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# OVERSEAS PASSENGER TERMINAL (TENANCY 5) AIR QUALITY IMPACT ASSESSMENT

RAMBOLL ENVIRON

# OVERSEAS PASSENGER TERMINAL (TENANCY 5)
# AIR QUALITY IMPACT ASSESSMENT

| Revision | Date | Made by | Checked by | Approved by | Signed |
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# 1. INTRODUCTION

Ramboll Environ Australia Pty Ltd (Ramboll Environ) has been engaged by Jimmy's On The Mall Pty Ltd (the Proponent) to provide an air quality impact assessment of the construction and operational phases of the proposed indoor and outdoor restaurant and bar (incorporating a micro-brewery) at Terminal 5 of the Overseas Passenger Terminal (OPT), Circular Quay West. The proposed indoor and outdoor restaurant and bar (incorporating a micro-brewery) is referred to as 'the proposed development' throughout this report.

## 1.1 Project setting

The proposed development site is located at Tenancy 5 of the OPT, Circular Quay West in Sydney (see **Figure 1-1**).

The OPT surrounds are characterised by a mix of commercial and residential properties to the north-west, west and south-west. To the west and south west, there is generally less high-rise buildings and more town-housing. Approximately 220 m to the west of the site there is the Bradfield Highway, which is a major arterial road.

The Sydney Harbour surrounds the OPT to the east and north. Residential apartments, hotels, commercial shopfronts, offices and the Sydney Opera house are approximately 350 m east of the OPT. To the south of the OPT is the Circular Quay ferry wharves, Circular Quay train station and the Cahill expressway. Past the Cahill expressway there are high-rise hotels and commercial buildings.

## 1.2 Project description

The proponent seeks to use Tenancy 5 as an indoor and outdoor restaurant and bar (incorporating a micro-brewery) as detailed below:

- Fitout, alterations and additions of Levels 1 & 2 for use as a restaurant and bar;
- External amendments to the OPT building including:
  - replacement of existing glazing on the northern and eastern elevations, with new window and door openings;
  - New ground floor terrace treatment and additional outdoor seating areas;
  - New Level 1 balcony on the western elevation;
  - New outdoor decks on Level 1 on the east and north elevations and within the tower drum providing additional outdoor seating;
- New retractable awning/sun shading structure to proposed outdoor seating areas;
- Landscaping of outdoor areas; and
- New micro-brewery within a pod structure located outside the OPT building.

Architectural plans provided by Collins and Turner Architects (July 2016) were relied upon for this assessment.

### 1.2.1 Construction

#### 1.2.1.1 Construction activities and equipment

The proposed development includes the construction of the following elements:

- a new deck and balustrade;
- a new façade level 1 and 2 consisting of sliding/folding elements; and
- a landscaped external area with localised shade structures.

The inside of the existing building will be fitted-out with a new restaurant and bar and the micro-brewery 'pod' will also be inserted in the external space.

#### 1.2.1.2 Construction hours and timing

Construction is anticipated t occur over an approximate five month period. The following standard construction hours are expected:

- 7 am-6 pm Monday-Friday;
- 8 am-1 pm on Saturdays; and

- no work on Sundays and public holidays.

#### 1.2.2 Operation

The proposal seeks development consent for the following hours of operation (internal and external areas):

- 6:00am to 12:00 midnight Sunday to Thursday inclusive
- 6:00am Friday to 1:00am Saturday
- 6:00am Saturday to 1:00am Sunday
- 6.00 am to 2.00 am on January 1

The current and proposed hours of operation under the existing On Premises Liquor Licence (as amended to apply to the proposed licensed area of the entire tenancy) including:

- Standard Trading Hours (Internal and External Areas):
  - 10:00am to 12:00 midnight 7 days a week; and
- Additional Trading Hours on Public Holidays (Internal and External Areas)
  - Good Friday – 12 noon – 10:00pm;
  - Christmas Day 12:00 noon – 10:00pm; and
  - December 31 – 6:00am to 2:00am on January 1.

Live music in accordance with the Plan of Management and Noise Report (limited generally to amplified music consisting of solo or duos and excluding a designated or purpose built dance floor and DJs)

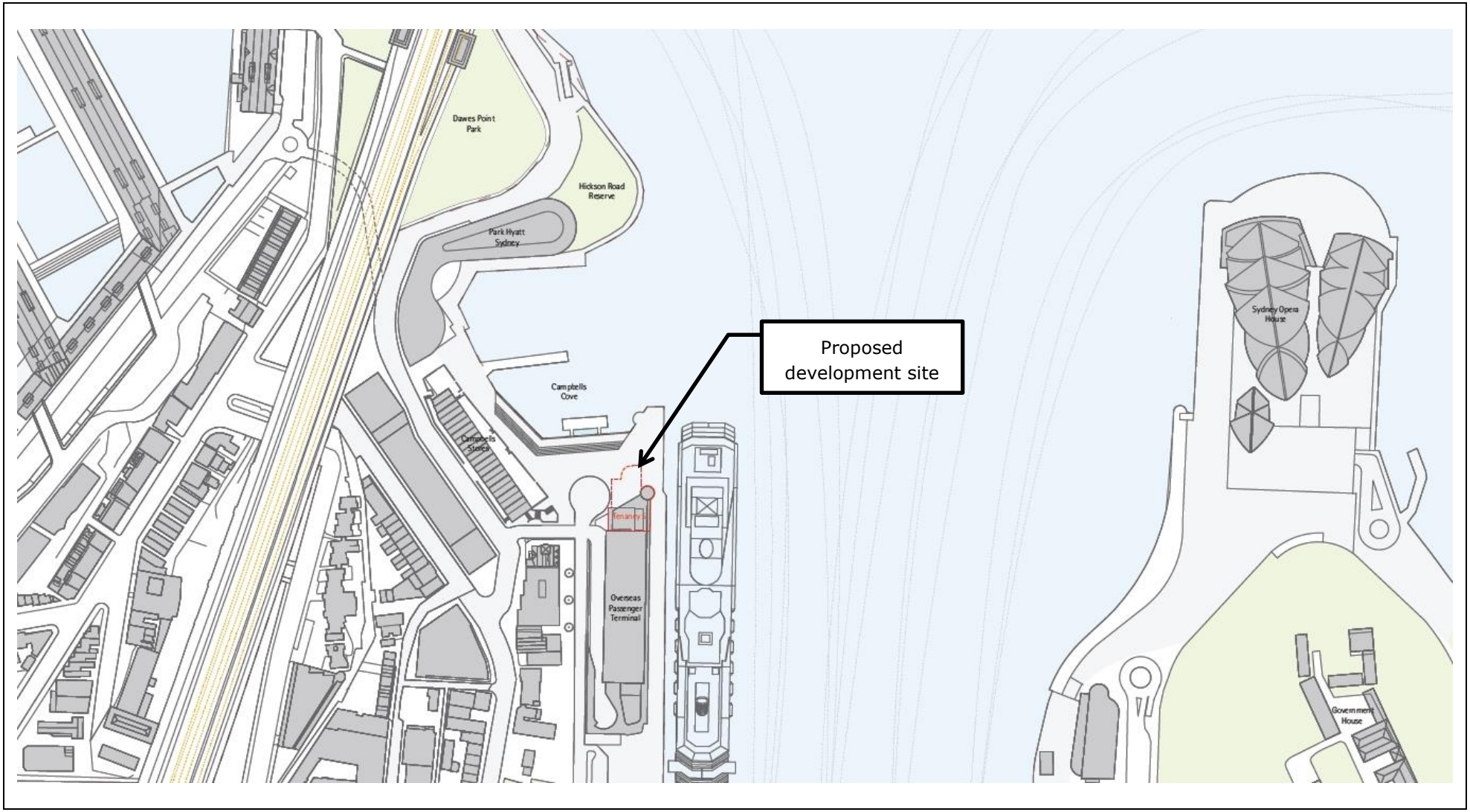


**Figure 1-1: Location of the proposed development**

Source: Collins and Turner Architecture (2016)

# 2. POTENTIAL AIR POLLUTION EMISSIONS

The primary pollutants generated by the proposed construction activities are expected to be particulate matter, including Total Suspended Particulates (TSP), particulate matter less than 10 microns in aerodynamic diameter ($PM_{10}$) and particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$).

Gaseous pollutants, including oxides of nitrogen ($NO_x$), sulphur dioxide ($SO_2$), carbon monoxide (CO) and volatile organic compounds (VOCs), associated with onsite fuel consumption would also be generated by the construction activities. It is expected that these emissions would be minor.

Emissions from the operational phase of the proposed development would principally be associated with the micro-brewery pod. The US EPA (1996a) identify that a brewery operation, such as the proposed micro-brewery pod, has the potential to generate emissions of particulate matter, VOCs, and other gaseous emissions.

PM emissions can be associated with grain handling, processing and storage, brewhouse operations, gas boiler operations and warehousing and transportation activities.

VOC emissions can be generated by brewhouse operations, gas boiler operations and warehousing and transportation activities. The US EPA (1996a) note that ethanol is the primary VOC emitted from the production of malt beverages in brewhouse operations.

Principal pollutants from the proposed development with regards to impact potential are considered to be $PM_{10}$ for the construction phase and ethanol for the operational phase.

# 3. EXISTING ENVIRONMENT

## 3.1 Prevailing Winds

The closest meteorological station that records wind speed and direction is the Bureau of Meteorology (BoM) Fort Denison meteorological station, located approximately 1.4 km east-northeast of the proposed development. A wind rose showing wind speed and direction data recorded at the BoM Fort Denison station recorded since 2009 is presented in **Figure 3-1**.

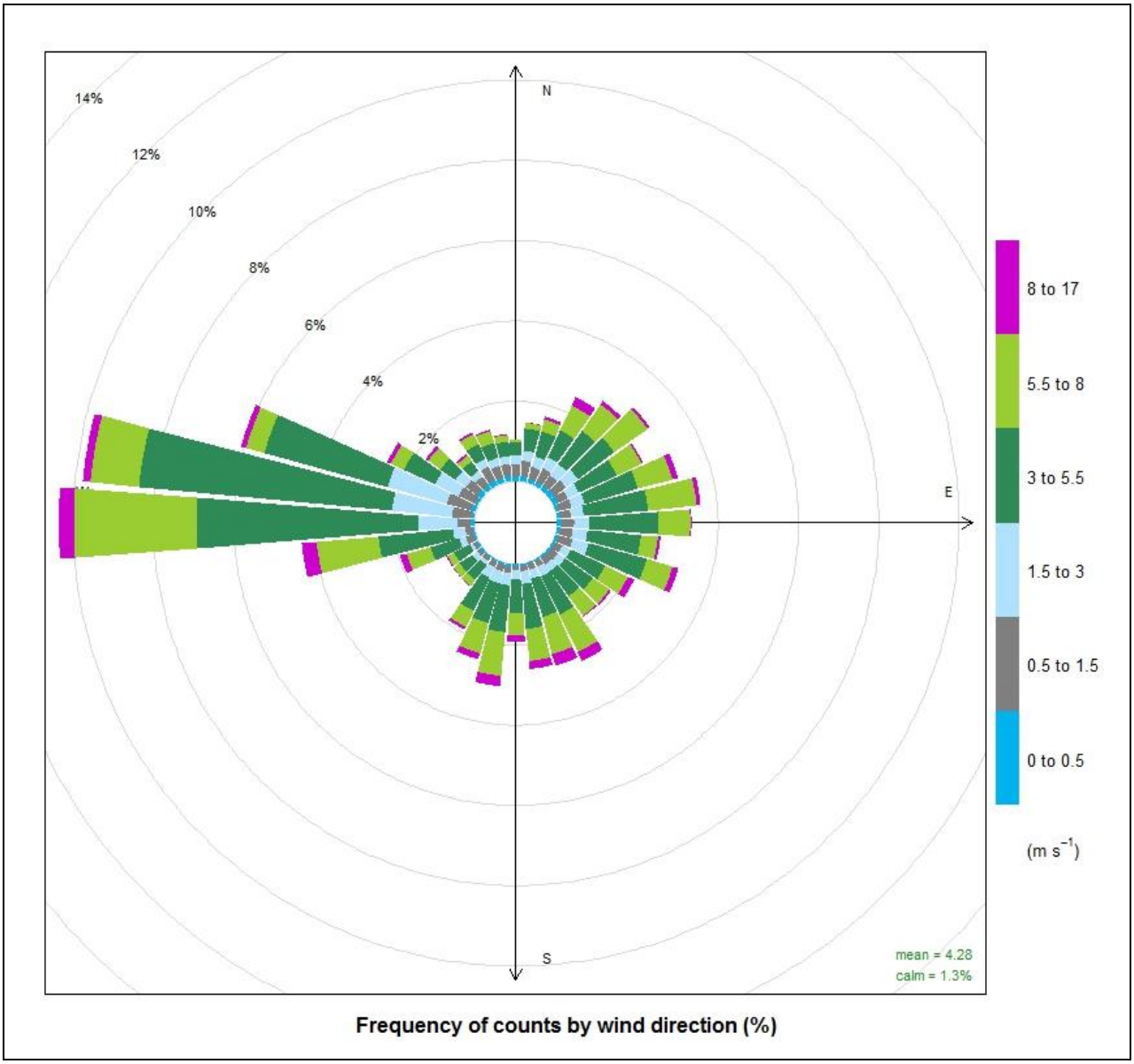


**Figure 3-1: Annual average wind rose – Fort Denison**

The annual recorded wind pattern is dominated by westerly airflow. Less frequent northeasterly to southerly flow is also experienced. The strongest wind speeds recorded are most frequently experienced from the west. The average recorded wind speed at Fort Denison is 4.3m/s, while calm conditions (wind speeds less than 0.5 m/s) are infrequent occurring in the order of 1% of the time.

Seasonal and diurnal (dividing the day into night and day) wind roses for the meteorological dataset are presented within **Appendix 1**.

Seasonal variation in wind direction is evident in the data recorded at Fort Denison. The westerly airflow is most evident in winter, with reducing frequency in autumn and spring. Summer is

dominated by air flow from the northeast to south. Wind speeds are reasonably consistent throughout the year.

Diurnal variation is limited in the Fort Denison data. Wind speeds are slightly higher during the daylight hours than at night. Night hours experience a higher frequency of airflow from the northeast.

## 3.2 Existing air quality

As stated in **Section 2**, the primary pollutants for impacts from the proposed development are $PM_{10}$ and ethanol.

The NSW OEH maintain a network of air quality monitoring stations across NSW, including five stations in the "Sydney Central-East" region (Randwick, Rozelle, Earlwood, Chullora and Lindfield). The closest NSW OEH station to the Overseas Passenger Terminal is located at Rozelle, approximately 4.5km to the west-southwest.

The annual average $PM_{10}$ concentrations recorded by these stations between 2010 and 2015 are illustrated in **Figure 3-2**. The annual average $PM_{10}$ concentrations recorded across the NSW OEH Sydney central-east network between 2010 and 2015 ranged from 13.3µg/m$^3$ to 19.9µg/m$^3$.

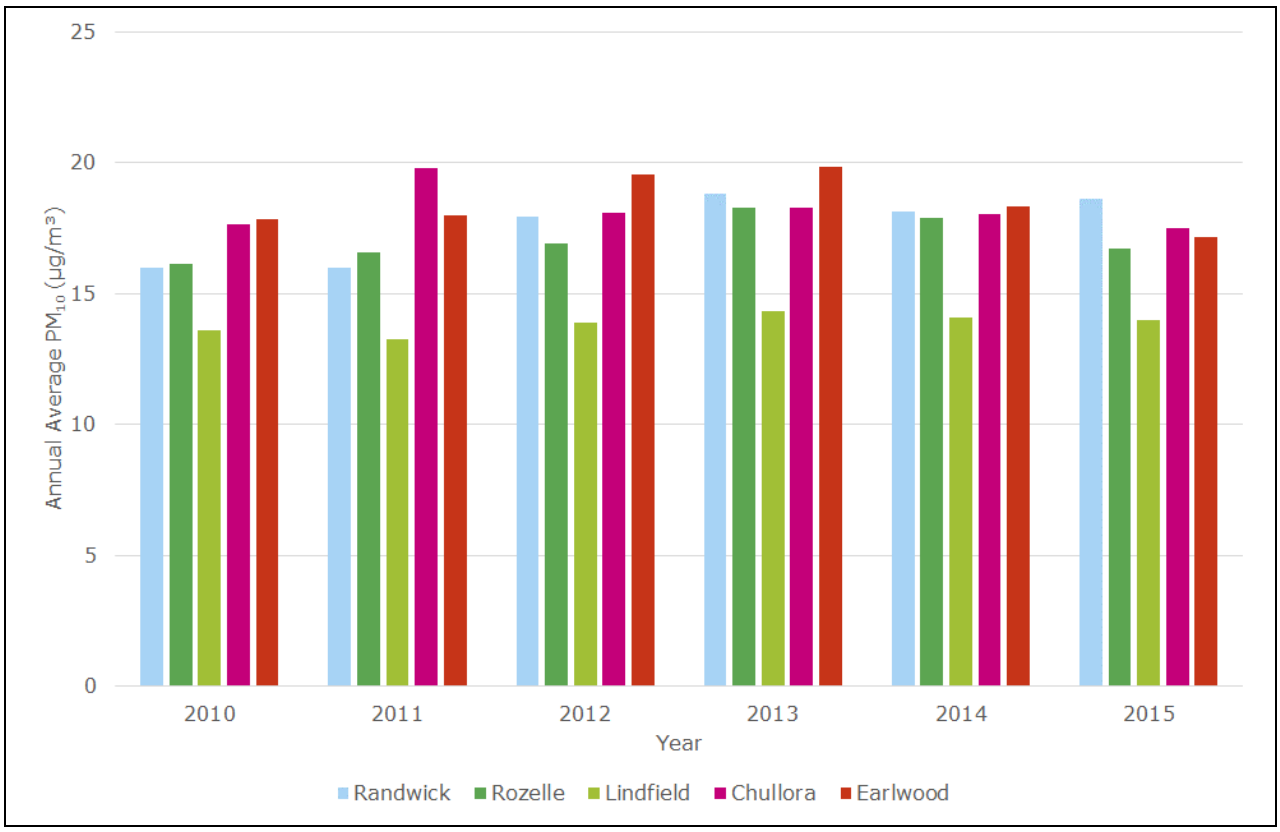


**Figure 3-2: Annual average $PM_{10}$ concentrations – NSW OEH Sydney Central-East– 2010 to 2015**

The primary air pollution emissions sources that contribute to existing ambient air quality levels in the local area include:

- Petrol and diesel combustion emissions from vehicle movements along public roads, in particular the Bradfield Highway and Cahill Expressway;
- Diesel combustion emissions from marine traffic, including ferries and periodic from ferries and ships docked at the Overseas Passenger Terminal;
- Dust entrainment and tyre and break wear due to vehicle movements along public roads;
- Recirculation of emissions across the Sydney metropolitan region, including those from motor vehicles and industrial operations;
- Regional transportation of air pollution from broad-scale events such as bushfires, hazard reduction burns and dust storms; and

- Sea salts contained in sea breezes.

More remote sources which contribute episodically to suspended particulates in the region include dust storms and bushfires. Whereas dust storms predominately contribute primary particulates from mechanical attrition, bushfires are a source of fine particulates including both primary particulates and secondary particulates formed by atmospheric gas to particle conversion processes.

There are no identified sources of ethanol in the vicinity of the proposed development, therefore existing concentrations in ambient air are considered to be negligible.

# 4. CONSTRUCTION DUST ASSESSMENT

In order to assess the air quality impact potential of the proposed construction phase, a qualitative impact assessment has been undertaken. While no specific methodology for such an assessment is available in Australia, the United Kingdom-based Institute of Air Quality Management (IAQM) has prepared the *Guidance on the Assessment of Dust from Demolition and Construction* (hereafter GADDC, IAQM 2014). The GADDC has been applied for construction projects in NSW and accepted by the NSW EPA air technical policy department as a progressive approach to assessing the particulate matter impact risk associated with short term construction and demolition projects.

The key steps to the GADDC approach to assessing air quality risks construction and demolition projects are as follows:

- **STEP 1** – screen requirement for a more detailed assessment based on proximity of surrounding receptors;
- **STEP 2** – assess the risk of dust impacts from demolition, earthworks, construction and truck movements and the sensitivity of surrounding receptors;
- **STEP 3** – determine the site-specific mitigation for each of the four potential activities in STEP 2;
- **STEP 4** – examine the residual effects and determine significance; and
- **STEP 5** – prepare dust assessment report.

The following sections document the construction dust assessment, conducted in accordance with the GADDC.

## 4.1 STEP 1 – Screen the Need for a Detailed Assessment

Screening criteria for a detailed assessment is presented in Box 1 of Section 6 of the GADDC. The IAQM specify that if a human receptor is located within 350m of the boundary of a site, or within 50m of a route used by construction vehicles beyond 500m from site boundary, then a detailed construction dust assessment should be undertaken.

Located within 350m of the OPT are a number of commercial, recreational and residential receptors. Consequently, the proposed construction activities trigger the criteria to undertake a more detailed construction dust assessment. This detailed construction assessment is presented in the following sections.

## 4.2 STEP 2 – Assess the Risk of Dust Impacts

The GADDC identifies that the risk category for dust impacts from construction activities should be allocated based on the following factors:

- The scale and nature of works (STEP 2A); and
- The sensitivity of the area to dust impacts (STEP 2B).

These factors are then combined to determine the risk of impacts from the works (STEP 2C). The risk rating process is addressed in the following sections.

### 4.2.1 STEP 2A – Scale and Nature of Works

Section 7.2 of the GADDC requires that in allocating dust impact risk, the scale and nature of the following components are to be determined:

- Demolition;
- Earthworks;
- Construction; and
- Truck movements.

The GADDC prescribes a range of criteria that classify the magnitude of each activity as either large, medium or small. The GADDC notes that not all criteria need to be satisfied to meet a certain classification. For this assessment, where more than one magnitude rating could be applied, the highest magnitude classification has been selected for conservatism. Based on the

proposed activities at site, the following magnitude ratings, and the rationale behind the classification, are applied:

- Demolition – **SMALL** – less than 20,000m$^3$ building volume, demolition activities occurring below 10m above ground, no onsite crushing activities;
- Earthworks – **SMALL** – negligible earthworks required during construction phase;
- Construction; – **SMALL** – less than 25,000m$^3$ building volume, no onsite concrete batching;
- Truck movements – **SMALL** – no unpaved road surfaces for truck trackout.

4.2.2 STEP 2B – Sensitivity of the Surrounding Environment

Section 7.3 of the GADDC details the approach to categorise the sensitivity of the surrounding environment reviewing the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- Local ambient $PM_{10}$ concentrations and likelihood of impact to human health; and
- Site specific factors to reduce wind-blown dust.

Based on the classification definitions presented within Section 7.3 of the GADDC, the following sensitivity ratings have been applied:

- Sensitivity of people to dust soiling effects - **MEDIUM**;
- Sensitivity of people to health effects of $PM_{10}$ – **MEDIUM**; and
- Sensitivity of surrounding flora and fauna communities – **LOW**.

The above receptor sensitivity classifications are then combined with the number of receptors, background $PM_{10}$ concentration (with regard to human health) and distance from source to classify the sensitivity of the surrounding environment. The specific influencing factors are as follows:

- The number of receptors within the surrounding environment is within the "greater than 100" category of the GADDC;
- As detailed in **Section 3.2**, the upper limit for annual mean $PM_{10}$ concentration for the area is taken to be 19.9µg/m$^3$.

After combining the above receptor sensitivity classifications with these influencing factors and comparing with the relevant rating tables in the GADDC (Table 2, Table 3 and Table 4), the sensitivity classification of the surrounding environment is as follows:

- Sensitivity of area to dust soiling effects on people and property - **LOW**;
- Sensitivity of area to human health effects – **LOW**;
- Sensitivity of area to ecological effects – **LOW.**

4.2.3 STEP 2C – Define the Risk of Dust Impacts

To determine the risk of impacts with no mitigation applied, Section 7.4 of the GADDC requires that the dust magnitude rating (**Section 4.2.1**) is combined with the sensitivity of the surrounding area (**Section 4.2.2**) for each of the four activity categories (demolition, earthworks, construction and truck movements).

**Table 4-1** presents the risk rating for the proposed construction activities.

| Table 4-1 Dust Impact Risk Rating | | | | |
|---|---|---|---|---|
| **Potential impact (sensitivity to impact)** | **Construction activity (impact risk magnitude)** | | | |
| | **Demolition (Small)** | **Earthworks (Small)** | **Construction (Small)** | **Truck movements (Small)** |
| **Dust Soiling (Low)** | Negligible | Negligible | Negligible | Negligible |
| **Human Health (Low)** | Negligible | Negligible | Negligible | Negligible |
| **Ecological (Low)** | Negligible | Negligible | Negligible | Negligible |

It can be seen from the results presented in **Table 4-1** that uncontrolled dust emissions from all aspects of the proposed construction activities are allocated a negligible impact risk.

### 4.3 Mitigation measures

Nevertheless, the following dust mitigation measures should be implemented during the construction phase to ensure that emissions are minimised as much as practicable.

- Maintain a log book during construction
- Record all dust and air quality complaints in the log book, identifying cause(s) and appropriate measures taken to reduce emissions;
- Record any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation in the log book;
- Carry out regular site inspections, record inspection results, and make the log book available to the local authority when asked;
- Erect solid screens or barriers around potentially dusty activities where practicable;
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction;
- Use enclosed chutes and conveyors and covered skips; and
- Provide an adequate water supply on the construction site for effective dust/particulate matter suppression/mitigation.

# 5. OPERATIONAL PHASE EMISSIONS

The Proponent have advised that the proposed micro-brewery pod will not involve many of the typical components of a typical brewery, such as a cereal cooker, hot wort settling tank, trub vessel or brewers grain holding tank. Brewing operations at the OPT would occur on average one day a week, between the hours of 7.30am and 2.30pm. Emissions from the brewing process would vent directly to ambient air. Emissions of particulate matter and combustion pollutants associated with grain handling and fuel combustion may also be associated with the proposed brewing operations, however these would be negligible

The proposed brewing operations would produce approximately 30,000L of beer per year. By applying US EPA (1996a, 1996b) process-specific VOC emission factors and assuming that 100% of VOC emissions released are ethanol, potential annual emissions from the proposed Brewhouse have been estimated and presented in **Table 5-1**.

**Table 5-1 Annual VOC (as ethanol) emissions**

| **Process** | **Emission Factor (kg/kL Beer)[1]** | **Annual Ethanol Emissions (kg/annum)** |
|---|---|---|
| Mash tun tank | 0.00046 | 0.01 |
| Lauter tun tank | 0.00005 | 0.00 |
| Brew kettle | 0.00545 | 0.16 |
| Wort cooler | 0.00019 | 0.01 |
| Fermenter tanks | 0.01704 | 0.51 |
| Ageing tank filling | 0.00486 | 0.15 |
| Waste beer storage tanks | 0.03750 | 1.12 |
| Keg filling | 0.00588 | 0.18 |
| **Total** | | **2.14** |

Note:
1 – US EPA (1996a) emission factors converted from lb/kBBL. 1 BBL (US Beer Barrel) = 117.35 litres.

As can be seen from the results presented in **Table 5-1**, annual ethanol emissions from the proposed micro-brewery operations at the OPT are estimated to total approximately 2 kg/annum. For reference, a recent air quality impact assessment of a proposed 30 million litre brewery completed by Ramboll Environ (Environ, 2014) estimated annual ethanol emissions to total approximately 4,000 kg/annum. Predicted air quality impacts from that facility were less than 10% of the applicable NSW EPA assessment criterion (2.1mg/m$^3$ for 99.9$^{th}$ percentile 1-hour average concentration) at or beyond site boundary. On the basis of estimated low amounts of ethanol emissions from the proposed micro-brewery operations, it is considered that potential impacts in the surrounding environment will be negligible.

Finally, The Proponent have advised that the micro-brewery units, such as the unit proposed for installation at the OPT, can be fitted with a vapour/steam condenser to effectively minimise emissions of VOCs from the brewing process.

# 6. CONCLUSIONS

This air quality impact assessment has been prepared by Ramboll Environ to review the potential for adverse air quality impacts to the local surrounding environment from the proposed development.

For the construction phase, the air quality assessment approach is a qualitative approach that allocates a dust impact risk rating for demolition, earthworks, construction and truck movement emissions based on the likely magnitude of proposed activities, proximity of surrounding receptors and sensitivity of the surrounding environment to dust impacts.

The risk rating completed for the proposed development assigned a negligible risk rating for dust impacts from proposed construction activities.

Operational emissions of ethanol from the micro-brewery pod process were reviewed and quantified. The likely annual emissions are very low and the risk of adverse impacts from the proposed brewing activities is considered negligible.

# 7. GLOSSARY OF KEY ACRONYMS AND SYMBOLS

| | |
|---|---|
| BBL | Beer Barrel |
| BoM | Australian Bureau of Meteorology |
| CO | Carbon monoxide |
| GADDC Construction | Guidance on the Assessment of Dust from Demolition and |
| IAQM | Institute of Air Quality Management |
| µg | Microgram (g x 10-6) |
| µm | Micrometre or micron (metre x 10-6) |
| $m^3$ | Cubic metre |
| $NO_x$ | Oxides of nitrogen |
| NPI | National Pollutant Inventory |
| NSW EPA | NSW Environment Protection Authority |
| OEH | Office of Environment and Heritage |
| OPT | Overseas Passenger Terminal |
| $PM_{10}$ | Particulate matter less than 10 microns in aerodynamic diameter |
| $PM_{2.5}$ | Particulate matter less than 2.5 microns in aerodynamic diameter |
| The Proponent | Jimmy's On The Mall Pty Ltd |
| Ramboll Environ | Ramboll Environ Australia Pty Ltd |
| $SO_2$ | Sulphur dioxide |
| tpa | Tonnes per annum |
| TSP | Total Suspended Particulate |
| US EPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compounds |

# 8. REFERENCES

Bureau of Meteorology (2016). Monitoring data from Fort Denison monitoring station.

ENVIRON (2014). Proposed Goulburn Brewery Air Quality Impact Assessment. 20 March 2014.

IAQM (2014). Guidance on the assessment of dust from demolition and construction.

NSW OEH (2016). Air quality monitoring data from the Sydney central-east monitoring network.3

US-EPA (1996a). AP42 Emission Factor Database, Chapter 19.2.1 Malt Beverages, United States Environmental Protection Agency, October 1996.

US-EPA (1996b). AP42 Emission Factor Database, Chapter 13.2.2 Background Document for Chapter 19.2.1 Malt Beverages, United States Environmental Protection Agency, October 1996.

# APPENDIX 1
# SEASONAL AND DIURNAL WIND ROSES – FORT DENISON

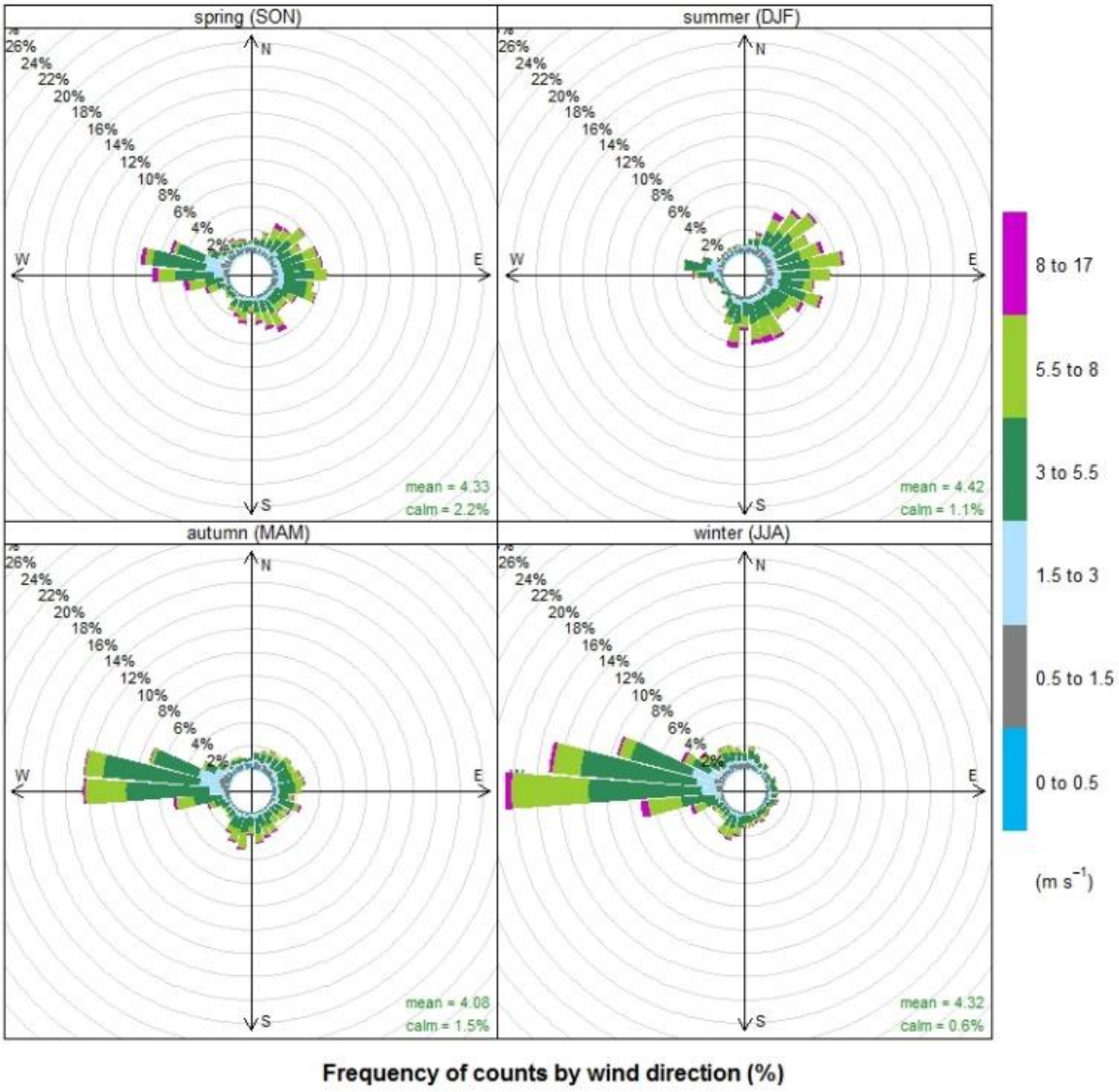


**Figure A2-1: Seasonal wind roses – Fort Denison**

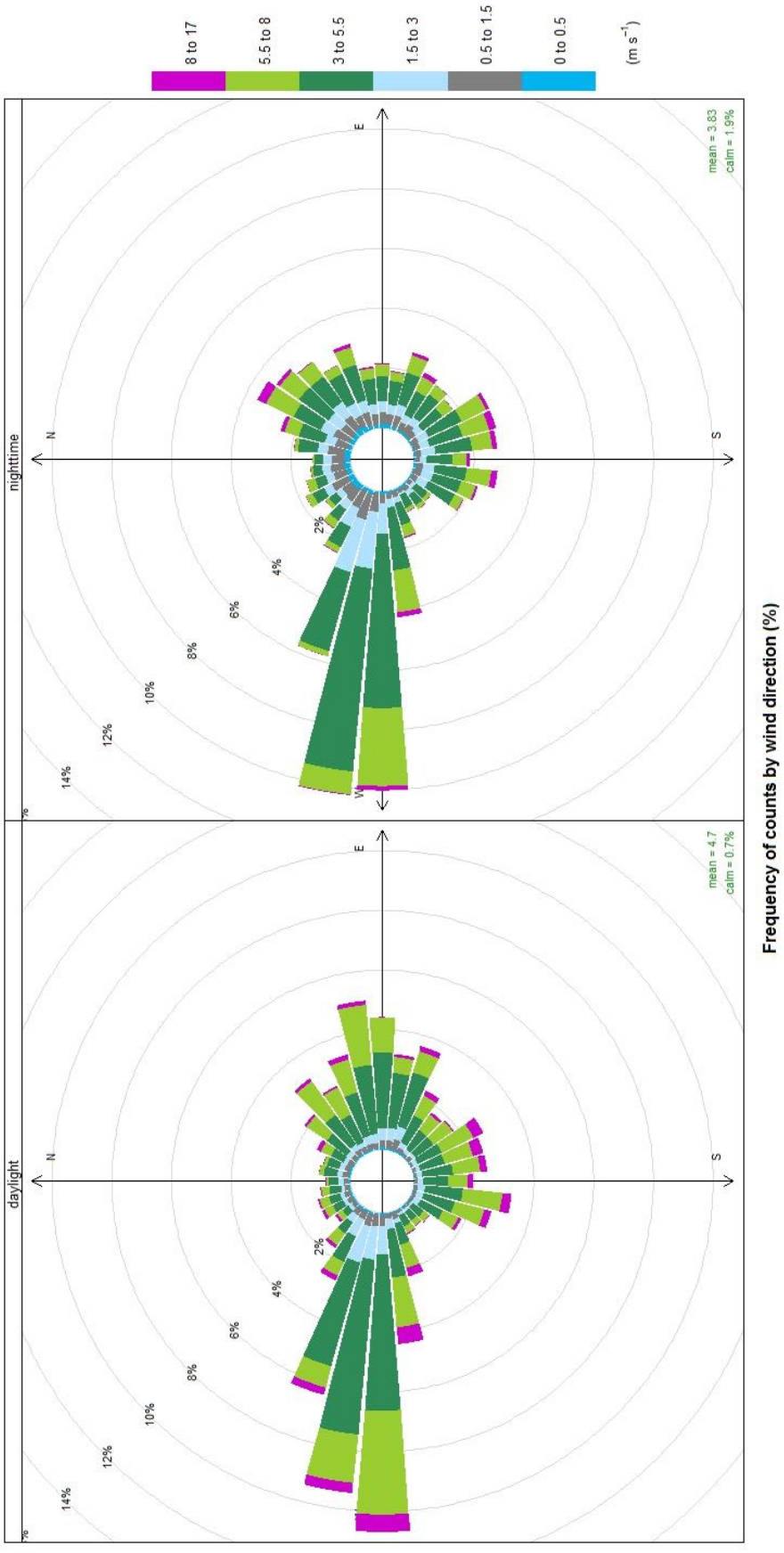


**Figure A2-2: Diurnal wind roses – Fort Denison**