.002
Cat 826 Waste compactor	1	75	0.5	324	0.2	0.2	0.007	0.007
Cat 745 Dump Truck	2	75	0.5	381	0.025	0.025	0.002	0.002
Water carts	2	50	0.5	200	0.2	0.2	0.0056	0.0056
						Total	**0.025**	**0.025**
[1]EF of 0.2 = Euro III A; EF of 0.025 = Euro IV								

A summary of mitigated emission rates used in the modelling scenario are presented in **Table 5.11**. Mitigation control factors built into these emission rates are summarised as follows:

- The haul road along the eastern boundary is sealed until the point where trucks move westwards onto the landfill itself.
- Watering down of unsealed haul roads at a rate of >2 litres per square metre per hour.
- Temporary revegetation/ hydroseeding of stockpile areas with grass cover.

Table 5.11 Summary of mitigated emission rates

Activity/ Source	Emission Rate (g/s)[1]		
	TSP	PM_{10}	$PM_{2.5}$
Unsealed haul road (weekdays)	1.12	0.30	0.030
Unsealed haul road (Saturdays)	0.55	0.15	0.003
Sealed haul road (weekdays)	0.66	0.13	0.031
Sealed haul road (Saturdays)	0.40	0.08	0.020
SAWT Sealed haul road	0.06	0.011	0.0026
Dozer on active face/ stockpiles	0.10	0.015	0.0015
Excavator removing waste from trucks	0.028	0.013	0.0020
Handling of intermediate cover (includes excavator/ scraper and dump truck)	0.054	0.015	0.0034
Wind erosion on active cells	2.53	1.27	0.19
Wind erosion on areas of intermediate cover	1.11	0.55	0.08

[1]Variable emission rates were applied to all sources according to Project operating hours, except wind erosion which was applied to all hours with wind speeds greater than or equal to 5.1 m/s.
[2]Emission rates for these sources varied by hour of day on weekdays, but not on Saturdays

6.0 Impact Assessment

6.1 Modelling Results

Results of the modelling are presented in **Table 6.1**. The results represent the highest predicted pollutants concentrations at the modelled sensitive receptors. The following is a summary of the results:

- Predicted cumulative TSP concentrations were below the criterion at all receptors. The highest Project contribution was 7.0 μg/m^3, or about 8% of the criterion.
- A single exceedance of the 24-hour PM_{10} criterion was predicted (at Receptor 1). The exceedance was due to an elevated background concentration which was already above the criteria. No additional exceedances of the criterion were predicted at any receptor. The highest Project contribution was 18.1 μg/m^3, or about 36% of the criterion.
- Two exceedances of the 24-hour $PM_{2.5}$ criterion were predicted for cumulative concentrations. One exceedance was due to a background concentration above the criterion. The second exceedance was primarily due to a background concentration which was at 99% of the criterion. No further exceedances of the criterion were predicted at any receptor. The highest Project contribution was 3.1 μg/m^3, or about 12% of the criterion.
- Cumulative annual average PM_{10} concentrations were predicted to be below the criterion at all receptors. The highest Project contribution was 4.0 μg/m^3, or about 16% of the criterion.
- The background annual average $PM_{2.5}$ concentration was above the criterion and therefore all cumulative predictions at receptors were also above the criterion. The highest Project contribution was 0.7 μg/m^3, or about 9% of the criterion.
- Predicted incremental rates of deposited dust were below the criteria at all modelled sensitive receptors.

Table 6.1 Summary of air dispersion modelling results

Pollutant of concern	Averaging period	Highest pollutant concentration at a receptor (μg/m^3)		Receptor with highest project only concentration	Criteria μg/m^3	Comments
		Project Only	Cumulative			
TSP	Annual	7.0	46.6	1	90	Comply
PM_{10}	Annual	4.0	23.8	1	25	Comply
	24-hour	18.1	**68.2**[1]	1	50	Single exceedance due to background
$PM_{2.5}$	Annual	0.7	**9.4**	1	8	Exceedance due to elevated background
	24-hour	3.1	**29.6**[1]	1	25	Two exceedances due to background
Deposited dust	Annual	1.0 g/m^2/month	-	1	2 g/m^2/month (incremental)	Comply

[1]Cumulative concentration predicted by means of contemporaneous assessment.

As shown in **Table 6.1**, exceedances of the Project criteria were predicted for 24-hour PM_{10}, and for 24-hour and annual average $PM_{2.5}$. As discussed above, the exceedances were mainly due to high background concentrations in the Project Area. The highest predicted concentrations were all at Receptor 1, which represents the closest receptor to the modelled active landfilling area (see **Figure 5.2**). The Project incremental pollutant concentrations were typically much lower at other receptors; for example, incremental 24-hour PM_{10} concentrations ranged from 0.6 $\mu g/m^3$ (Receptor 18) to 9.5 $\mu g/m^3$ (Receptor 2) at the other modelled receptors.

As discussed in **Section 4.4**, high existing background concentrations of PM_{10} and $PM_{2.5}$ necessitated assessment by means of a contemporaneous assessment. These were conducted by adding 24-hour average PM_{10} observations from the Bringelly monitoring station (for PM_{10}) and Prospect monitoring station (for $PM_{2.5}$) to the model predictions for each day in the modelled year of 2015. The results of the contemporaneous assessments are presented graphically in **Figure 6.1** for 24-hour average PM_{10} and **Figure 6.2** for 24-hour average $PM_{2.5}$.

As shown in **Figure 6.1**, there is a single exceedance of the PM_{10} 24-hour criteria in the background data and no additional exceedances caused by the Project. It is evident in this graph that Project incremental PM_{10} concentrations are generally higher during the winter months as wind swing more westerly and blow Project emissions more towards Receptor 1 and dispersion conditions are generally worse.

There is a single exceedance of the $PM_{2.5}$ 24-hour criteria in the background data as shown in **Figure 6.2** and no additional exceedances caused by the Project. Based on the results, $PM_{2.5}$ impacts to nearby receptors due to the Project are not expected to result in adverse impacts.

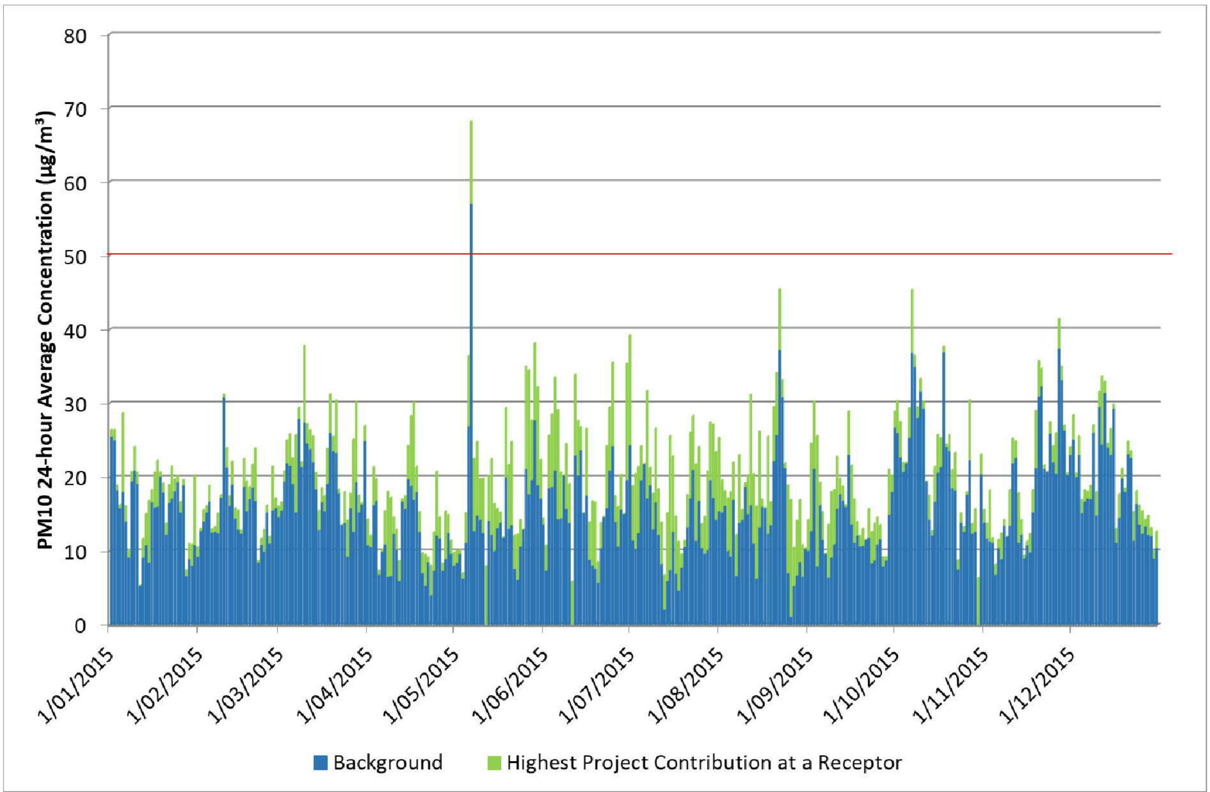


Figure 6.1 24-hour PM_{10} contemporaneous assessment – background PM_{10} data from Bringelly 2015

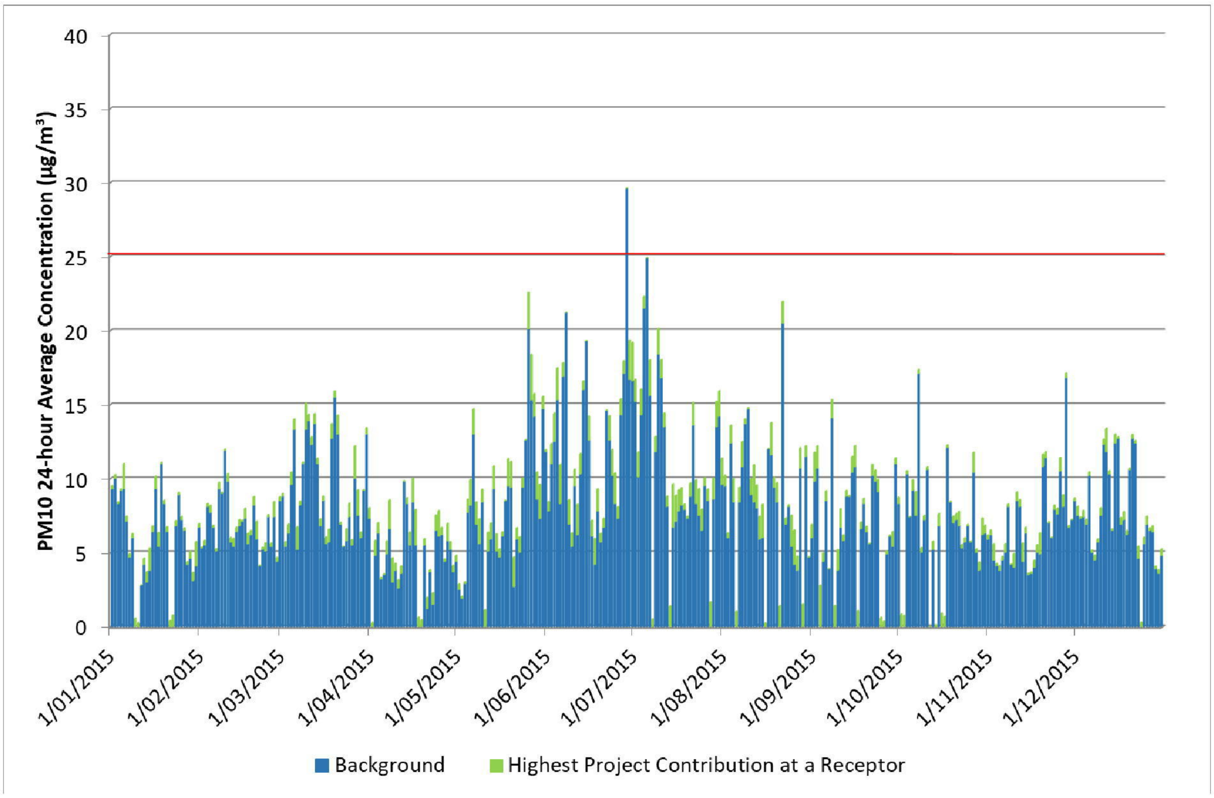


Figure 6.2 24-hour $PM_{2.5}$ contemporaneous assessment – background $PM_{2.5}$ data from Prospect 2015

Contour plots for selected pollutants and averaging times are presented in the next four figures. Project-only contribution for 24-hour PM_{10} and $PM_{2.5}$ are presented in **Figure 6.3** and **Figure 6.4**, respectively. Annual average cumulative concentrations for PM_{10} and $PM_{2.5}$ are presented in **Figure 6.5** and **Figure 6.6**, respectively.

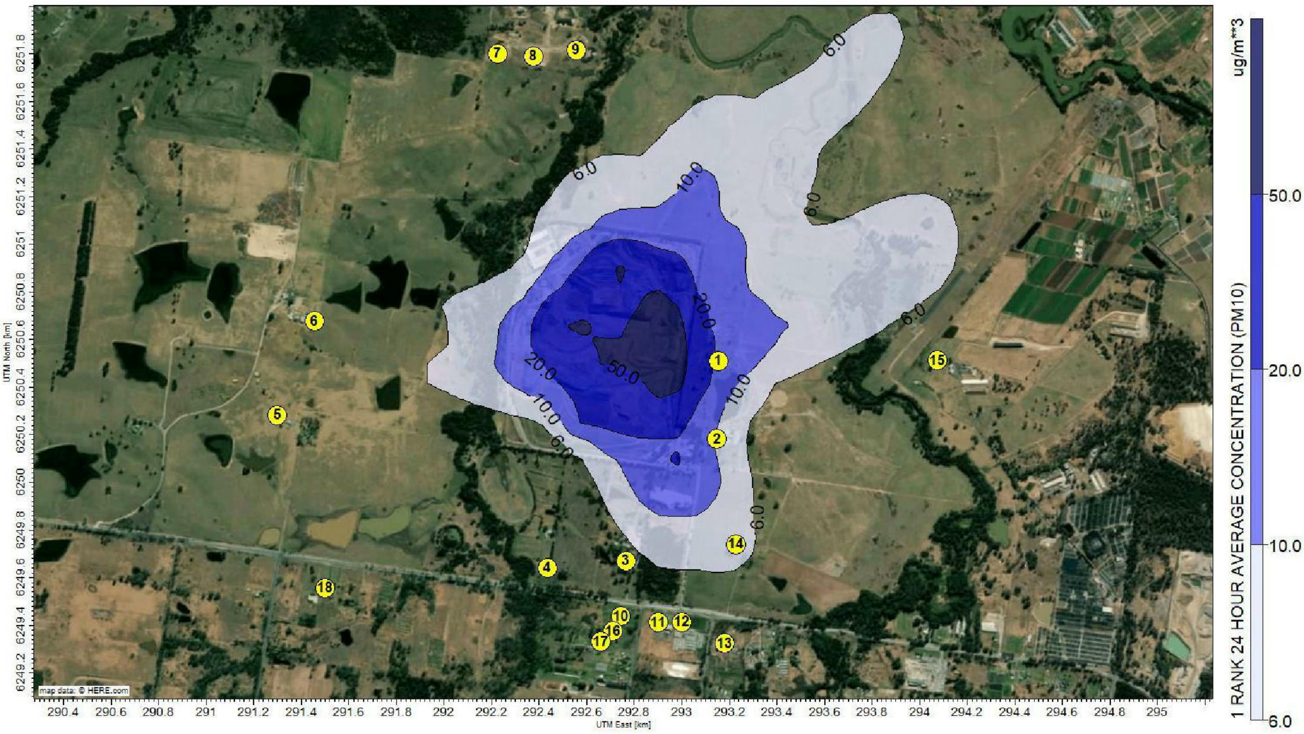


Figure 6.3 Maximum 24-hour PM_{10} Concentrations – Project only

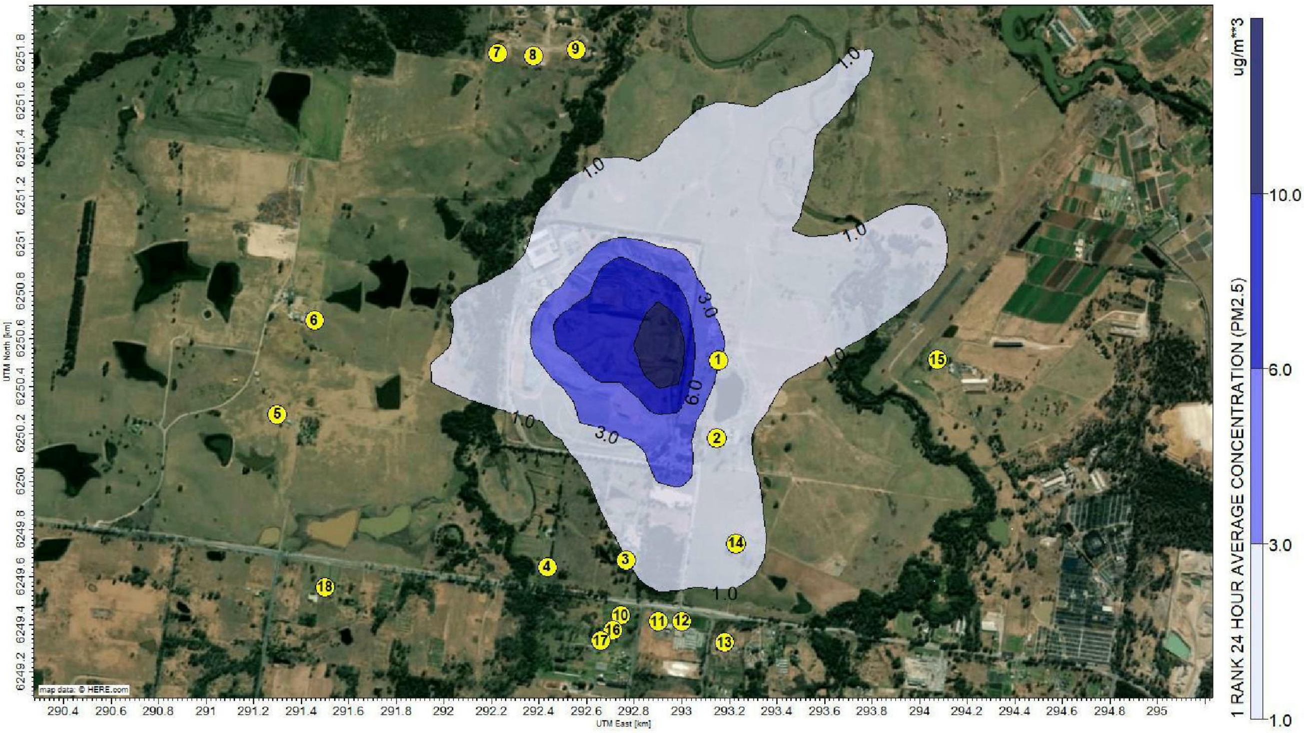


Figure 6.4 Maximum 24-hour $PM_{2.5}$ Concentrations – Project only

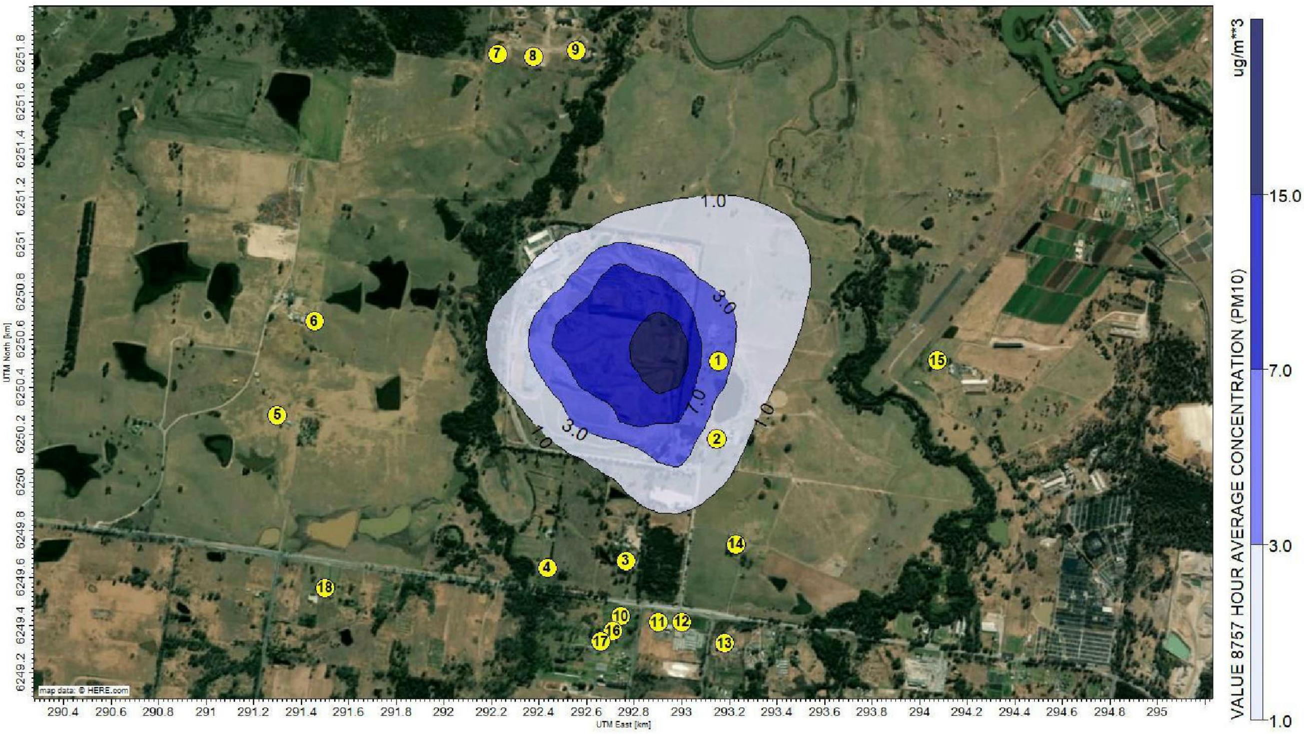


Figure 6.5 Annual Average PM_{10} Concentrations – Cumulative

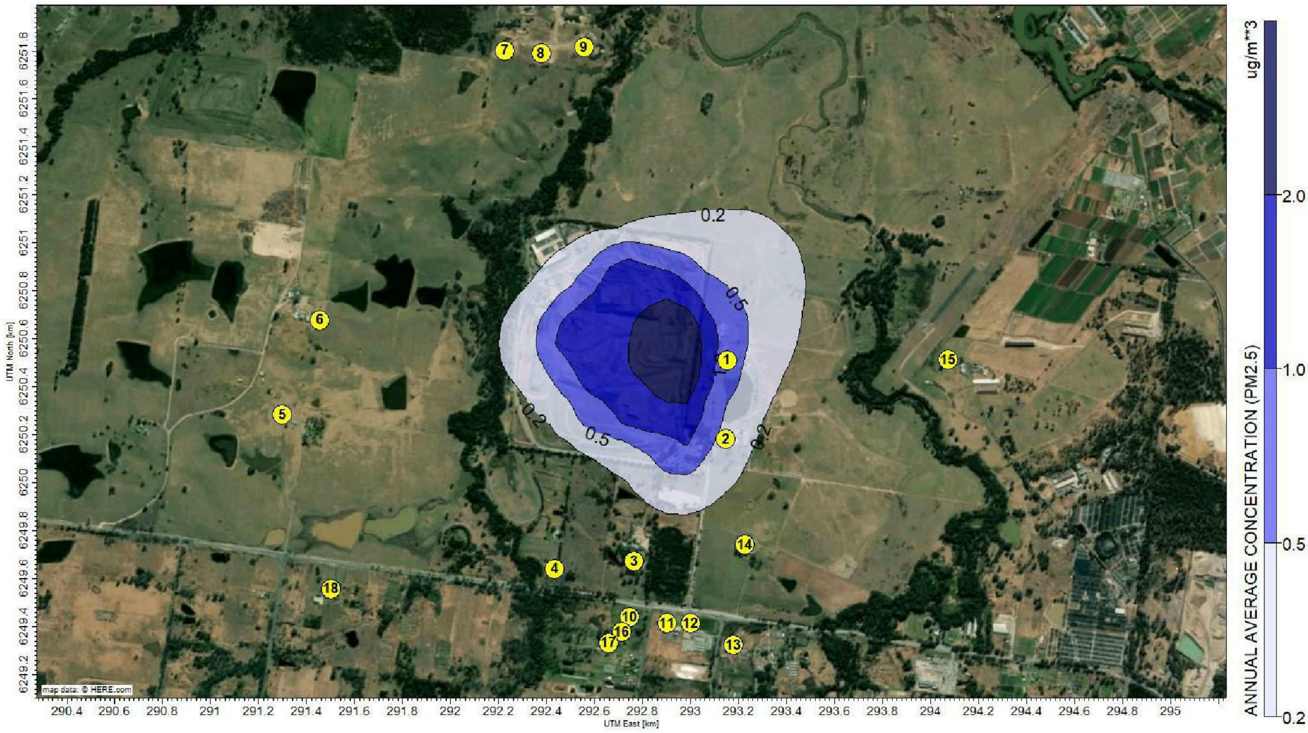


Figure 6.6 Annual Average PM$_{2.5}$ Concentrations – Cumulative

6.2 Discussion of Modelling Results

Overall, the results of the modelling showed that Project incremental dust impacts are relatively minor and are fairly typical for a landfilling operation. As shown in **Figure 6.1** and **Figure 6.2**, the inclusion of background PM_{10} and $PM_{2.5}$ pushes predicted cumulative concentrations higher, but the majority of days are still well below the respective dust fraction criteria. It is only the occasional day with high background particulate concentrations that result in elevated cumulative particulate concentrations close to or above the Project criteria. The occurrences of high background particulate concentrations are typically due to exceptional events, such as hazard reduction burning, bushfires, or dust storms. Management of the Project will need to take high background dust concentrations (as monitored and reported online by NSW EPA) into account to ensure that the Project does not contribute to an already degraded airshed resulting in worse particulate concentrations at nearby receptors over the criteria. This will be particularly important during the winter months when winds are blowing towards the receptors to the east of the facility. Potential management strategies for the operation of the landfilling activities which are of particular importance for the days with elevated background particulate concentrations are discussed in **Section 7**.

A single "worst-case" scenario was modelled for this assessment. The scenario was chosen based on proximity of the expected landfilling activities to the nearest receptor (Receptor 1) on the eastern side of the Site. As active landfilling moves around the Site, the spatial distribution of dust concentrations will also move. The nearest receptors to the south of the Site are Receptor 3, Receptor 4, and Receptor 14, which are at least 400 m from the Site boundary. The prevailing wind during the drier late winter and early spring months, when conditions would likely be dustier, are from the southwest. Even if landfilling activities are concentrated along the southern boundary, it is likely that concentrations at these receptors would be lower than those predicted in this assessment for Receptor 1. All other receptors are even further from the site and significant impacts are highly unlikely for the duration of the Project.

6.3 Odour Assessment

The majority of waste proposed to be accepted for the Project would be non-putrescible general solid waste and restricted waste (such as construction and demolition material, CSI waste, contaminated soil and dry solid waste) that is not expected to contain odorous materials. However, as stated in **Section 3.1**, there is still a potential that some odorous materials may be accepted for the Project. For example, Restricted Solid Waste (RSW) that is brought to the landfill from contaminated sites may contain odorous contaminants such as volatile organic compounds. RSW is expected to account for less than 10% of accepted waste for the Project and not all RSW is likely to be odorous.

If not managed appropriately there it the potential for odour impacts at nearby sensitive receptors when handling odorous RSW. Odour emissions would be managed by ensuring that the RSW is only exposed for very short periods of time. Trucks delivering RSW to site would all be fully covered. When the trucks arrive at the designated RSW landfill cell, the load would be uncovered, deposited into the cell, and covered almost immediately. This would reduce the amount of time that RSW is exposed to the air and would limit the potential for odour emissions.

Landfill gas (LFG) would be collected by the existing LFG extraction system. This is comprised of a series of wells and pipes, which transport the LFG to the turbines, located adjacent to the SAWT. Here the LFG is combusted to generate electricity, with excess gas being flared. The LFG extraction system provides advective pressure relief and reduces the risk of a breach in the containment system and reduces upward migration of landfill gas prior to the construction of final capping. The active extraction coupled to a flare allows the effective destruction (in excess of 98% of odorous compounds and methane). The continued operation of the landfill gas to energy system will continue to minimise odour impacts arising from LFG generated by the capped landfill.

Odour is currently managed at the landfill in accordance with the site's Environmental Protection Licence (EPL), number 4068, and Landfill Environment Management Plan. Current management practices result in no odour impacts, and these practices will continue for the Project. A list of odour management practices listed in the LEMP are presented in **Section 7.0**. Odour related conditions listed in the EPL are presented in Annexure B.

The neighbouring SAWT facility is another potential source of odour. However, the SAWT is operated under a separate consent and emissions from the SAWT are therefore not relevant to the Project.

The combination of RSW handling practices and the LFG extraction system are expected to keep odour emissions due to the Project to a minimum. The impact of odour arising from Project activities on surrounding receivers is therefore expected to be negligible.

7.0 Mitigation Measures

A range of mitigation strategies were included in the calculation of emissions for the modelling scenario. These strategies are considered the minimum requirement for the Project to ensure that offsite air quality impacts are kept to a minimum. The strategies are summarised as follows:

- Seal the haul road along the eastern boundary of the Site. The haul road would need to be sealed along the boundary until the point where trucks move westwards onto the landfill itself.
- Watering down of unsealed haul roads frequently when conditions are dry and/or when dust lift-off is visible.
- Temporarily revegetate/hydroseed stockpile areas with grass cover as soon as possible.

Further mitigation strategies that are listed in the current EMP (SUEZ 2016) or would be beneficial to the further reduction of dust emissions include:

- All trucks entering and leaving the Site should have loads covered.
- Watering down of areas of active landfilling when dust is visibly blown by strong winds towards the receptors.
- Watering down or sweeping the sealed haul road if high dust loads are tracked-out from the unsealed areas and dust lift-off becomes visible from the sealed road.
- Maintain plant and equipment according to manufacturer's specifications to reduce the potential for abnormal exhaust particulate emissions.
- Maintain diesel particulate filters in good working order where fitted to plant and equipment.
- Train staff in proper use of all equipment from a dust-minimisation perspective.
- Maintain a register for all dust-related complaints received from nearby residents. All complaints shall be investigated and further mitigation applied as required.
- On days of high background PM_{10} or $PM_{2.5}$, reduce or halt dust-generating activities, or apply additional mitigation to ensure no visible dust is produced onsite. Daily air quality alerts can be found on the EPA website and should be included for discussion in daily pre-start toolbox talks. A mitigation plan would be included in the Dust Management Plan, part of the Landfill Environmental Management Plan for the Site operations. An example mitigation plan based around the forecast Air Quality Index for the day might be similar to the following:
  - A forecast AQI of "Fair" on the EPA website would trigger additional mitigation, for example watering down of active landfilling areas and waste in trucks, or halting dozer activities.
  - A forecast AQI of "Poor" would trigger a reduction or halting of dust generating activities.
  - A forecast AQI of "Very Poor" or "Hazardous" would trigger an immediate stop to all activities onsite pending a reduction in the AQI.

Mitigation measures listed in the current EMP (SUEZ 2016) for reducing the likelihood of odour impacts due to the Project are:

- ensuring the immediate deposition of waste upon delivery
- covering of received waste as soon as practicable
- regular review of LFG infrastructure performance
- periodical maintenance of LFG infrastructure, as required, and
- sourcing of odour neutralising systems, as required.

Odour management will be undertaken to ensure continued compliance with conditions listed in the site EPL, number 4068, as presented in Annexure B.

8.0 Cumulative Assessment

The Project has been assessed in this report according to existing land uses and sensitive receptors. However, the area surrounding the Site is included in the Western Sydney Priority Growth Area, which will result in changes to land use surrounding the Site. The existing rural land surrounding the site is likely to be rezoned as commercial and industrial as nearby projects such as the Western Sydney Airport, M12 Motorway, M9 Motorway and North South Rail Link come commence.

Construction earthworks for some of the future projects listed above will likely overlap to varying degrees with the Project (between 2026 and 2031) and will almost certainly result in cumulative dust impacts with the Project. However, at the time of this report, the spatial and temporal distribution and magnitude of dust emissions from these future projects is unknown. Assessment of cumulative impacts associated with these future projects is therefore currently not possible. Management of any cumulative dust impacts (taking into account emissions from the Project) would need to be considered as part of the assessment and approval process for any future project.

As outlined above the Project is likely to lead to a negligible impact on odour. On this basis there would be no residual odour impact and as such no potential for the Project to contribute cumulatively to existing odour in the area.

9.0 Conclusion

An AQIA was undertaken for proposed operations associated with an increase in the final finished height of the SUEZ landfill operation located at Elizabeth Drive, Badgerys Creek. The proposal includes the raising of the final landfill height from RL 80 to RL 95. The increase in the landfill landform height will be associated with landfilling of non-putrescible general solid waste and restricted solid waste in accordance with approved consent and EPA licence requirements.

The existing environment was described in terms of meteorology, terrain, land use and air quality. Dust emissions due to the Project were assessed by means of the CALPUFF air dispersion model. A “worst-case” modelling scenario was identified with 100% of landfilling activities occurring in a section abutting the eastern landfill boundary. Dust emission rates were estimated based on forecast waste delivery volumes and plant utilisation. The following is a summary of the modelling results:

- Predicted cumulative TSP concentrations were below the criterion at all receptors. The highest Project contribution was 7.0 $\mu g/m^3$, or about 8% of the criterion
- A single exceedance of the 24-hour PM_{10} criterion was predicted (at Receptor 1). The exceedance was due to an elevated background concentration which was already above the criteria. No additional exceedances of the criterion were predicted at any receptor. The highest Project contribution was 18.1 $\mu g/m^3$, or about 36% of the criterion
- Two exceedances of the 24-hour $PM_{2.5}$ criterion were predicted for cumulative concentrations. One exceedance was due to a background concentration above the criterion. The second exceedance was primarily due to a background concentration which was at 99 % of the criterion. No further exceedances of the criterion were predicted at any receptor. The highest Project contribution was 3.1 $\mu g/m^3$, or about 12% of the criterion
- Cumulative annual average PM_{10} concentrations were predicted to be below the criterion at all receptors. The highest Project contribution was 4.0 $\mu g/m^3$, or about 16% of the criterion
- The background annual average $PM_{2.5}$ concentration was above the criterion and therefore all cumulative predictions at receptors were also above the criterion. The highest Project contribution was 0.7 $\mu g/m^3$, or about 9% of the criterion
- Predicted incremental rates of deposited dust were below the criteria at all modelled sensitive receptors.

Emissions in the model were based on all accepted waste being handled in a small area adjacent to the eastern boundary. In reality, most waste would be handled elsewhere within the site over the course operation of the landfill. Based on this scenario, annualised PM_{10} and $PM_{2.5}$ concentrations at the nearest receptor are therefore likely to be lower than those predicted in this assessment. The same may be said for other nearby receptors, all of whom are a greater distance from the active landfill.

Potential odour emissions due to the acceptance and handling of RSW would be managed by covering delivery truck loads and covering waste in the landfill cells upon deposition. In this manner, exposure to air of any odorous materials and potential odour impacts off site would be minimised. Fugitive landfill gas emissions would be managed via the LFG extraction system. LFG would be combusted and flared in the existing LFG to energy system. The combination of RSW handling practices and the LFG extraction/energy system are expected to keep odour emissions from the Project to a minimum. The impact of odour arising from Project activities on surrounding receivers is therefore expected to be negligible.

Overall, predicted Project contributions to dust concentrations at sensitive receptors were relatively low compared to the criteria. However, the Project is located is Western Sydney and as such, background particulate concentrations can be elevated at times, which emphasises the need for the Project to manage dust emissions appropriately. A range of mitigation measures have been identified for Project operations. With these mitigation measures in place, the Project is not expected to result in significant air quality impacts upon nearby sensitive receptors.

10.0 References

Bureau of Meteorology (BoM) (2018), *(http://www.bom.gov.au/climate/averages/tables/cw_067108.shtml; accessed 27 July 2018) and (http://www.bom.gov.au/climate/averages/tables/cw_067119.shtml; accessed 27 July 2018)*

Cowherd C., Donaldson J, Hegarty R., Ono D. (2006). *Proposed revisions to fine fraction ratios used for AP-42 fugitive dust emissions*. Midwest Research Institute.

Environment Protection Authority, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, 2016.

http://www.bom.gov.au/climate/averages/tables/cw_067108.shtml (accessed 27 July 2018)

http://www.bom.gov.au/climate/averages/tables/cw_067119.shtml (accessed 27 July 2018)

http://www.environment.nsw.gov.au/AQMS/search.htm (accessed 27 July 2018)

National Pollutant Inventory (NPI) (2012). *Emission estimation technique manual for mining (Version 3.1)*. Canberra: Commonwealth of Australia Department of Sustainability, Environment, Water, Population and Communities (DSEWPC).

SUEZ (2016). *Environmental Management Plan; Elizabaeth Drive Landfill*. Issue Date 22-Jan-2016

United States Environmental Protection Agency (USEPA) (1998-2). *AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Chapter 11.9: Western Surface Coal Mining*.

United States Environmental Protection Agency (USEPA) (2006). *AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Chapter 13: Miscellaneous Sources, 13.2.2 Unpaved Roads*.

Annexure A

Analysis of CALMET Dataset

CALMET Meteorological Data Review

This section presents a summary of CALMET model predictions at the proposed project location (Site), with reference against observations recorded at the Bureau of Meteorology (BoM) Badgerys Creek automatic weather station (AWS). This AWS constitutes the closest observations station within the modelling domain, which has all required data for verification, along with a similar proximity to common terrain features, and is located approximately 4 km southwest from the Site.

Winds

Wind predictions were extracted from CALMET at the Site for reference against long term (2013 to 2017) regional observations at BoM Badgerys Creek. The following tables present a comparison between the two data sets.

Wind speed statistics for 2016 are presented in **Table 10.1.** Winds predicted by CALMET at the Site are generally lower than at Badgerys Creek, with an average wind speed of 1.8 m/s. A higher frequency of calms are also predicted by CALMET compared with the observations at Badgerys Creek.

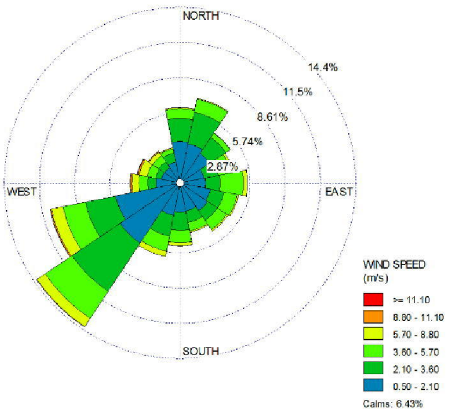
Table 10.1 Regional Wind Statistics Comparison

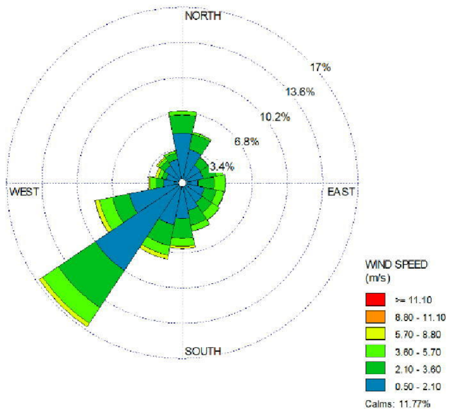
Wind Parameters	BoM Badgerys Creek 2013 – 2017	CALMET 2015
Average (m/s)	2.4	1.8
Maximum (m/s)	12.5	8.8
Calms (%) (<0.5m/s)	6.4	11.8

CALMET winds are compared against long term winds at BoM Badgerys Creek in **Table 10.2**. CALMET wind directions are very comparable to the long term trends at the BoM station; although again the wind speeds generated by CALMET are slightly lower.

Table 10.2 Annual Wind Rose Comparison CALMET 2015 to Long Term (2013 – 2017) BoM Badgerys Creek

BoM Badgerys Creek 2013 – 2017	CALMET 2015

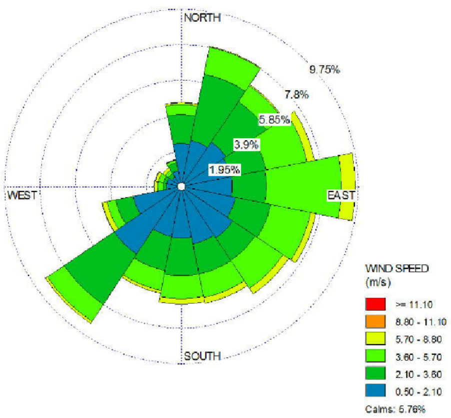


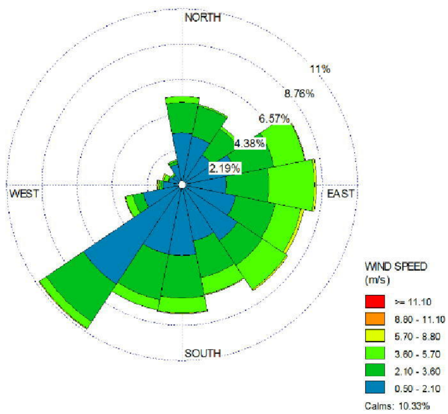


Seasonal winds predicted by CALMET are compared against long term winds at BoM Badgerys Creek in **Table 10.3**. Overall there is a good correlation between the two data sets, with some minor differences. The wind roses show the lower winds speeds predicted by CALMET at the Site compared with the BoM observations.

Table 10.3 Seasonal wind rose comparison CALMET 2015 to long term (2013 – 2017) BoM Badgerys Creek

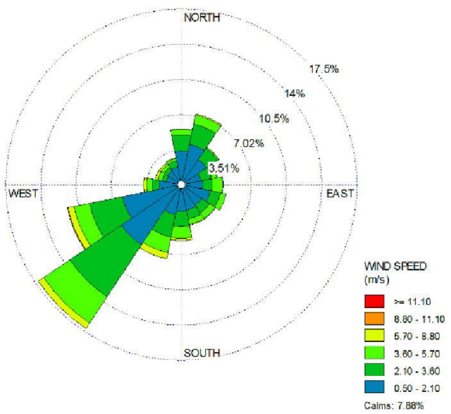
Summer Wind Rose

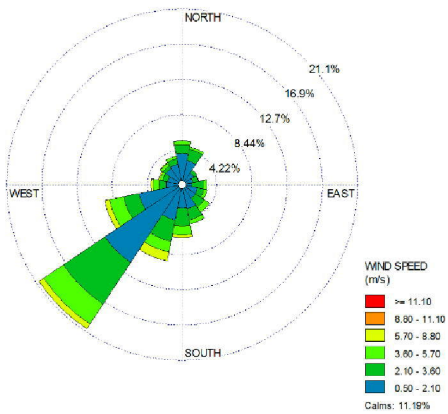




BoM Badgerys Creek 2013 - 2017 | CALMET 2015

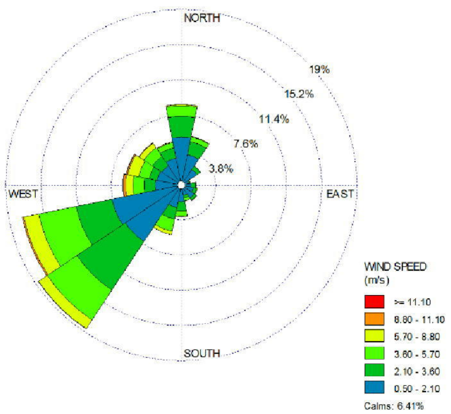
Autumn Wind Rose

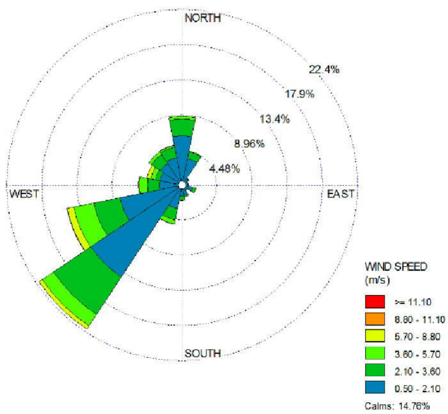




BoM Badgerys Creek 2013 - 2017 | CALMET 2015

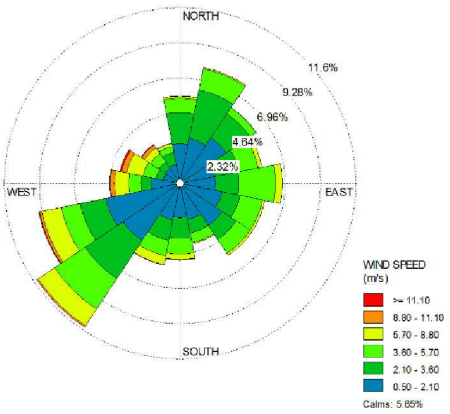
Winter Wind Rose

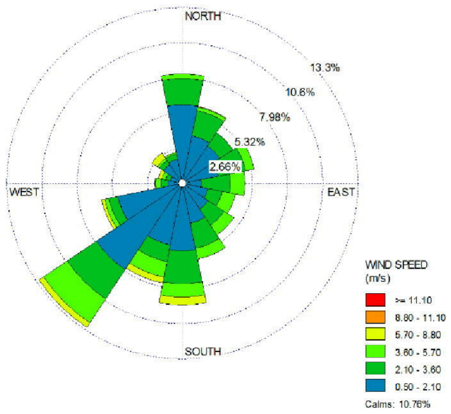




BoM Badgerys Creek 2013 - 2017 | CALMET 2015

Spring Wind Rose



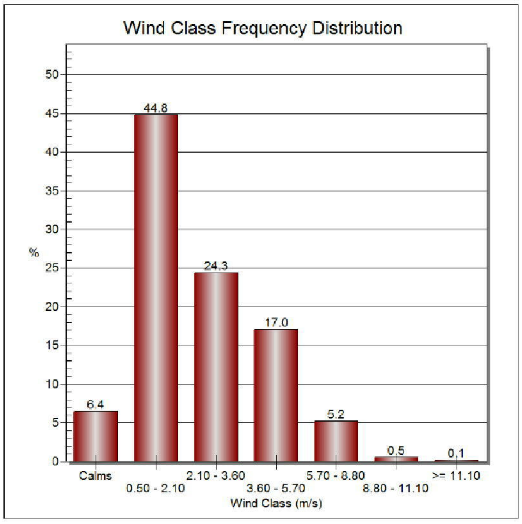


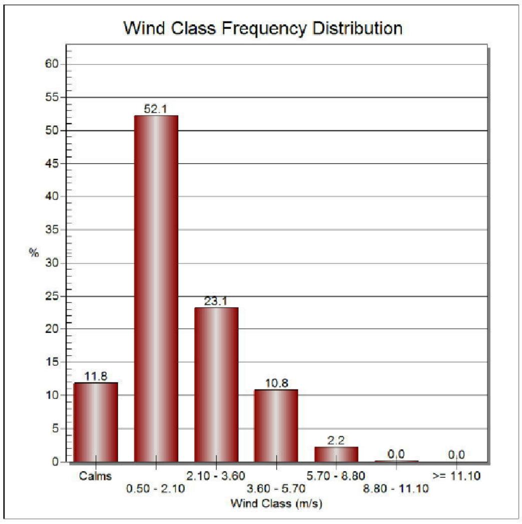
BoM Badgerys Creek 2013 - 2017 | CALMET 2015

The wind speed frequencies presented in **Table 10.4** show some similar trends between the two datasets, with the winds being predominantly light to moderate in nature. The CALMET data shows a slightly higher percentage of light winds and lower percentage of moderate winds compared to the long term BoM data.

Table 10.4 Wind Speed Frequency Distributions Comparison

Wind Class Frequency





BoM Badgerys Creek 2013 - 2017 | CALMET 2015

Temperature

Temperature data is estimated within the CALMET program for each hour of the meteorological data set. A comparison of the temperature vs. hour of day for CALMET is presented in **Figure 10.1**. The results are consistent with expected patterns for western parts of Sydney.

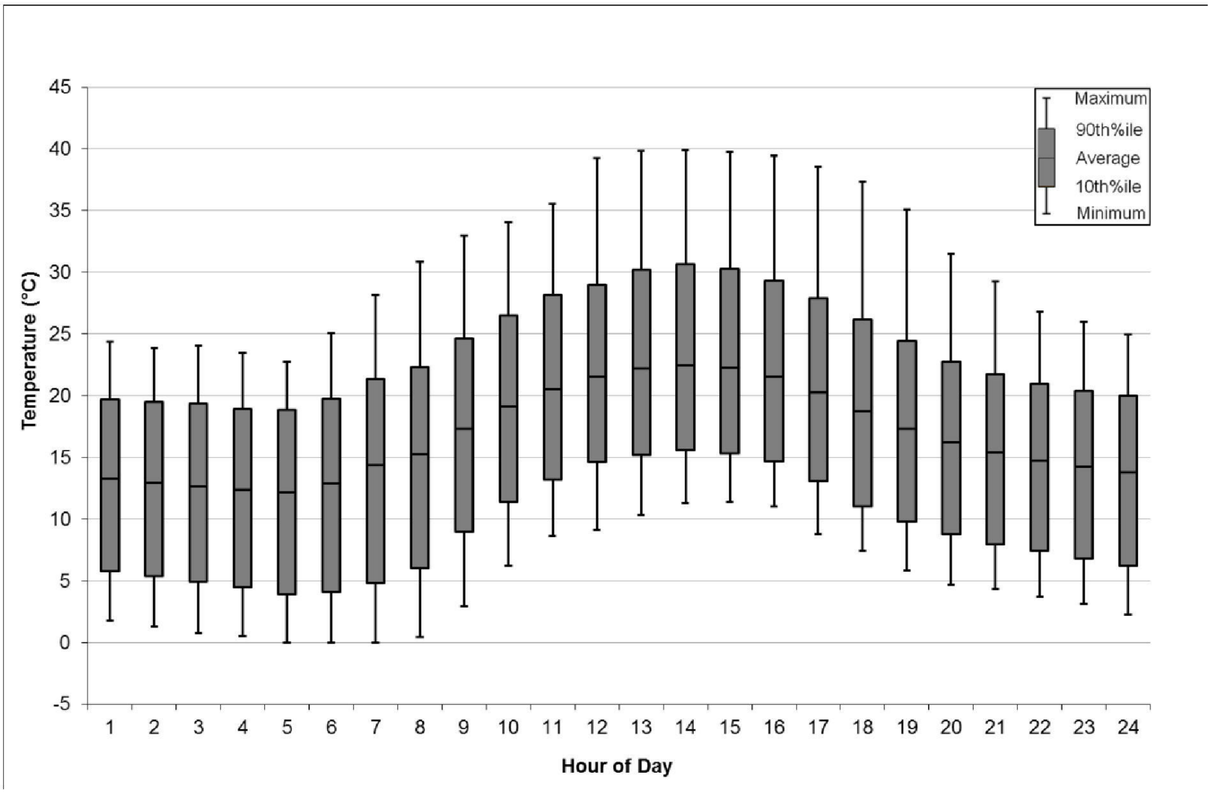


Figure 10.1Box and whisker plot of temperature data for the CALMET 2015 dataset

Mixing Height

Mixing height is estimated within CALMET for stable and convective conditions (respectively), with a minimum mixing height of 50 m. **Figure 10.2** presents mixing height statistics by hour of day across the meteorological dataset, as generated by CALMET at the Site. These results are consistent with general atmospheric processes that show increased vertical mixing with the progression of the day, as well as lower mixing heights during night time. In addition, peak mixing heights are consistent with typical ranges.

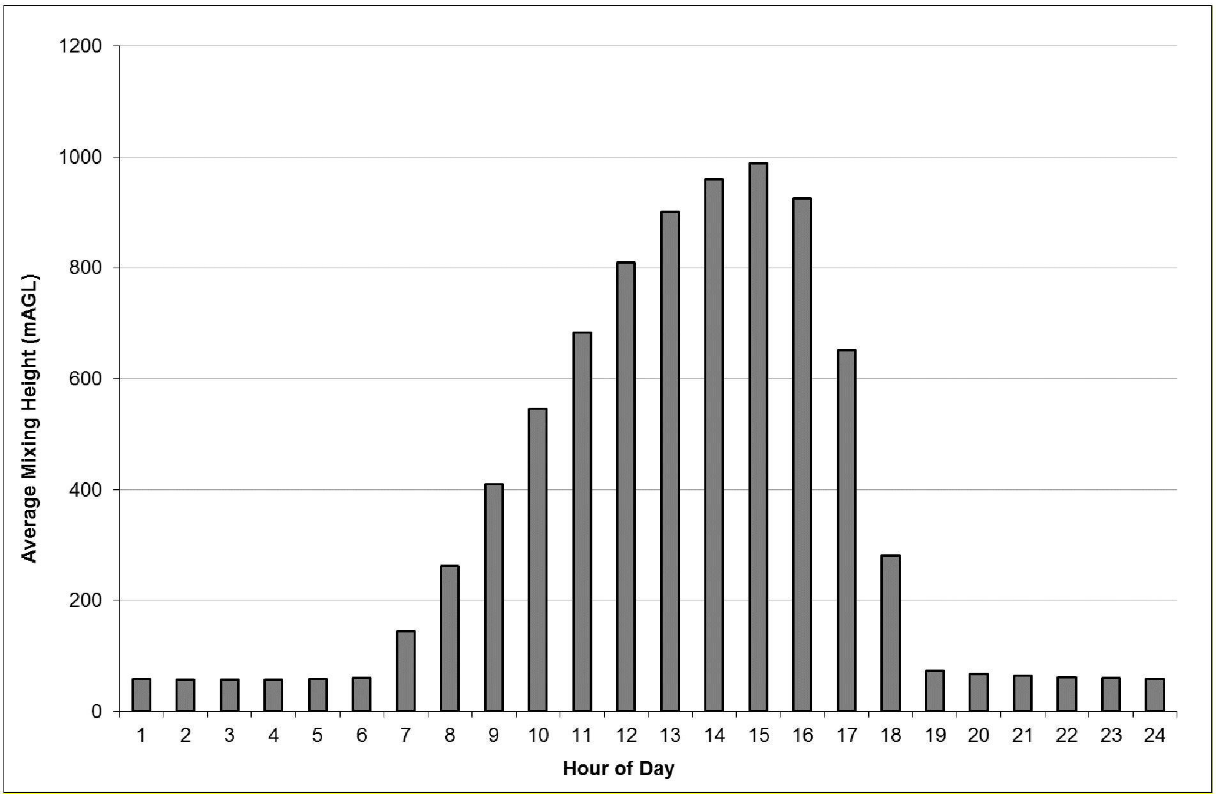


Figure 10.2Mixing height statistics by hour of day for the CALMET 2015 dataset

Atmospheric Stability

Stability class is used as an indicator of atmospheric turbulence for use in meteorological models. The class of atmospheric stability generally used in these types of assessments is based on the Pasquill-Gifford-Turner (PG) scheme where six categories are used (A to F) which represent atmospheric stability from extremely unstable to moderately stable conditions respectively. The stability class of the atmosphere is based on three main characteristics, these being:

- Static stability (vertical temperature profile/structure)
- Convective turbulence (caused by radiative heating of the ground)
- Mechanical turbulence (caused by surface roughness).

Whilst CALPUFF centrally uses Monin-Obukhov (MO) similarity theory to characterise the stability of the surface layer, conversions are made within the model to calculate the PG class based on Golders method (Golder 1972[1]) as a function of both MO length and surface roughness height. The PG Stability class frequencies for the CALMET dataset are provided in **Table 10.5**.

[1] Golder, D. 1972, "Relations among stability parameters in the surface layer", Boundary Layer Meteorology, 3, 47-58

Table 10.5 Stability Class Frequency for the CALMET 2015 dataset

Stability Class	Frequency CALMET
A (Extremely Unstable)	5%
B (Moderately Unstable)	21%
C (Slightly Unstable)	17%
D (Neutral)	7%
E (Slightly Stable)	2%
F (Moderately Stable)	48%

Figure 10.3 and **Table 10.6** present an analysis of stability class frequency against wind speed for the CALMET 2015 dataset and confirm a typical distribution.

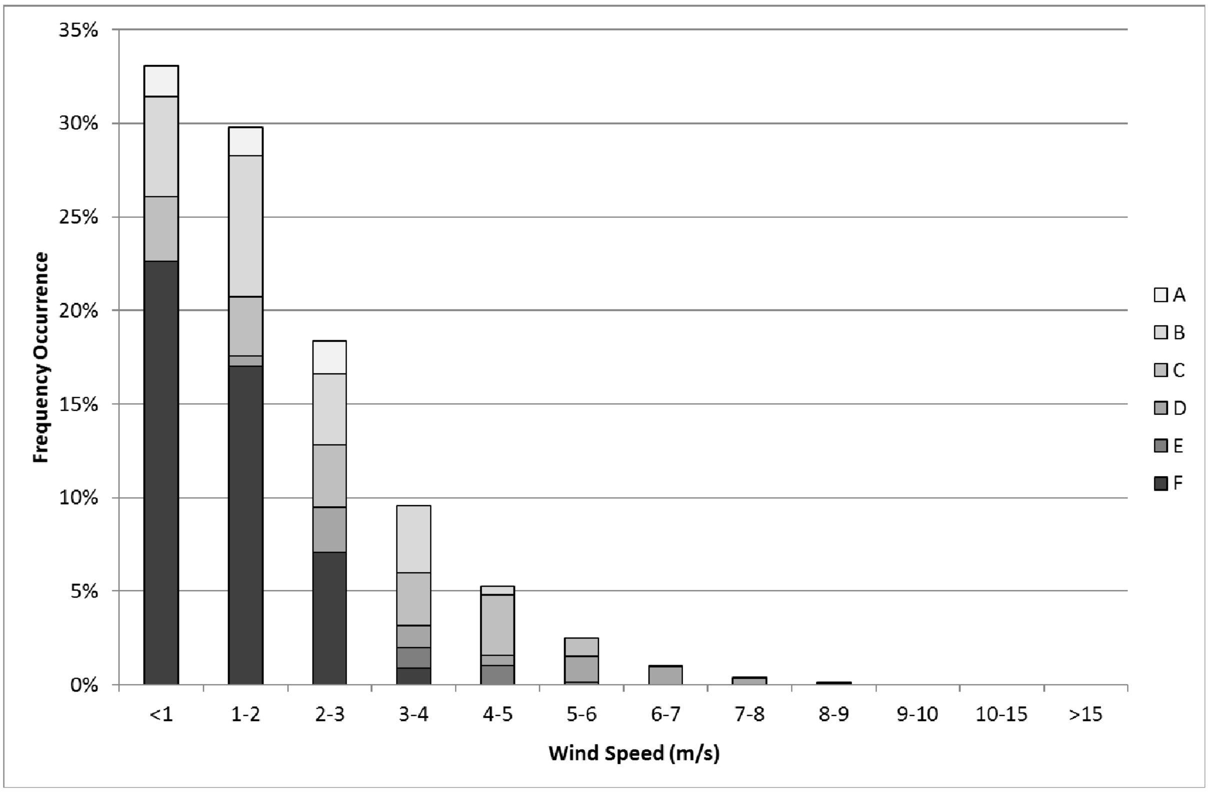


Figure 10.3Stability Class Frequency by Wind Speed for the CALMET 2015 dataset

Table 10.6 Stability Class Frequency by Wind Speed for the CALMET 2015 dataset

Stability Class	Frequency by Wind Speed (m/s)												
	<1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-15	>15	All
A	142	133	156	0	0	0	0	0	0	0	0	0	431
B	468	661	332	314	39	0	0	0	0	0	0	0	1814
C	304	276	291	249	284	86	4	5	3	0	0	0	1502
D	0	47	210	103	50	121	85	29	6	0	0	0	651
E	0	0	0	96	88	10	0	0	0	0	0	0	194
F	1981	1491	619	76	0	0	0	0	0	0	0	0	4167
TOTAL	**2895**	**2608**	**1608**	**838**	**461**	**217**	**89**	**34**	**9**	**0**	**0**	**0**	**8759**

Figure 10.4 presents an analysis of stability class for the CALMET dataset by hour of the day and confirms a typical distribution.

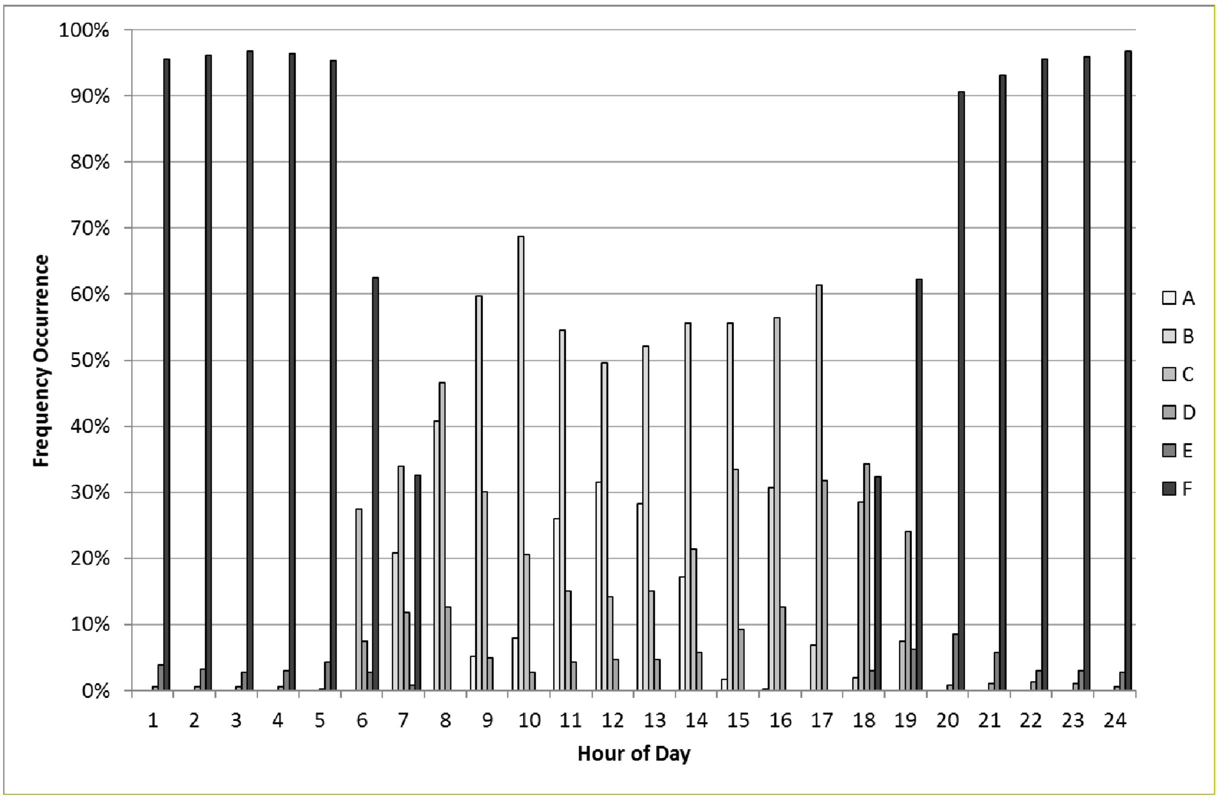


Figure 10.4Stability Class by Hour of Day for the CALMET 2015 dataset

Conclusion

A 12-month meteorological dataset has been prepared for the Site using a combination of local observations and prognostic modelling. Data has been evaluated using hourly observation data. The findings of the data analysis show that the CALMET model is performing well. The predicted meteorology is considered to be fit for purpose and acceptable for use in modelling of emissions from the Site.

Annexure B

Environmental Protection Licence Conditions

Conditions listed in the existing site Environment Protection Licence (EPL) number 4068 relevant to dust are odour are:

- L7 Potentially offensive odour
    - L7.1 No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

      Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if 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 a licence directed at minimising odour.
- M7 Landfill gas monitoring
    - M7.4 Landfill gas monitoring must be undertaken in accordance with Section 5 of the "NSW EPA Environmental Guidelines Solid Waste Landfills, Second edition, 2016" with the exception of surface gas emissions monitoring which is to be conducted quarterly.
    - M7.5 If the subsurface or enclosed space gas monitoring detects methane concentrations above 1% (v/v), the licensee must: a) notify the EPA within 24 hours; b) increase the frequency of monitoring to daily until advised otherwise in writing by the EPA; and c) submit a written assessment to the EPA within 14 days of the incident becoming known to the licensee; the report must detail the emissions, and the management controls implemented (or proposed to be implemented), to prevent further emissions.
- O3 Dust
    - O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.
    - O3.2 The licensee must ensure no material, including sediment, is tracked from the premises.

This page has been left blank intentionally.