MOTT MACDONALD

Homebush State-led Rezoning

Air Quality Impact Assessment

November 2024

This page left intentionally blank for pagination.

Mott MacDonald
383 Kent Street
Sydney
NSW 2000
PO Box Q1678
QVB Sydney NSW
1230 Australia

Department of Planning, Housing and Infrastructure
4 Parramatta Square 12
Darcy Street Parramatta
NSW 2150

Homebush State-led Rezoning

Air Quality Impact Assessment

November 2024

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
0	21/06/2024	Amy Schmidt	Sophie Materia Kirsty Robinson	Asok Rao	Draft for client comment
1	08/11/2024	Amy Schmidt	Sophie Materia	Kirsty Robinson	Final report

Document reference: 703102716 | | 1 |

Information class: Standard

Contents

1 Introduction 1
1.1 Background 1
1.2 Purpose of this report 1
1.3 Scope of works 2
1.4 Limitations and assumptions 2

2 Existing environment 3
2.1 Site location 3
2.2 Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) 2016 3
2.3 Land use 5
2.4 Proposed building heights 7
2.5 Sensitive receptors 9
2.6 Ambient air quality 11

3 Assessment criteria 12
3.1 Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales 12
3.2 Nitrogen dioxide conversion 13

4 Dispersion modelling 14
4.1 Emissions inventory 14
4.1.1 URVF parameters 14
4.1.2 Emission rates 14
4.2 Model configuration 16

5 Results 17
5.1 NO_2 – 1 hour average 17
5.2 $PM_{2.5}$ – 24 hour average 18
5.3 $PM_{2.5}$ – annual average 19
5.4 Summary 19

6 Planning controls 20
6.1 Air dispersion modelling outcomes 20
6.2 Recommendations 20

7 Conclusions 24

Tables

Table 3-1: Assessment and performance criteria 12
Table 4-1: URVF parameters 14
Table 4-2: Emission rates for NO_2 and $PM_{2.5}$ 15
Table 6-1: Strathfield LGA Permitted Developments 20

Figures

Figure 2-1: Precinct and URVF location 3
Figure 2-2: Homebush Precinct Structure Plan Extract 4
Figure 2-3: Existing and proposed land use zones (COX 2024) 6
Figure 2-4: Existing and proposed building heights 8
Figure 2-5: 2019-2023 wind rose for Canterbury Racecourse AWS 10
Figure 2-6: 2019-2023 seasonal wind roses for Canterbury Racecourse AWS 11
Figure 5-1: NO_2 1-hour averaged predicted 41 µg/m³ performance criterion contours 17
Figure 5-2: $PM_{2.5}$ 24-hour averaged predicted 6 µg/m³ performance criterion contours 18

1 Introduction

1.1 Background

The Homebush State-led rezoning project seeks to rezone part of the Homebush Precinct ("the Precinct") as defined in the NSW Government endorsed Parramatta Road Corridor Urban Transformation Strategy 2016 (PRCUTS).

The Homebush Precinct is located within the Strathfield and Canada Bay Local Government Areas (LGAs) and borders Burwood LGA to the south-east. The Precinct is positioned between Homebush Station, North Strathfield Station and Strathfield Station. The Precinct excludes the area at the northern part of the Homebush Precinct near Concord West Station which was rezoned by City of Canada Bay Council in December 2022.

The rezoning proposal will validate and update existing planning work and identify opportunities for further growth in the Homebush Precinct through refinements to the PRCUTS planning controls, where appropriate.

The rezoning proposal will result in a set of revised planning controls for the Precinct that aims to enable renewal and redevelopment of the area to provide additional housing, jobs, open space, transport connections and community infrastructure through good urban design and addressing infrastructure needs.

The Department of Planning, Housing and Infrastructure ("the Department") is leading the rezoning in Homebush as part of the Transport Oriented Development (TOD) program. In December 2023, the NSW Government released the Transport Oriented Development (TOD) Program to unlock more well-located homes close to transport, jobs and services. Part of the program identified eight Sydney transport hubs (tier one – accelerated precincts) for State-led accelerated rezoning for the delivery of up to 47,800 new homes over the next 15 years. Homebush has been included as one of the eight accelerated precincts.

The objectives of the program are to:

- Increase housing supply in well-located areas.
- Enable a variety of land uses (residential, commercial, recreational) within walking distance of train and metro stations.
- Deliver housing that is supported by attractive public spaces, vibrancy, and community amenity.
- Increase the amount of affordable housing in these locations.

Located within the Precinct is the WestConnex Underwood Road Ventilation Facility (URVF). The URVF releases air pollutants from vehicle combustion generated in the WestConnex M4 East tunnel into the atmosphere. The URVF is the focus of this assessment.

1.2 Purpose of this report

The purpose of this Air Quality Impact Assessment is to inform and support planning controls for the Precinct and verify the appropriateness of the recommended building height and controls for the areas surrounding the URVF.

1.3 Scope of works

The following tasks were completed:

- An existing conditions assessment which involved reviewing existing and proposed sensitive land uses, local meteorology and ambient air quality concentrations.
- Air dispersion modelling of the URVF for nitrogen dioxide (NO_2) and particles less than 2.5 micrometres in diameter ($PM_{2.5}$) using AERMOD. This involved:
  - Configuring the model in accordance with the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants* ("Approved Methods").
  - Processing meteorological and land use data.
  - Developing an emissions inventory for the URVF.
  - The inclusion of relevant buildings and sensitive receptors (including elevated building locations).
  - Evaluation of predicted concentrations at sensitive receptor locations against relevant air quality criteria.
- An assessment of dispersion modelling results to determine which areas of the Precinct are at increased risk of air quality impacts and as such require additional planning controls.
- Verification of the appropriateness of recommended building heights and controls for the areas around the URVF.
- Guidance and recommendations for any required inclusions to the recommended planning controls and design guide.
- Reporting on the above.

1.4 Limitations and assumptions

The following limitations and assumptions apply to this assessment:

- Local meteorological data from the Bureau of Meteorology (BoM) operated Automatic Weather Stations (AWS) at Canterbury Racecourse and cloud data Bankstown Airport collected from 2017 to 2023 are representative of the URVF and surrounding areas.
- The M4 East ventilation data published by Linkt (including air quality concentrations, flow rates and temperature) are accurate.
- This assessment is subject to the limitations of the AERMOD dispersion model. It is noted that due to the different types of models available (e.g., steady state plume models vs Lagrangian models) different predicted concentrations may arise from the use of a different model. However, the AERMOD dispersion model is considered appropriate for use in this assessment.
- The study was desktop based and no site visits were undertaken.

2 Existing environment

2.1 Site location

The Homebush Precinct is located within the Strathfield and Canada Bay LGAs and borders Burwood LGA to the south-east. The Precinct is positioned between Homebush Station, North Strathfield Station and Strathfield Station. The Precinct excludes the area at the northern part of the Homebush Precinct near Concord West Station which was rezoned by City of Canada Bay Council in December 2022. The URVF is located above the westbound carriageway on the Western Motorway.

The Precinct boundary and URVF location are shown in Figure 2-1.

Figure 2-1: Precinct and URVF location

2.2 Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) 2016

The *Parramatta Road Corridor Urban Transformation Strategy 2016* (PRCUTS) is a 30-year plan developed by the NSW Government to grow and renew communities along the Parramatta Road corridor. The Strategy will be used to drive and inform land use planning and development decisions and long-term infrastructure delivery programs.

The Homebush State-Led Rezoning Project sits within the 'Homebush Precinct' (see Figure 2-2), which is identified within the Strategy to transform into an active and varied hub, blending

higher density housing and a mix of different uses, supported by a network of green links and open spaces with walking access to four train stations.

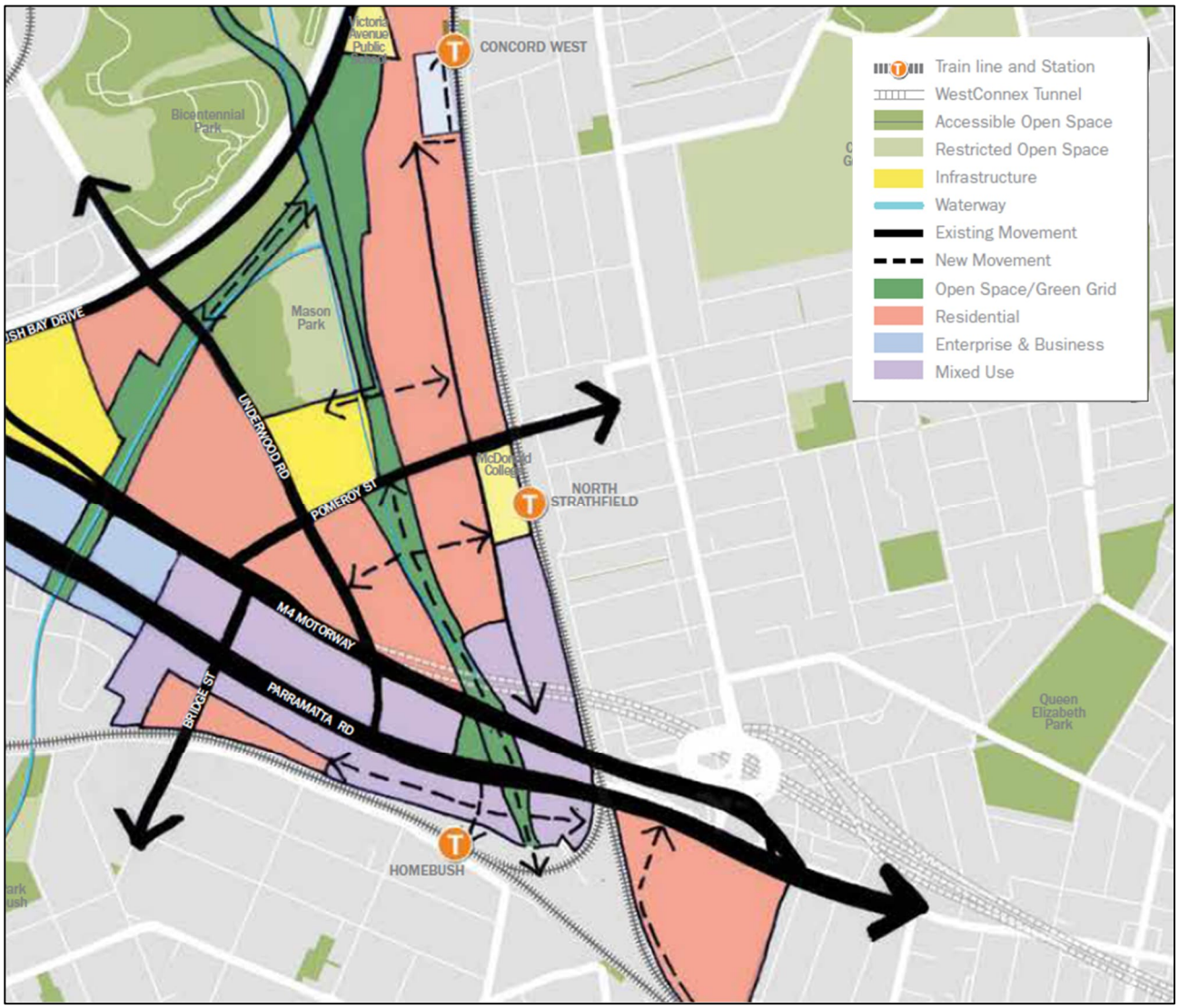

Figure 2-2: Homebush Precinct Structure Plan Extract

Principle 4 of the Strategy relates to vibrant communities and places, and in reference to air quality considerations, states the following:

> *As urban renewal progresses, more people could be exposed to air and noise pollution along major roads, such as Parramatta Road, the M4 Motorway and WestConnex. In addition, predicted higher temperatures will add to the pressures on air quality.*
>
> *Currently there is no consistent or strong land use and design framework to guide development along busy roads, despite a rising body of evidence that exposure to noise levels and poor air quality poses a public health risk. The Strategy builds upon the Development Near Rail Corridors and Busy Roads – Interim Guideline and provides the opportunity to provide a consistent design and land use framework to address air, noise quality and amenity challenges in the Parramatta Road Corridor Planning and Design Guidelines. Design principles and measures to address noise and air quality have been developed for multi-unit and mixed-use developments ensuring that consistent rules apply for renewal across the Corridor.*

The design principles and measures referenced above are addressed in the *PRCUTS Planning and Design Guidelines* to attenuate the effects of noise and air pollution.

The *PRCUTS Planning and Design Guidelines* will inform future controls in local environmental plans (LEPs) and Development Control Plans (DCPs) by providing development principles and controls for land within the Corridor that should be considered during rezoning proposals.

Relating to air quality considerations, the guidelines include the following:

- Corridor-wide guidelines: including indicative site layouts and design principles for the following elements:
  - Building massing, scale and building articulation
  - Setbacks and street frontage heights
  - Amenity
- Homebush Precinct guidelines: including recommended planning controls (land use, building height, density).

2.3 Land use

Existing land use within the Precinct is predominately residential with a mix of other land uses including general industrial, local centres, commercial centres and public open space/recreation. To the north of the URVF the land is currently zoned medium density residential and to the south is zoned high density residential and mixed-use zone.

Proposed land zoning changes under the PRCUTS include rezoning from medium density residential to high density residential to the north of the URVF and mixed-use zone to the south.

Refer to COX 2024 LEP Controls report[1] for further information. The existing and proposed land use, extracted from COX 2024, is shown in Figure 2-3.

[1] COX 2024, Homebush State Led Rezoning, LEP Controls

Figure 2-3: Existing and proposed land use zones (COX 2024)

2.4 Proposed building heights

Current building height limits surrounding the URVF are up to 9.5 m to the north and ranging from 12 m up to 22 m with a local provision to permit up to 32 m building heights to the south. As part of PRCUTS, the proposed building heights are proposed to increase from 9.5 m to 21-52 m to the north of the URVF and are proposed to increase from 12-22 m to 75-103 m to the south of the URVF.

Refer to COX 2024 LEP Controls report for further information. The existing and proposed building heights, extracted from COX 2024, are shown in Figure 2-4.

Figure 2-4: Existing and proposed building heights

2.5 Sensitive receptors

The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Approved Methods) document (discussed in Section 3.1) defines a sensitive receptor as "*a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area*". Under this definition the following land uses in the Precinct have been identified as a sensitive land use:

- Low density residential
- Medium density residential
- High density residential
- Mixed use (on the assumption that this includes residential receptors at 2 storeys which is equivalent to heights of approximately 8 m and above)

Therefore, there are proposed sensitive land uses surrounding the URVF at both ground level and at height, with the closest sensitive land use, medium and high density residential, located approximately 20 m north of the URVF.

2.6 Meteorology

Local meteorology has a significant influence on the air quality impacts of an emission source. Wind speed and wind direction are two parameters which affect pollutant dispersion. Observations of wind speed and wind direction measured at the Bureau of Meteorology (BoM) Canterbury Racecourse Automatic Weather Station (AWS) are considered representative of wind conditions near the URVF. A wind rose which graphically represents hourly wind speed and direction observations for the years 2019 to 2023 is presented in Figure 2-5.

The predominant wind directions are from the southeast and south-southeast (occurring for approximately 8% and 7.5% of the time respectively). Few winds occur from the south-southwest and east (less than 3.5% of the time). Moderate wind speeds (3 - 7.5 m/s) occur predominantly from the south-southeast and the southeast and light wind speeds (0.5 – 3 m/s) occur predominantly from the northwest, west-northwest and west.

The wind roses for each season are provided in Figure 2-6 and show that:

- The predominant wind direction in summer is from the southwest, occurring approximately 15% of the time.
- Light winds (<3 m/s) occur approximately 11% of the time in summer.
- The predominant wind direction in winter is from the northwest and southwest sectors.
- Light winds occur approximately 21% of the time in winter.
- Autumn and spring contain characteristics of both summer and winter. The predominant wind direction in autumn is southeast and northwest, occurring for approximately 8% of the time. In spring, the predominant wind direction is southeast and northeast, occurring for approximately 9% of the time.
- Light winds occur approximately 22% of the time in autumn and 16% of the time in spring.

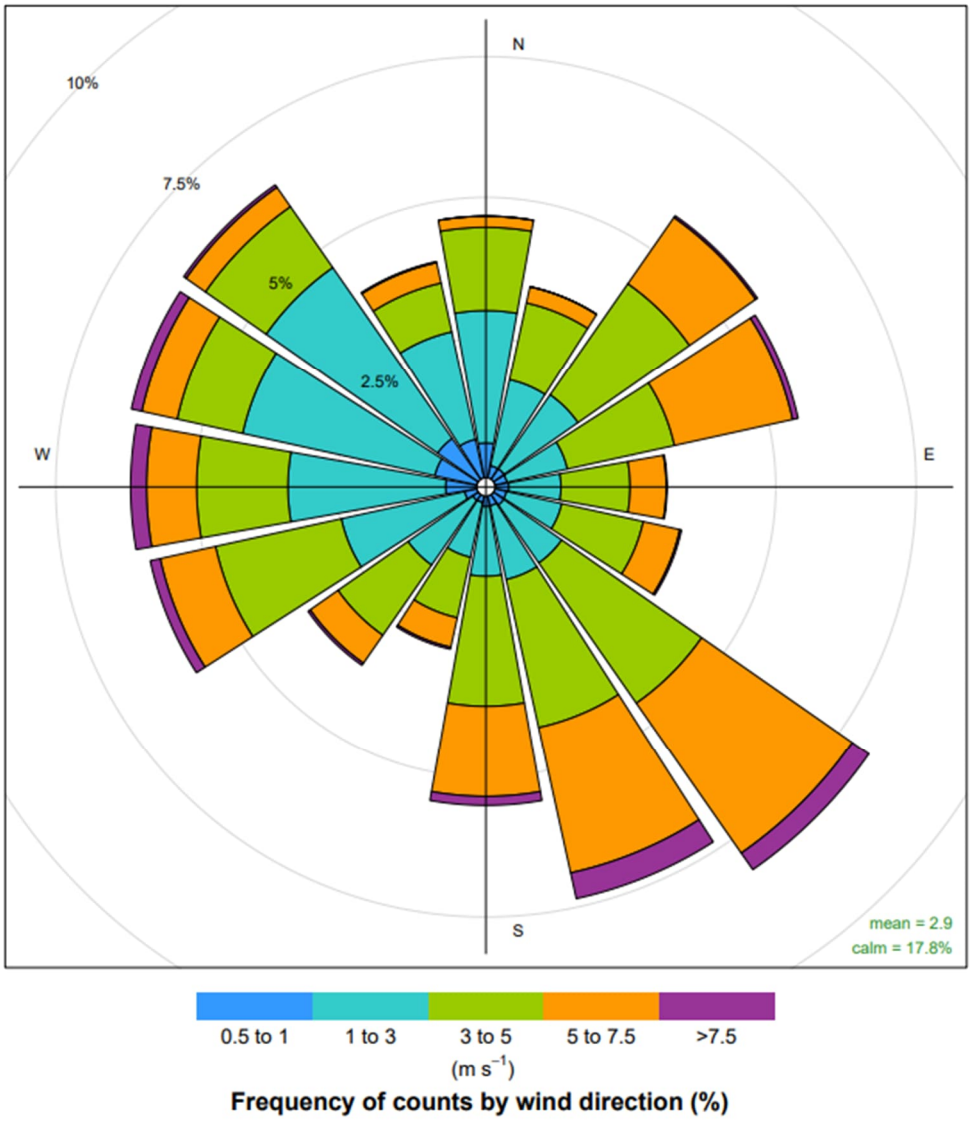

Figure 2-5: 2019-2023 wind rose for Canterbury Racecourse AWS

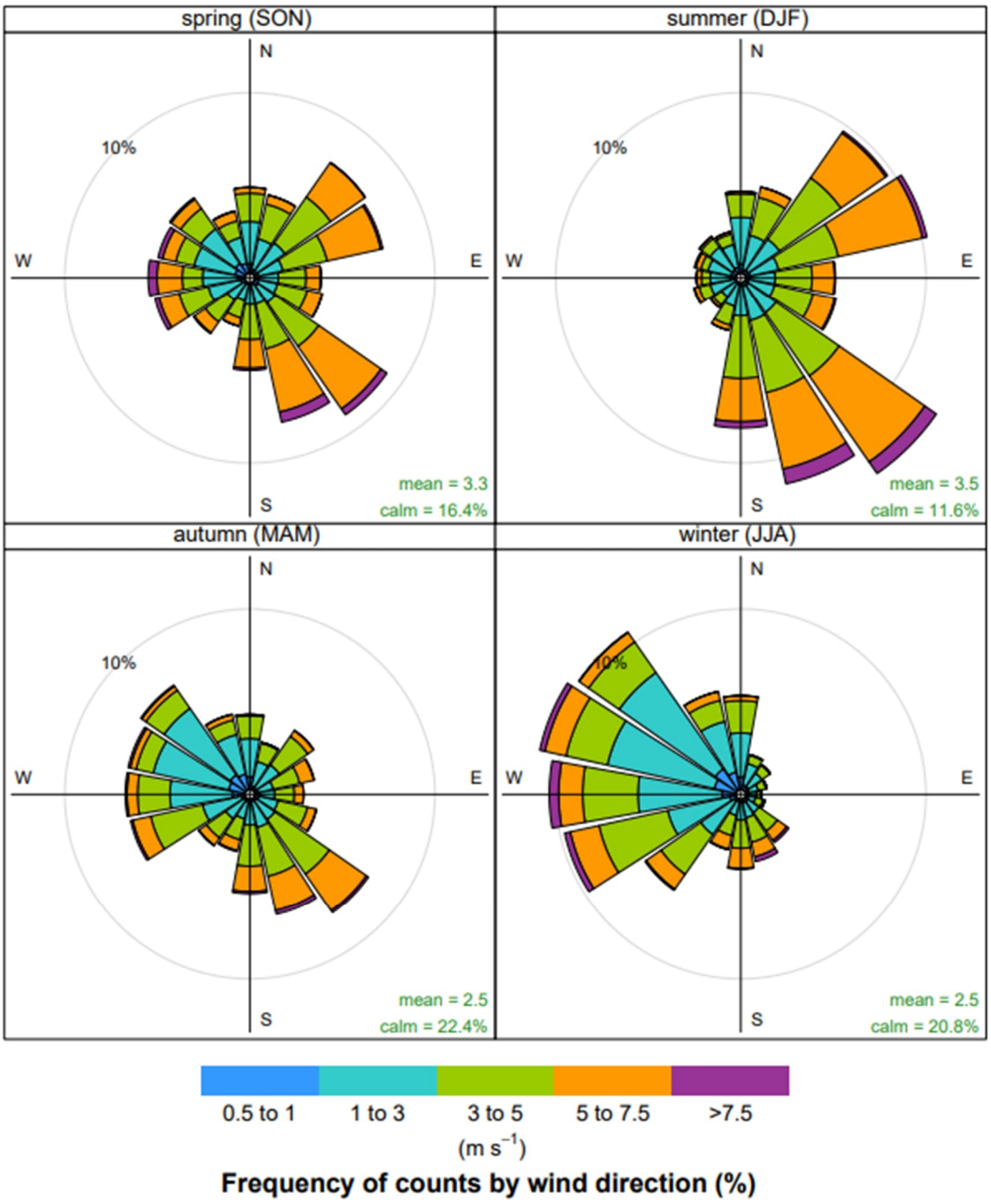

Figure 2-6: 2019-2023 seasonal wind roses for Canterbury Racecourse AWS

2.7 Ambient air quality

A review of the industries within and surrounding the Precinct with an NSW EPA licence or reporting to the National Pollutant Inventory (NPI) was undertaken to gain an understanding of the potential background air pollution from nearby industries. Land uses with potential air emissions included the URVF, Elgas, Sydney Olympic Park, Ausgrid and transport from nearby roads (Parramatta Road and Centenary Drive/Homebush Bay Drive). It was determined that:

- No additional air quality assessment was required to be undertaken for these industries.
- The industries are unlikely to result in cumulative air quality impacts required to be included in this assessment.

3 Assessment criteria

This assessment considers the concentrations of nitrogen dioxide (NO_2) and particulate matter that has a diameter of 2.5 µm or smaller ($PM_{2.5}$). This is because previous project experience indicates that NO_2 and $PM_{2.5}$ are the most critical pollutants related to traffic and ventilation emissions and are associated with negative health impacts.

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

The NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods) outlines the statutory methods for modelling and assessing air pollutants from stationary sources. This document lists the assessment criteria as concentration limits for a given averaging period for various pollutants. The assessment criteria are designed to protect human health and the impact of pollutants on sensitive receptors.

Assessment criteria considers the total pollutant load from both existing and new sources. When determining the potential impact of a new source, it is common practice to calculate the impact of new emissions by adding them to existing background concentrations. However, this assessment considers air quality impacts at height and as such the background concentrations are unknown. Therefore, performance criteria have been adopted which instead refer to a change in concentration due a source. In alignment with the methodology undertaken for the M4 East and new M5 projects, the criteria have been adjusted to reflect 25% of the assessment criteria listed in the Approved Methods.

The Approved Methods assessment criteria, the performance criteria and associated averaging period for the relevant pollutant assessed are listed in Table 3-1.

Table 3-1: Assessment and performance criteria

Pollutant	Averaging period	Assessment criteria (µg/m³)	Performance criteria (µg/m³)
NO_2	1 hour	164	41
$PM_{2.5}$	24 hour	25	6
	Annual	8	2

3.2 Nitrogen dioxide conversion

Road vehicle exhausts contains a mixture of nitric oxide (NO) and NO_2, with NO_x representing the sum of both compounds. NO_2 is formed as a secondary pollutant when NO rapidly oxidises in atmospheric photochemical reactions. As a pollutant that has been linked to adverse health outcomes, it is important to understand concentrations of NO_2.

Air pollution models predict NO_x concentrations, however, to accurately model air pollution it is necessary to estimate NO_2 concentrations to assess them against air quality criteria. Previous analysis (Boulter et al., 2015[2]; Manansala et al., 2015[3]) found that measurements of NO_x and NO_2 for several years at a range of locations across Sydney indicated that a conversion rate of 50% for the one-hour average was conservative and appropriate for modelling. Therefore, a 50% conversion rate has been adopted for this assessment.

[2] WestConnex M4 East Environmental Impact Assessment: Appendix H (Air Quality Impact Assessment) 2015: RMS Accessible Template (nsw.gov.au)

[3] WestConnex New M5 Environmental Impact Statement Appendix H (Technical Working Paper: Air Quality) 2015: WestConnex New M5 Environmental Impact Statement (nsw.gov.au)

4 Dispersion modelling

Air quality dispersion modelling was undertaken using AERMOD, a Gaussian type plume dispersion model developed by the United States Environmental Protection Agency (US EPA).

4.1 Emissions inventory

This section provides an overview of the URVF parameters and emission rates used in the assessment. Measured data, sourced from the Linkt website,[4] was used where available (e.g., flow rates, temperature and pollutant concentrations).

4.1.1 URVF parameters

An overview of the URVF parameters used in the dispersion model are summarised in Table 4-1. Modelled fan speed (low, medium and high) was varied dependent on hour of day.[5]

Table 4-1: URVF parameters

Parameter		Value	Justification
Stack height (m)		38.1	Adopted from the WestConnex M4 Conditions of Approval[6]
Temperature (°C)		5 degrees above ambient	Analysis of URVF measured ventilation and ambient temperature data between February 2022 and September 2023 found that on average the ventilation outlet temperature was 5 °C above ambient.
Low fan scenario (hours 0-4)	**Flow rate (m³/s)**	100	Based on URVF measured flow rate data between February 2022 and September 2023
	Effective diameter (m)	8.7	Calculated based on an individual fan area of 19.86 m² - assuming 3 fans are operating under low fan conditions.
	Exit velocity (m/s)	1.7	Calculated based on flow rate and diameter.
Medium fan scenario (hours 5, 20-23)	**Flow rate (m³/s)**	200	Based on URVF measured flow rate data between February 2022 and September 2023
	Effective diameter (m)	10.1	Calculated based on an individual fan area of 19.86 m² - assuming 4 fans are operating under medium fan conditions.
	Exit velocity (m/s)	2.5	Calculated based on flow rate and diameter.
High fan scenario (hours 6-19)	**Flow rate (m³/s)**	300	Based on URVF measured flow rate data between February 2022 and September 2023
	Effective diameter (m)	10.1	Calculated based on an individual fan area of 19.86 m² - assuming 4 fans are operating under high fan conditions.
	Exit velocity (m/s)	3.7	Calculated based on flow rate and diameter.

4.1.2 Emission rates

Measured URVF NO_x and total suspended particulate (TSP) concentrations between January 2020 and December 2022 were used to form the basis of the emission rates. QA/QC

[4] Linkt WestConnect M4 tunnel air quality: https://www.linkt.com.au/using-toll-roads/about-sydney-toll-roads/westconnex/tunnel-air-quality-m4/sydney

[5] This is based on the M4 East Air Quality Community Consultative Committee meeting minutes 16/03/2021 Meeting minutes,m4-east-aqccc-notes-and-presentation.pdf (westconnex.com.au)

[6] WestConnex M4 Conditions of Approval: https://www.westconnex.com.au/media/nzbfmq4p/m4-east-consolidated-instrument-of-approval-mod-5-july-2018.pdf

procedures were undertaken on the data to exclude values that likely did not represent normal conditions.

Emission rates were calculated from the concentrations using the relevant flow rate, in accordance with Equation 3.1 of the Approved Methods. Emission rates were calculated for hours 0-23 based on the 90th percentile value for the relevant hour. This percentile allows for impacts to be more reflective of conditions in which emissions are higher but could be reasonably expected to occur again (i.e. excluding outliers).

A 0.7 TSP to $PM_{2.5}$ ratio was applied to determine the $PM_{2.5}$ emission rates in accordance with the M4 East EIS.[7] As noted in section 0, a 50% NO_x to NO_2 conversion rate was adopted for this assessment.

Table 4-2: Emission rates for NO_2 and $PM_{2.5}$

Hour	**NO_x (g/s)**			**$PM_{2.5}$ (g/s)**		
Fan condition	**Low**	**Medium**	**High**	**Low**	**Medium**	**High**
0	0.30	0	0	0.01	0	0
1	0.30	0	0	0.01	0	0
2	0.30	0	0	0.01	0	0
3	0.30	0	0	0.01	0	0
4	0.30	0	0	0.01	0	0
5	0	0.57	0	0	0.03	0
6	0	0	0.66	0	0	0.04
7	0	0	0.49	0	0	0.04
8	0	0	0.36	0	0	0.03
9	0	0	0.26	0	0	0.03
10	0	0	0.23	0	0	0.02
11	0	0	0.21	0	0	0.02
12	0	0	0.21	0	0	0.01
13	0	0	0.17	0	0	0.01
14	0	0	0.09	0	0	0.01
15	0	0	0.04	0	0	0.00
16	0	0	0.06	0	0	0.00
17	0	0	0.09	0	0	0.01
18	0	0	0.37	0	0	0.01
19	0	0	0.67	0	0	0.01
20	0	0.48	0	0	0.01	0
21	0	0.55	0	0	0.02	0
22	0	0.59	0	0	0.02	0
23	0	0.57	0	0	0.02	0

[7] The EIS notes that for road transport it can (broadly) be assumed that TSP is equivalent to PM_{10}. A 0.7 PM_{10} to $PM_{2.5}$ ratio was determined based on the NSW EPA emissions model (and the European Environment Agency's Guidebook method for non-exhaust PM).

4.2 Model configuration

Key components of the model configuration are summarised below:

- Meteorology and topography: a five year (2019-2023) meteorological data file was developed using data from the BoM operated AWS at Canterbury Racecourse and cloud data from Bankstown Airport. This data was processed through AERMET – the meteorological pre-processor for AERMOD. No site topography or three-dimensional terrain was included in the model.
- Receptors: ten 1 km x 1 km square receptor grids were centred over the URVF, using a grid resolution of 10 m, at heights 0 m, 10 m, 20 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m and 90 m.
- Modelled hours: the URVF was modelled for all hours of the year with hour of day varying emission rates.
- Buildings: to determine which buildings are wake affected and therefore required to be included in the model, the methodology outlined in the Approved Methods was undertaken:

  The location and dimensions of buildings located within a distance of 5L (where L is the lesser of the height or width of the building) from each release point for buildings with a height greater than 0.4 times the stack height should be entered in BPIP.
- Dispersion coefficient: The urban dispersion coefficient was applied to the model on the basis that the density of Homebush Precinct is greater than 750 people/km^2. The urban population of Greater Sydney (5,450,496) was applied to the model.
- The 100th percentile concentrations were predicted for all heights.

5 Results

5.1 NO_2 – 1 hour average

The 1-hour average NO_2 predicted concentrations are plotted in Figure 5-1, which shows the predicted 41 µg/m^3 performance criterion at heights ranging from 20 m to 90 m (shown in different colours). The performance criterion was not predicted to be exceeded at heights 0 m and 10 m and therefore these contours have not been included in the figure. From Figure 5-1, it can be seen that the contours are mostly round with slight extensions to the north, east and west, and that at all heights the performance criterion is largely contained within 100 m of the URVF. Note that a component of the dispersion pattern occurs as a result of building downwash[8] impacts. A 100 m buffer has been included on the figure for reference.

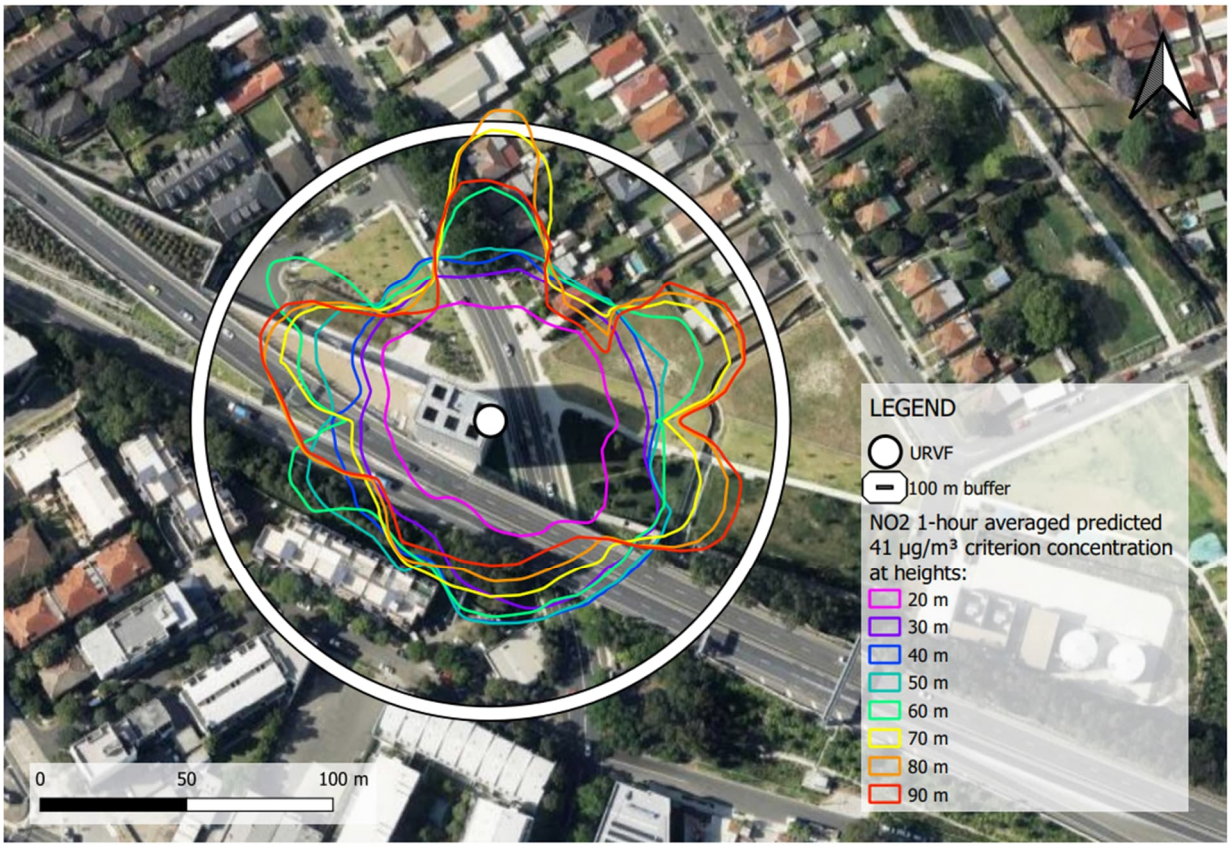

Figure 5-1**: NO_2 1-hour averaged predicted 41 µg/m³ performance criterion contours**

[8] "Buildings and similar structures in the path of air flow create a turbulent wake region on the leeward (i.e., downwind) side of the building. A plume caught in the path of this flow is drawn into the wake, temporarily trapping it in a recirculating cavity. This downwash effect leads to higher ground-level pollutant concentrations near the building than if the building was not present." US EPA

5.2 $PM_{2.5}$ – 24 hour average

The 24-hour average $PM_{2.5}$ predicted concentrations are plotted in Figure 5-2, which shows the predicted 6 µg/m^3 performance criterion at heights ranging from 20 m to 50 m (shown in different colours). The performance criterion was not predicted to be exceeded at heights 0 m, 10 m, 60 m, 70 m, 80 m and 90 m and therefore these contours have not been included on the figure. From Figure 5-2, it can be seen that the contours are contained to the area surrounding the URVF, extending a maximum distance of 28 m from the URVF. A 100 m buffer has been included on the figure for reference.

Figure 5-2: $PM_{2.5}$ 24-hour averaged predicted 6 µg/m³ performance criterion contours

5.3 $PM_{2.5}$ – annual average

The annual average $PM_{2.5}$ predicted concentrations indicated that the 2 µg/m^3 performance criterion was not predicted to be exceeded at any modelled heights. Therefore, no figure has been included.

5.4 Summary

Based on the results presented in Sections 5.1, 5.2 and 5.3, it can be seen that 1-hour averaged NO_2 is the critical pollutant resulting in the largest performance criterion contours. Based on the results it was determined that:

- At heights 0 m – 10 m, no performance criteria are exceeded in the area surrounding the URVF
- At heights greater than or equal to 20 m, within 100 m from the centre URVF the 1-hour averaged NO_2 performance criterion is not met.
- The $PM_{2.5}$ performance criteria contours are contained within the 1-hour averaged NO_2 performance criterion and therefore it is anticipated that any controls or recommendations applicable to NO_2 will be more than sufficient for $PM_{2.5}$.

6 Planning controls

6.1 Air dispersion modelling outcomes

The air dispersion modelling results indicate that for buildings within 100 m of the URVF, at heights greater than or equal to 20 m, possible options for sensitive uses include:

- No sensitive uses
- Sensitive uses subject to:
  - A detailed Air Quality Impact Assessment
  - Based on the results of the assessment, additional built form control measures including
    - Mechanical ventilation
    - Strategic location of air intakes
    - Use of a filtration unit
    - Non-openable windows or balconies

Detailed recommendations are provided in the below section.

6.2 Recommendations

The air dispersion modelling results demonstrate that any future sensitive uses within 100 m of the URVF at a height greater than or equal to 20m may be inhibited by undesirable air quality concentrations from the URVF. Accordingly, this section relates to planning controls relevant to this scenario.

Recommended Planning Controls

A. Land Use

Land surrounding the URVF is proposed to be zoned MU1 Mixed Use, R3 Medium Density Residential and R4 High Density Residential. The permissible uses in the zones will be determined by Strathfield Council, however as it stands, the following uses are permitted/prohibited in the MU1, R3 and R4 zones in the Strathfield LGA.

Table 6-1: Strathfield LGA Permitted Developments

Zoning	Permitted Development	Prohibited Development
MU1	Amusement centres; Boarding houses; Car parks; Centre-based child care facilities; Commercial premises; Community facilities; Entertainment facilities; Function centres; Hostels; Information and education facilities; Light industries; Local distribution premises; Medical centres; Multi dwelling housing; Oyster aquaculture; Passenger transport facilities; Places of public worship; Recreation areas; Recreation facilities (indoor); Registered clubs;	Advertising structures; Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home occupations (sex services);

	Residential flat buildings; Respite day care centres; Restricted premises; Shop top housing; Tank-based aquaculture; Tourist and visitor accommodation; Vehicle repair stations; Any other development not specified in item 2 or 4 (prohibited development)	Industrial retail outlets; Industrial training facilities; Industries; Jetties; Marinas; Moorings; Mooring pens; Open cut mining; Port facilities; Recreation facilities (major); Recreation facilities (outdoor); Research stations; Residential accommodation; Rural industries; Sex services premises; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Warehouse or distribution centres; Water recreation structures; Water supply systems; Wholesale supplies
R3	Attached dwellings; Bed and breakfast accommodation; Boarding houses; Building identification signs; Business identification signs; Centre-based child care facilities; Community facilities; Dual occupancies; Dwelling houses; Environmental protection works; Group homes; Home businesses; Multi dwelling housing; Neighbourhood shops; Oyster aquaculture; Places of public worship; Recreation areas; Residential care facilities; Residential flat buildings; Respite day care centres; Roads; Secondary dwellings; Semi-detached dwellings; Seniors housing; Tank-based aquaculture; Water recycling facilities	Any other development not specified in item 2 or 3 (permitted).
R4	Boarding houses; Centre-based child care facilities; Community facilities; Hotel or motel accommodation; Neighbourhood shops; Oyster aquaculture; Places of public worship; Residential flat buildings; Respite day care centres; Roads; Shop top housing; Any other development not specified in item 2 or 4	Advertising structures; Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Attached dwellings; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria; Depots; Dual occupancies; Dwelling houses; Eco-tourist facilities; Entertainment facilities; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Function centres; Heavy industrial storage establishments; Helipads; Highway service centres; Home occupations (sex services); Industrial retail outlets; Industrial

		training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Passenger transport facilities; Port facilities; Public administration buildings; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Research stations; Restricted premises; Rural industries; Rural workers' dwellings; Semi-detached dwellings; Service stations; Sex services premises; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Warehouse or distribution centres; Water recreation structures; Water treatment facilities; Wholesale supplies

It is considered that the proposed land use zonings surrounding the URVF are appropriate for the locality, considering the results of the air dispersion modelling. While a number of sensitive uses are permitted within the zones, the air dispersion modelling results indicate that air quality impacts on future development can be mitigated through restrictions on allowable maximum building heights.

B. Building Heights

The air dispersion modelling results indicate that maximum building heights above 20m within 100m of the URVF may not be appropriate for sensitive uses from an air quality perspective. As such, the following options should be explored:

- No sensitive uses (i.e. dwelling, school, hospital, office or public recreation area) at heights greater than or equal to 20m within 100m of the URVF, or
- Sensitive uses at heights greater than or equal to 20m within 100m of the URVF are subject to:
  - A detailed Air Quality Impact Assessment
  - Based on the results of the assessment, additional building design measures, including:
    - Mechanical ventilation
    - Strategic location of air intakes
    - Use of a filtration unit
    - Non-openable windows or balconies

It is recommended that the following site-specific control is included within the amendment to the *Strathfield Local Environmental Plan 2012*:

- *Development consent must not be granted for development for the purpose of sensitive land uses at heights greater than or equal to 20m within 100m of the URVF, unless a detailed air quality impact assessment has been submitted and the consent authority is satisfied that the air quality impacts to these uses are acceptable*.

Restricting uses at certain heights or requiring detailed impact assessment or built form control measures (outlined above) may also be addressed in the *Draft Design Guide* or any future Development Control Plan.

C. Densities

The proposed floor space ratio (FSR) mapping in proximity to the URVF generally align with the maximum building heights. Higher FSRs (4:1 to 6:1) are concentrated along the eastern portion of Parramatta Road, which then generally taper off to between 0.65:1 and 2.8:1 in the more established residential areas north of the Western Motorway and to the south of Parramatta Road.

The FSRs promote a range of building heights and slender tower forms.

The air dispersion modelling results do not require any direct amendments to the proposed FSR mapping, however it is considered that these may need to be amended to reflect any changes to maximum building heights within 100m of the URVF.

7 Conclusions

The Homebush State-led rezoning project seeks to rezone part of the Homebush Precinct ("the Precinct") as defined in the NSW Government endorsed Parramatta Road Corridor Urban Transformation Strategy 2016 (PRCUTS). Located within the Precinct is the WestConnex Underwood Road Ventilation Facility (URVF). The URVF releases air pollutants from vehicle combustion generated in the WestConnex M4 East tunnel to the atmosphere.

An Air Quality Impact Assessment has been completed to inform and support the planning controls for the Precinct and verify the appropriateness of the recommended building height and controls for the areas surrounding the URVF.

The assessment used the AERMOD dispersion model to predict concentrations of NO_2 and $PM_{2.5}$ at heights ranging from ground level to 90 meters. As this assessment considered air quality impacts at height (where background concentrations are unknown) performance criteria were used to assess the acceptable limits for NO_2, and $PM_{2.5}$.

The following conclusions were made:

Modelling

- At heights 0 m – 10 m, no performance criteria are exceeded in the area surrounding the URVF.
- At heights greater than or equal to 20 m, within 100 m from the centre URVF the 1-hour averaged NO_2 performance criterion was not met; and
- The $PM_{2.5}$ performance criteria contours were contained within the 1-hour averaged NO_2 performance criterion and therefore it is anticipated that any controls or recommendations applicable to NO_2 will be more than sufficient for $PM_{2.5}$.

Outcomes

- Any future sensitive uses within 100m of the URVF at a height greater than or equal to 20m may be inhibited by undesirable air quality concentrations from the URVF.

As such, the following options are proposed:

- No sensitive uses (i.e. dwelling, school, hospital, office or public recreation area) at heights greater than or equal to 20m within 100m of the URVF, or
- Sensitive *uses* at heights greater than or equal to 20m within 100m of the URVF are subject to:
  - A detailed Air Quality Impact Assessment
  - Based on the results of the assessment, additional building design measures, including:
    - Mechanical ventilation
    - Strategic location of air intakes
    - Use of a filtration unit
    - Non-openable windows or balconies

Planning recommendations :

- It is recommended that the following site-specific control is included within the amendment to the *Strathfield Local Environmental Plan 2012*:
  - *Development consent must not be granted for development for the purpose of sensitive land uses at heights greater than or equal to 20m within 100m of the URVF, unless a*

detailed air quality impact assessment has been submitted and the consent authority is satisfied that the air quality impacts to these uses are acceptable.

- Restricting uses at certain heights or requiring detailed impact assessment or built form control measures (outlined above) may also be addressed in the *Draft Design Guide* or any future Development Control Plan.