

HUNTINGWOOD PROCESSING EXPANSION

AIR QUALITY AND ODOUR ASSESSMENT

Prepared for:

Charter Hall Holdings Pty Ltd
Level 20, No.1 Martin Place
Sydney
NSW 2000

SLR Ref: 610.30322-R02
Version No: -v4.0
August 2021



PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street
North Sydney NSW 2060 Australia

T: +61 2 9427 8100
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Charter Hall Holdings Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30322-R02-v4.0	26 August 2021	K Lawrence	A Naghizadeh	K Lawrence
610.30322-R02-v3.0	2 August 2021	K Lawrence	A Naghizadeh	K Lawrence
610.30322-R02-v2.0	19 July 2021	K Lawrence	A Naghizadeh	K Lawrence
610.30322-R02-v1.0	31 May 2021	K Lawrence	A Naghizadeh	K Lawrence

CONTENTS

1	INTRODUCTION	6
1.1	Approach to Assessment	6
1.1.1	Construction Impact Assessment Methodology.....	7
1.1.2	Operational Impact Assessment Methodology	7
2	PROJECT DESCRIPTION	9
2.1	Site Location.....	9
2.2	The Proposed Development	10
2.3	Site Inspection	12
3	PROJECT SETTING	14
3.1	Sensitive Receptors.....	14
3.2	Local Topography.....	15
3.3	Local Meteorological Conditions	16
3.4	Other Air Emission Sources.....	19
4	POLLUTANTS OF CONCERN	20
4.1	Construction Phase	20
4.1.1	Fugitive Dust Emissions	20
4.1.2	Products of Combustion	20
4.2	Operational Phase.....	20
4.2.1	Current Emissions.....	20
4.2.2	Proposed Emissions.....	22
4.2.2.1	Odour	22
4.2.2.2	Products of Combustion	23
5	REGULATORY FRAMEWORK.....	25
5.1	Relevant Legislation, Policy and Guidance	25
5.1.1	Protection of the Environment Operations (POEO) Act 1997 & Amendment Act 2011	25
5.1.2	Protection of the Environment Operations (Clean Air) Regulation 2010	25
5.1.3	NSW Environment Protection Authority Air Quality Policy and Guidance	26
5.1.4	Odour Technical Framework and Notes.....	26
5.1.5	Local Air Quality Toolkit.....	26
5.1.6	Building Code of Australia and Australian Standards	27
5.2	Relevant Air Quality Criteria	27
5.2.1	Odour	28
5.2.2	Products of Combustion and Fugitive Dust	29
5.3	Recommended Separation Distances	33

CONTENTS

6	REVIEW OF AMBIENT AIR QUALITY MONITORING DATA	37
7	ASSESSMENT OF POTENTIAL IMPACTS	41
7.1	Construction Phase	41
7.1.1	Fugitive Dust Emissions	41
7.1.2	Products of Fuel Combustion	43
7.2	Operational Phase.....	44
7.2.1	Odour Emissions from Baking Operations.....	44
7.2.2	Odour Emissions from Handling and Storage of Raw Materials and Waste.....	46
7.2.3	Products of Combustion from Gas-Fired Ovens	47
7.2.4	Products of Combustion from Mobile Plant and Delivery Vehicles.....	48
7.2.5	Summary	48
8	MITIGATION MEASURES AND MONITORING	50
8.1	Existing and Proposed Controls	50
8.2	Additional Recommendations	50
8.3	Monitoring	51
9	CONCLUSIONS	52

DOCUMENT REFERENCES

TABLES

Table 1	Overview of Proposed Development	10
Table 2	Proposed Changes in Daily Vehicle Movements – Operational Phase	11
Table 3	Surrounding Sensitive Receivers	14
Table 4	Reported Annual Air Emissions –2019/2020 NPI Reporting Year	21
Table 5	Morning Peak Traffic Volumes – Surrounding Road Network	24
Table 6	Schedule 6 Standards of Concentration for (Group C ¹) Non-Scheduled Premises	26
Table 7	NSW EPA Impact Assessment Criteria for Complex Mixtures of Odorous Air Pollutants	29
Table 8	Impact Assessment Criteria for Carbon Monoxide (CO)	30
Table 9	Impact Assessment Criteria for Nitrogen Dioxide (NO ₂)	31
Table 10	Impact Assessment Criteria for Suspended Particulate Matter.....	32
Table 11	EPA Impact Assessment Criteria for Allowable Dust Deposition	32
Table 12	Impact Assessment Criteria for Sulphur Dioxide (SO ₂)	33
Table 13	Impact Assessment Criteria for VOCs.....	33
Table 14	Recommended Separation Distances, ACT EPA.....	34
Table 15	Recommended Separation Distances, VIC EPA.....	34
Table 16	Recommended Separation Distances, SA EPA	35
Table 17	Recommended Separation Distances, WA EPA	35

CONTENTS

Table 18	Summary of Prospect AQMS Data (2015 – 2020)	37
Table 19	Site-Specific Management Measures Recommended by the IAQM.....	42
Table 20	Risk Assessment of Odour Impacts – Baking Operations.....	44
Table 21	Risk Assessment of Odour Impacts – Handling and Storage of Raw Materials and Waste	47
Table 22	Risk Assessment of Impacts from Products of Combustion – Gas-Fired Ovens	47
Table 23	Risk Assessment of Impacts from Products of Combustion – Mobile Plant and Delivery Vehicles	48
Table 24	Impact Significance Residual Risks	48

FIGURES

Figure 1	Site Location and Surrounding Receivers.....	9
Figure 2	Proposed Development.....	12
Figure 3	Zoning of Surrounding Land	15
Figure 4	Topography of Area Surrounding the Site	16
Figure 5	Horsley Park Equestrian Centre AWS Annual and Seasonal Wind Roses 2016- 2020.....	18
Figure 6	1-Hour Average Ambient CO Concentrations - Prospect AQMS (2015 – 2020).....	38
Figure 7	1-Hour Average Ambient NO ₂ Concentrations - Prospect AQMS (2015 – 2020).....	38
Figure 8	Ambient 1-Hour Average SO ₂ Concentrations - Prospect AQMS (2015 – 2020).....	39
Figure 9	24-Hour Average Ambient PM ₁₀ Concentrations - Prospect AQMS (2015 – 2020)	39
Figure 10	Ambient 24-Hour Average PM _{2.5} Concentrations - Prospect AQMS (2015 – 2020)	40
Figure 11	Bakery Operations – Separation Distance.....	45

APPENDICES

APPENDIX A	Construction Assessment Methodology
APPENDIX B	Operational Assessment Methodology

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by FDC Construction on behalf of Charter Hall Holdings Pty Ltd to undertake an air quality and odour impact assessment of a proposed expansion of the food processing facility (bakery) at 65 Huntingwood Drive, Huntingwood (the Site). The existing facility is occupied by Arnott's Biscuits.

The Planning Secretary's Environmental Assessment Requirements (SEARs) relating to air quality issues for the project are as follows:

The EIS must include an assessment of the potential impacts of the proposal (including cumulative impacts) and develop appropriate measures to avoid, mitigate, manage and/or offset these impacts. The EIS must address the following specific matters:

- **Air Quality and Odour** – including:
 - a description of all potential sources of odour and emissions during the construction and operational phases of the development;
 - an assessment of the potential air quality, dust and odour impacts of the development in accordance with relevant Environment Protection Authority guidelines; and
 - details of dust control during site preparation and civil works.

The NSW Environmental Protection Agency has also provided the following guidance for the project:

The environmental outcomes of the project should be to ensure:

- emissions do not cause adverse impact upon human health or the environment.
- no offensive odours are caused or permitted from the premises.
- emissions of dust from the premises (including material handling, storage, processing, haul roads, transport and material transfer systems) are prevented or minimised

This report summarises the potential construction and operational air quality impacts associated with the Project and has been prepared to accompany the State Significant Development (SSD) application for the proposal.

1.1 Approach to Assessment

At the time of preparing this report, detailed information on the proposed operational activities within the building (ventilation rates, potential emission rates, location of ventilation stacks, etc.) is not yet available. A large number of assumptions would therefore be required to be used as input to any quantitative (i.e. air dispersion modelling) assessment. Similarly, a quantitative modelling assessment of potential air emissions associated with the construction activities would also require a number of assumptions to be made to enable the estimation of particulate emission rates for input into the models. The uncertainty associated with the output of such studies means it would be of limited value and would not (in itself) assist with the identification of air quality control measures to actively manage the risks.

SLR has therefore performed a qualitative (risk-based) assessment of both construction and operational impacts based on the information available, to identify activities that have the potential for off-site air quality impacts if not adequately controlled, so that appropriate mitigation measures can be identified and incorporated into the project design and relevant environmental management plans.

Based on SLR's experience, for almost all construction activities, provided effective mitigation is adopted, the residual air quality impact will be insignificant. The adopted quantitative assessment approach identifies the appropriate mitigation measures based on the level of risk during each phase of the construction works and is therefore deemed to be a more appropriate methodology than quantitative modelling.

1.1.1 Construction Impact Assessment Methodology

For the assessment of construction phase impacts, the *IAQM Guidance on the Assessment of Dust from Demolition and Construction*, developed in the United Kingdom by the Institute of Air Quality Management (IAQM, 2014) has been used to provide a qualitative assessment method (see **Appendix A** for full methodology). The IAQM method uses a four-step process for assessing potential dust impacts from construction activities:

- **Step 1:** Screening based on distance to the nearest sensitive receptor; whereby the sensitivity to dust deposition and human health impacts of the identified sensitive receptors is determined.
- **Step 2:** Assess risk of dust effects from activities based on:
 - the scale and nature of the works, which determines the potential dust emission magnitude; and
 - the sensitivity of the area surrounding dust-generating activities.
- **Step 3:** Determine site-specific mitigation for remaining activities with greater than negligible effects.
- **Step 4:** Assess significance of remaining activities after management measures have been considered.

1.1.2 Operational Impact Assessment Methodology

A risk-based qualitative assessment approach has also been adopted for the proposed operational activities at the Site (see **Appendix B** for full methodology). Similar to the construction phase air quality assessment, a quantitative assessment in general accordance with the Approved Methods could be prepared for the operational phase of the Project, however, the inputs into the model would be subject to a high degree of uncertainty as:

- Detailed information on the proposed operational activities is not yet available for all the identified sources (ventilation rates, potential emission rates, location of ventilation stacks, etc.); and
- There is a very high degree of uncertainty associated with quantification of emissions from the bakery and waste/food handling as no published emission factors are available for such sources and the emission inventory would need to rely on publicly available pollutant concentrations measured at other sites which may handle different types of food and have different management practices. The availability of such data is also very limited and a number of assumptions would need to be made to be able to apply it to the Project to compile the stack and emission data required for a modelling assessment.

The risk-based operational assessment methodology takes account of a range of impact descriptors, including the following:

- **Nature of Impact:** does the impact result in an adverse or beneficial environment?

- **Sensitivity:** how sensitive is the receiving environment to the anticipated impacts? This may be applied to the sensitivity of the environment in a regional context or specific receptor locations.
- **Magnitude:** what is the anticipated scale of the impact?

The integration of sensitivity with impact magnitude is used to derive the predicted significance of that change. Given the nature of the operations proposed to be performed, and the limited design data available at the time of preparing this report, it is considered that this approach is appropriate to identify those key activities that have the potential to give rise to off-site air quality impacts, in order that recommended mitigation measures may be identified. If appropriate, these recommendations may include further detailed modelling assessment of key activities to confirm that the proposed mitigation measures will ensure compliance with relevant air quality criteria, once detailed design data is available.

As part of the qualitative risk-based approach adopted for the operational phase air quality assessment, published separation distances have been referenced to evaluate the potential risk of conflicting land uses. As there are no separation guidelines issued by NSW EPA, guidelines set by other regulatory agencies in Australia have been reviewed and the most conservative applicable separation distances were adopted for the risk based assessment.

In states where separation distance guidelines are published, the separation distances are typically used as a screening tool to identify if a detailed quantitative assessment is required. As such, these separation distances, which are typically based on quantitative modelling studies, history of complaints and air quality monitoring data are considered to be conservative in nature and overestimate the level of risk associated with emission sources.

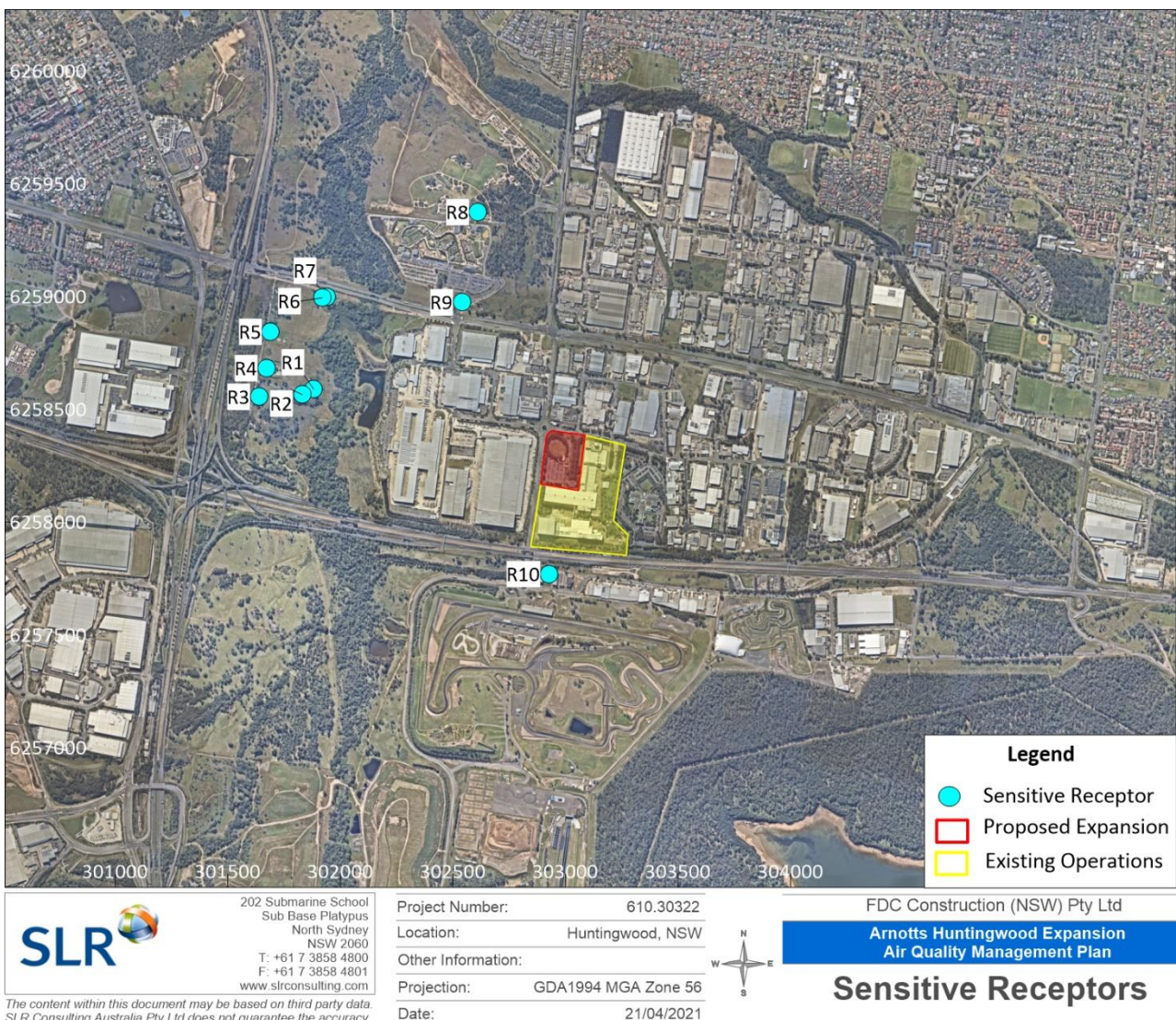
2 Project Description

2.1 Site Location

The proposed expansion is to be located within the existing Arnott's Site at 65 Huntingwood Drive (see **Figure 1**), Lot 1 DP866251, within the Huntingwood Industrial Estate, 32 km west of the Sydney CBD and 4k m south of Blacktown Town Centre. The Site is situated along the southern boundary of Huntingwood, bordering the Western Motorway (M4) to the south and Huntingwood Drive to the north.

The total area of the Site is 163,933 m² (16.4 hectares). The site currently contains three large freestanding industrial buildings, the main 'L-shaped' processing building to the north and two warehouses to the south. The balance of the site includes small ancillary buildings, car parking, loading areas and privately used open space. The north-west corner of the site currently acts as an on-site detention (OSD) basin.

Figure 1 Site Location and Surrounding Receivers



2.2 The Proposed Development

The current operations on the Site involve food processing (bakery) which operates 24 hours a day, seven days a week.

The Project comprises the expansion of the existing food processing operations at the Site, including construction of a new processing building in the northwest corner of the Site (as indicated in **Figure 1**). The facility currently produces approximately 55,000 tonnes of products per year, and the proposed expanded facility is estimated to add a further 13,000 tonnes per year. An overview of the Project is provided in **Table 1**.

Table 1 Overview of Proposed Development

Element	Proposed
Site Preparation	• Removal of existing car parking, driveway and ancillary structures. • Vegetation clearing. • Excavation for car park and bulk earthworks and supporting structures. • Drainage connections. • Land stabilisation.
Development summary	• Construction of a new processing facility (24,775 m²) to the west of the existing building. • Construction of a new ingredient silo building (1,000 m²) along the Huntingwood Drive frontage. • Construction of a new storage building (270 m²) to the east of the existing building. • Construction of a new processing building (1,200 m²) and ingredient silo building (120 m²) to the south of the main facility. • Replacement of the existing on-site detention (OSD) basin with an OSD tank below the basement car park. • Landscaped setbacks along both street frontages to screen the new processing facility and loading area.
Access and Parking	• New loading area above two levels of car parking (468 spaces) at the north-west corner of Huntingwood Drive and Brabham Drive. • Trucks will utilise the existing access point adjacent to the eastern boundary of the site. • The existing (westernmost) vehicle access to Huntingwood Drive will be retained and upgraded to provide access to the new basement car park.
Hours of Operation	• The facility will continue to operate 24 hours per day, seven days per week.

The on-Site activities associated with the proposed expansion will be similar to those currently undertaken at the Site, namely:

- Raw materials delivery and storage;
- Production and baking of biscuits and crackers,
- Product packaging;
- Dispatch and distribution; and
- Ancillary office administration.

The proposed ground floor layout shown in **Figure 2** (HLA Architects Drawing No: 200810-DA-003-Q) has been annotated to show the existing and proposed future vehicle routes and mechanical plant locations, and the existing wastewater treatment plant. The existing wastewater treatment plant is understood to have capacity to deal with the additional throughput that would result from the proposed expansion, with no upgrade or modification of this plant proposed.

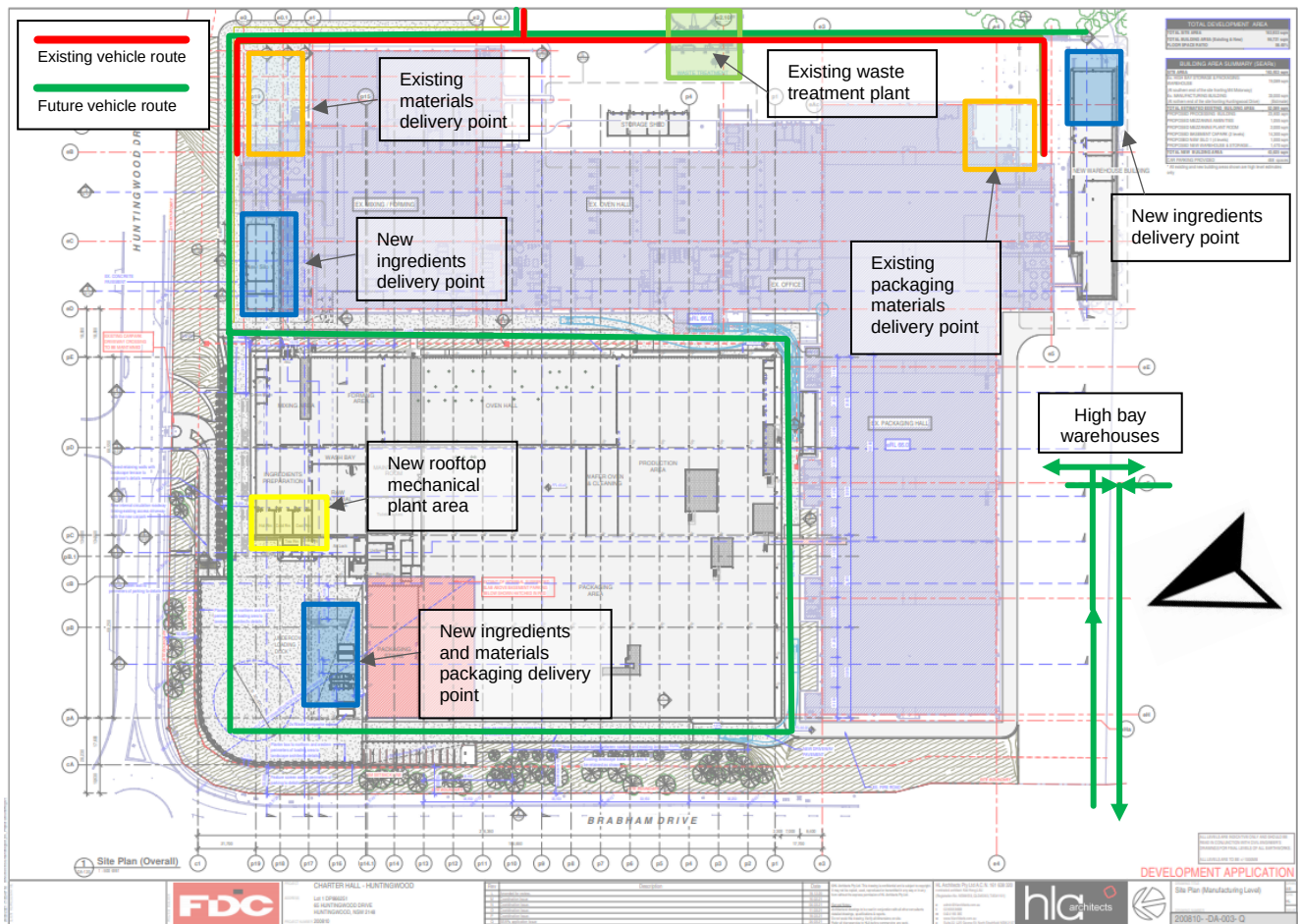
Vehicular access to the site for light vehicles is via an existing entry and exit driveway (Liberty Road) at the Huntingwood Drive frontage. Separate heavy vehicle access to the site is available from Huntingwood Drive adjacent to the eastern boundary. Heavy vehicle access to the high-bay warehouse is also available from Brabham Drive. After the site expansion, vehicles will move further into the northwestern corner of the site, to access a new ingredients and packaging materials delivery point. The projected increases in traffic movements associated with the expansion are shown in **Table 2**.

Table 2 Proposed Changes in Daily Vehicle Movements – Operational Phase

Location	Vehicle Type	Approximate Timing	Current Huntingwood Daily Numbers	Expected Additional Daily Numbers Post Project Completion	Total
Raw Materials	Semi-trailer tankers	24 hrs/day	12	3	15
	Semi-trailer	7am – 7pm	8	4	12
	Rigid	7am – 7pm	6	1	7
Waste	Rigid/skip change out	5am – 11pm	6	2	8
	Semi-trailer	7am – 3pm	2	1	3
Packaging Materials	B-Double	7am – 6pm	once/twice per week – no change		
	Semi-trailer	7am – 6pm	7	2	9
	Rigid	7am – 6pm	5	2	7
High Bay Warehouse	B-Double	6am – 10 pm	9	2	11
	Semi-trailer	6am – 10 pm	15	2	17
	Rigid	6am – 10 pm	1	0	1
	Container delivery/collection	6am – 10 pm	4	2	6
Service and Support Vehicles	Courier vans	7am – 5pm	3	1	4
	Engineering and service vans	7am – 5pm	1	0	1
	Deliveries	7am – 5pm	2	1	3
Total Movements			81	23 (30% increase)	104

A ventilation system is being designed for the new processing facility to capture and appropriately vent the oven emissions via dedicated discharge vents located on the roof of the new building. As outlined in **Section 1.1**, detailed information on the proposed air extraction and (if required) filtration system is not available at the time of preparing this report. However, it is noted that all ventilation systems will be designed to meet relevant Australian Standards (AS) and Building Council of Australia (BCA) requirements.

Figure 2 Proposed Development



2.3 Site Inspection

During the site visit, the weather was characterised as overcast skies and calm conditions. The Facility was fully operational, with normal production and wastewater treatment processes in progress.

Potential sources of air emissions associated with the operation of the Facility were identified as follows:

- Odour emissions from the baking and processing of products
- Odour emissions from ingredient storage
- Combustion gas emissions from the operation of the gas fired ovens
- Odour emissions from the treatment of wastewater and storage of sludge
- Products of fuel combustion (including particulates) from onsite vehicle movements; and
- Wheel-generated particulate emissions from onsite vehicle movements.

During the site visit, 'distinct' odours could be detected within the boundary of the Facility and 'weak' odours were detectable within an approximate 100 m radius of the Facility boundary. The hedonic tone of these odours ranged from +1 to -1 ('mildly pleasant' to 'mildly unpleasant'). The odours were predominantly characteristic of baking processes. No 'distinct' raw material odours or wastewater/sludge odours could be detected except at locations very close to these activities.

During the site visit, no visible dust emissions were observed. The housekeeping at the facility was observed to be of the highest order.

3 Project Setting

3.1 Sensitive Receptors

The Site is currently subject to the land use and development control provisions of the *Blacktown Local Environmental Plan 2015*. **Figure 3** illustrates the surrounding land zoning as specified in the *Blacktown Local Environmental Plan 2015* as well as the location of the closest nearby residential receptors. The areas immediately to the east and north of the Site are zoned light industrial (IN-2). A small area of General Industrial (IN-1) and Private Recreational (RE-2) zones is located immediately south of the Site.

Large unzoned areas located to the south, west and northwest of the Site are subject to State Environmental Planning Policy (Western Sydney Parklands) 2009 (WSP SEPP). Current uses for these areas include motorsports (south), warehousing (west) and parklands (northwest).

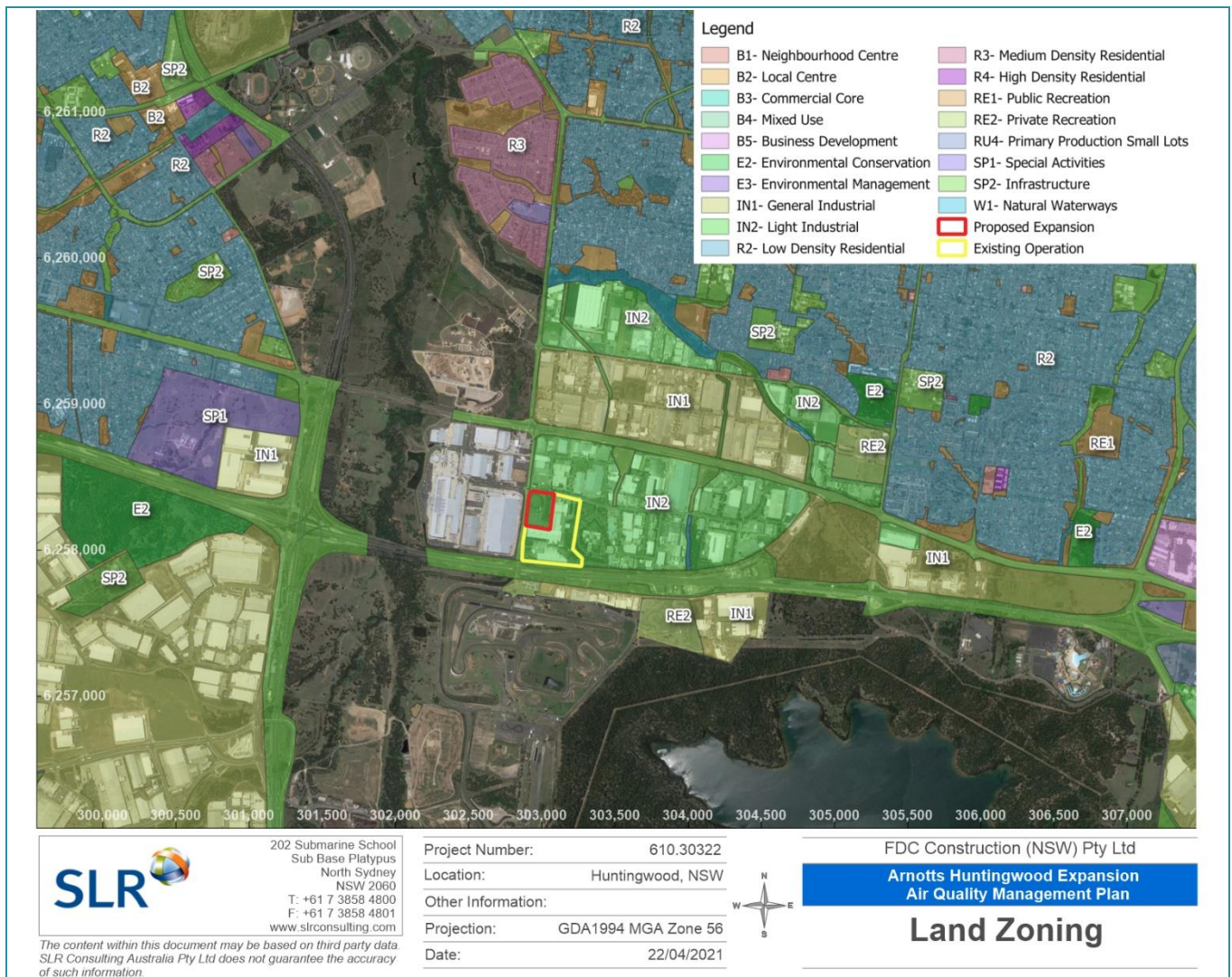
The nearest residential areas are located approximately 1.5 km north of the site in Bungarribee. There are industrial receptors on neighbouring lots and Sydney Zoo is located approximately 800 m to the northwest, with the Bungarribee Playground beyond that. A small number of scattered residences are located along Pikes Lane, 1.1 – 1.3 km to the west of the Site. The nearest receivers are shown in **Figure 1** and detailed in **Table 3**.

The facility does not have any records of any complaints relating to air quality issues and is not aware of any concerns in the local community regarding odours from the existing operations.

Table 3 Surrounding Sensitive Receivers

ID	Address	Type	Distance from Expansion Area (m)	Direction
R1	47 Pikes Lane, Eastern Creek	Residential	1,100	West
R2	51 Pikes Lane, Eastern Creek	Residential	1,100	West
R3	55 Pikes Lane, Eastern Creek	Residential	1,250	West
R4	40 Pikes Lane, Eastern Creek	Residential	1,250	West
R5	25 Pikes Lane, Eastern Creek	Residential	1,300	West-northwest
R6	715 Great Western Highway, Eastern Creek	Residential	1,150	Northwest
R7	711 Great Western Highway, Eastern Creek	Residential	1,150	Northwest
R8	Bungarribee Playground, Bungarribee	Recreational	1,000	North-northwest
R9	Sydney Zoo, Bungarribee	Recreational	800	Northwest
R10	2A Peter Brock Drive, Eastern Creek	Hotel	400	South

Figure 3 Zoning of Surrounding Land



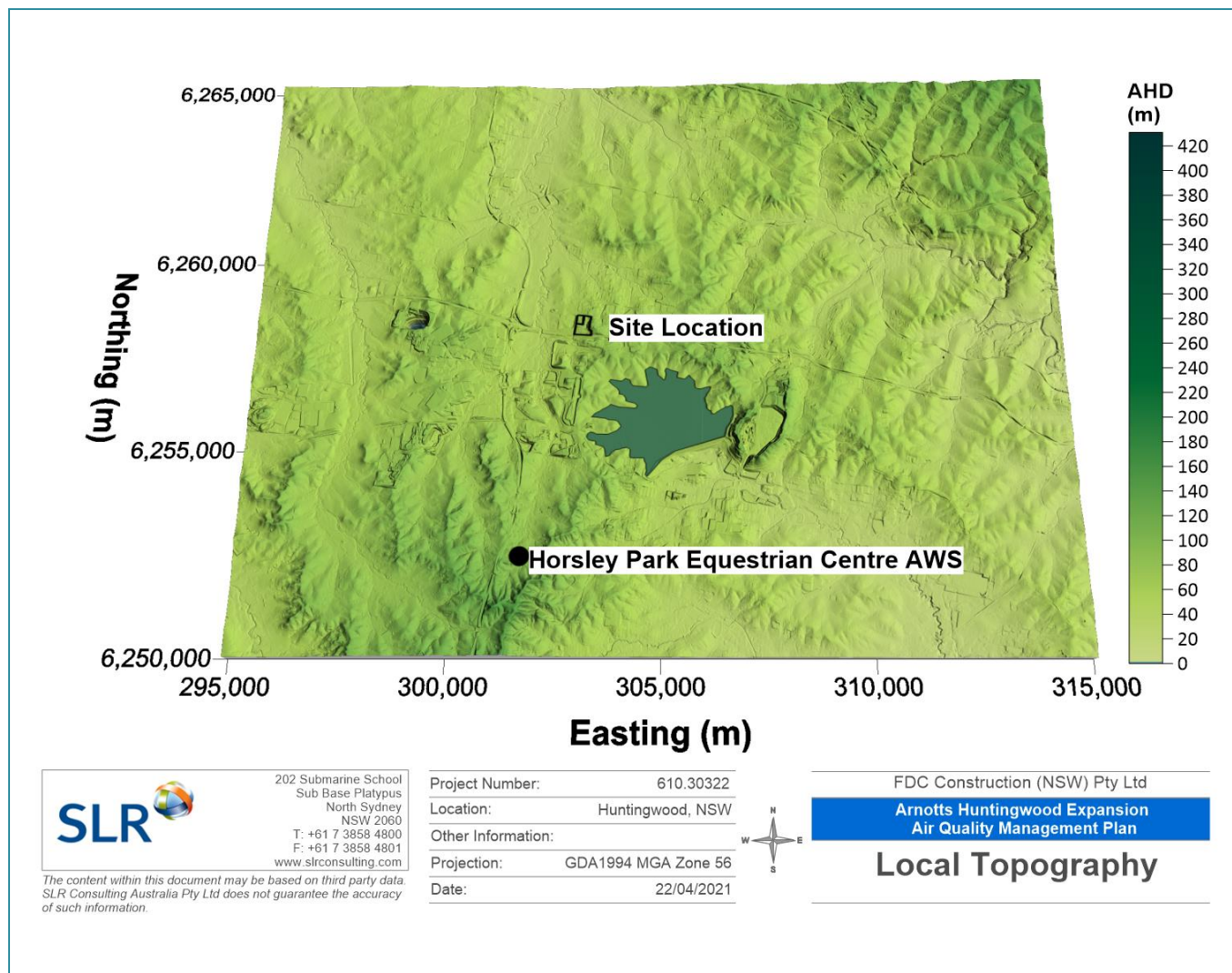
3.2 Local Topography

Topography is important in air quality studies as local atmospheric dispersion can be influenced by night-time katabatic (downhill) drainage flows from elevated terrain or channelling effects in valleys or gullies.

A three-dimensional representation of the region surrounding the Site is shown in **Figure 4**. The topography of the local area ranges from an approximate elevation of 25 m to 195 m Australian Height Datum (AHD).

The topography of the Site and its immediate surrounds is relatively flat, with open areas of land cleared for motorsports to south. The northwestern edge of the Site sits up to approximately 4 m above the surrounding road reserves. The balance of the site is reasonably flat with a slight fall towards the northwest. A large water body (Prospect Reservoir) is located approximately 1.5 km to the southeast.

Figure 4 Topography of Area Surrounding the Site



3.3 Local Meteorological Conditions

Local wind speed and direction influence the dispersion of air pollutants. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. Wind direction, and the variability in wind direction, determines the general path pollutants will follow and the extent of crosswind spreading. Surface roughness (characterised by features such as the topography of the land and the presence of buildings, structures and trees) will also influence dispersion.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station to the Site with available data is the Horsley Park Equestrian Centre Weather Station (AWS), which is located approximately 6 km to the south-southwest of the Site.

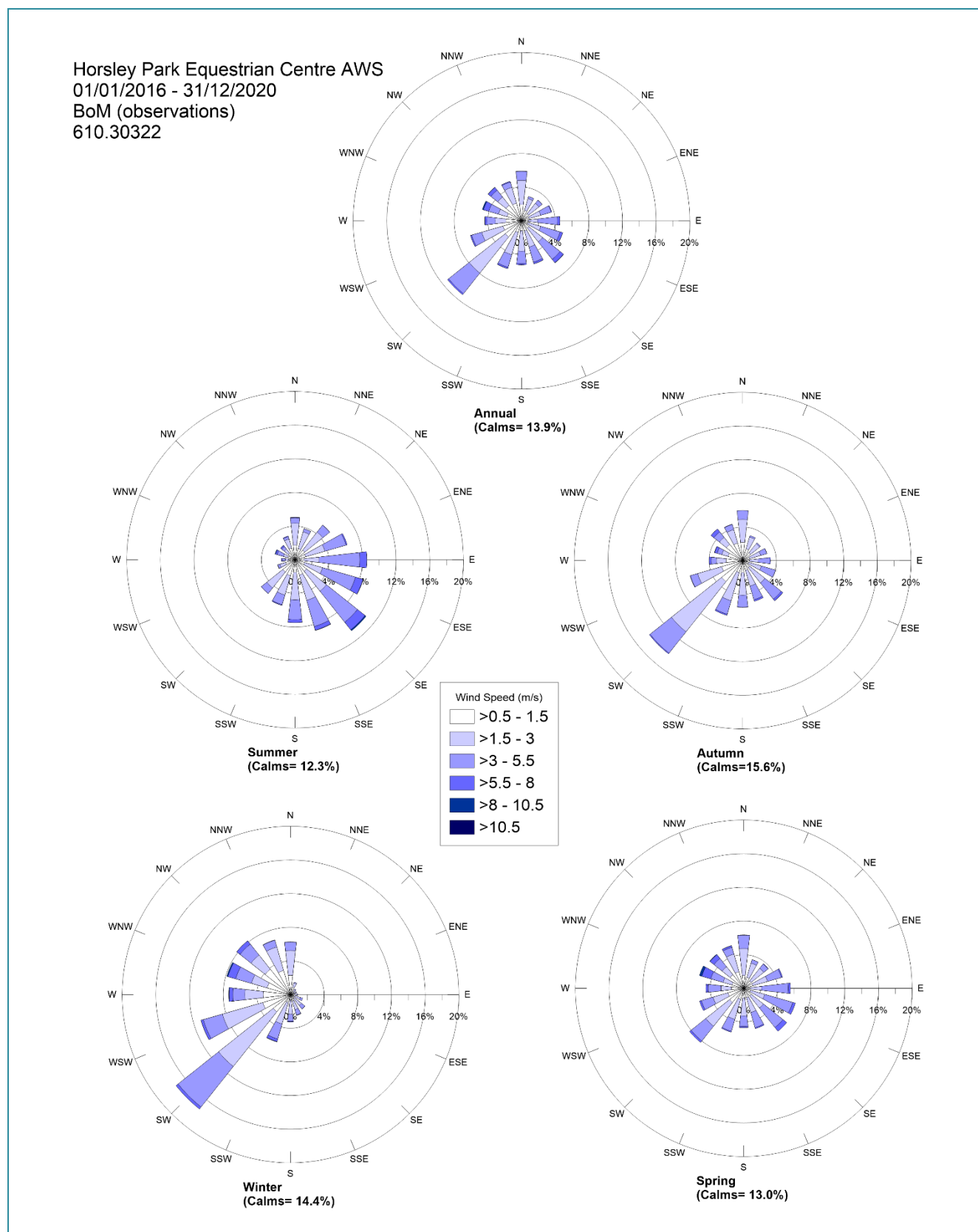
Annual and seasonal wind roses for the years 2016-2020 (inclusive), compiled from data recorded by the Horsley Park Equestrian Centre AWS is presented in **Figure 5**. Wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (degrees from North). The bar at the top of each wind rose diagram represents winds blowing from the north (i.e. northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Thus it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for particular periods during the day.

The annual wind rose indicates the predominant wind directions in the area are from southwest. Calm wind conditions (wind speed less than 0.5 m/s) were predicted to occur approximately 13.9% of the time throughout the investigated period. The average seasonal wind roses for the year 2016-2020 indicate that:

- In summer, winds are mostly gentle (between 1.5 m/s and 5.5 m/s) predominantly from the southeast quadrant, with very few winds from the northwest quadrant. Calms were recorded 12.3% of the time.
- In autumn, winds are light to gentle (between 0.5 m/s and 5.5 m/s) predominantly from the southwest direction, with very few winds from the northeast. Calms were recorded 15.6% of the time.
- In winter, winds are mostly light to gentle (between 0.5 m/s and 5.5 m/s) and are from the southwest direction, with very few winds from the eastern quadrant. Calms were recorded 14.4% of the time.
- In spring, winds are mostly light to gentle (between 0.5 m/s and 5.5 m/s) and blow from all directions with the majority blowing from the southwest. Calms were recorded 13.0% of the time.

As identified in **Section 3.1**, the closest existing sensitive receptors are located west, northwest and south of the Site boundary. Winds between the east and south-southeast directions, which would blow air emissions from the Site towards the nearest existing residences and recreation facilities, occur approximately 23% of the time. Winds from the north which would blow air emissions towards the nearby hotel occur only 7% of the time.

Figure 5 Horsley Park Equestrian Centre AWS Annual and Seasonal Wind Roses 2016-2020



3.4 Other Air Emission Sources

Other sources of air emissions and odour in the area with the potential to result in cumulative impacts with emissions from the construction and operation of the expansion, as identified from the site visit and a desktop review of aerial imagery, are as follows:

- Traffic emissions from the surrounding road network, including the M4 Western Motorway (M4) and Westlink (M7), and the Eastern Creek racetrack. There are several logistics/distribution centres in the area which will also generate potentially significant local traffic movements.
- A search of the National Pollutant Inventory (NPI) identified only one industrial facility in the 2148 post code that is located within 1 km of the Site, being the Diageo Australia operations (described as the manufacture and importation of alcoholic (spirits) and non-alcoholic beverages, located 760 m to the northeast). This site reported emissions of volatile organic compounds (VOCs) and therefore has potential for some odour emissions, however they would be of a very different character to those emitted from the existing and proposed operations at the Site. There is not considered to be any potential for cumulative impacts from this facility with air emissions from the Arnott's operations.
- A search of existing Environmental Protection Licences on the EPA website for Huntingwood identified one site, being Cookers Bulk Oil System, located at 2 Healey Circuit, Huntingwood. This site is licenced to receive and store "Used cooking oil only". Any odour emissions from this site would be of a very different character to those emitted from the existing and proposed operations at the Site. There is not considered to be any potential for cumulative impacts from this facility with air emissions from the Arnott's operations.

4 Pollutants of Concern

4.1 Construction Phase

Potential air emissions associated with the construction phase include:

- Fugitive dust emissions from the demolition/construction of buildings and other structures; and
- Products of combustion from construction plant and machinery.

No significant sources or emissions of odour are expected during the construction phase.

4.1.1 Fugitive Dust Emissions

During the construction phase, the potential for dust to be emitted from the Site will be directly influenced by the nature of the activities being performed. Activities that may lead to short-term emissions of dust, include:

- Loading and unloading of materials;
- Wheel-generated dust from trucks travelling along unpaved roads; and
- Wind erosion of exposed surfaces and stockpiles.

These activities will need to be managed appropriately to ensure off-site impacts are minimised (refer **Section 7.1.1**).

Temporary elevation in the emissions of particulate matter and local dust is considered to be inevitable as part of the construction works, particularly where those activities are undertaken during periods of low rainfall and/or windy conditions. The impact of elevated dust emissions is dependent upon the potential for particulates to become and remain airborne prior to being deposited as dust or experienced as an ambient particulate concentration.

The construction works may require up to 16 months to complete. It is noted that dust-generating activities will not be occurring continuously throughout this period.

4.1.2 Products of Combustion

Exhaust emissions from cranes, trucks, plant and other equipment associated with the construction of the Project will be a source of emissions to air during the construction phase.

Considering the size of the nature of the proposed development, air emissions from diesel-powered construction plant and machinery are anticipated to be relatively small compared to the existing background emission levels from vehicles on the surrounding road network (see **Section 4.2.2.2**).

4.2 Operational Phase

4.2.1 Current Emissions

Table 4 presents the annual air emission loads reported by the Arnott's Huntingwood facility to the NPI for the 2019/2020 reporting year. As shown in the table, the main emission is ammonia, which is associated with the use of ammonium bicarbonate in some products; when these products are baked, ammonia gas is released causing the goods to rise.

The next most significant group of emissions are the key combustion-related pollutants (NO_x, CO, PM₁₀, PM_{2.5}, total VOCs and SO₂). A very small portion of these emissions are identified as being fugitive in nature (not discharged via a stack or vent), however the vast majority are associated with gas combustion in the baking ovens. Very small quantities of metals and individual VOCs are also reported as being emitted, which will be associated with trace emissions from fuel combustion.

Table 4 Reported Annual Air Emissions –2019/2020 NPI Reporting Year

Substance	Fugitive Emissions (kg)	Point Source (Stack) Emissions (kg)	Total Emissions (kg)
Ammonia (total)		28,501	28,501
Oxides of Nitrogen (NO _x)	23	8,081	8,104
Carbon monoxide (CO)	65	6,809	6,875
Particulate Matter less than 10 µm (PM ₁₀)	1	599	600
Particulate Matter less than 2.5 µm (PM _{2.5})	1	599	600
Total Volatile Organic Compounds (VOCs)	9	445	454
Sulfur dioxide (SO ₂)	0.003	89	89
Zinc and compounds		2.3	2.3
Nickel & compounds		0.17	0.17
Chromium (III) compounds		0.11	0.11
Cadmium & compounds		0.09	0.09
Copper & compounds		0.07	0.07
Polycyclic aromatic hydrocarbons (B[a]Peq)	3 x 10 ⁻⁷	0.05	0.05
Lead & compounds		0.04	0.04
Manganese & compounds		0.03	0.03
Mercury & compounds		0.02	0.02
Arsenic & compounds		0.02	0.02
Formaldehyde (methyl aldehyde)	0.004		0.004
Acetaldehyde	0.003		0.003
Benzene	0.003		0.003
Cobalt & compounds		0.007	0.007
Selenium & compounds		0.002	0.002
Toluene (methylbenzene)	0.001		0.001
Xylenes (individual or mixed isomers)	0.001		0.001
Beryllium & compounds		0.0001	0.0001
1,3-Butadiene (vinyl ethylene)	0.0001		0.0001
Polychlorinated dioxins and furans (TEQ)		4 x 10 ⁻⁷	4 x 10 ⁻⁷

4.2.2 Proposed Emissions

Based upon a review of the new activities that are proposed as part of the Site expansion (presented in **Section 2.2**), potential air emission sources associated with the operational phase have been identified as follows:

- Odours from the ovens on the existing and new manufacturing lines;
- Odours from on-site handling and storage of solid and liquid waste;
- Products of combustion from the gas-fired ovens on the existing and new manufacturing lines; and
- Products of combustion from mobile plant (forklifts etc) and incoming/outgoing delivery trucks.

In addition to odour, particulates are also emitted from bakery operations in the form of fumes. Cooking methods such as solid fuel-fired cooking produce the most significant quantities of particulate matter. There is a very low potential for significant particulate matter emissions from the existing and proposed gas-fired ovens at the Arnott's Site, except under upset operating conditions.

4.2.2.1 Odour

Odour is the principal air emission of concern from the new processing facility and will be primarily generated from the baking processes. There is also the potential for odour emissions from the waste management operations on the Site.

Impacts from odorous air contaminants are often nuisance-related rather than health-related. There are various elements that are commonly regarded as combining to cause odour nuisance, which are listed below and are collectively known as the FIDOL factors:

- *Frequency*: how often the odour occurs;
- *Intensity*: how strong the odour is perceived to be;
- *Duration*: how long the odour is present for;
- *Offensiveness*: how offensive the odour is perceived to be; and
- *Location or Context*: where the person is experiencing the odour.

Other factors may also come into play when assessing odour impacts, such as:

- *Population sensitivity*: any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it may contain.
- *Background level*: whether a given odour source, because of its location, is likely to contribute to a cumulative odour impact. In areas with more closely-located sources it may be necessary to apply a lower threshold to prevent offensive odour.
- *Public expectation*: whether a given community is tolerant of a particular type of odour and does not find it offensive, even at relatively high concentrations. For example, background agricultural odours may not be considered offensive until a higher threshold is reached than for odours from a landfill facility.

Baking Odours

Odorous emissions from bakeries are the result of complex mixtures of odorous VOCs, which are formed in the baking process as a result of chemical reactions between sugars and amino acids in the dough and breakdown of natural fats and oils.

The addition of chocolate manufacturing as part of the expansion will result in a change in the character of the odour emitted from this part of the operations compared to the current situation, however the hedonic tone of the odours can be expected to be pleasant to the vast majority of the population which would have significantly lower annoyance potential than unpleasant/neutral odours.

Odour emissions from bakeries may be effectively managed through the implementation of a combination of physical and management measures. This is discussed further in **Section 8**.

Handling and Storage of Raw Materials and Waste

If not appropriately managed, some raw ingredients delivered to the Site could be a source of odour emissions. Solid and liquid organic waste produced on site also has the potential to be a source of odour emissions. The most effective way to minimise odours from the ingredient and waste storage and handling areas is by ensuring all material is stored at appropriate temperatures and that all areas are well ventilated.

Odour emissions from the ingredient storage and waste storage/treatment areas can be directly released into the atmosphere through openings in the buildings. While not all such emissions can be captured by air extraction systems (e.g. slightly positive pressures are required for chilled warehouse, odour emissions from waste being transferred off site will be emitted directly to atmosphere, etc.), suitable air extraction systems are being designed for all processing and storage areas to ensure odorous air is extracted in compliance with relevant AS and BCA guidelines. Moreover, it is understood that:

- Containment measures for spillages will be provided at appropriate locations to reduce odorous emissions from waste spillages;
- Solid organic waste and general waste will be removed from site for off-site disposal on a daily basis on Monday to Friday; and
- The refrigerated warehouse areas will ensure that all perishable food is kept at an appropriate temperature to avoid spoiling.

Odour emissions from food and waste handling and storage may be effectively managed through the implementation of a combination of physical and management measures. Refer to **Section 8** for control measures.

4.2.2.2 Products of Combustion

Gas-Fired Ovens

Emissions associated with the combustion of natural gas in the existing and new ovens will include carbon monoxide (CO), oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). There will also be very levels of emission of particulate matter (PM₁₀ and PM_{2.5}). Emissions of sulfur dioxide (SO₂) from fossil fuel combustion are directly linked to the amount of sulfur in the fuel. As Australian natural gas contains only trace amounts of sulfur, SO₂ emissions from the ovens will be minimal.

The gas consumption for the current Site operations is approximately 15,000 GJ/month of gas in the ovens (equivalent to approximately 12,400 m³/day, based on a heating value for town gas of 39 MJ/m³ (DEE, 2017)). This is expected to approximately double as result of the expansion, based on the doubling of the Site production capacity. The emissions from the burners on the existing ovens are vented directly to atmosphere via stacks located on the roof of the building, and this will also be the case for the new ovens.

Given the above, it is expected that current combustion product emissions from the site, as reported in **Table 4**, are likely to approximately double as a result of the proposed expansion.

Mobile Plant and Delivery Vehicles

Emissions associated with the combustion of fuel (diesel, petrol, etc.) in mobile plant and delivery/staff/service vehicles will include CO, NO_x, PM₁₀ and PM_{2.5}, sulfur dioxide (SO₂) and VOCs. The rate and composition of air pollutant emissions from road vehicles is a function of a number of factors, including the type, size and age of the vehicles, the type of fuel combusted, number and speed of vehicles and the road gradient.

Table 2 indicates that the Project will result in a 30% increase in vehicle movements at the Site, giving a total of 69 vehicle movements per day (61 of these being heavy vehicles). To put this into context, the existing morning peak traffic volumes for the surrounding road network are presented in **Table 5**.

Table 5 Morning Peak Traffic Volumes – Surrounding Road Network

Location	Light Vehicle Movements	Heavy Vehicle Movements
Horsley Dr & Cowpasture Rd Roundabout	3,611	313
Cowpasture Rd & The Horsley Dr Signals	3,272	631
Cowpasture Rd & Victoria St Roundabout	1,532	315
Cowpasture Rd & Trivet St Intersection	1,217	109

Source: Ason Group

5 Regulatory Framework

5.1 Relevant Legislation, Policy and Guidance

The following Air Quality Policy and Guidance documents have been referenced within this assessment and have been used to identify the relevant air quality criteria (see **Section 5.2**).

5.1.1 Protection of the Environment Operations (POEO) Act 1997 & Amendment Act 2011

The POEO Act (and Amendment Act 2011) is a key piece of environment protection legislation administered by the NSW Department of Planning, Industry and Environment's Environment, Energy and Science (EES) group which enables the Government to establish instruments for setting environmental standards, goals, protocols and guidelines.

The following sections of the POEO Act are of general relevance to the Site:

- Section 124 and 125 of the POEO Act states that any plant located at a premise (e.g. the oven exhaust fans at the Site) should be maintained in an efficient condition and operated in a proper and efficient manner to reduce the potential for air pollution.
- Section 126 of the POEO Act requires that materials (e.g. raw ingredients and waste storage/disposal at the Site) are managed in a proper and efficient manner to prevent air pollution (e.g. odour).
- Section 128 of the POEO Act states:
 1. The occupier of a premises must not carry out any activity or operate any plant in or on the premises in such a manner to cause or permit the emission at any point specified in or determined in accordance with the regulation of air impurities in excess of [the standard of concentration and/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 activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

5.1.2 Protection of the Environment Operations (Clean Air) Regulation 2010

The POEO (Clean Air) Regulation 2010 (the Regulation) is the core regulatory instrument for air quality issues in NSW. In relation to industry, the Regulation:

- sets maximum limits on emissions from activities and plant for a number of substances;
- deals with the transport and storage of volatile organic liquids;
- restricts the use of high sulphur liquid fuel; and
- imposes operational requirements for certain afterburners, flares, vapour recovery units and other treatment plant.

Part 5 of the POEO (Clean Air) Regulation 2010 (the Regulation) also deals with emissions of air impurities from activities and plant, and sets maximum limits on emissions for a number of substances (including solid particles and visible smoke) as noted below in **Table 6**, with the limits relevant to the Site highlighted. The standards of concentrations prescribed by Part 5, Division 3 do not apply to plant during startup and shutdown periods, however such emissions are still subject to the requirements of Section 128 (2) of the POEO Act in relation to the prevention and minimisation of air pollution.

Table 6 Schedule 6 Standards of Concentration for (Group C¹) Non-Scheduled Premises

Air Impurity	Activity	Concentration ²
Particles	Any activity/ plant	100 mg/m ³
Smoke	Solid fuel is burnt	Ringlemann 1 or 20% opacity
	Liquid fuel is burnt	Ringlemann 1 or 20% opacity

Note 1 Group C: Activity granted DA consent and commenced to operate after 1 September 2005.

Note 2 Reference conditions are: Dry, 273 K, 101.3 kPa for any activity.

5.1.3 NSW Environment Protection Authority Air Quality Policy and Guidance

The EPA is the NSW regulatory authority responsible for air quality regulation and associated activities.

NSW Environment Protection Authority document *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (hereafter 'the Approved Methods') (EPA 2017), lists the statutory methods for modelling and assessing air pollutants from stationary sources and specifies criteria which reflect the environmental outcomes adopted by the EPA. The Approved Methods are referred to in the POEO (Clean Air) Regulation 2002 for assessment of impacts of air pollutants. The air quality criteria set out in the Approved Methods have been reproduced and discussed in **Section 5.2**.

5.1.4 Odour Technical Framework and Notes

The EPA publications, *Technical Framework: Assessment and management of odour from stationary sources in NSW* and the associated *Technical Notes* (the Odour Policy) (NSW DEC, 2006) provide a policy framework for assessing and managing activities that emit odour and offers guidance on dealing with odour issues. **Section 0** outlines relevant recommendations from these documents.

5.1.5 Local Air Quality Toolkit

The Local Government Air Quality Toolkit (AQ Toolkit) has been developed by the EPA to assist local government in their management of air quality issues and provides guidelines for air quality management and for the use of air pollution control techniques. Relevant AQ Toolkit air quality guidance notes include:

- Dust from urban construction sites (NSW EPA, 2007a);
- Construction sites (NSW EPA, 2007b); and
- Food outlets (NSW EPA, 2007c).

5.1.6 Building Code of Australia and Australian Standards

The Building Code of Australia (BCA) is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Australian Government with the aim of efficiently achieving nationally consistent, minimum necessary standards of relevant health and safety, amenity and sustainability objectives. The BCA contains mandatory technical provisions for the design and construction of BCA class buildings.

Australian Standard (AS) 1668.2-2012 *The use of ventilation and air conditioning in building, Part 2: Ventilation design for indoor air contaminant control* sets design requirements for mechanical ventilation systems. Mechanical ventilation is required in enclosures where specific health and ventilation amenity requirements cannot be met by natural means.

Section 3.10.1 states of the AS states “*All exhaust air shall be discharged to atmosphere in such a manner not to cause danger or nuisance to occupants in the building, occupants of neighbouring buildings or members of the public.*”

Section 5 of the AS states the following:

- **5.2.2 Exhaust locations:** As far as practicable, exhaust-air intakes used for general exhaust-air collection shall be located on the opposite sides of the enclosure from the sources of make-up air, to ensure that the effluents are effectively removed from all parts of the enclosure.
- **5.3.2.1 General requirements:** The effluent shall be collected as it is being produced, as close as practicable to the source of generation.
- **5.10.1 Air discharges:** Where discharges are deemed to be objectionable (i.e. nuisance related), discharges shall:
 - Be emitted vertically with discharge velocities not less than 5 m/s.
 - Be situated at least 3 m above the roof at point of discharge.
 - Treated to reduce the concentration of contaminants where required.
 - Be emitted to the outside at velocities and in a direction that will ensure, to the extent practicable, a danger to health or a nuisance will not occur.
 - Be situated a minimum separation distance of 6 m (where the airflow rate is $\geq 1,000$ L/s) from any outdoor) air intake opening, natural ventilation device or opening, and boundary to an adjacent allotment, except that where the dimensions of the allotment make this impossible, then the greatest possible distance shall apply.

5.2 Relevant Air Quality Criteria

As discussed in **Section 1.1**, a qualitative (risk-based) assessment has been performed for both construction and operational impacts, to identify activities that have the potential for off-site air quality impacts if not adequately controlled, so that appropriate mitigation measures can be identified and incorporated into the project design and relevant environmental management plans. A quantitative emissions estimation and dispersion modelling study has not been performed, hence the Project’s compliance with the ambient air quality criteria listed in the following sections is not able to be presented as part of this assessment report. The criteria have been used, however, to assess the existing background air quality in **Section 6**.

5.2.1 Odour

Impacts from odorous air contaminants are often nuisance-related rather than health-related. Odour performance goals guide decisions on odour management, but are generally not intended to achieve “no odour”.

The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. This point is called the *odour threshold* and defines one odour unit (ou). An odour goal of less than 1 OU would theoretically result in no odour impact being experienced.

In practice, the character of a particular odour can only be judged by the receiver’s reaction to it, and preferably only compared to another odour under similar social and regional conditions. Based on the literature available, the level at which an odour is perceived to be a nuisance can range from 2 ou to 10 ou depending on a combination of the following factors:

- **Odour quality:** whether an odour results from a pure compound or from a mixture of compounds. Pure compounds tend to have a higher threshold (lower offensiveness) than a mixture of compounds.
- **Population sensitivity:** any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it contains.
- **Background level:** whether a given odour source, because of its location, is likely to contribute to a cumulative odour impact. In areas with more closely-located sources it may be necessary to apply a lower threshold to prevent offensive odour.
- **Public expectation:** whether a given community is tolerant of a particular type of odour and does not find it offensive, even at relatively high concentrations. For example, background agricultural odours may not be considered offensive until a higher threshold is reached than for odours from a landfill facility.
- **Source characteristics:** whether the odour is emitted from a stack (point source) or from an area (diffuse source). Generally, the components of point source emissions can be identified and treated more easily than diffuse sources. Emissions from point sources can be more easily controlled using control equipment. Point sources tend to be located in urban areas, while diffuse sources are more often located in rural locations.
- **Health effects:** whether a particular odour is likely to be associated with adverse health effects. In general, odours from agricultural activities are less likely to present a health risk than emissions from industrial facilities.

The NSW EPA recommends within the Technical Framework that, as a design goal, no individual be exposed to ambient odour levels of greater than 7 ou. This is based on experience gained through odour assessments from proposed and existing facilities in NSW indicating that an odour performance goal of 7 ou is likely to represent the level below which “offensive” odours should not occur (for an individual with a ‘standard sensitivity’ to odours). This is expressed as the 99th percentile value, as a nose response time average (approximately one second).

Odour performance goals need to be designed to take into account the range in sensitivities to odours within the community, and provide additional protection for individuals with a heightened response to odours, using a statistical approach which depends on the size of the affected population. As the affected population size increases, the number of sensitive individuals is also likely to increase, which suggests that more stringent goals are necessary in these situations. In addition, the potential for cumulative odour impacts in relatively sparsely populated areas can be more easily defined and assessed than in highly populated urban areas. It is often not possible, or practical, to determine and assess the cumulative odour impacts of all odour sources that may impact on a receptor in an urban environment. Therefore, the proposed odour performance goals allow for population density, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity.

The equation used by the NSW EPA to determine the appropriate impact assessment criteria for complex mixtures of odorous air pollutants, as specified in the Odour Framework, is expressed as follows:

$$\text{Impact assessment criterion (ou)} = \frac{(\log_{10} \text{population} - 4.5)}{-0.6}$$

A summary of the impact assessment criteria given for various population densities, as drawn from the Odour Framework, is given in **Table 7**. For areas such as that surrounding the Site, the relevant odour impact assessment criterion set by the Approved Methods for complex mixtures of odorous air pollutants is 2 ou (nose-response-time average, 99th percentile). As noted above, a quantitative odour modelling assessment has not been performed as part of this study, hence compliance with the criterion cannot be demonstrated. As discussed in **Section 3.1**, the facility is not aware of any complaints or concerns from the local community regarding odours from the existing operations.

Table 7 NSW EPA Impact Assessment Criteria for Complex Mixtures of Odorous Air Pollutants

Population of Affected Community (number of receptors)	Impact Assessment Criteria for Complex Mixtures of Odours (ou) (nose-response-time average, 99 th percentile)
Urban area (≥ 2000)	2
~500	3
~125	4
~30	5
~10	6
Single residence (≤ 2)	7

5.2.2 Products of Combustion and Fugitive Dust

Ambient air quality criteria for the products of combustion and fugitive dust emissions associated with the Project are prescribed by Section 7.1 of the Approved Methods. The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW and are considered to be appropriate for the setting. Those relevant to the identified emission sources at the Project are discussed below.

The criteria outlined in the sections below present the current ambient air quality criteria adopted by the NSW Government. It is noted that these criteria are based on the standards set out in the National Environment Protection (Ambient Air Quality) Measure (the AAQ NEPM). On 15 April 2021, The National Environmental Protection Council agreed to vary the AAQ NEPM, and as part of this upcoming variation, the ambient air standards for NO₂ and SO₂ currently included in the AAQ NEPM are to be amended. These changes to the ambient air quality standards for NO₂ and SO₂ include:

- SO₂:
 - The 1-hour standard for SO₂ in the AAQ NEPM will be retained, however the numerical value of the standard will be reduced to 100 ppb (previously 200 ppb).
 - A future 1-hour SO₂ standard of 75 ppb will be implemented from 2025.
 - The 24-hour standard for SO₂ in the AAQ NEPM will be retained, however the numerical value of the standard will be reduced to 20 ppb (previously 80 ppb).
 - No future target for 24-hour average SO₂ concentrations is proposed at this stage.
 - The current annual mean standard for SO₂ will be removed from the AAQ NEPM.
 - The form of both the revised 1-hour and 24-hour SO₂ standards will be as maximum values with no allowable exceedances.
- NO₂:
 - The 1-hour standard for NO₂ in the AAQ NEPM will be retained, however the numerical value of the standard will be reduced to 80 ppb (previously 120 ppb).
 - The annual standard for NO₂ in the AAQ NEPM will be retained, however the numerical value of the standard will be reduced to 15 ppb (previously 30 ppb).
 - The form of both the 1-hour and annual NO₂ standards will be as maximum values with no allowable exceedances.

It is not yet known if or when the Approved Methods will be amended to reflect the upcoming changes to the AAQ NEPM. The assessment presented in this report is therefore based on the current ambient air quality criteria adopted by DPIE.

Carbon Monoxide

CO is an odourless, colourless gas formed from the incomplete burning of fuels. CO bonds to the haemoglobin in the blood and reduces the oxygen carrying capacity of red blood cells, thus decreasing the oxygen supply to the tissues and organs, in particular the heart and the brain.

CO in urban areas results almost entirely from vehicle emissions and its spatial distribution follows that of traffic flow. The highest concentrations are found at the kerbside, with concentrations decreasing rapidly with increasing distance from the road.

The impact assessment criteria specified within the Approved Methods for CO are provided in **Table 8**.

Table 8 Impact Assessment Criteria for Carbon Monoxide (CO)

Pollutant	Averaging Period	Criterion
CO	15-min	87 ppm (100 mg/m ³)

	1-hour	25 ppm (30 mg/m ³)
	8-hour	9 ppm (10 mg/m ³)

Note: ppm = parts per million

Oxides of Nitrogen

NO_x is a general term used to describe any mixture of nitrogen oxides formed during combustion. In atmospheric chemistry NO_x generally refers to the total concentration of nitric oxide (NO) and nitrogen dioxide (NO₂).

NO is a colourless and odourless gas that does not significantly affect human health. However, in the presence of oxygen, NO can be oxidised to form NO₂ which can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. Long term exposure to NO₂ can lead to lung disease.

NO will be converted to NO₂ in the atmosphere after being emitted. The impact assessment criteria specified within the Approved Methods for NO₂ are provided in **Table 9**.

Table 9 Impact Assessment Criteria for Nitrogen Dioxide (NO₂)

Pollutant	Averaging Period	Criterion
NO ₂	1-hour	12 pphm (246 µg/m ³)
	Annual	3 pphm (62 µg/m ³)

Note: pphm = parts per hundred million

Suspended Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms “dust” and “particulates” are often used interchangeably. The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP).

The annual impact assessment criteria for TSP recommended by the NSW EPA is 90 µg/m³. The TSP impact assessment criteria was developed before the more recent results of epidemiological studies which suggested a relationship between health impacts and exposure to concentrations of finer particulate matter.

PM₁₀ and PM_{2.5} are considered important pollutants due to their ability to penetrate into the respiratory system. In the case of the PM_{2.5} category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM₁₀ and PM_{2.5} include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

The impact assessment criteria specified within the Approved Methods for suspended particulate matter are provided in **Table 10**.

Table 10 Impact Assessment Criteria for Suspended Particulate Matter

Pollutant	Averaging Period	Criterion
TSP	Annual	90 µg/m ³
PM ₁₀	24-hour	50 µg/m ³
	Annual	25 µg/m ³
PM _{2.5}	24-hour	25 µg/m ³
	Annual	8 µg/m ³

Deposited Particulate

The criteria presented above are concerned in large part with the health impacts of airborne particulate matter. Nuisance impacts from fugitive dust emissions during the construction phase also need to be considered, mainly in relation to deposited dust.

In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 grams per square metre per month (g/m²/month).

Table 11 presents the impact assessment criteria set out in the Approved Methods for dust deposition, showing the allowable increase in dust deposition level over the ambient (background) level to avoid dust nuisance.

Table 11 EPA Impact Assessment Criteria for Allowable Dust Deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 g/m ² /month	4 g/m ² /month

Source: Approved Methods, EPA 2017

Sulphur Dioxide

SO₂ is a colourless, pungent gas with an irritating smell. When present in sufficiently high concentrations, exposure to SO₂ can lead to impacts on the upper airways in humans (i.e. the nose and throat irritation). SO₂ can also mix with water vapour to form sulphuric acid (acid rain) which can damage vegetation, soil quality and corrode materials.

Main sources of SO₂ in the air are industries that process materials containing sulphur (e.g. wood pulping, paper manufacturing, metal refining and smelting, textile bleaching, wineries etc.). SO₂ is also present in motor vehicle emissions, however since Australian fuels are relatively low in sulphur, high ambient concentrations are not common.

The impact assessment criteria specified within the Approved Methods for SO₂ are provided in **Table 12**.

Table 12 Impact Assessment Criteria for Sulphur Dioxide (SO₂)

Pollutant	Averaging Period	Criterion
SO ₂	10-min	25 pphm (712 µg/m ³)
	1-hour	20 pphm (570 µg/m ³)
	24-hour	8 pphm (228 µg/m ³)
	Annual	2 pphm (60 µg/m ³)

Note: pphm = parts per hundred million

Volatile Organic Compounds

VOCs are organic compounds (i.e. contain carbon) that have high vapour pressure at normal room-temperature conditions. Their high vapour pressure leads to evaporation from liquid or solid form and emission release to the atmosphere.

VOCs are emitted by a variety of sources, including motor vehicles, chemical plants, automobile repair services, painting/printing industries, and rubber/plastics industries. VOCs that are often typical of these sources include benzene, toluene, ethylbenzene and xylenes (BTEX). Biogenic (natural) sources of VOC emissions are also significant (eg vegetation).

Impacts due to emissions of VOCs can be health or nuisance (odour) related. Benzene is a known carcinogen and a key VOC linked with the combustion of motor vehicle fuels. The impact assessment criteria specified within the Approved Methods for BTEX compounds are provided in **Table 13**.

Table 13 Impact Assessment Criteria for VOCs

Pollutant	Averaging Period	Criteria*
Benzene	1-hour	0.029 mg/m ³
Ethylbenzene	1-hour	8.0 mg/m ³
Toluene	1-hour	0.36 mg/m ³
Xylenes	1-hour	0.19 mg/m ³

* Gas volumes are expressed at 25°C and at an absolute pressure of 1 atmosphere (101.325 kPa)

5.3 Recommended Separation Distances

The application of minimum recommended separation distances (or 'buffer' distances) provides a valuable screening tool to judge whether a detailed assessment is required to evaluate the potential risk of conflicting land uses. Separation distances provide guidance on the appropriate level of separation between a source of emissions and sensitive land uses in order to mitigate the impacts of intended and unintended emissions on people. This approach relies on the knowledge that impacts on the environment generally decrease with increasing distance from the source of emissions. Separation distances are based on an understanding of the types of emissions associated with various industries and their potential impacts on people. These distances can vary based on the scale and size of the industry, location topography, prevailing winds and other factors.

There are no separation guidelines issued by NSW EPA, hence the following sections refer to guidelines set by other regulatory agencies in Australia. These recommended separation distances have been developed to be applied to sensitive uses, such as residential dwellings, schools, hospitals and childcare centres.

Australian Capital Territory EPA

The document '*Separation distance guidelines for air emissions*', published by ACT EPA (ACT Government, 2018) includes recommended minimum separation distances for activities identified in **Section 4.2**, as shown in **Table 14**.

Table 14 Recommended Separation Distances, ACT EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (m)
Bakery	Bakery	> 40 tonnes/day < 40 tonnes/day	100 See note ~
Handling and Storage of Food and Waste	NA	NA	NA
Operational Phase Traffic	NA	NA	NA

Source: (ACT Government, 2018)

~ For food and beverage manufacturing where no separation distances are specified. For these cases it is recommended that there be no visible discharge of dust or emission of odours offensive to humans, beyond the boundary of the premises, subject to the adoption of BATEA.

As noted in **Section 2.2**, facility currently produces approximately 55,000 tonnes of products per year, which is projected to increase to around 68,000 tonnes per year after the expansion. On a daily basis (assuming 365 days/year operation), both the current and proposed throughput are greater than the 40 tonnes/day (tpd) threshold above which the 100 m separation distance recommendation applies.

Victoria EPA

The Victoria EPA document '*Recommended separation distances for industrial residual air emissions*', Publication No. AQ 1518 (EPAV, 2013) includes minimum recommended separation distances for relevant activities identified in **Section 4.2**, as shown in **Table 15**.

Table 15 Recommended Separation Distances, VIC EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (m)
Processing facility	Bakery	> 200 tonnes/year < 200 tonnes/year	100 See note *
Handling and storage of food and waste	NA	NA	NA
Operational phase traffic	NA	NA	NA

Source: (EPAV, 2013)

* For food and beverage manufacturing producing less than 200 tonnes of product per year, no separation distances are specified. For these cases, EPA recommends there is no visible discharge of dust or emissions of odours offensive to the senses of human beings, beyond the boundary of the premises.

As outlined above, the throughput of the facility is proposed to increase from approximately 55,000 tonnes/year, to around 68,000 tonnes/year. This is well above the 200 tpy threshold to which the 100 m separation distance applies. Therefore, the 100 m separation distance recommended by the Victoria EPA may be considered applicable to the Project operations.

South Australia EPA

The document '*Evaluation distances for effective air quality and noise management*' published by South Australian EPA (EPA SA, 2016) includes recommended evaluation distances for relevant activities identified in **Section 4.2**, as shown in **Table 16**.

Table 16 Recommended Separation Distances, SA EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (m)
Processing facility	Bakery	>20 tonnes/week of ingredients	200
Handling and storage of food and waste	NA	NA	NA
Operational phase traffic	NA	NA	NA

Source: (EPA SA, 2016)

Based on the annual production rates noted above, the equivalent weekly throughputs are approximately 1,060 tonnes/week, increasing to 1,310 tonnes/week. Assuming the total ingredient weight is approximately equal to total product weight, the 200 m separation distance recommendation would apply to both current and proposed operations.

Western Australia EPA

In the Western Australia Environmental Protection Authority (WA EPA) policy documentation for minimum recommended separation distances - *Separation distances between Industrial and Sensitive Land Uses* (WA EPA, 2015), the WA EPA makes recommendations for assessing appropriate separation distances where amenity may be reduced for sensitive or incompatible land uses. Sensitive land uses which warrant protection from amenity-reducing off-site effects of industry by maintenance of a separation distance include residential areas and zones, hospitals and schools.

The WA EPA document lists a number of industries with their recommended separation distances and states that where the appropriate separation distance is unable to be provided by the emitter, the impact on neighbouring land uses may be reduced by careful site layout. EPAWA 2015 further states that '*It is not the purpose of a separation distance to 'sterilise' land from development; non-sensitive land uses can be located within the area between the source of emissions and sensitive land use.*'

The WA EPA recommends EPA consultation where site-specific circumstances indicate a lesser separation distance may be appropriate (i.e. where there is no history of complaints arising from residual emissions or where the plant is significantly smaller than that used in the recommendations etc.). A summary of the separation distances specified by WA EPA that may be applicable to the Site is provided in **Table 17**.

Table 17 Recommended Separation Distances, WA EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (m)
Processing facility	Bakeries	Depending on size	100-200
Handling and storage of food and waste	NA	NA	NA
Operational phase traffic	NA	NA	NA

Source: Appendix 1, (WA EPA, 2015)

In relation to the proposed processing facility, according to the WA EPA document a separation distance of 100 m to 200 m may be applicable depending on the size. However, it is noted that the document does not specify thresholds for the separation distance requirements. Given the scale of the Project, however, a separation distance of 200 m may be considered applicable to the Project.

Summary

In relation to the proposed processing facility, a separation distance of 100 m to 200 m may be considered applicable depending on the referenced document and bakery production capacity. As a conservative measure, a separation distance of 200 m from the Site has been adopted for the purpose of this qualitative assessment and is considered appropriate for both the current and proposed throughput (ie covers the potential cumulative impacts of the facility after the expansion Project is complete).

No separation distance guidelines directly relevant to the handling and storage of food and waste, or operational phase traffic, were identified.

6 Review of Ambient Air Quality Monitoring Data

The NSW EES maintains a network of air quality monitoring stations (AQMS) across NSW. The nearest such station is located at Prospect, approximately 3.8 km to the east of the Site (see **Figure 4**).

The Prospect AQMS was commissioned in 2007 and is located in William Lawson Park, Myrtle Street, Prospect. It is situated in a residential area and is at an elevation of 66 m. A number of air pollutants and meteorological variables are currently measured by the Prospect AQMS including:

- NO, NO₂ & NO_x
- SO₂
- PM₁₀
- PM_{2.5}
- CO

Air pollutant data recorded by the Prospect AQMS were obtained for the calendar years 2015 – 2020. The data are summarised in **Table 18** (red font/shading indicates an exceedance of the relevant criterion), and are presented graphically in **Figure 6** to **Figure 10**. To be consistent with the annual NSW compliance monitoring reports, the data for gaseous pollutants are presented in parts per hundred million (pphm) or parts per million (ppm), rather than µg/m³ and mg/m³.

Table 18 Summary of Prospect AQMS Data (2015 – 2020)

Pollutant	CO	NO ₂		SO ₂		PM ₁₀		PM _{2.5}	
Averaging Period	Maximum 1-hour	Maximum 1-hour	Annual	Maximum 1-hour	Annual	Maximum 24-hour	Annual	Maximum 24-hour	Annual
Units	ppm	pphm	pphm	pphm	pphm	µg/m ³	µg/m ³	µg/m ³	µg/m ³
2015	1.9	5.3	1.1	2.7	0.1	68.7	17.6	29.6	8.2
2016	1.6	5.3	1.0	2.1	0.1	110.1	18.9	84.9	8.7
2017	1.6	6.0	1.0	2.3	0.1	61.1	18.9	30.1	7.7
2018	1.3	5.1	0.9	2.5	0.1	113.3	21.9	47.5	8.5
2019	5.5	4.9	0.9	2.1	0.1	182.8	26.0	134.1	11.9
2020	2.1	4.3	0.7	1.8	0.1	245.8	20.2	70.8	8.6
Criterion	25	12	3	20	2	50	25	25	8

Notes:

- ¹ For 2015, one (1) exceedance of the 24-hour average PM₁₀ and one (1) exceedance of the 24-hour average PM_{2.5} was recorded.
- ² For 2016, four (4) exceedances of the 24-hour average PM₁₀ and five (5) exceedances of the 24-hour average PM_{2.5} were recorded.
- ³ For 2017, one (1) exceedance of the 24-hour average PM₁₀ and three (3) exceedances of the 24-hour average PM_{2.5} were recorded.
- ⁴ For 2018, eight (8) exceedances of the 24-hour average PM₁₀ and four (4) exceedances of the 24-hour average PM_{2.5} were recorded.
- ⁵ For 2019, 25 exceedances of the 24-hour average PM₁₀ and 25 exceedances of the 24-hour average PM_{2.5} were recorded.
- ⁶ For 2020, ten (10) exceedances of the 24-hour average PM₁₀ and 13 exceedances of the 24-hour average PM_{2.5} were recorded.

Figure 6 1-Hour Average Ambient CO Concentrations - Prospect AQMS (2015 – 2020)

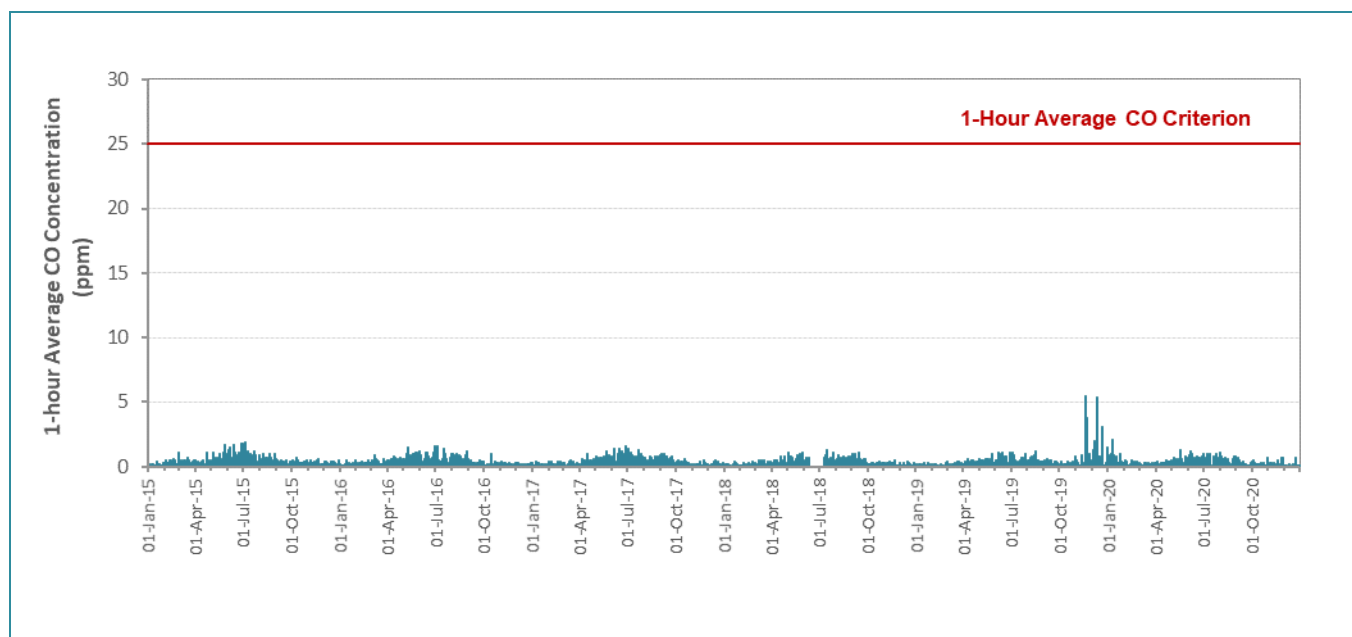


Figure 7 1-Hour Average Ambient NO₂ Concentrations - Prospect AQMS (2015 – 2020)

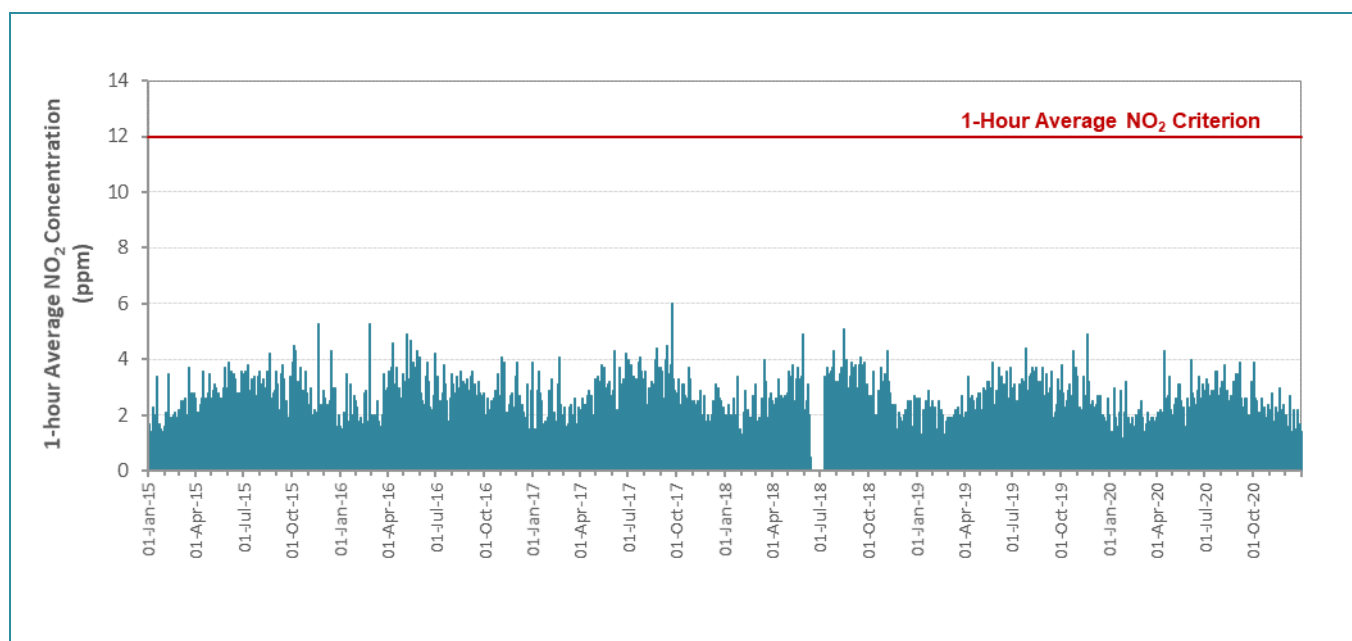


Figure 8 Ambient 1-Hour Average SO₂ Concentrations - Prospect AQMS (2015 – 2020)

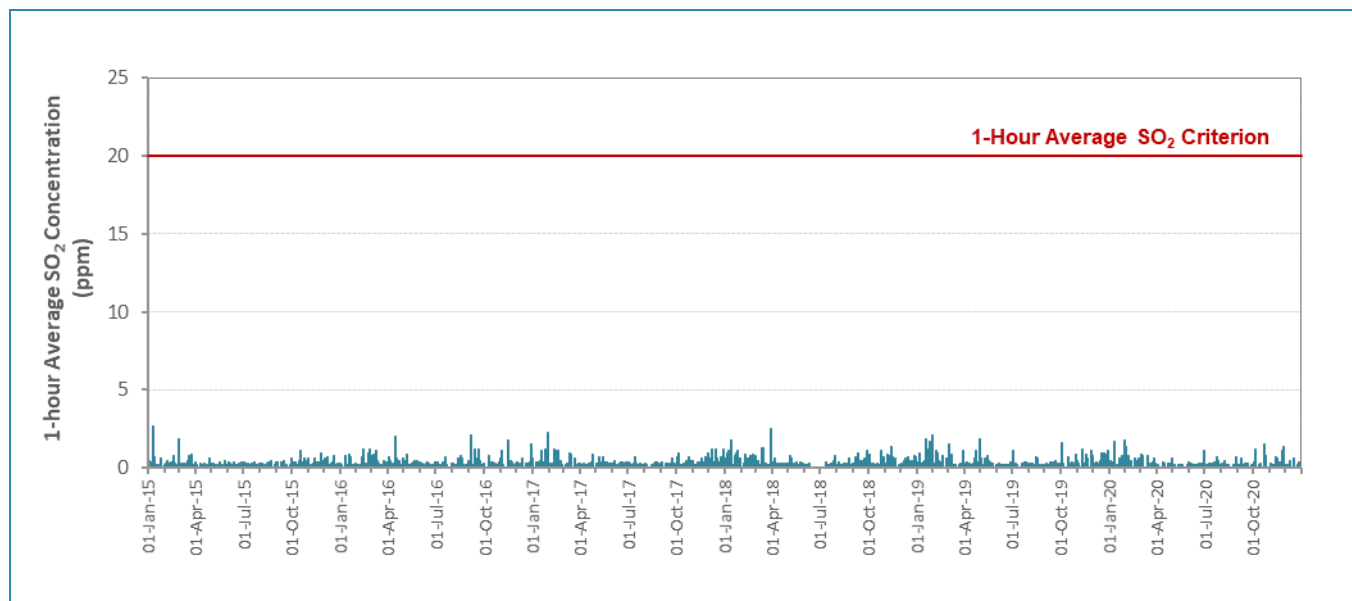


Figure 9 24-Hour Average Ambient PM₁₀ Concentrations - Prospect AQMS (2015 – 2020)

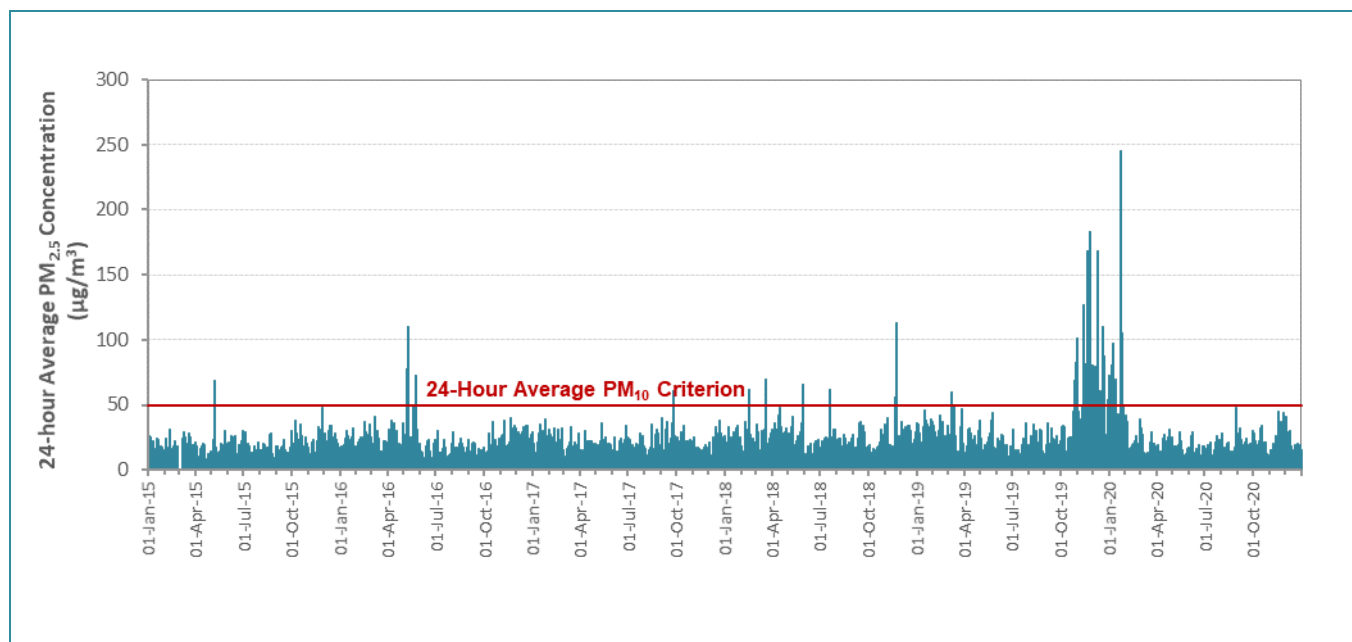
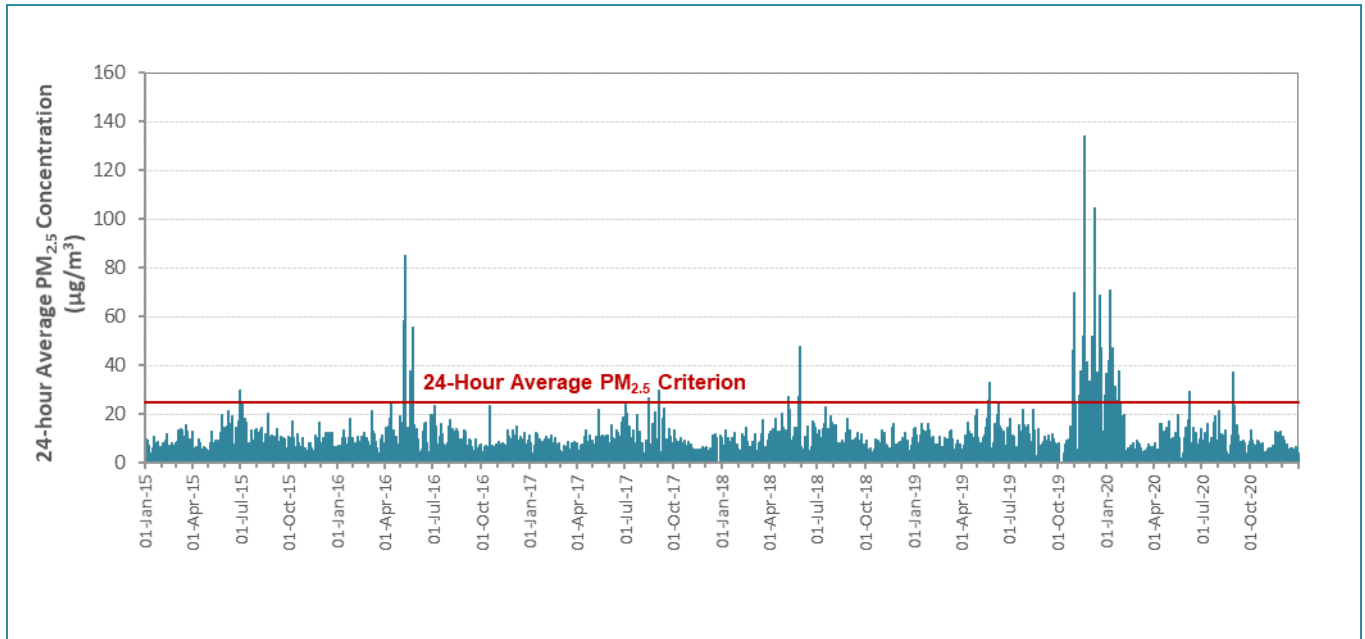


Figure 10 Ambient 24-Hour Average PM_{2.5} Concentrations - Prospect AQMS (2015 – 2020)



A review of the Prospect AQMS data shows that exceedances of the 24-hour average PM₁₀ and PM_{2.5} criteria were recorded by the Prospect AQMS in all six years. A review of the available compliance monitoring reports indicates that the exceedances recorded by the Prospect AQMS were primarily due to exceptional events, such as bushfire emergencies, dust storms and hazard reduction burns. The high number of exceedances recorded by the Prospect AQMS in late 2019 and early 2020 was due to the bushfire smoke that affected Sydney and the surrounding areas for a number of weeks over this period.

Exceedances of the annual average PM_{2.5} criterion were also recorded by the Prospect AQMS in all years investigated except for 2017. Ambient PM_{2.5} concentrations often exceed the annual average criteria set out in the Approved Methods across the Sydney Greater Metropolitan Area. The annual average PM₁₀ criterion was only exceeded in 2019, which was primarily due to the abovementioned bushfires in the areas surrounding Sydney in late 2019.

Ambient concentrations of the gaseous pollutants SO₂, NO₂, and CO were all well below the relevant criteria for all years investigated.

7 Assessment of Potential Impacts

7.1 Construction Phase

7.1.1 Fugitive Dust Emissions

The key potential air pollution and amenity issues associated with fugitive dust emissions from the proposed activities during the construction works at the Site are:

- Annoyance due to dust deposition (soiling of surfaces) and visible dust plumes; and
- Elevated suspended particulate concentrations (PM₁₀).

Modelling of dust from construction activities is generally not considered appropriate, as emission rates can vary significantly depending on a combination of the activity and prevailing meteorological conditions (i.e. rainfall and wind speed), which cannot be reliably predicted. The following sections therefore present a qualitative assessment of the potential risks to air quality associated with dust from construction activities at the Project. Details of the IAQM methodology used to perform the risk assessment are provided in **Appendix A**.

Step 1 – Screening Based on Separation Distance

As noted in **Section 3.1**, the nearest existing residential receptors have been identified as being located more than 1 km from the Site boundary, on Pikes Lane. The closest receptor identified that may be sensitive to dust impacts from the construction works, is the hotel located 400 m to the south.

As no potentially sensitive receptors have been identified within 350 m from the boundary of the Site, or within 500 m from the Site entrance, no further assessment is required by the IAQM method.

Mitigation Measures

While no sensitive receptors are located within the IAQM screening distances, best practice dust controls should be applied during the works to minimise potential impacts on the surrounding commercial and industrial activities.

Table 19 lists the mitigation measures designated as *highly recommended* (H) or *desirable* (D) by the IAQM methodology for a development shown to have a low risk of adverse impacts. Not all these measures would be practical or relevant to construction works at the Site, so these measures should be reviewed in consultation with the construction contractor or as part of the development of the Construction Environmental Management Plan (CEMP) before their implementation. For almost all construction activities, the IAQM Methods notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is normally possible.

Table 19 Site-Specific Management Measures Recommended by the IAQM

	Activity	
1	Communications	
1.1	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
1.2	Display the head or regional office contact information.	H
1.3	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.	D
2	Site Management	
2.1	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H
2.2	Make the complaints log available to the local authority when asked.	H
2.3	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	H
3	Monitoring	
3.1	Perform daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary.	D
3.2	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority, when asked.	H
3.3	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H
4	Preparing and Maintaining the Site	
4.1	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
4.2	Erect solid screens or barriers around dusty activities or the site boundary that is at least as high as any stockpiles on site.	H
4.3	Keep site fencing, barriers and scaffolding clean using wet methods.	D
4.4	Cover, seed or fence stockpiles to prevent wind erosion	D
5	Operating Vehicle/Machinery and Sustainable Travel	
5.1	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable	H
5.2	Ensure all vehicles switch off engines when stationary - no idling vehicles	H
5.3	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable	H
6	Operations	
6.1	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	H
6.2	Use enclosed chutes and conveyors and covered skips	H
6.3	Minimise drop heights from loading shovels and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate	H

	Activity	
7	Waste Management	
7.1	Avoid bonfires and burning of waste materials.	H
7.2	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D
7.3	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H
8	Construction	
8.1	Avoid scabbling (roughening of concrete surfaces) if possible	D
8.2	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	D
9	Trackout	
9.1	Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site.	D
9.2	Avoid dry sweeping of large areas.	D
9.3	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D
9.4	Record all inspections of haul routes and any subsequent action in a site log book.	D
9.5	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D

H = Highly recommended; D = Desirable

7.1.2 Products of Fuel Combustion

Ambient air quality monitoring performed in the Sydney area over the last few decades has shown that the city's air quality has typically improved and is continuing to improve. A major driver of this improvement in urban air quality is the fact that newer vehicles produce significantly less emissions than older vehicles. This is in part a result of improvements in the quality and composition of fuels, as well as improved engine designs and fuel efficiency. According to Trends in Motor Vehicles and their Emissions (NSW EPA, 2014) cars built from 2013 onwards emit only 3% of the NO_x emissions compared to vehicles built in 1976, and diesel trucks built from 2011 onwards emit just 8% of the particles emitted by vehicles built in 1996. Therefore, even as Sydney's population, and total vehicle kilometres travelled each year have increased (ABS, 2018) key measures of air pollution have dropped significantly and this trend is expected to continue.

The results from the background air quality concentrations show that the monitored concentrations have been well below the respective criteria for CO, NO₂ and SO₂ for six years running (2015-2020) (see **Section 6**).

Given the nature of the construction works, it is considered that the emissions generated due to the combustion of fuel in construction plant and machinery will be of limited duration and small compared to the emissions generated by road traffic on the surrounding road network. Given the short term and low level of emissions of these pollutants from the Site during the construction works, they are considered unlikely to have significant impacts on local air quality and have not been considered any further in this assessment.

7.2 Operational Phase

This section presents a high-level assessment of the potential risks of adverse air quality impacts at sensitive receptors due to the proposed operations at the Site. The impact assessment uses the methodology summarised in **Section 1.1.2** of this report, which integrates the receptor sensitivity with impact magnitude to derive the potential significance of that change. Details of the operational risk assessment methodology used are provided in **Appendix B**. In the context of this methodology, the resultant risk is termed “impact significance”.

The nearest existing residential receptors have been identified as being located more than 1 km from the Site boundary, on Pikes Lane. The closest receptor identified that may be sensitive to operational phase air emissions, is the hotel located 400 m to the south (see **Section 3.1**). With regards to the methodology outlined in **Appendix B**, the sensitivity of the surrounding residential areas to air pollutant emissions generated by the Site has been classified as **high**.

7.2.1 Odour Emissions from Baking Operations

As discussed in **Section 4.2.2.1**, odour emissions will occur from activities at the expanded facility. The new processing building is proposed to be equipped with AS and BCA compliant air extraction systems.

As discussed in **Section 5.3**, a conservative recommended separation distance of 200 m between bakery operations and sensitive land uses has been adopted for this study, which is applicable for both the current and proposed operations. This separation distance is to be applied to the distance between the nearest sensitive receptor and the bakery building or exhaust vents (noting that the exhaust vents will be located on the roof of the processing buildings). The nearest residential receptors are located more than 1 km from the Site (see **Figure 11**) which means that the adopted separation distance would be met. It is noted that the hotel located to the south of the Site is also located approximately 400 m from the proposed expansion area and 300 m from the existing processing building and therefore also meets the recommended separation distance.

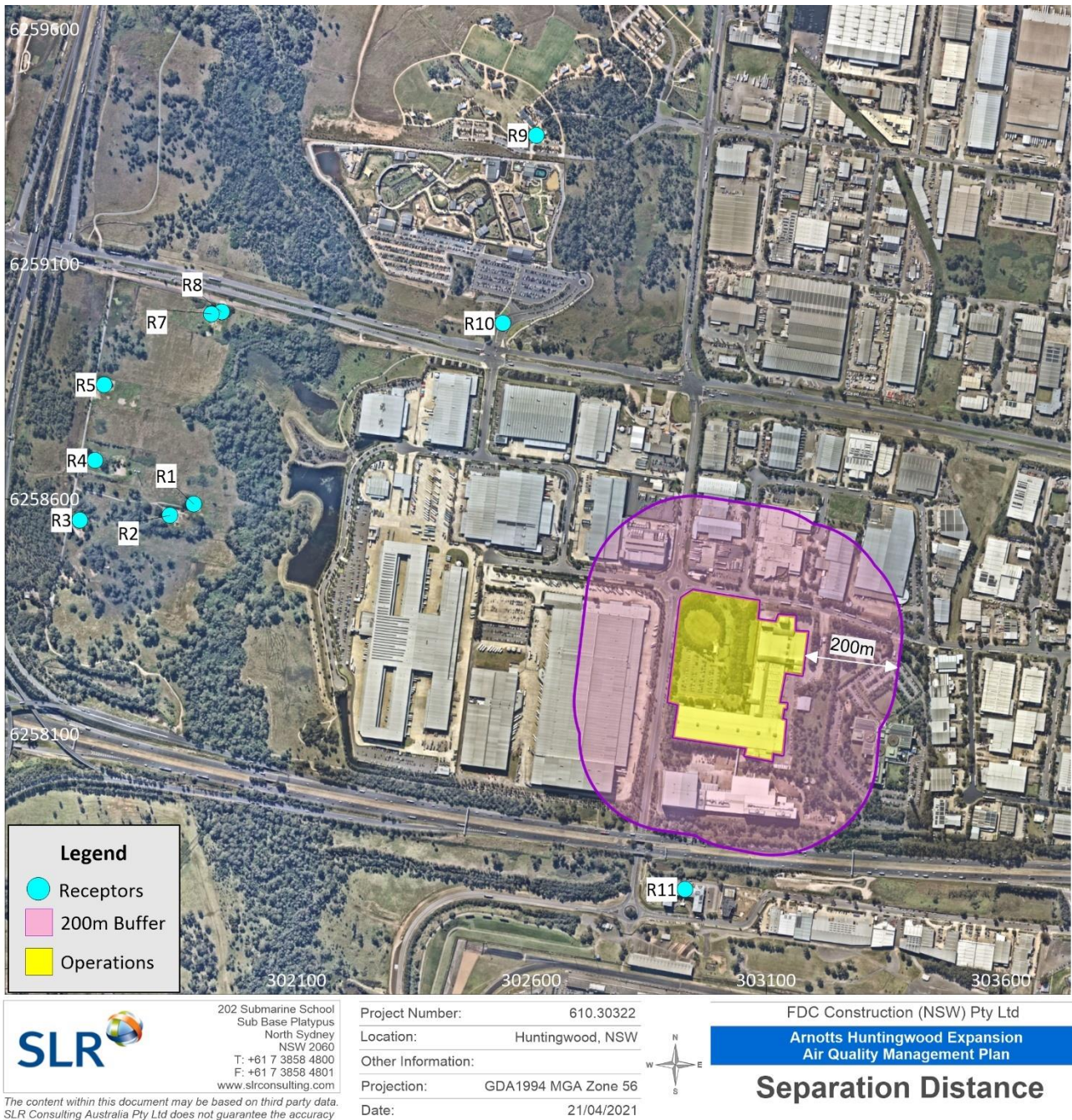
Given the above considerations, the magnitude for nearby sensitive receptors is predicted to be **negligible** (i.e. Impact is predicted to cause no significant consequences, **Table B2**). Given the **high sensitivity** of the potentially affected receptors and the **negligible magnitude** of the potential odour impact of the processing facility, the potential impact significance for the local receptors is concluded to be of **neutral significance** (see **Table 20**).

Table 20 Risk Assessment of Odour Impacts – Baking Operations

Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

Considering the neutral impact significance for receptors due to the facility's expanded operations, additional mitigation measures are not deemed necessary. However, further mitigation measures can be put in place to further reduce or remove any impacts (refer to **Section 8**).

Figure 11 Bakery Operations – Separation Distance



7.2.2 Odour Emissions from Handling and Storage of Raw Materials and Waste

As discussed in **Section 4.2.2.1** odour emissions could occur from handling and storage of fresh food and waste on site. All fresh food and waste handling and processing areas are proposed to be equipped with AS and BCA compliant air extraction systems.

By addressing the FIDOL factors, the potential for odour impacts from these sources at the sensitive receptors may be determined, as follows:

- Frequency – The closest residential areas have the potential to experience impacts when winds blow towards the receptors. As outlined in **Section 3.3** winds blowing towards the nearest existing residences and recreational facilities (>800 m away) occur approximately 23% of the time, while winds that would blow air emissions towards the nearby hotel (400 m away) occur only 7% of the time. Given this, and as the Site is a 24/7 operation, it is concluded that there is a medium likelihood that sensitive receptors would be downwind of the Site.
- Intensity – The fresh food and waste storage areas within the Site are proposed to be equipped with BCA and AS compliant ventilation systems which are designed to ensure effective dispersal of emissions. Moreover, all fresh food will be stored in temperature-controlled environment to avoid spoiling. Given the above, and based on observations during the Site visit, the intensity of any odours travelling off-site would likely be very low.
- Duration – the duration of any potential odour impact may last as long as the wind is blowing in the direction of the sensitive receptors. Based on local wind patterns and given the Site is a 24/7 operation, the duration of any odour impact is concluded to be medium.
- Offensiveness – Given organic waste will be removed from site on a daily basis, Monday to Friday, the offensiveness is likely to be low.
- Location – the impact of location on the acceptability of odours from the Site has been accounted for by the receptor sensitivity classification of high.

Further to the above, it is noted that the closest potentially sensitive receptor is located over 400 m away from the new waste storage and warehouse areas.

Given the above considerations, the magnitude of odour is predicted to be of **negligible** magnitude (ie predicted impact may be tolerated, **Table B2**).

Given the **high sensitivity** of the potentially affected receptors and the **negligible magnitude** of the potential odour impact of the handling and storage activities, the potential impact significance for the expanded site at the local receptors is concluded to be of **neutral significance**.

The proposed odour mitigation measures for waste management and raw materials handling are listed in **Section 8**.

Table 21 Risk Assessment of Odour Impacts – Handling and Storage of Raw Materials and Waste

Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

7.2.3 Products of Combustion from Gas-Fired Ovens

The key pollutant of interest for natural gas combustion is NO₂, and based on the data presented in **Table 4**, the hourly average NO_x emission (i.e. assuming gas consumption is consistent over all shifts for the 24/7 operations) for the oven operations is estimated to increase from around 0.25 g/s to 0.50 g/s as a result of the expansion. In SLR's experience, NO_x emissions of this magnitude would have no significant potential for off-site exceedances of ambient air quality criteria for NO₂ provided they are appropriately dispersed from a suitably designed stack. Combustion emissions from the gas-fired ovens will be vented via stacks located on the roof of the building, which will promote dispersion and minimise off-site ground level concentrations of air pollutants.

Given the above considerations, the magnitude for nearby sensitive receptors is predicted to be **slight** (i.e. Impact is predicted to cause no significant consequences, **Table B2**).

Given the **high sensitivity** of the potentially affected receptors and the **slight magnitude** of the potential impacts from products of combustion from the gas-fired ovens, the potential impact significance for the expanded site is concluded to be of **intermediate/minor significance** for the closest receptors.

Table 22 Risk Assessment of Impacts from Products of Combustion – Gas-Fired Ovens

Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

7.2.4 Products of Combustion from Mobile Plant and Delivery Vehicles

As outlined in **Section 7.1.2**, improvements in the quality and composition of fuels as well as improved engine designs and fuel efficiency, have led to continuously improving air quality in the Sydney area. According to Trends in Motor Vehicles and their Emissions (EPA 2014), cars built from 2013 onwards emit only 3% of the NO_x emissions compared to vehicles built in 1976, and diesel trucks built from 2011 onwards emit just 8% of the particles emitted by vehicles built in 1996.

Given the scale of on-site vehicle parking and proposed increases in delivery truck operations it is considered that the emissions generated due to the combustion of fuel in light and heavy vehicles generated by the Project will be negligible compared to the emissions generated by traffic on the surrounding road network and do not represent a major increase relative to the current on-Site operations (see **Table 2**).

Given the above considerations, and the distance between the site and the nearest sensitive receptors, the magnitude for nearby sensitive receptors is predicted to be **negligible** magnitude (i.e. predicted impact may be tolerated, **Table B2**).

Given the **high sensitivity** of the potentially affected receptors and the **negligible magnitude** of the potential impacts from products of combustion from operational phase traffic activities, the potential impact significance for the expanded site is concluded to be of **neutral significance** for the closest sensitive receptors.

Table 23 Risk Assessment of Impacts from Products of Combustion – Mobile Plant and Delivery Vehicles

Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

7.2.5 Summary

Table 24 presents a summary of predicted air quality impacts on sensitive receptors. The mitigation measures listed in **Section 8**) will further reduce any residual risks to local air quality.

Table 24 Impact Significance Residual Risks

Pollutant	Source	Predicted Impact	
		Impact Magnitude	Impact Significance
Odour	Bakery operations	Negligible	Neutral
	Handling/storage of raw ingredients and waste	Negligible	Neutral

Pollutant	Source	Predicted Impact	
		Impact Magnitude	Impact Significance
Products of Combustion	Gas-fired ovens	Slight	Intermediate/Minor
	Mobile plant and delivery vehicles	Negligible	Neutral
Particulate Matter	Bakery operations	Negligible	Neutral

8 Mitigation Measures and Monitoring

8.1 Existing and Proposed Controls

As outlined in **Section 4.2** a number of mitigation measures have been adopted by the Project. These include the following:

- Discharges of pollutants to the air from the majority of potentially odorous activities (ovens and production areas) will be captured by BCA and AS standard compliant extraction systems and directed to rooftop vents.
- Containment measures for spillages will be provided at appropriate locations in the expansion area to reduce odorous emissions from waste spillages.
- The good housekeeping observed during the site visit will continue to be maintained on all areas of the Site, including regular cleaning of all internal and external areas.
- Organic waste and general waste will be removed from site for off-site disposal on a daily basis, Monday to Friday. In addition:
 - All generated waste will be identified and separated into common material streams or categories at the point of generation for separate collection. This ensures that any waste that has the potential to cause odour emissions is dealt with appropriately.
 - All organic waste will be stored in closed containers and away from direct sun.
 - All putrescible waste materials will be covered during transport.
 - Signage will be provided in waste management and processing areas to provide information relating to general housekeeping requirements and to act as a daily reminder to staff working at the premises.
- The physical controls (including ventilation fans, exhaust stacks, extraction hoods, grease traps, air pollution control devices etc.) are/will be designed to allow for easy and safe cleaning and maintenance. Regular cleaning of physical controls is and will be undertaken as per manufacturer's requirements.

In addition, the capacity of the wastewater treatment plant has been reviewed and has been confirmed as being adequate to treat waste from the expanded operations without any modifications to the plant.

8.2 Additional Recommendations

In order to further reduce the potential for off-site air quality impacts during operation, additional mitigation measures can be put in place. The following outlines a number of possible mitigation measures relevant to the proposed activities at the Site. It is noted that some of these measures are being considered by the detailed design team. Recommended mitigation measures for the construction phase are provided in **Section 7.1.1**.

- As outlined above, BCA/AS standard compliant extraction systems are being designed for the Project in order to extract emissions and discharge them to atmosphere via dedicated discharge vents. Air pollution control devices may be implemented to further reduce emissions where complaints are received in relation to nuisance odour or where prolonged smoke is visible during normal or peak operations (i.e. not during start up or shut down).

- Signage should be displayed to remind drivers to turn off vehicle engines when idling at the Site for longer than 1 minute to minimise exhaust emissions.
- General environmental awareness training should be provided to relevant staff and contractors, including:
 - Potential air quality and odour impacts that may be caused by activity during normal and abnormal circumstances;
 - Prevention of accidental air emissions and actions to be taken when accidental emissions occur;
 - Efficient and appropriate use and maintenance of equipment used on the Site (where relevant to their role); and
 - Procedures for complaint handling.
- All staff and contractors should be instructed to report any undue pollutant release (including odour) and visible emissions from the exhaust vents to the Site manager.
- In order to reduce the company's overall carbon footprint and combustion gas emissions generated by vehicles, it is recommended that commuting to work using sustainable modes of travel (such as public transport, cycling, and car share) be encouraged through the implementation of an incentive scheme and that facilities for cyclists such as bike storage areas, showers and lockers be provided.

8.3 Monitoring

Given the nature and scale of the Project, it is not anticipated that any impacts upon human health or amenity values would be experienced during the construction or operational phases.

Regular site walk overs and boundary inspections are recommended to be performed during the construction phase and ongoing monitoring of air quality is not considered to be required.

9 Conclusions

The main potential sources of air emissions were identified as dust impacts during the construction phase, and odour and products of combustion during the operational phase.

The potential for off-site dust impacts was assessed using a qualitative risk-based approach prescribed by the Institute of Air Quality Management (IAQM). The results of this assessment indicate that dust impacts due to the construction works do not have significant potential to adversely impact on surrounding sensitive land uses.

The potential for off-site air quality impacts due to operational phase activities was also assessed using a qualitative risk-based approach. Based on this qualitative assessment, considering the nature of the operations proposed and mitigation measures adopted, it has been concluded that the risk of relevant air quality criteria being exceeded as a result of the operation of the Project is negligible. The nearest residential receptors are located more than 1 km from the Site, which means that the adopted recommended minimum separation distance of 200 m between bakery operations and sensitive land uses (applicable to both current and proposed throughputs) would be easily met.

Based on the qualitative assessment performed, which takes into account the scale and nature of the proposed operations, site location and mitigation measures adopted, SLR concludes that any exceedances of the relevant air quality criteria due to the Project are highly unlikely and further quantitative assessment is not appropriate or warranted. The additional mitigation measures recommended in this report will assist in further reducing the risk of any adverse off-site air quality impacts.

APPENDIX A CONSTRUCTION ASSESSMENT METHODOLOGY

APPENDIX A - Construction Assessment Methodology

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located more than 350 m from the boundary of the Site, more than 50 m from the route used by construction vehicles on public roads, and more than 500 m from the Site entrance. This step is noted as having deliberately been chosen to be conservative and will require assessments for most projects.

Step 2a – Assessment of Scale and Nature of the Works

Step 2a of the assessment provides “dust emissions magnitudes” for each of four dust generating activities; demolition, earthworks, construction, and trackout (the movement of site material onto public roads by vehicles). The magnitudes are: *Large*; *Medium*; or *Small*, with suggested definitions for each category. The definitions given in the IAQM guidance for earthworks, construction activities and trackout, which are most relevant to this Development, are as follows:

Demolition (Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time):

- **Large:** Total building volume >50,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- **Medium:** Total building volume 20,000 m³ – 50,000 m³, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- **Small:** Total building volume <20,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks (Covers the processes of soil-stripping, ground-levelling, excavation and landscaping):

- **Large:** Total site area greater than 10,000 m², potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t.
- **Medium:** Total site area 2,500 m² to 10,000 m², moderately dusty soil type (e.g. silt), five to 10 heavy earth moving vehicles active at any one time, formation of bunds 4 m to 8 m in height, total material moved 20,000 t to 100,000 t.
- **Small:** Total site area less than 2,500 m², soil type with large grain size (e.g. sand), less than five heavy earth moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 t, earthworks during wetter months.

Construction (Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc):

- **Large:** Total building volume greater than 100,000 m³, piling, on site concrete batching; sandblasting.
- **Medium:** Total building volume 25,000 m³ to 100,000 m³, potentially dusty construction material (eg concrete), piling, on site concrete batching.

- **Small:** Total building volume less than 25,000 m³, construction material with low potential for dust release (eg metal cladding or timber).

Trackout (*The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network*):

- **Large:** More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length.
- **Medium:** Between 10 and 50 heavy vehicle movements per day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length.
- **Small:** Less than 10 heavy vehicle movements per day, surface materials with a low potential for dust generation, less than 50 m of unpaved road length.

In order to provide a conservative assessment of potential impacts, it has been assumed that if at least one of the parameters specified in the 'large' definition is satisfied, the works are classified as large, and so on.

Step 2b – Risk Assessment

Assessment of the Sensitivity of the Area

Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:

- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts;
- The proximity and number of those receptors;
- In the case of PM₁₀, the local background concentration; and
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Individual receptors are classified as having *high*, *medium* or *low* sensitivity to dust deposition and human health impacts (ecological receptors are not addressed using this approach). The IAQM method provides guidance on the sensitivity of different receptor types to dust soiling and health effects as summarised in **Table A-1**. It is noted that user expectations of amenity levels (dust soiling) is dependent on existing deposition levels.

Table A-1 IAQM Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	<i>Examples: Dwellings, museums, medium- and long-term car parks and car showrooms.</i>	<i>Examples: Parks and places of work.</i>	<i>Examples: Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.</i>
Health effects	Locations where the public are exposed over a time period relevant to the air quality objective for PM ₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM ₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where human exposure is transient.
	<i>Examples: Residential properties, hospitals, schools and residential care homes.</i>	<i>Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM₁₀.</i>	<i>Examples: Public footpaths, playing fields, parks and shopping street.</i>

According to the IAQM methods, the sensitivity of the identified individual receptors (as described above) is then used to assess the *sensitivity of the area* surrounding the active construction area, taking into account the proximity and number of those receptors, and the local background PM₁₀ concentration (in the case of potential health impacts) and other site-specific factors. Additional factors to consider when determining the sensitivity of the area include:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area and if relevant, the season during which the works will take place;
- Any conclusions drawn from local topography;
- The duration of the potential impact (as a receptor may be willing to accept elevated dust levels for a known short duration, or may become more sensitive or less sensitive (acclimatised) over time for long-term impacts); and
- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

The IAQM guidance for assessing the sensitivity of an area to dust soiling is shown in **Table A-2**. The sensitivity of the area should be derived for each of activity relevant to the project (i.e. construction and earthworks).

Table A-2 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Soiling Effects

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Note: Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

A modified version of the IAQM guidance for assessing the *sensitivity of an area* to health impacts is shown in **Table A-3**. For high sensitivity receptors, the IAQM methods takes the existing background concentrations of PM₁₀ (as an annual average) experienced in the area of interest into account and is based on the air quality objectives for PM₁₀ in the UK. As these objectives differ from the ambient air quality criteria adopted for use in this assessment (i.e. an annual average of 25 µg/m³ for PM₁₀) the IAQM method has been modified slightly.

- This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine alternative sensitivity categories, taking into account the following factors:
- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;

- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area, and if relevant the season during which the works will take place;
- any conclusions drawn from local topography;
- duration of the potential impact; and
- any known specific receptor sensitivities which go beyond the classifications given in this document.

Table A-3 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Health Effects

Receptor sensitivity	Annual mean PM ₁₀ conc.	Number of receptors ^{a,b}	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-25 µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	17-21 µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<17 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	21-25 µg/m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	17-21 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<17 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Notes: (a) Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m); noting that only the highest level of area sensitivity from the table needs to be considered.
(b) In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table A-4** (demolition), **Table A-5** (earthworks and construction) and **Table A-6** (trackout) to determine the risk category with no mitigation applied.

Table A-4 Risk Category from Demolition Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A-5 Risk Category from Earthworks and Construction Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A-6 Risk Category from Trackout Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3 - Site-Specific Mitigation

Once the risk categories are determined for each of the relevant activities, site-specific management measures can be identified based on whether the site is a low-, medium- or high-risk site.

Step 4 – Residual Impacts

Following Step 3, the residual impact is then determined after management measures have been considered.

APPENDIX B OPERATIONAL ASSESSMENT METHODOLOGY

APPENDIX B - Operational Assessment Methodology

The risk-based assessment takes account of a range of impact descriptors, including the following:

- **Nature of Impact:** does the impact result in an adverse or beneficial environment?
- **Sensitivity:** how sensitive is the receiving environment to the anticipated impacts? This may be applied to the sensitivity of the environment in a regional context or specific receptor locations.
- **Magnitude:** what is the anticipated scale of the impact?

The integration of receptor sensitivity with impact magnitude is used to derive the predicted **significance** of that change.

Nature of Impact

Predicted impacts may be described in terms of the overall effect upon the environment:

- **Beneficial:** the predicted impact will cause a beneficial effect on the receiving environment.
- **Neutral:** the predicted impact will cause neither a beneficial nor adverse effect.
- **Adverse:** the predicted impact will cause an adverse effect on the receiving environment.

Receptor Sensitivity

Sensitivity may vary with the anticipated impact or effect. A receptor may be determined to have varying sensitivity to different environmental changes, for example, a high sensitivity to changes in air quality, but low sensitivity to noise impacts. Sensitivity may also be derived from statutory designation which is designed to protect the receptor from such impacts.

Sensitivity terminology may vary depending upon the environmental effect, but generally this may be described in accordance with the broad categories outlined in **Table B1**, which has been used in this assessment to define the sensitivity of receptors to air quality impacts.

Table B1 Methodology for Assessing Sensitivity of a Receptor to Air Quality Impacts

Sensitivity	Criteria
Very High	Receptors of very high sensitivity to air pollution (eg dust or odour) such as: hospitals and clinics, retirement homes, painting and furnishing businesses, hi-tech industries and food processing.
High	Receptors of high sensitivity to air pollution, such as: schools, residential areas, food retailers, glasshouses and nurseries, horticultural land and offices.
Medium	Receptors of medium sensitivity to air pollution, such as: farms, outdoor storage, light and heavy industry.
Low	All other air quality sensitive receptors not identified above.

Magnitude of Impact

Magnitude describes the anticipated scale of the anticipated environmental change in terms of how that impact may cause a change to baseline conditions. **Table B2** outlines the methodology used in this assessment to define the magnitude of the identified potential air quality impacts.

Table B2 Methodology for Assessing Magnitude of Impacts

Magnitude	Description
Substantial	Impact is predicted to cause significant consequences on the receiving environment (may be adverse or beneficial)
Moderate	Impact is predicted to possibly cause statutory objectives/standards to be exceeded (may be adverse)
Slight	Predicted impact may be tolerated.
Negligible	Impact is predicted to cause no significant consequences.

Significance of Impact

The risk-based matrix provided below illustrates how the definition of the sensitivity and magnitude interact to produce impact significance.

Table B3 Impact Significance Matrix

Sensitivity		[Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

ASIA PACIFIC OFFICES

BRISBANE

Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA

GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN

Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST

Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY

21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE

Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE

10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH

Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY

Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE

12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG

Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 404 939 922

AUCKLAND

68 Beach Road
Auckland 1010
New Zealand
T: 0800 757 695

NELSON

6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628