Air Quality Impact Assessment of the Proposed Silverweir Poultry Development

Prepared for:

[redacted]

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Final

Prepared by:

Katestone Environmental Pty Ltd
ABN 92 097 270 276
Level 4, 154 Melbourne Street, South Brisbane
Queensland, 4101, Australia

www.katestone.global
admin@katestone.com.au
Ph +61 7 3369 3699

katestone
www.katestone.global

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Prepared by:	Sathya Roysmith, Jemima Goodhew and Alexander Scholten
Reviewed by:	Natalie Shaw
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Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
kg	kilograms
kg/m^3	kilograms per cubic metre
km	kilometres
m	metres
m/s	metres per second
m^2	square metres
m^3	cubic metres
m^3/s	cubic metres per second
m^3/hour	cubic metres per hour
OU	odour units
OU.m^3/s	odour units per cubic metres per second
Nomenclature	**Definition**
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
Abbreviation	**Definition**
AHD	Australian Height Datum
Air NEPM	National Environmental Protection (Ambient Air Quality) Measure
Approved Methods for Modelling	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW
Approved Methods for Sampling	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW
AWS	Automatic Weather Station
Clean Air Regulation	Protection of the Environment Operations (Clean Air) Regulation 2022
CSIRO	The Commonwealth Scientific and Industrial Research Organisation
DAF	Department of Agriculture and Fisheries (Queensland)
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPL	Environment Protection Licence
LBL	Load-based license
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NSW EPA	NSW Environment Protection Authority
OER	Odour emission rate
POEO Act	Protection of the Environment (Operations) Act 1997
QLD	Queensland
TAPM	The Air Pollution Model

EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd was commissioned by [redacted] on behalf of Baiada Poultry Pty Ltd to complete an odour and dust impact assessment of the proposed Silverweir Poultry Development located in Appleby near Tamworth, NSW.

The proposed Silverweir development consists of 16 broiler poultry sheds with a combined capacity of 960,000 birds. Nearby to the proposed Silverweir development are the existing Taradale and Gidley poultry farms, with capacities of 225,000 and 567,900 birds, respectively.

Dispersion modelling has been conducted using the regulatory dispersion model CALPUFF for five years of modelled meteorological data (2019 - 2023). Ground-level concentrations of odour and dust associated with proposed Silverweir development have been predicted at nearby sensitive receptors and across a Cartesian grid of receptors. A cumulative assessment has been undertaken including background odour emissions from the existing nearby Taradale and Gidley poultry farms, and background dust emissions from the existing farms with ambient monitoring data from the NSW DCCEEW's Tamworth air quality monitoring station.

Results of the odour impact assessment have been compared against the relevant odour impact assessment criterion specified in the Approved Methods for Modelling. The odour assessment has shown that:

- For the proposed 16-shed Silverweir development in isolation applying a k-factor of 2.2:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.
- For the proposed 16-shed Silverweir development in isolation applying a k-factor of 1.9:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.
- For cumulative impacts of the proposed 16-shed Silverweir development and the existing Taradale and Gidley farms applying a k-factor of 2.2 to all farms:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in the model years of 2019, 2020, 2022 and 2023.
    - In the model year of 2021, predicted odour concentrations exceed the odour impact assessment criterion at one sensitive receptor (R38).
- For cumulative impacts of the proposed 16-shed Silverweir development applying a k-factor of 1.9 and the existing Taradale and Gidley farms applying a k-factor of 2.2:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.

Results of the dust impact assessment have been compared against the relevant $PM_{2.5}$ and PM_{10} impact assessment criteria specified in the Approved Methods for Modelling. The dust assessment has shown that:

- Predicted 24-hour and annual average ground-level concentrations of $PM_{2.5}$ due to the proposed Silverweir development in isolation are at most 5.8% and 1.2% of the relevant impact assessment criteria, respectively.
- Predicted 24-hour and annual average ground-level concentrations of PM_{10} due to the proposed Silverweir development in isolation are at most 11.6% and 1.5% of the relevant impact assessment criteria, respectively.

- A contemporaneous assessment combining modelled results of the proposed Silverweir development with the existing Gidley and Taradale Farms with the observed ambient dust levels showed that an additional exceedance day at one sensitive receptor was predicted for $PM_{2.5}$ for modelled year 2019. The modelled contribution at the relevant receptors due to the proposed Silverweir development was 0.07 µg/m^3 on this day. An elevated background level was the primary cause for the exceedance, likely caused by widespread smoke impacts from bushfires.

The assessment has demonstrated that the proposed Silverweir development is unlikely to cause adverse odour and dust impacts.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by [redacted] on behalf of Baiada Poultry Pty Ltd (Baiada) to complete an odour and dust impact assessment of the proposed Silverweir Poultry Development (proposed Silverweir development) located in Appleby near Tamworth, NSW.

The proposed Silverweir development consists of 16 broiler poultry sheds with a combined capacity of 960,000 birds. The proposed Silverweir shed configuration is depicted in Figure 1. Nearby to the proposed development are the existing Taradale and Gidley poultry farms, with capacities of 225,000 and 567,900 birds, respectively. Combined concentrations of odour and dust due to each of these existing farms have been included in the assessment of the proposed Silverweir development.

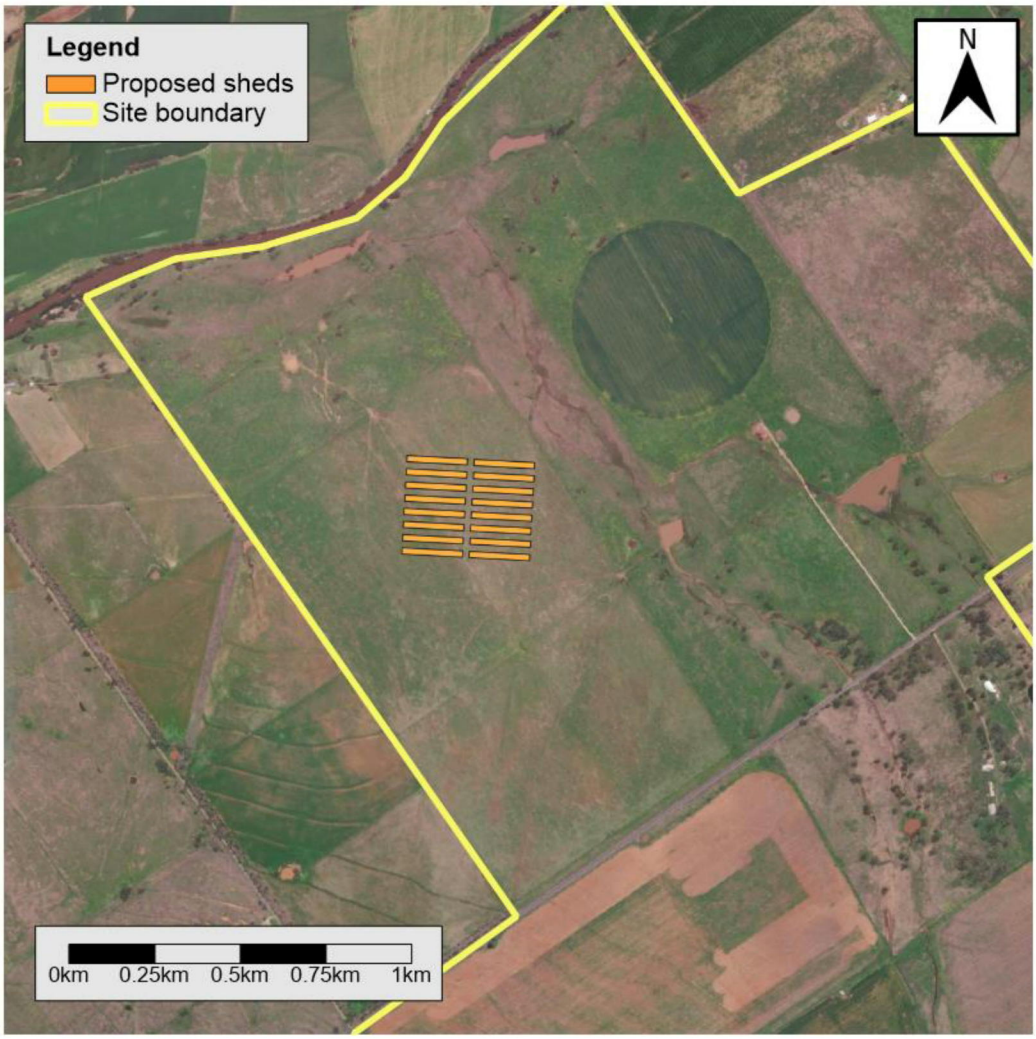

Figure 1 Proposed site layout of the proposed Silverweir development

As part of early consideration of development options, Katestone previously undertook dispersion modelling of the Silverweir Development in 2016, with results presented in Katestone memorandum D15036-2 *Odour Modelling Results for Silverweir Poultry Farm*. Modelling has been utilised from previous work where available, with parameters revised as required to represent current operations of the existing farms and the Silverweir development as it is now proposed.

This report addresses the following aspects:

- Description of the proposed and existing poultry farm designs
- Outline of the relevant regulatory framework for odour and dust
- Characterisation of the existing environment and identification of sensitive receptors
- Characterisation of odour and dust emissions for the proposed Silverweir development, using methodology outlined in the AgriFutures Planning and environment guideline for establishing meat chicken farms: Guide 1 – assessment guide (the AgriFutures guideline) (McGahan, Wiedemann and Galvin, 2021)
- Generation of a suitable site-specific meteorological dataset to use in dispersion modelling in accordance with the EPA's Approved Methods for Modelling
- Configuration of the CALPUFF dispersion model to predict odour and dust concentrations due to the proposed Silverweir development in isolation and with combined impacts from existing developments in accordance with the EPA's Approved Methods for Modelling
- Comparison of dispersion modelling results against the relevant impact assessment criteria.

2. LEGISLATIVE FRAMEWORK FOR AIR QUALITY

2.1 Overview

The regulation of air pollution in NSW is provided for in the *Protection of the Environment (Operations) Act 1997* (POEO Act), which is underpinned by a number of regulatory instruments that address air quality including:

- *Protection of the Environment Operations (Clean Air) Regulation 2022* (Clean Air Regulation) – imposes generic operational requirements for activities and plant.
- Environmental Protection Licence (EPL) – A licence held by the operator of a scheduled activity that details the activities that may be carried out at the premises and the conditions that must be met to retain that permission.
- *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022)* (Approved Methods for Modelling) – provides statutory requirements for the assessment and modelling of air emissions from a premises.
- *Approved Methods for Sampling and Analysis of Air Pollutants in NSW* (Approved Methods for Sampling) – provides statutory requirements for the measurement of air emissions from a premises.
- Load-based licensing (LBL) – an incentive-based scheme where licence fees are linked to pollutant loads.

2.2 Approved Methods for Modelling

In NSW, air quality impact assessments of new activities or amendments to existing activities are carried out in accordance with the Approved Methods for Modelling, which lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources. The Approved Methods for Modelling is subordinate legislation under Part 4 of the Clean Air Regulation.

The Approved Methods for Modelling lists the statutory methods for modelling and assessing emissions of air pollutants from major projects in NSW. The Approved Methods for Modelling is referred to in:

- Conditions attached to statutory instruments including environmental assessment requirements under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act)
- Part 5: Air Impurities Emitted from Activities and Plant in the Clean Air Regulation.

In general, the Approved Methods for Modelling includes information and methods for the following:

- Preparation of emissions inventory data
- Preparation of meteorological data
- Accounting for background concentrations and dealing with elevated background concentrations
- Dispersion modelling
- Interpretation of dispersion modelling results
- Impact assessment criteria for:
    - Sulfur dioxide, nitrogen dioxide, ozone, lead, $PM_{2.5}$, PM_{10}, total suspended particulates, deposited dust, carbon monoxide and hydrogen fluoride
    - Individual and complex mixtures of toxic air pollutants
    - Individual and complex mixtures of odorous air pollutants
- Modelling of chemical transformation

- Procedures for developing site-specific emission limits, including hydrogen sulfide.

This air quality assessment has been conducted in accordance with the Approved Methods for Modelling.

For dust, particulate matter as PM_{10} and $PM_{2.5}$ specifically have been included in this assessment. The relevant impact assessment criteria for both are summarised in Table 1.

Table 1 Impact assessment criteria for dust (Approved Methods for Modelling)

Air pollutant	Averaging period	Criterion (µg/m^3)	Source
$PM_{2.5}$	24-hour	25	National Environment Protection (Ambient Air Quality) Measure (Air NEPM) (2021)
	Annual	8	
PM_{10}	24-hour	50	
	Annual	25	

In regards to odour, the Approved Methods for Modelling states that:

> *"...the impact assessment criteria for complex mixtures of odours have been designed to take into account the range of sensitivity to odours within the community and to provide additional protection for individuals with a heightened response to odours. This is achieved by using a statistical approach dependent upon population size. As the population density increases, the proportion of sensitive individuals is also likely to increase, indicating that more stringent criteria are necessary in these situations."*

A summary of the criteria for various population densities is presented in Table 2. These odour criteria are concerned with controlling odours to ensure offensive odour impacts will be effectively managed but are not intended to achieve 'no odour'.

Predicted ground-level concentrations of odour have been compared to the odour impact assessment criterion of 5 OU (99th percentile, nose-response-time average). This criterion is suitable given the number of isolated farmhouses and small isolated communities (< 3 houses) in the vicinity of the proposed Silverweir development.

Table 2 Impact assessment criteria (Approved Methods for Modelling)

Population of affected community	Impact assessment criterion for complex mixtures of odorous air pollutants (OU)
Urban (≥~2,000) and/or schools or hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≥~2)	7.0

3. AIR QUALITY ASSESSMENT METHODOLOGY

3.1 Existing environment

The assessment includes an analysis of the characteristics of the existing environment (Section 4) in the area surrounding the proposed Silverweir development that are important for the dispersion of air pollutants and that may influence the level of odour at sensitive receptors. Characteristics include terrain features, regional land uses, existing sources of emissions and the locations of sensitive receptors relative to the sources.

3.2 Meteorology

The dispersion modelling assessment was conducted using the most recent versions of the TAPM (version 4.0.5) and CALMET (version 6.5.0) models at the time of undertaking the study. A site-specific meteorological data file for five years of data (2019 – 2023) was generated for the project site by coupling the prognostic model TAPM with the diagnostic metrological model CALMET.

The coupled TAPM/CALMET modelling system was developed to enable high resolution modelling capabilities for regulatory and environmental assessments. The modelling system incorporates synoptic, mesoscale, and local atmospheric conditions, detailed topographic and land use categorisation schemes to simulate synoptic and regional scale meteorology for input into pollutant dispersion models such as CALPUFF.

Technical details of the TAPM and CALMET model configurations are provided in Section A1 of Appendix A, including a validation of the generated data and a summary of the meteorological data generated for the study area.

Observational data from the Bureau of Meteorology's (the Bureau) Tamworth airport monitoring station was assimilated into TAPM modelling, to ensure a robust modelled meteorological dataset was produced that accounts for local meteorological conditions. An evaluation of the local meteorology is presented in Section 4.4.

3.3 Dispersion modelling

The CALPUFF model (version 7.2.1) was used for dispersion modelling. CALPUFF is an advanced non-steady-state air quality modelling system. Five years (2019 to 2023) of meteorological data was used as input for the dispersion model in order to account for variability in atmospheric conditions likely to be experienced in the region, as described in Appendix A.

Emission sources were configured in CALPUFF based on the information for sources detailed in Section 5.

Details of the model configuration are provided in Section A1.4.3 of Appendix A.

3.4 Cumulative assessment

A cumulative assessment has been conducted incorporating the contributions of the existing Taradale and Gidley poultry farms for the assessment of odour impacts, and the contribution of both the existing farms and ambient background levels of $PM_{2.5}$ and PM_{10} observed at the NSW Department of Climate Change, Energy, the Environment and Water's (DCCEEW) Tamworth air quality monitoring station for the assessment of dust impacts. A summary of predicted ground-level concentrations of background dust at discrete receptors (due to the existing farms and ambient monitoring levels) is presented in Appendix B. Table 3 summarises the sources included in the cumulative assessment, whilst results in Section 6 have been presented for the proposed Silverweir development in isolation and cumulatively for both odour and dust.

Table 3 Sources of data for the cumulative assessment

Pollutant	Proposed 16-shed Silverweir development	Gidley farm	Taradale farm	Ambient monitoring data[(1)]
Odour	✓	✓	✓	×
$PM_{2.5}$	✓	✓	✓	✓[(1)]
PM_{10}	✓	✓	✓	✓[(1)]

Table note:
[(1)] Contemporaneous background used

3.5 Analysis of model output

The NSW EPA requires peak ground-level concentrations to be calculated for complex mixtures of odour, which entails the calculation of peak concentrations on timescales of less than 1 second. However, the dispersion model CALPUFF calculates averages for periods of 1 hour or longer. Peak concentrations can be obtained from averaging extreme short-term and long-term concentrations.

Emission sources for this assessment have been modelled as wake-affected stacks. The relevant peak-to-mean ratio that has been utilised is presented in Table 4.

Table 4 Peak-to-mean ratios for estimating peak near-field concentrations in flat terrain

Pasquill-Gifford Stability Class	Scaling factor for a wake affected point
A-F	2.3

For dust, 100th percentile predicted $PM_{2.5}$ and PM_{10} ground-level concentrations have been assessed at sensitive receptors in accordance with the Approved Methods for Modelling.

3.6 Limitations and uncertainty

This study relies on the accuracy of a number of data sets that feed into the dispersion model, all of which will have uncertainties associated with them. The input data sets include:

- Meteorological monitoring observations from the Bureau
- Parameters used to estimate odour emission rates provided by Baiada
- Synoptic and surface information datasets from CSIRO.
- Air quality monitoring data from the NSW DCCEEW

It is also important to note that numerical models are based on an approximation of governing equations and will inherently be associated with some degree of uncertainty. The more complex the physical model, the greater the number of physical processes that must be included. There will be physical processes that are not explicitly accounted for in the model and, in general, these approximations tend to lead to an over prediction of air pollutant levels.

The dispersion model has been configured with conservative assumptions and, therefore, the assessment is likely to overpredict potential impacts of the proposed Silverweir development.

4. EXISTING ENVIRONMENT

4.1 Local terrain and land-use

The proposed development site boundary comprises approximately 758 hectares of agricultural land located in Appleby, NSW, approximately 5.5 km southwest of the farming community of Attunga, and 18 km northwest of Tamworth. The site is positioned adjacent to the Peel River.

Figure 2 displays a terrain map of the study area. Elevations within the site boundary ranges from approximately 340 m AHD at the northwestern end of the site (adjacent to the Peel River) to approximately 380 m AHD at the southwestern corner. A region of lower-lying terrain follows the curve of the Peel River to the north and east of the proposed development. Across the river from the site, in the northeastern corner of the study area, terrain rises steeply at several peaks to a maximum of approximately 650 m AHD.

Land-use around the proposed development site primarily consists of cropping and grazing, with some scattered areas of intensive animal production and residential dwellings. Mining, quarrying and horticulture also occupy some of the nearby land-use. Major industries relevant to odour include the nearby Gidley and Taradale poultry farms.

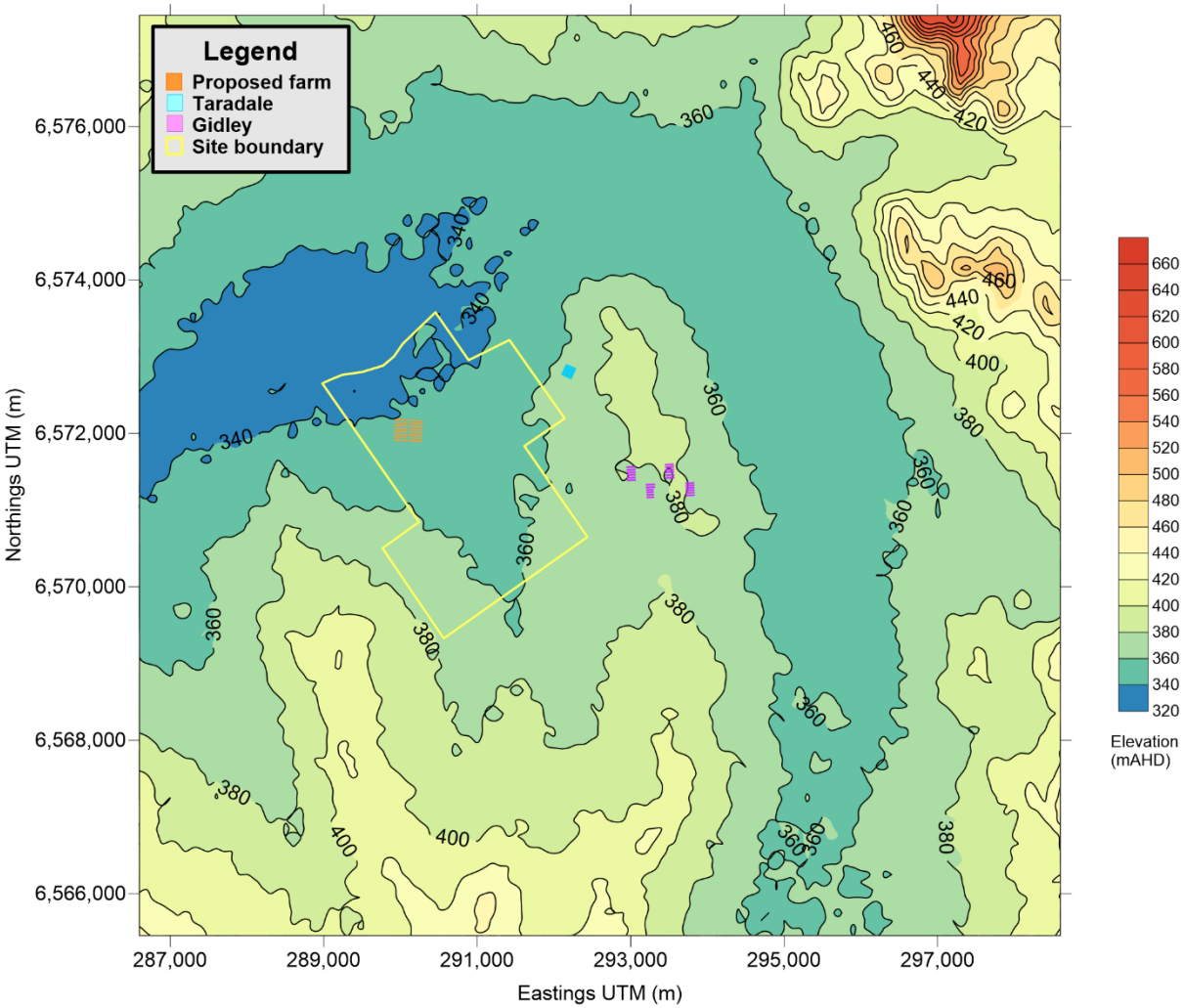

Figure 2 Terrain surrounding the study area

4.2 Sensitive receptors

Specific sensitive receptors have been identified in the study area, including worst-case locations (these being at the façades of the residential properties closest to the sources). The selected sensitive receptors are described in Table 5 and shown in Figure 3.

Pollutant concentrations have also been predicted across a Cartesian grid of receptors (at 100 m resolution) to enable the production of contour plots of concentrations across the study area.

Table 5 Nearest sensitive receptors to the proposed Silverweir development

Receptor ID	Name	Easting (m)	Northing (m)
R1	Amaroo	288,050	6573,940
R2	Unnamed 1	289,985	6573,880
R3	Camelon	290,507	6575,290
R4	Martinbrae	290,428	6575,510
R5	The Poplars	291,260	6575,570
R6	Riverside	291,911	6574,360
R7	Pontiban	292,054	6576,060
R8	Unnamed 2 (Attunga outskirts)	293,163	6576,220
R9	Unnamed 3 (Attunga outskirts)	294,100	6575,820
R10	Balmoral	294,944	6574,800
R11	Wallanbean	293,281	6574,630
R12	Appleby House	293,934	6573,950
R13	Woodside	294,492	6573,230
R14	Proposed 1	293,035	6572,830
R15	Craiglea	294,444	6572,420
R16	Lindon Vale	293,730	6572,220
R17	Oakleigh	294,729	6571,830
R18	Unnamed 4 (Moore outskirts)	295,921	6571,750
R19	Avondale	294,874	6571,470
R20	Kingston Park	292,225	6572,080
R21	Matilda Park	292,530	6571,690
R22	RMB 256 A	292,704	6570,770
R23	Wick's	292,746	6570,340
R24	Glenloch	294,610	6569,970
R25	RMB 391	293,714	6569,550
R26	Bimbadeen	294,029	6569,180
R27	Naroo Park	293,744	6568,910
R28	Yearman's	293,625	6568,480
R29	Hazeldene	291,435	6568,700
R30	Werribee Park	289,399	6568,130
R31	Roseville Park	289,022	6569,010
R32	Unnamed 5	287,592	6568,550

Receptor ID	Name	Easting (m)	Northing (m)
R33	Milroy	288,595	6569,480
R34	Sunnyside	288,370	6569,780
R35	J & H Kelly	289,632	6569,820
R36	Forsyth's	289,243	6570,370
R37	Roseview	288,304	6572,150
R38	Ravensfield	288,680	6572,380
R39	R1	291,993	6569,550
R40	R2	288,381	6568,860
R41	R3	288,994	6570,180
R42	R4	287,934	6572,010
R43	R5	287,365	6573,350
R44	R6	291,543	6573,680

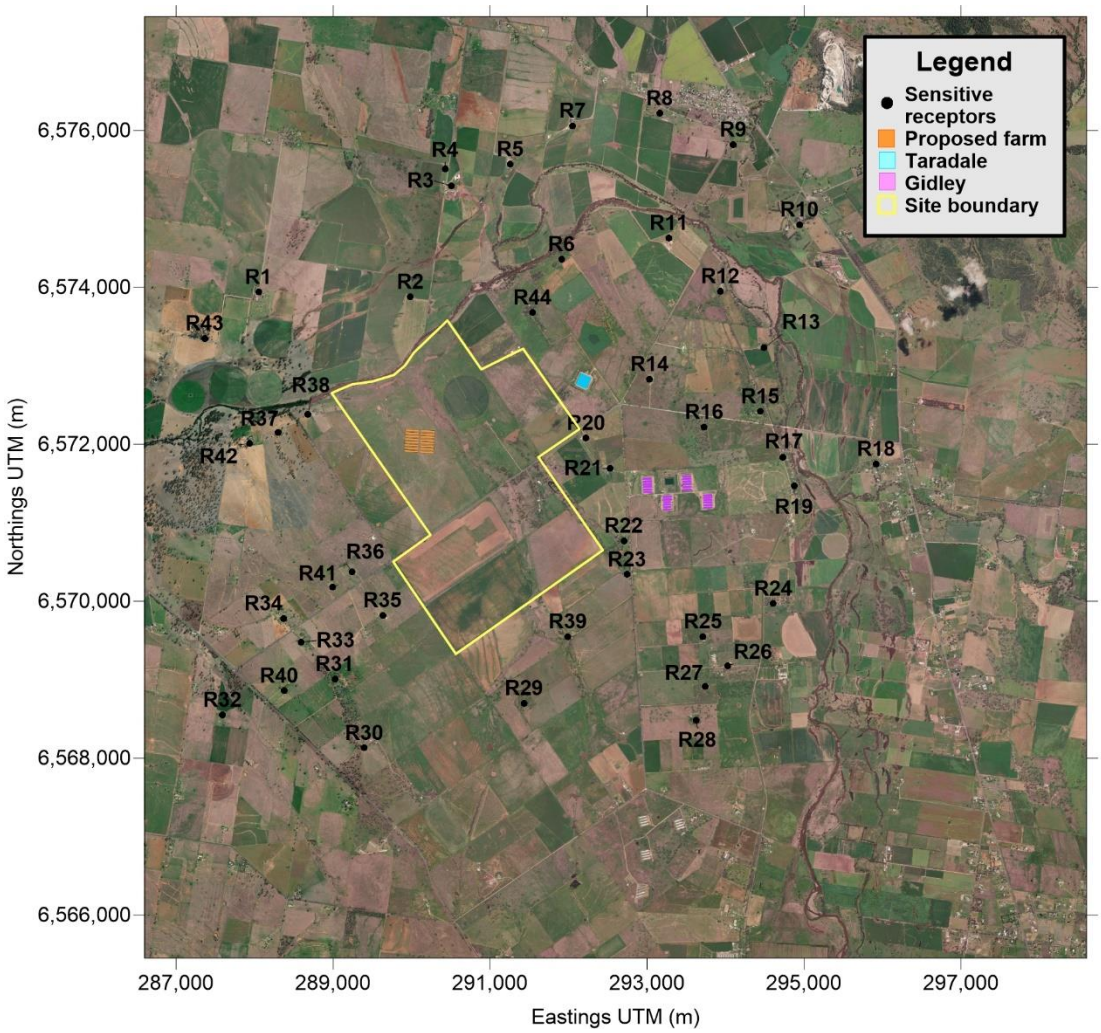

Figure 3 Sensitive receptors near the proposed Silverweir development

4.3 Existing air quality

4.3.1 Existing sources of emissions

There are two existing poultry farms located approximately 3.0 km east (Gidley) and 2.0 km northeast (Taradale) or the proposed development. The locations of these existing farms are shown in Figure 3.

These existing farms have been included in the modelling assessment, and their modelling details are presented in Section 5.1.2.

4.3.2 Existing ambient air quality

The NSW DCCEEW is responsible for undertaking ambient air quality monitoring in New South Wales. The NSW DCCEEW does not conduct any monitoring of odour. In the absence of any suitable monitoring data and given the inclusion of nearby poultry farms in the dispersion modelling, no ambient background concentration of odour is used in this assessment.

In regard to dust, the nearest NSW DCCEEW monitoring station that records particulate matter is located in Tamworth. Analysis of the Tamworth data covering the five-year model period showed that ambient levels of dust exceeded the 24-hour average Air NEPM standards occasionally. Specifically, the ambient monitoring data indicated:

- For $PM_{2.5}$:
    - 34 exceedances of the 24-hour average criterion occurred in 2019
    - 4 exceedances of the 24-hour average criterion occurred in 2020
    - No other exceedances occurred in 2021, 2022 and 2023
    - The annual criterion was also exceeded in 2019.
- For PM_{10}:
    - 50 exceedances of the 24-hour average criterion occurred in 2019
    - 8 exceedances of the 24-hour average criterion occurred in 2020
    - No other exceedances occurred in 2021, 2022 and 2023
    - The annual criterion was also exceeded in 2019.

The observed exceedances in the Tamworth monitoring data can be attributed to unprecedented external factors. Intense drought conditions and extensive bushfires in 2019 caused widespread smoke impacts in the region, which impacted air quality through 2019 and into 2020.

Due to the elevated ambient background levels observed, a contemporaneous assessment was undertaken for all model years to ensure a refined and robust cumulative assessment of dust impacts.

4.4 Local meteorology

The following section presents an evaluation of observed meteorological data in the region surrounding the proposed Silverweir development. Local meteorology is of paramount importance for dispersion of odour and dust generated by the proposed Silverweir development. Key features that influence dispersion include wind speed, wind direction, atmospheric stability and boundary layer mixing height. When assimilating observed data into the meteorological model, it is essential that the data is robust to ensure the local meteorological features are accurately reflected in the model.

Weather data from four weather stations in the region was analysed in order to characterise the local meteorological conditions. A short summary of each station is presented in Table 6 whilst Figure 4 depicts the locations of each station relative to the terrain in the region.

Table 6 Parameters used to characterise odour emission rates for the proposed sheds at Silverweir

Weather station	Distance and direction from the proposed Silverweir development	Data range
The Bureau's Tamworth airport weather station	~12 km SSE	1989 to present
Baiada's Oakburn rendering facility (Oakburn)	~11.1 km SSE	March 2011 to March 2012
ProTen's Murrami poultry production farm (Murrami)	~18.7 km W	13 April 2023 to 25 March 2024
ProTen's Rushes Creek poultry farm (Rushes Creek)	~26.6 km NW	15 April 2023 to 16 Jun 2024

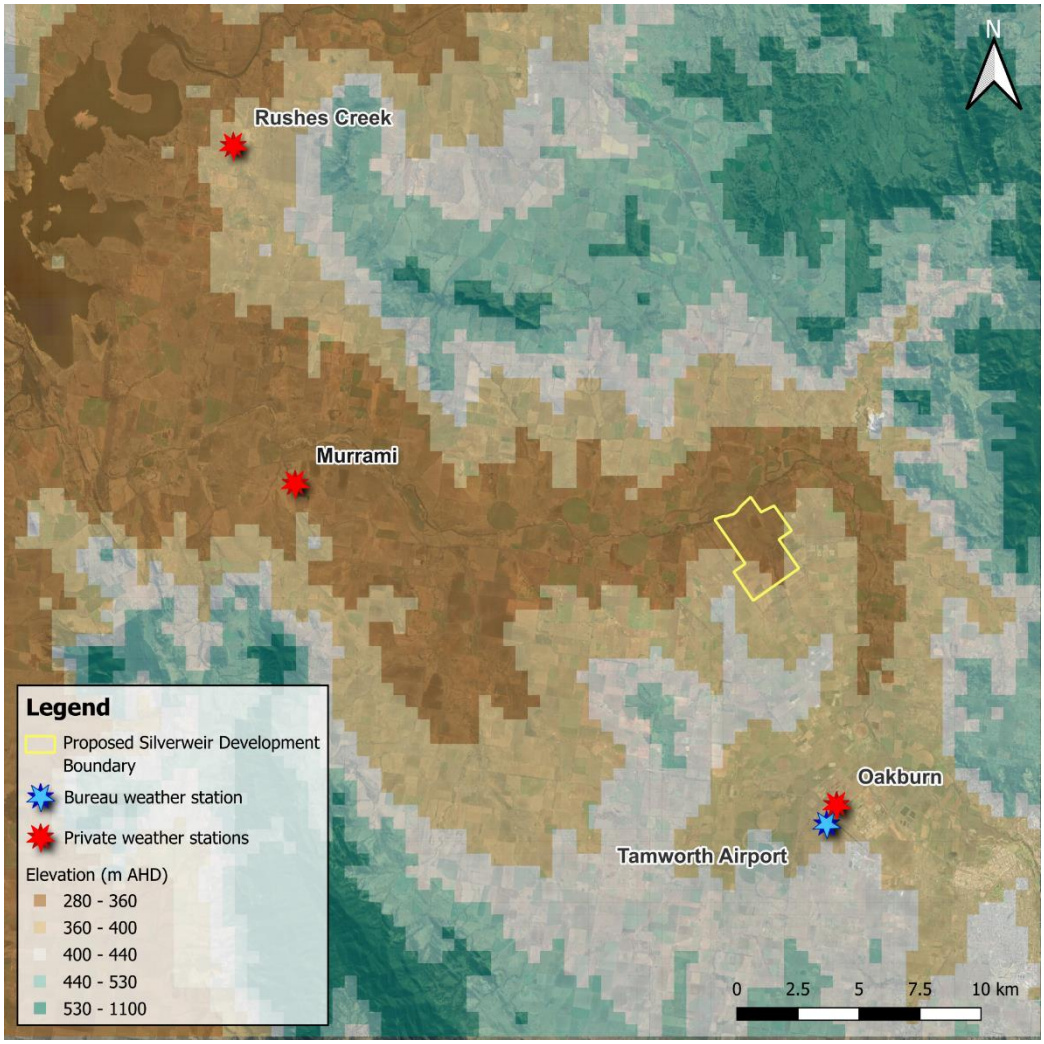

Figure 4 Locations of weather stations in the region with terrain included

The most complete and robust meteorological data available in the region is from the Bureau's Tamworth airport station. This data was analysed for the five years modelled, with annual wind roses presented in Figure 5. It is noted that wind speed and direction at the Tamworth airport AWS are measured using a cup anemometer (Bureau of Meteorology, 2024). Predicted annual average wind speed measured at Tamworth airport remains relatively consistent across the five years ranging between 3.15 m/s and 3.59 m/s, with winds most commonly coming from the southeast quadrant, and less frequently from the northwest. Calms were observed at between 1.1% and 1.8% of the time.

The document Observation Specification No. 2013.1 *Guidelines for the Siting and Exposure of Meteorological Instruments and Observing Facilities* (the Bureau guideline) outlines the criteria for siting and exposure of Bureau stations such as the automatic weather station (AWS) at Tamworth Airport (Bureau of Meteorology, 1997). The criteria include specifications for siting, maintenance and calibration, and environmental considerations to ensure that measurements from Bureau stations are to an acceptable standard. Station metadata is also made available, detailing surrounding features as well as equipment history at the Tamworth airport AWS (Bureau of Meteorology, 2024). Hence the observations recorded at the Tamworth airport AWS were deemed suitable for assimilation into the model, to refine conditions relevant for atmospheric dispersion.

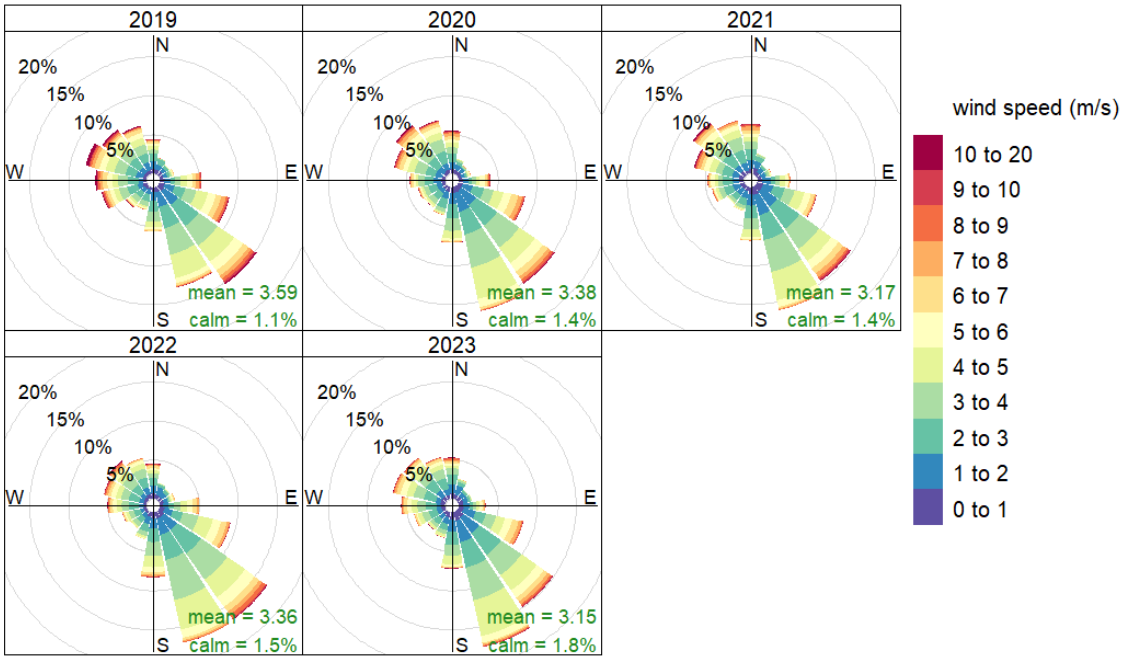

Figure 5 Annual wind roses for 2019 - 2023 (extracted from the BoM Tamworth Airport weather station)

Data from the meteorological station located at Baiada's Oakburn rendering facility (Oakburn) was analysed with particular focus on comparing the available data with observed data at the Bureau's Tamworth airport station for the same period. The two stations are located within 900 metres of each other and are both sited at similar elevations, with no major terrain features in the nearby surrounds. Hence, it would be expected that meteorological conditions observed at both stations would be similar.

Figure 6 presents a wind rose comparison between the Oakburn and Tamworth Airport. Whilst wind direction between the sites is comparable, wind speed magnitude is notably different, with Oakburn winds considerably lower at an average of 0.95 m/s compared to 3.38 m/s at Tamworth Airport. The percentage of calms also differs with 26.6% of calms recorded at Oakburn compared to 2% at Tamworth Airport.

Due to the time elapsed since the Oakburn weather station was functioning, information regarding its operation is not extensive. The type of anemometer installed at the weather station is also unknown. Whilst imagery indicates that the station was situated at a height of 10 metres, there is no other information available regarding siting to suggest if the station complied with criteria outlined in the Bureau guideline. Similarly, information regarding the maintenance and calibration schedule for the station is not available. Satellite imagery from 2012 shows that there was no significant vegetation nearby, though the rendering facility building was originally situated ~80 m to the southeast of the station in the direction of the prevailing winds, at an unknown height. It is also understood that the Oakburn weather station was impacted by a lightning strike which may impact the veracity of the data.

Though the difference in wind magnitude compared to the Bureau's Tamworth airport station is not abundantly clear from this information alone, the lack of information regarding maintenance and calibration as well as siting relative to buildings means that Katestone is unable to confirm that observations from Oakburn are accurately representative of local meteorological conditions.

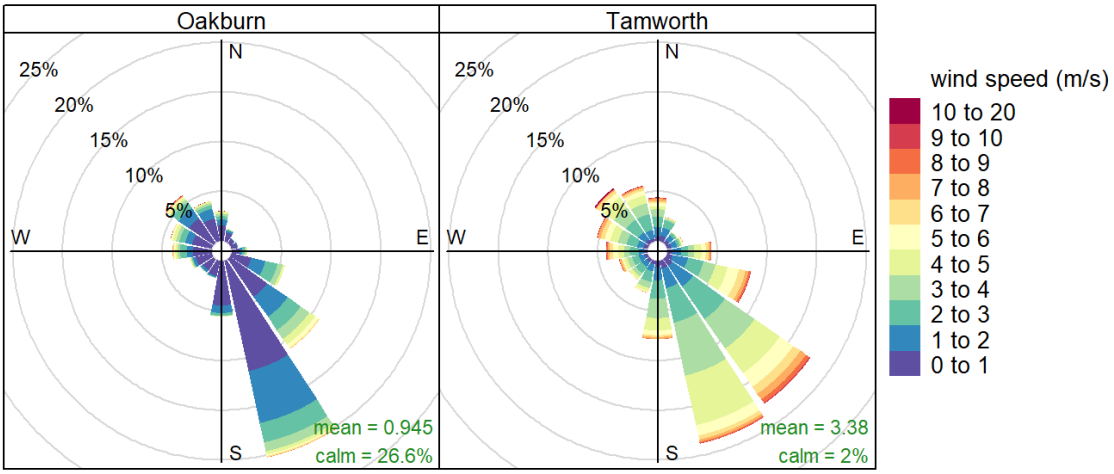

Figure 6 **Annual wind distribution observed at the Oakburn processing facility (left) and Tamworth Airport BoM station (right) in March 2011 – March 2012**

Annual wind roses for observed data at Murrami and Rushes Creek for their respective time periods are presented in Figure 7. In comparison with the Tamworth Airport and Oakburn stations, average wind speeds recorded at these sites are generally lower still, at 0.9 m/s and 0.78 m/s for Murrami and Rushes Creek respectively. Wind directions also differ, however this can be attributed to the distance between stations and hence the different terrain and topographical features influencing conditions.

As with the Oakburn weather station, there is insufficient information regarding the standards applied to the operation of both the Murrami and Rushes Creek weather stations. Satellite imagery indicates that both stations are sited in the open, however other siting information and environmental conditions are unknown. Regarding wind speed and direction measurement, Katestone has been advised that an ultrasonic anemometer has been used at the Rushes Creek station since 2018, though it is unknown what type of anemometer is used at the Murrami station. It us also unclear if the anemometers are situated at a height of 10 m, and whether regular maintenance and calibration of the stations is undertaken. Hence, similarly to the Oakburn observations, the accuracy of observations from Murrami and Rushes Creek relevant to local meteorological conditions is unable to be confirmed.

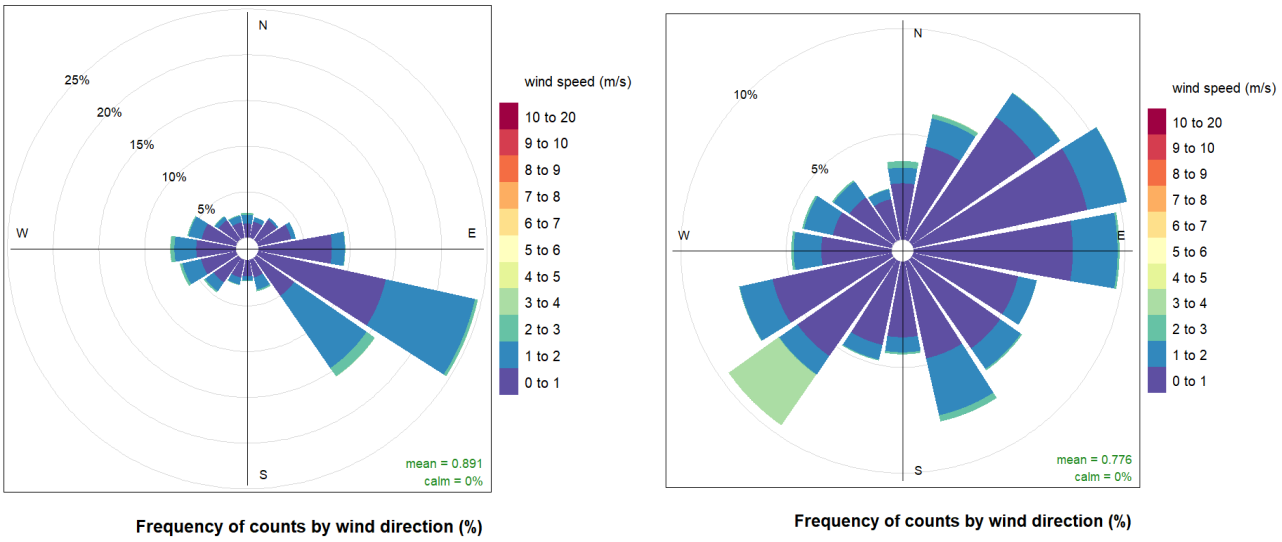

Figure 7 **Annual wind distribution observed at the Murrami poultry farm in April 2023 – March 2024 (left) and the Rushes Creek poultry farm in April 2023 – June 2024 (right)**

5. EMISSIONS

5.1 Odour emissions

The assumptions and parameters used to determine the odour emission rates from the proposed and existing sheds are presented in the following sections. Emissions have been estimated using methods outlined in the AgriFutures guideline, commonly used in NSW and throughout Australia for estimating emissions from poultry farms.

5.1.1 Overview

Odour emissions from poultry sheds are a function of:

- Bird numbers
- Bird stocking density (bird age, bird mass, shed dimensions)
- Ventilation rate (function of bird age and ambient temperature)
- Shed management practices.

The odour emission rate can be determined using the following equation:

$$OER_s = 0.025 * K * V^{0.5}$$

Where:

OER_s = Standardised odour emission rate ($OU.m^3/s$) per unit area of shed (m^2) per unit stocking density (kg/m^3)

K = A scaling factor used to account for the variations in odour emission rates between farms based on design and management.

V = Ventilation rate (m^3/s)

To calculate the odour emission rate at any stage of the growing cycle, the equation above can be expanded to account for the stocking density in the shed as follows:

$$OER = 0.025 * K * A * D * V^{0.5}$$

Where:

OER = Odour emission rate at any stage of the bird growth cycle ($OU.m^3/s$)

K = A scaling factor used to account for the variations in odour emission rates between farms based on design and management.

A = Total floor area (m^3)

D = Bird stocking density (kg/m^3)

V = Ventilation rate (m^3/s)

5.1.2 Model parameters

5.1.2.1 Proposed Silverweir sheds

The proposed broiler farm was modelled with:

- 16 sheds
- 60,000 birds per shed
- Maximum ventilation air flow rate of 233.4 m^3/s (840,240 m^3/hour).

The 16 proposed sheds at Silverweir are configured in the same way. The parameters used in the odour modelling assessment are presented in Table 7.

Table 7 Parameters used to characterise odour emission rates for the proposed sheds at Silverweir

Parameter	Value	Units	Reference
Shed length	177	m	Baiada
Shed width	18.3	m	Baiada
Shed height	4.75	m	Value from previous model (D15036-2)
Shed area	3,239.1	m^2	Calculated
Number of sheds	16	Sheds	Baiada
Birds per shed	60,000	Birds/Shed	Baiada
Length of growing cycle	55	Days	Baiada
Length of clean-out	10	Days	Baiada

5.1.2.2 Taradale sheds

Shed parameters for the Taradale poultry farm remained the same as previously modelled in D15036-2, with bird numbers updated to reflect current practice. The Taradale farm was modelled with:

- 5 sheds
- A total of 225,000 birds (45,000 birds per shed)
- Maximum ventilation air flow rate of 155.1 m^3/s (558,360 m^3/hour).

The five sheds at Taradale have the same configuration, with the shed parameters presented in Table 8.

Table 8 Parameters used to characterise odour emission rates for the sheds at Taradale

Parameter	Value	Units	Reference
Shed length	151.9	m	Baiada
Shed width	17	m	Baiada
Shed height	4.2	m	Baiada
Shed area	2,582.3	m^2	Calculated
Number of sheds	5	Sheds	Baiada
Birds per shed	45,000	Birds/Shed	Baiada
Length of growing cycle	55	Days	Baiada
Length of clean-out	10	Days	Baiada

5.1.2.3 Gidley sheds

Shed parameters for the Gidley poultry farm remained the same as previously modelled in D15036-2, whilst bird numbers and fan configurations were updated, to reflect future amendments to the Gidley farm. The Gidley farm was modelled with:

- 24 sheds
- A total of 567,900 birds (between 19,300 and 27,200 birds per shed depending on the shed dimensions)
- Maximum ventilation air flow rate of 152.9 m^3/s (550,368 m^3/hour).

The Gidley farm consists of four separate pads that contain six sheds per pad. Shed sizes and parameters differ within the pads, with three shed configurations identified. All sheds were modelled with 13 total fans, with 12 tunnel fans at one end of the sheds and one minimum ventilation fan on the opposite end. The parameters for the three different shed types are presented in Table 9 (Type 1), Table 10 (Type 2) and Table 11 (Type 3).

Table 9 Parameters used to characterise odour emission rates for the Type 1 sheds at Gidley

Parameter	Value	Units	Reference
Shed length	109.4	m	Baiada
Shed width	12.5	m	Baiada
Shed height	4.45	m	Baiada
Shed area	1,367.5	m^2	Calculated
Number of sheds	13	Sheds	Baiada
Birds per shed	23,100	Birds/Shed	Baiada
Length of growing cycle	55	Days	Baiada
Length of clean-out	10	Days	Baiada

Table 10 Parameters used to characterise odour emission rates for the Type 2 sheds at Gidley

Parameter	Value	Units	Reference
Shed length	112	m	Baiada
Shed width	14	m	Baiada
Shed height	3.96	m	Baiada
Shed area	1,568	m^2	Calculated
Number of sheds	7	Sheds	Baiada
Birds per shed	27,200	Birds/Shed	Baiada
Length of growing cycle	55	Days	Baiada
Length of clean-out	10	Days	Baiada

Table 11 Parameters used to characterise odour emission rates for the Type 3 sheds at Gidley

Parameter	Value	Units	Reference
Shed length	90.95	m	Baiada
Shed width	12.12	m	Baiada
Shed height	4.4	m	Baiada
Shed area	1,102.3	m^2	Calculated
Number of sheds	4	Sheds	Baiada
Birds per shed	19,300	Birds/Shed	Baiada
Length of growing cycle	55	Days	Baiada
Length of clean-out	10	Days	Baiada

5.1.3 Ventilation fans

The fan parameters and ventilation rates used to determine the odour emission rates from the proposed sheds at Silverweir are presented in Table 12. The fan parameters and ventilation rates used to determine the odour emission rates from the existing sheds are presented in Table 13 (Taradale) and Table 14 (Gidley).

Table 12 Fans and ventilation rates for the proposed sheds at Silverweir

Parameter	Value	Units	Reference
Number of fans per shed	20	Fans/Shed	PSA Consulting
Air flow per fan	11.7	m^3/s	PSA Consulting
Total flow per shed	233.4	m^3/s	Calculated
	840,240	m^3/hr	Calculated

Table 13 Fans and ventilation rates for the sheds at Taradale

Parameter	Fan Type	Value	Units	Reference
Number of fans per shed	Small fans	1	Fans/Shed	Baiada
	Large fans	16		
Air flow per fan	Small fans	4.7	m^3/s	PSA Consulting
	Large fans	9.4		
Total flow per shed	All fans	155.1	m^3/s	Calculated
		558,360	m^3/hr	Calculated

Table 14 Fans and ventilation rates for the sheds at Gidley (all of Types 1-3)

Parameter	Fan Type	Value	Units	Reference
Number of fans per shed	Small fans	1	Fans/Shed	Baiada
	Large fans	12		
Air flow per fan	Small fans	10.4	m^3/s	PSA Consulting
	Large fans	12.7		
Total flow per shed	All fans	152.9	m^3/s	Calculated
		550,368	m^3/hr	Calculated

5.1.4 Bird harvesting regime

The bird harvesting regime used in the odour emissions model is presented in Table 15. The same regime was applied to both proposed and existing farms.

Table 15 Bird harvesting regime used in the odour emissions model

Harvest	Modelling details		
	Harvesting day	% harvested	Cumulative %
Harvest 1	31	20	20
Harvest 2	38	30	50
Harvest 3	44	30	80
Harvest 4	55	20	100

5.1.5 K-factor

The k-factor is a scaling factor used to account for the variation in odour emission rates between farms based on design and management practices. The higher the k-factor the greater the odour emission rate from the poultry shed.

A k-factor of 2.2 was assumed for all existing sheds included in the modelling assessment for conservatism. For the proposed sheds, results have been presented at both a k-factor of 2.2 and at a k-factor of 1.9. This is in accordance with the AgriFutures guideline, which states:

> *"It is recommended that when modelling a 'greenfield' site that will be operated to best management practice, a K-factor of no less than 1.9 should be used, as it represents the most recent test data from new farms"*

5.1.6 Additional assumptions

The odour emissions for each shed were configured assuming:

- 1-day old chicks are simultaneously placed in the sheds on January 1st to start the growth/clean-out cycles for the year for the proposed and existing sheds.
- Odour emissions were simulated from a "pseudo-stack" for each shed, which represent the odour emission rates and air ventilation rates from each of the sheds.

5.2 Dust emissions

The method used to determine dust emission rates from the proposed and existing sheds is presented below. As with odour emissions, dust emissions have been estimated using methods outlined in the AgriFutures guideline.

Dust emissions from poultry sheds are a function of:

- Bird numbers
- Bird age (days)

The emission rate of particulate matter less than 10 µm in diameter (PM_{10}) can be determined using the following equation:

$$D(PM_{10}) = 0.0367 \times A$$

Where:

$D(PM_{10})$ = maximum PM_{10} emissions at growth cycle age (mg/s/1000 birds)

A = bird age (days)

Particulate matter less than 2.5 µm in diameter ($PM_{2.5}$) was also deemed relevant for inclusion in the dust assessment. The ratio of 3.98:1 PM_{10}:$PM_{2.5}$ has been applied, as suggested in the AgriFutures guideline.

6. RESULTS

6.1 Dispersion modelling results

The following sections present predicted odour and dust results from dispersion modelling of the proposed Silverweir development. Odour results are presented for the proposed sheds in isolation and cumulatively, with contributions from the existing Taradale and Gidley farms included for all five model years. Dust results are presented for the proposed sheds in isolation and cumulatively, with contributions from the existing farms included as well as ambient background dust levels.

6.1.1 Odour – Proposed sheds at a K-factor of 2.2

Predicted ground-level concentrations of odour at discrete receptors due to the proposed farm in isolation are presented in Table 16, whilst ground level concentrations of odour due to the proposed and existing farms cumulatively are presented in Table 17. A conservative k-factor of 2.2 was applied to emissions for both the proposed and existing farms. The cumulative contour plots for each model year are presented in Plate 1 to Plate 5. The results show:

For the proposed 16-shed Silverweir development in isolation applying a k-factor of 2.2:

- Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.

For cumulative impacts of the proposed 16-shed Silverweir development and the existing Taradale and Gidley farms also applying a k-factor of 2.2:

- Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in the model years of 2019, 2020, 2022 and 2023.
- In the model year of 2021, predicted odour concentrations exceed the odour impact assessment criterion at one sensitive receptor (R38).

Table 16 Predicted ground-level concentrations of odour at sensitive receptors due to the proposed Silverweir sheds in isolation at a k-factor of 2.2

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R1	3.16	3.44	3.78	3.44	3.71
R2	1.72	2.09	1.44	2.22	1.87
R3	0.46	0.69	0.37	0.65	0.49
R4	0.42	0.61	0.34	0.63	0.40
R5	0.32	0.35	0.24	0.31	0.33
R6	0.57	0.47	0.51	0.48	0.48
R7	0.21	0.22	0.17	0.18	0.24
R8	0.15	0.16	0.15	0.13	0.14
R9	0.18	0.14	0.15	0.20	0.11
R10	0.28	0.13	0.16	0.19	0.15

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R11	0.44	0.29	0.27	0.37	0.27
R12	0.60	0.27	0.32	0.26	0.28
R13	0.45	0.22	0.31	0.21	0.29
R14	1.05	0.70	0.82	0.48	0.66
R15	0.49	0.26	0.34	0.31	0.40
R16	0.79	0.43	0.49	0.50	0.76
R17	0.48	0.26	0.34	0.33	0.41
R18	0.24	0.16	0.19	0.22	0.25
R19	0.44	0.24	0.37	0.38	0.36
R20	1.74	0.95	1.14	1.26	1.52
R21	1.33	0.84	1.12	1.38	1.12
R22	1.30	1.25	1.22	1.12	1.28
R23	1.40	1.67	1.35	1.08	1.08
R24	0.60	0.47	0.52	0.47	0.48
R25	0.98	1.05	1.04	0.91	0.82
R26	0.75	0.88	0.86	0.85	0.78
R27	0.89	1.10	1.19	1.04	1.06
R28	0.79	1.16	1.05	0.95	1.21
R29	1.68	1.93	1.47	1.38	2.15
R30	1.68	1.10	1.37	1.21	1.71
R31	2.15	1.33	1.94	1.53	1.71
R32	1.13	0.63	0.53	0.58	0.70
R33	2.09	1.41	1.51	1.53	1.47
R34	2.17	1.55	1.27	1.55	1.56
R35	2.84	1.92	2.42	2.20	2.64
R36	4.24	2.54	2.30	2.54	2.70
R37	3.42	2.67	3.01	2.68	3.61
R38	4.56	4.17	4.64	3.39	4.29
R39	1.19	1.86	1.46	1.17	1.72
R40	1.73	1.03	1.23	0.92	1.16
R41	3.79	2.53	2.36	2.86	2.29
R42	2.45	1.95	2.28	2.01	2.73
R43	3.66	3.52	3.83	2.82	3.90
R44	1.05	0.82	0.86	0.94	0.81
Maximum	**4.56**	**4.17**	**4.64**	**3.44**	**4.29**
Odour criterion	**5 OU**				

Table 17 **Predicted ground-level concentrations of odour at sensitive receptors due to proposed and existing sheds at a k-factor of 2.2**

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R1	3.64	3.91	4.20	3.81	4.33
R2	2.57	2.59	2.33	2.54	2.70
R3	1.35	1.44	1.27	1.58	1.54
R4	1.21	1.37	1.13	1.39	1.33
R5	1.12	1.17	0.90	1.31	1.31
R6	1.37	1.52	1.47	1.54	1.65
R7	0.55	0.59	0.59	0.70	0.63
R8	0.42	0.38	0.32	0.45	0.41
R9	0.38	0.38	0.29	0.46	0.35
R10	0.49	0.35	0.37	0.52	0.37
R11	1.07	0.86	0.84	0.97	0.95
R12	1.26	0.76	0.83	0.98	0.89
R13	0.99	0.66	0.85	0.76	0.90
R14	4.41	3.34	3.63	3.43	3.92
R15	1.39	1.01	1.16	1.31	1.33
R16	2.85	2.06	2.47	2.53	2.95
R17	1.84	1.12	1.24	1.30	1.55
R18	0.90	0.56	0.55	0.77	0.88
R19	1.95	1.21	1.19	1.36	1.58
R20	4.18	3.0	3.47	3.17	3.67
R21	4.42	3.77	4.43	3.45	3.56
R22	3.04	2.46	2.72	2.16	3.08
R23	3.00	2.40	2.48	2.04	2.73
R24	1.72	1.46	1.63	1.31	1.47
R25	2.67	2.71	2.28	2.30	2.71
R26	2.13	2.33	2.06	2.1	2.35
R27	2.79	2.33	2.45	2.62	3.12
R28	2.19	2.11	2.05	2.23	2.61
R29	2.21	2.37	2.16	2.06	2.81
R30	2.19	1.61	2.0	1.85	2.32
R31	2.45	1.88	2.57	1.96	2.46
R32	1.16	0.76	0.78	0.71	0.86
R33	2.54	1.84	1.98	1.82	2.02
R34	2.45	1.93	1.64	1.83	1.97
R35	3.35	2.40	3.01	2.91	3.33

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R36	4.54	2.72	2.99	3.32	3.1
R37	3.84	3.02	3.71	3.09	4.13
R38	4.96	4.58	**5.19**	3.80	4.98
R39	1.97	2.24	2.12	1.64	2.28
R40	1.86	1.31	1.52	1.29	1.63
R41	4.08	2.83	2.89	3.25	2.79
R42	2.80	2.26	2.77	2.30	3.08
R43	4.20	4.05	4.24	3.12	4.45
R44	2.55	2.47	2.71	2.31	2.39
Maximum	**4.96**	**4.58**	**5.19**	**3.81**	**4.98**
Odour criterion	**5 OU**				

6.1.2 Odour – Proposed sheds at a K-factor of 1.9

Additional modelling was undertaken with the purpose of applying a k-factor of 1.9 to emissions from the proposed farm, being a representative factor for greenfield farms that will be operated using best practice management (McGahan, Wiedemann and Galvin, 2021). The predicted ground-level concentrations of odour at discrete receptors due to the proposed farm in isolation are presented in Table 18, whilst ground level concentrations of odour due to the proposed farm and existing farms cumulatively are presented in Table 19. The cumulative contour plots for each model year are presented in Plate 6 to Plate 10. The results show:

For the proposed 16-shed Silverweir development in isolation applying a k-factor of 1.9:

- Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.

For cumulative impacts of the proposed 16-shed Silverweir development applying a k-factor of 1.9 and the existing Taradale and Gidley farms applying a k-factor of 2.2:

- Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.

Table 18 Predicted ground-level concentrations of odour at sensitive receptors due to proposed sheds in isolation at a k-factor of 1.9

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R1	2.73	2.97	3.26	2.97	3.21
R2	1.49	1.81	1.24	1.92	1.62
R3	0.39	0.60	0.32	0.56	0.42
R4	0.36	0.53	0.29	0.55	0.34
R5	0.27	0.30	0.21	0.26	0.29
R6	0.49	0.40	0.44	0.41	0.42

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R7	0.18	0.19	0.15	0.16	0.20
R8	0.13	0.13	0.13	0.11	0.12
R9	0.16	0.12	0.13	0.17	0.10
R10	0.24	0.11	0.13	0.17	0.13
R11	0.38	0.25	0.23	0.32	0.24
R12	0.52	0.23	0.27	0.22	0.24
R13	0.39	0.19	0.27	0.18	0.25
R14	0.91	0.60	0.71	0.41	0.57
R15	0.43	0.22	0.29	0.27	0.35
R16	0.68	0.37	0.43	0.43	0.66
R17	0.42	0.22	0.29	0.29	0.36
R18	0.21	0.14	0.16	0.19	0.21
R19	0.38	0.21	0.32	0.33	0.31
R20	1.50	0.82	0.98	1.09	1.32
R21	1.14	0.73	0.97	1.19	0.97
R22	1.12	1.08	1.05	0.97	1.10
R23	1.21	1.44	1.17	0.93	0.93
R24	0.51	0.41	0.45	0.41	0.41
R25	0.84	0.91	0.90	0.79	0.71
R26	0.65	0.76	0.74	0.73	0.67
R27	0.77	0.95	1.02	0.89	0.92
R28	0.68	1.00	0.91	0.82	1.04
R29	1.45	1.66	1.27	1.19	1.85
R30	1.45	0.95	1.18	1.04	1.48
R31	1.86	1.15	1.68	1.32	1.47
R32	0.97	0.54	0.46	0.50	0.61
R33	1.80	1.22	1.30	1.32	1.27
R34	1.88	1.34	1.10	1.34	1.35
R35	2.45	1.66	2.09	1.90	2.28
R36	3.66	2.19	1.98	2.19	2.33
R37	2.95	2.31	2.60	2.31	3.12
R38	3.94	3.60	4.01	2.93	3.70
R39	1.03	1.61	1.26	1.01	1.49
R40	1.50	0.89	1.06	0.80	1.00
R41	3.28	2.18	2.04	2.47	1.97
R42	2.11	1.69	1.97	1.74	2.36
R43	3.16	3.04	3.31	2.43	3.36

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R44	0.91	0.71	0.75	0.81	0.70
Maximum	**3.94**	**3.60**	**4.01**	**2.97**	**3.70**
Odour criterion	**5 OU**				

Table 19 Predicted ground-level concentrations of odour at sensitive receptors due to proposed sheds at a k-factor of 1.9 and existing sheds at a k-factor of 2.2

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R1	3.34	3.43	3.71	3.31	3.82
R2	2.41	2.34	2.15	2.28	2.48
R3	1.33	1.34	1.22	1.54	1.49
R4	1.17	1.28	1.08	1.37	1.30
R5	1.1	1.15	0.89	1.24	1.29
R6	1.35	1.45	1.41	1.49	1.59
R7	0.55	0.58	0.57	0.70	0.61
R8	0.39	0.36	0.29	0.43	0.38
R9	0.36	0.36	0.27	0.42	0.33
R10	0.46	0.34	0.35	0.49	0.35
R11	0.98	0.85	0.8	0.93	0.90
R12	1.18	0.74	0.77	0.91	0.87
R13	0.97	0.63	0.84	0.76	0.85
R14	4.28	3.27	3.59	3.32	3.82
R15	1.35	0.98	1.12	1.25	1.27
R16	2.77	1.97	2.39	2.44	2.91
R17	1.76	1.08	1.18	1.27	1.48
R18	0.86	0.54	0.52	0.74	0.83
R19	1.85	1.18	1.15	1.32	1.53
R20	3.97	2.92	3.46	3.09	3.35
R21	4.18	3.69	4.16	3.33	3.54
R22	3.00	2.36	2.54	2.08	3.03
R23	2.8	2.3	2.38	1.90	2.59
R24	1.68	1.45	1.52	1.25	1.39
R25	2.46	2.63	2.19	2.19	2.67
R26	1.98	2.26	1.94	1.91	2.15
R27	2.68	2.24	2.39	2.56	2.94
R28	2.12	1.98	1.95	2.13	2.37
R29	2.07	2.15	2.00	1.96	2.55

Receptor ID	99th percentile, nose response time average odour concentrations (OU)				
	2019	2020	2021	2022	2023
R30	1.98	1.44	1.77	1.68	2.10
R31	2.24	1.66	2.35	1.74	2.32
R32	1.01	0.66	0.70	0.68	0.78
R33	2.36	1.62	1.74	1.65	1.86
R34	2.12	1.69	1.51	1.59	1.74
R35	3.00	2.21	2.71	2.59	3.10
R36	4.03	2.41	2.77	3.04	2.71
R37	3.37	2.71	3.23	2.69	3.62
R38	4.34	4.06	4.52	3.34	4.34
R39	1.00	2.08	1.86	1.50	2.11
R40	1.68	1.15	1.37	1.15	1.45
R41	3.62	2.48	2.66	2.89	2.51
R42	2.53	1.98	2.46	2.03	2.71
R43	3.67	3.59	3.73	2.74	3.90
R44	2.49	2.43	2.61	2.27	2.30
Maximum	**4.34**	**4.06**	**4.52**	**3.34**	**4.34**
Odour criterion	**5 OU**				

6.1.3 Dust

Predicted ground-level concentrations of $PM_{2.5}$ and PM_{10} at discrete receptors due to the proposed Silverweir development in isolation are presented in Table 20 and Table 21 respectively.

Results show that:

- Predicted 24-hour and annual average ground-level concentrations of $PM_{2.5}$ due to the proposed Silverweir development in isolation are at most 5.8% and 1.2% of the relevant impact assessment criteria respectively.
- Predicted 24-hour and annual average ground-level concentrations of PM_{10} due to the proposed Silverweir development in isolation are at most 11.6% and 1.5% of the relevant impact assessment criteria respectively.

A contemporaneous assessment has been undertaken to determine if the small contribution of dust from the proposed Silverweir development in isolation resulted in any additional days of exceedances for $PM_{2.5}$ and PM_{10}, other than those already predicted in background levels (from monitoring at the NSW DCCEEW's Tamworth air quality monitoring station combined with the contribution from the existing Taradale and Gidley farms). Background exceedances are summarised in Section B1.1 of Appendix B. Table 22 and Table 23 present the exceedance day summaries for $PM_{2.5}$ and PM_{10} respectively for the cumulative proposed Silverweir development and background dust. Results of the contemporaneous assessment shows:

- For $PM_{2.5}$:
    - The contribution of the proposed Silverweir development with background dust results in one additional exceedance day at R14 in the model year of 2019. On this day, the background 24-hour average $PM_{2.5}$ level was elevated at 24.97 $\mu g/m^3$. The contribution from the proposed farm in isolation at R14 on this day was marginal, at 0.07 $\mu g/m^3$. A detailed breakdown of $PM_{2.5}$ results at R14 for 2019 is presented in Section B1.2 of Appendix B.
    - No other additional exceedances are predicted in other model years due to the contribution from the proposed Silverweir development.
- For PM_{10}
    - No additional exceedances are predicted in all model years due to the contribution from the proposed Silverweir development.

Table 20 Predicted ground-level concentrations of $PM_{2.5}$ at sensitive receptors due to the proposed sheds in isolation

Receptor ID	Ground-level concentrations of $PM_{2.5}$ (µg/m^3)									
	2019		2020		2021		2022		2023	
	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average
R1	0.79	0.07	0.74	0.07	1.06	0.08	0.69	0.07	0.67	0.08
R2	0.31	0.03	0.72	0.03	0.47	0.03	0.59	0.04	0.63	0.04
R3	0.28	0.01	0.45	0.01	0.19	0.01	0.37	0.01	0.29	0.01
R4	0.27	0.01	0.32	0.01	0.17	0.01	0.37	0.01	0.26	0.01
R5	0.20	0.01	0.18	0.01	0.18	0.00	0.43	0.01	0.12	0.01
R6	0.30	0.01	0.37	0.01	0.32	0.01	0.27	0.01	0.23	0.01
R7	0.20	0.00	0.15	0.00	0.10	0.00	0.20	0.00	0.08	0.00
R8	0.13	0.00	0.11	0.00	0.21	0.00	0.10	0.00	0.12	0.00
R9	0.32	0.00	0.15	0.00	0.35	0.00	0.09	0.00	0.26	0.00
R10	0.11	0.00	0.50	0.00	0.19	0.00	0.11	0.00	0.11	0.00
R11	0.23	0.01	0.34	0.01	0.18	0.01	0.20	0.01	0.23	0.01
R12	0.35	0.01	0.18	0.01	0.27	0.01	0.16	0.01	0.35	0.01
R13	0.43	0.01	0.19	0.00	0.25	0.01	0.18	0.00	0.12	0.01
R14	1.02	0.02	0.49	0.01	1.46	0.02	0.36	0.01	0.36	0.01
R15	0.74	0.01	0.19	0.00	0.43	0.01	0.24	0.01	0.33	0.01
R16	0.69	0.01	0.40	0.01	0.71	0.01	0.56	0.01	0.48	0.01
R17	0.39	0.01	0.23	0.01	0.26	0.01	0.29	0.01	0.30	0.01
R18	0.31	0.00	0.32	0.00	0.15	0.00	0.22	0.01	0.11	0.00
R19	0.28	0.01	0.20	0.01	0.24	0.01	0.24	0.01	0.27	0.01
R20	0.52	0.03	0.50	0.02	0.66	0.02	0.90	0.03	1.05	0.03

Receptor ID	Ground-level concentrations of $PM_{2.5}$ (µg/m^3)									
	2019		2020		2021		2022		2023	
	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average
R21	0.59	0.03	0.80	0.02	0.77	0.03	0.69	0.02	0.49	0.02
R22	0.45	0.03	0.40	0.03	0.48	0.02	0.57	0.02	0.35	0.02
R23	0.45	0.02	0.55	0.03	0.41	0.02	0.47	0.02	0.39	0.02
R24	0.19	0.01	0.40	0.01	0.21	0.01	0.40	0.01	0.13	0.01
R25	0.23	0.01	0.47	0.02	0.35	0.02	0.31	0.02	0.33	0.01
R26	0.19	0.01	0.42	0.02	0.37	0.02	0.30	0.01	0.33	0.01
R27	0.25	0.01	0.35	0.02	0.43	0.02	0.36	0.02	0.38	0.02
R28	0.18	0.01	0.52	0.02	0.38	0.02	0.34	0.02	0.27	0.02
R29	0.89	0.02	0.80	0.03	0.45	0.03	0.76	0.02	0.87	0.03
R30	0.64	0.02	0.48	0.02	0.48	0.02	0.51	0.02	0.41	0.02
R31	0.68	0.03	0.46	0.02	0.70	0.03	0.46	0.02	0.47	0.03
R32	0.36	0.01	0.22	0.01	0.29	0.01	0.32	0.01	0.17	0.01
R33	0.66	0.03	0.32	0.02	0.53	0.03	0.56	0.03	0.48	0.03
R34	0.49	0.03	0.36	0.02	0.41	0.02	0.80	0.03	0.40	0.03
R35	1.05	0.04	0.58	0.03	0.88	0.04	0.80	0.04	0.55	0.04
R36	1.07	0.05	0.54	0.04	0.65	0.04	1.10	0.05	0.76	0.05
R37	0.66	0.06	0.51	0.05	0.62	0.06	0.43	0.05	1.25	0.07
R38	0.97	0.09	1.10	0.09	0.97	0.09	0.64	0.07	1.08	0.10
R39	0.34	0.02	0.56	0.03	0.49	0.03	0.67	0.02	0.51	0.03
R40	0.61	0.02	0.27	0.02	0.36	0.02	0.39	0.02	0.37	0.02
R41	1.14	0.05	0.56	0.04	0.53	0.04	1.16	0.04	0.77	0.04
R42	0.48	0.05	0.40	0.03	0.45	0.04	0.38	0.04	0.80	0.05

Receptor ID	Ground-level concentrations of $PM_{2.5}$ (µg/m^3)									
	2019		2020		2021		2022		2023	
	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average
R43	0.67	0.07	0.92	0.07	0.79	0.06	0.46	0.05	1.09	0.07
R44	0.38	0.02	0.35	0.01	0.44	0.02	0.29	0.01	0.35	0.02
Maximum	**1.14**	**0.09**	**1.10**	**0.09**	**1.46**	**0.09**	**1.16**	**0.07**	**1.25**	**0.10**
Criterion (µg/m^3)	**25**	**8**	**25**	**8**	**25**	**8**	**25**	**8**	**25**	**8**

Table 21 Predicted ground-level concentrations of PM_{10} at sensitive receptors due to the proposed sheds in isolation

Receptor ID	Ground-level concentrations of PM_{10} (µg/m^3)									
	2019		2020		2021		2022		2023	
	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average
R1	3.16	0.27	2.95	0.29	4.20	0.30	2.74	0.30	2.67	0.30
R2	1.24	0.11	2.86	0.13	1.87	0.11	2.33	0.17	2.51	0.15
R3	1.11	0.03	1.79	0.05	0.75	0.03	1.48	0.05	1.14	0.04
R4	1.10	0.03	1.28	0.04	0.68	0.02	1.48	0.05	1.02	0.03
R5	0.80	0.02	0.71	0.02	0.69	0.02	1.73	0.03	0.49	0.03
R6	1.18	0.05	1.48	0.04	1.25	0.05	1.06	0.04	0.90	0.04
R7	0.80	0.01	0.58	0.02	0.40	0.01	0.79	0.01	0.31	0.02
R8	0.53	0.01	0.44	0.01	0.83	0.01	0.40	0.01	0.49	0.01
R9	1.27	0.01	0.62	0.01	1.39	0.01	0.36	0.01	1.02	0.01
R10	0.45	0.02	1.99	0.02	0.75	0.01	0.45	0.01	0.45	0.01

Receptor ID	Ground-level concentrations of PM_{10} (µg/m^3)									
	2019		2020		2021		2022		2023	
	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average
R11	0.93	0.03	1.36	0.03	0.71	0.03	0.82	0.03	0.90	0.02
R12	1.38	0.04	0.73	0.02	1.07	0.03	0.64	0.02	1.40	0.03
R13	1.72	0.03	0.75	0.02	0.99	0.03	0.71	0.02	0.48	0.02
R14	4.05	0.08	1.96	0.06	5.82	0.09	1.43	0.04	1.44	0.06
R15	2.96	0.04	0.77	0.02	1.71	0.03	0.94	0.03	1.32	0.03
R16	2.74	0.06	1.60	0.04	2.81	0.05	2.23	0.06	1.91	0.06
R17	1.54	0.04	0.92	0.02	1.05	0.03	1.14	0.03	1.19	0.03
R18	1.25	0.02	1.29	0.02	0.59	0.02	0.87	0.02	0.45	0.02
R19	1.10	0.04	0.81	0.03	0.96	0.03	0.97	0.03	1.07	0.03
R20	2.07	0.12	2.00	0.08	2.63	0.10	3.60	0.11	4.18	0.14
R21	2.33	0.10	3.17	0.08	3.07	0.11	2.75	0.10	1.95	0.09
R22	1.80	0.10	1.61	0.10	1.91	0.10	2.28	0.08	1.40	0.08
R23	1.81	0.08	2.18	0.10	1.62	0.10	1.86	0.08	1.57	0.08
R24	0.76	0.04	1.59	0.04	0.83	0.04	1.59	0.04	0.54	0.03
R25	0.91	0.05	1.88	0.07	1.41	0.07	1.24	0.06	1.33	0.06
R26	0.77	0.04	1.68	0.06	1.49	0.06	1.19	0.06	1.30	0.05
R27	0.99	0.05	1.40	0.06	1.72	0.07	1.45	0.07	1.50	0.07
R28	0.70	0.04	2.05	0.06	1.49	0.07	1.37	0.06	1.09	0.06
R29	3.56	0.09	3.19	0.10	1.78	0.11	3.01	0.09	3.49	0.11
R30	2.55	0.09	1.90	0.07	1.93	0.09	2.04	0.08	1.63	0.10
R31	2.71	0.11	1.84	0.08	2.78	0.10	1.85	0.10	1.88	0.11
R32	1.43	0.05	0.88	0.04	1.16	0.04	1.26	0.04	0.67	0.05

Receptor ID	Ground-level concentrations of PM_{10} (µg/m^3)									
	2019		2020		2021		2022		2023	
	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average	24-hour average	Annual average
R33	2.62	0.12	1.28	0.09	2.10	0.10	2.24	0.11	1.90	0.10
R34	1.96	0.11	1.42	0.09	1.64	0.09	3.17	0.11	1.60	0.10
R35	4.18	0.17	2.31	0.12	3.51	0.15	3.18	0.14	2.20	0.17
R36	4.25	0.21	2.15	0.16	2.57	0.17	4.35	0.19	3.02	0.18
R37	2.63	0.25	2.05	0.20	2.46	0.23	1.72	0.20	4.96	0.29
R38	3.86	0.36	4.41	0.35	3.87	0.34	2.56	0.29	4.30	0.38
R39	1.35	0.07	2.23	0.11	1.93	0.11	2.66	0.09	2.02	0.10
R40	2.45	0.09	1.08	0.06	1.42	0.08	1.56	0.07	1.47	0.08
R41	4.55	0.19	2.25	0.14	2.10	0.16	4.60	0.18	3.05	0.16
R42	1.90	0.18	1.60	0.14	1.78	0.17	1.50	0.15	3.18	0.21
R43	2.66	0.26	3.66	0.27	3.15	0.26	1.83	0.21	4.32	0.29
R44	1.53	0.07	1.38	0.06	1.76	0.07	1.17	0.06	1.39	0.06
Maximum	**4.55**	**0.36**	**4.41**	**0.35**	**5.82**	**0.34**	**4.60**	**0.30**	**4.96**	**0.38**
Criterion (µg/m^3)	**50**	**25**	**50**	**25**	**50**	**25**	**50**	**25**	**50**	**25**

Table 22 Contemporaneous assessment - additional exceedance day summary for $PM_{2.5}$

Receptor ID	$PM_{2.5}$ – Number of exceedance days (additional days due to the proposed Silverweir development contribution)				
	2019	2020	2021	2022	2023
R1	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R2	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R3	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R4	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R5	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R6	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R7	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R8	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R9	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R10	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R11	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R12	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R13	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R14	35 (1)	4 (0)	0 (0)	0 (0)	0 (0)
R15	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R16	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R17	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R18	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R19	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R20	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R21	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R22	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R23	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R24	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R25	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R26	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R27	35 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R28	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R29	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R30	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R31	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R32	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R33	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R34	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R35	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)

Receptor ID	$PM_{2.5}$ – Number of exceedance days (additional days due to the proposed Silverweir development contribution)				
	2019	2020	2021	2022	2023
R36	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R37	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R38	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R39	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R40	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R41	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R42	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R43	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)
R44	34 (0)	4 (0)	0 (0)	0 (0)	0 (0)

Table 23 Contemporaneous assessment - additional exceedance day summary for PM_{10}

Receptor ID	PM_{10}– Number of exceedance days (additional days due to proposed and existing farms)				
	2019	2020	2021	2022	2023
R1	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R2	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R3	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R4	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R5	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R6	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R7	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R8	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R9	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R10	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R11	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R12	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R13	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R14	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R15	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R16	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R17	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R18	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R19	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R20	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R21	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R22	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)

Receptor ID	PM_{10}– Number of exceedance days (additional days due to proposed and existing farms)				
	2019	2020	2021	2022	2023
R23	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R24	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R25	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R26	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R27	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R28	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R29	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R30	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R31	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R32	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R33	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R34	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R35	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R36	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R37	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R38	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R39	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R40	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R41	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R42	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R43	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)
R44	50 (0)	8 (0)	0 (0)	0 (0)	0 (0)

7. CONCLUSIONS

Katestone Environmental Pty Ltd was commissioned by [redacted] on behalf of Baiada Poultry Pty Ltd to complete an odour and dust impact assessment of the proposed Silverweir Poultry Development located in Appleby near Tamworth, NSW.

Dispersion modelling has been conducted using the regulatory dispersion model CALPUFF for five years of modelled meteorological data (2019 - 2023). Ground-level concentrations of odour and dust associated with proposed Silverweir development have been predicted at nearby sensitive receptors and across a Cartesian grid of receptors. A cumulative assessment has been undertaken including background odour emissions from the existing nearby Taradale and Gidley poultry farms, and background dust emissions from the existing farms with ambient monitoring data from the NSW DCCEEW's Tamworth air quality monitoring station.

Results of the odour impact assessment have been compared against the relevant odour impact assessment criterion specified in the Approved Methods for Modelling. The odour assessment has shown that:

- For the proposed 16-shed Silverweir development in isolation applying a k-factor of 2.2:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.
- For the proposed 16-shed Silverweir development in isolation applying a k-factor of 1.9:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.
- For cumulative impacts of the proposed 16-shed Silverweir development and the existing Taradale and Gidley farms applying a k-factor of 2.2 to all farms:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in the model years of 2019, 2020, 2022 and 2023.
    - In the model year of 2021, predicted odour concentrations exceed the odour impact assessment criterion at one sensitive receptor (R38).
- For cumulative impacts of the proposed 16-shed Silverweir development applying a k-factor of 1.9 and the existing Taradale and Gidley farms applying a k-factor of 2.2:
    - Predicted ground-level concentrations of odour comply with the odour impact assessment criterion at all sensitive receptors in all five model years.

Results of the dust impact assessment have been compared against the relevant $PM_{2.5}$ and PM_{10} impact assessment criteria specified in the Approved Methods for Modelling. The dust assessment has shown that:

- Predicted 24-hour and annual average ground-level concentrations of $PM_{2.5}$ due to the proposed Silverweir development in isolation are at most 5.8% and 1.2% of the relevant impact assessment criteria respectively.
- Predicted 24-hour and annual average ground-level concentrations of PM_{10} due to the proposed Silverweir development in isolation are at most 11.6% and 1.5% of the relevant impact assessment criteria respectively.
- A contemporaneous assessment combining modelled results with observed ambient dust levels showed that an additional exceedance day at one sensitive receptor was predicted for $PM_{2.5}$ for the model year of 2019. The modelled contribution at the relevant receptors due to the proposed Silverweir development was 0.07 $\mu g/m^3$ on this day. An elevated background level was the primary cause for the exceedance, likely caused by widespread smoke impacts from bushfires.

The assessment has demonstrated that the proposed Silverweir development is unlikely to cause adverse odour and dust impacts.

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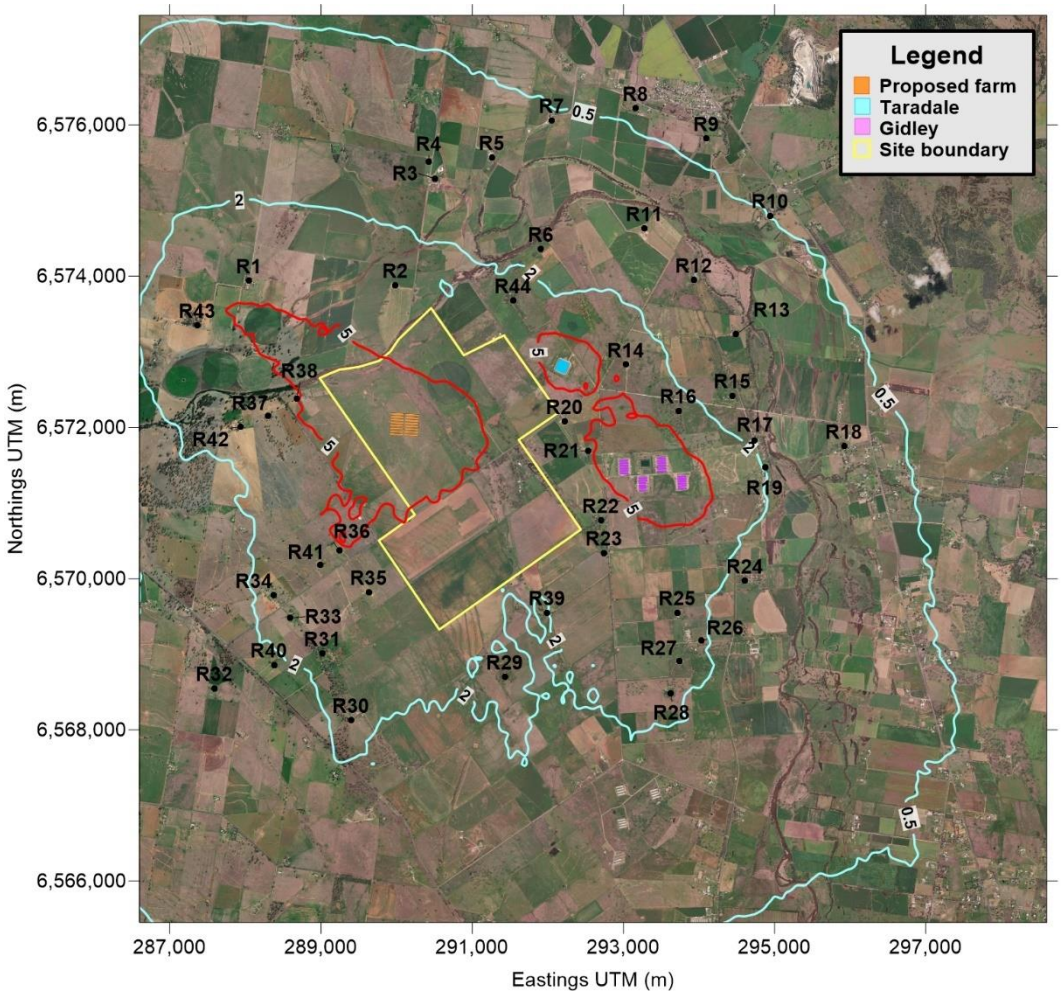

Plate 1 **2019 predicted ground-level concentrations of odour: Proposed 16 shed farm and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

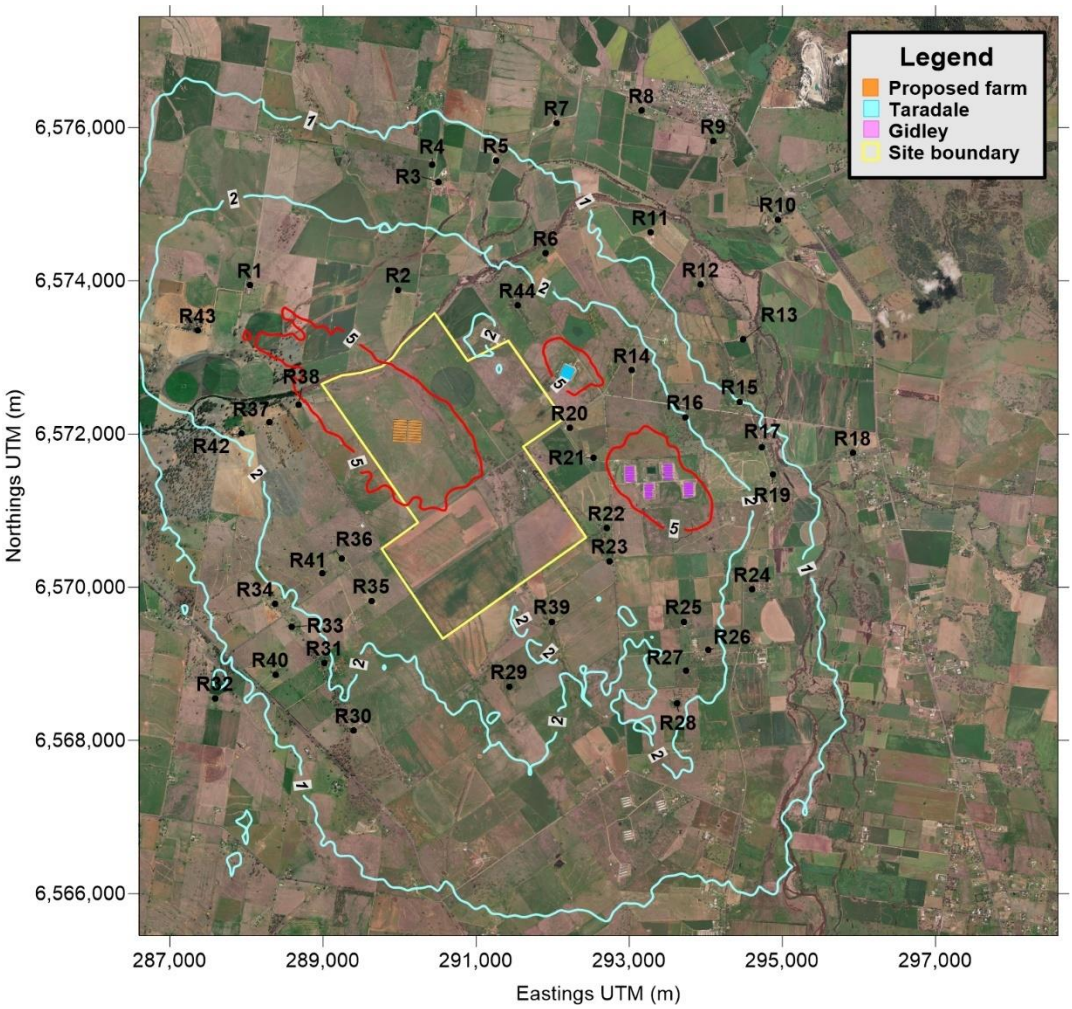

Plate 2 **2020 predicted ground-level concentrations of odour: Proposed 16 shed farm and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

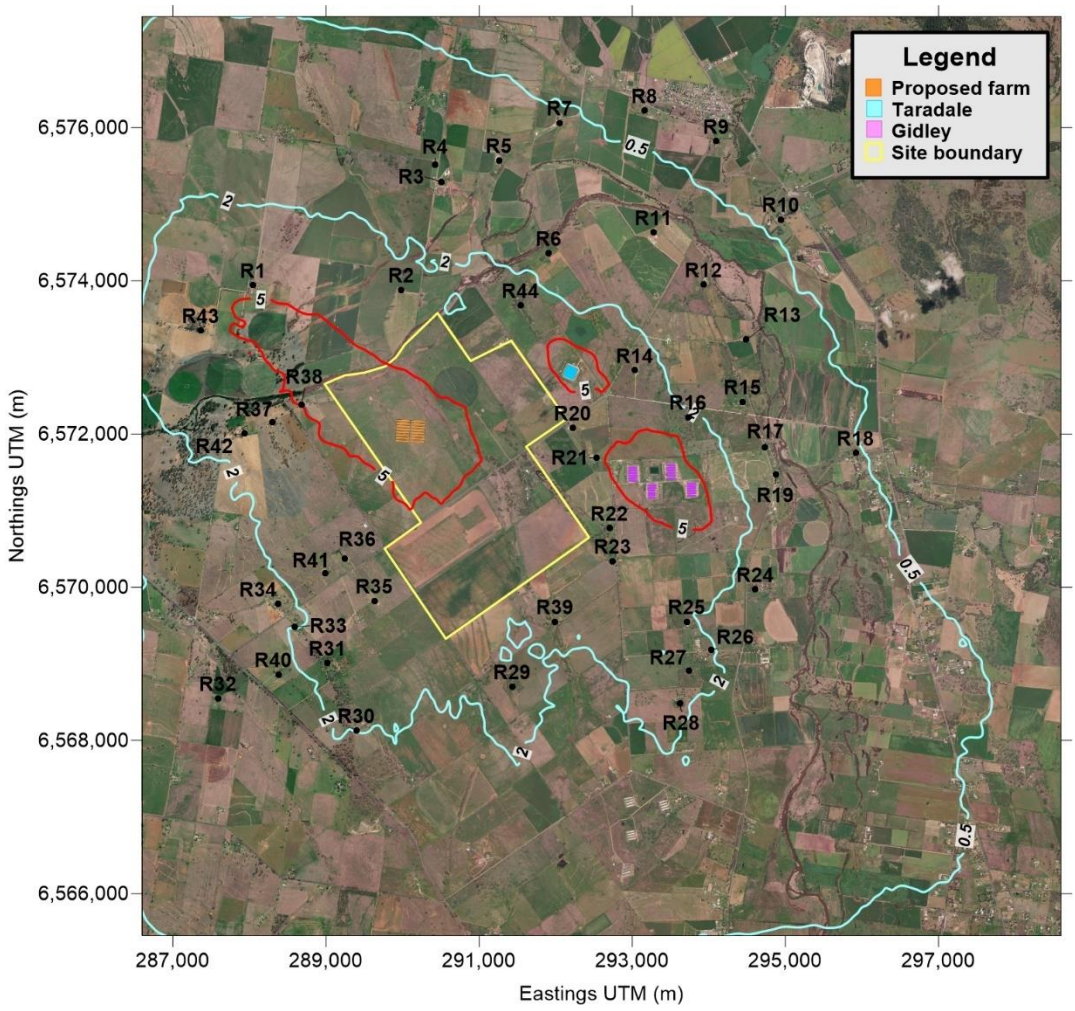

Plate 3 **2021 predicted ground-level concentrations of odour: Proposed 16 shed farm and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

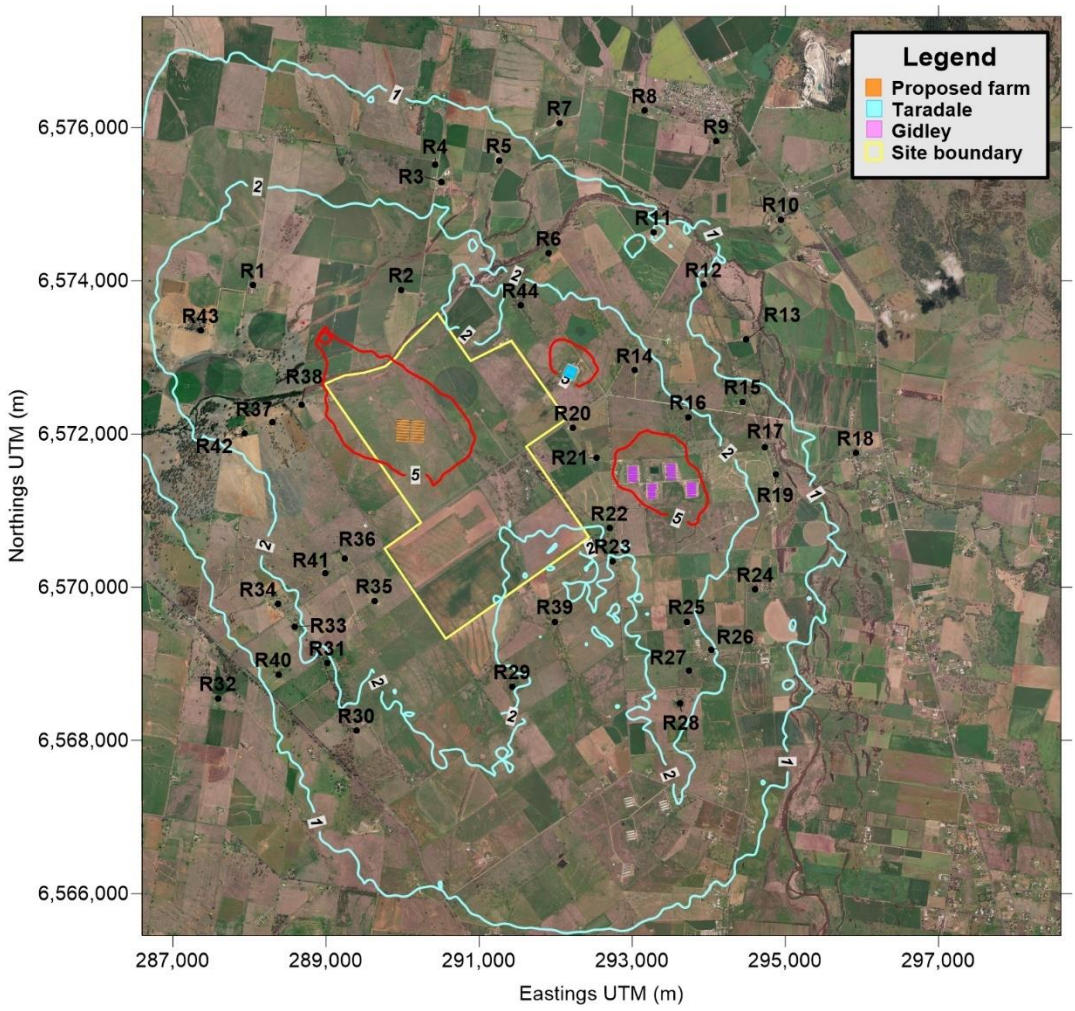

Plate 4 **2022 predicted ground-level concentrations of odour: Proposed 16 shed farm and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

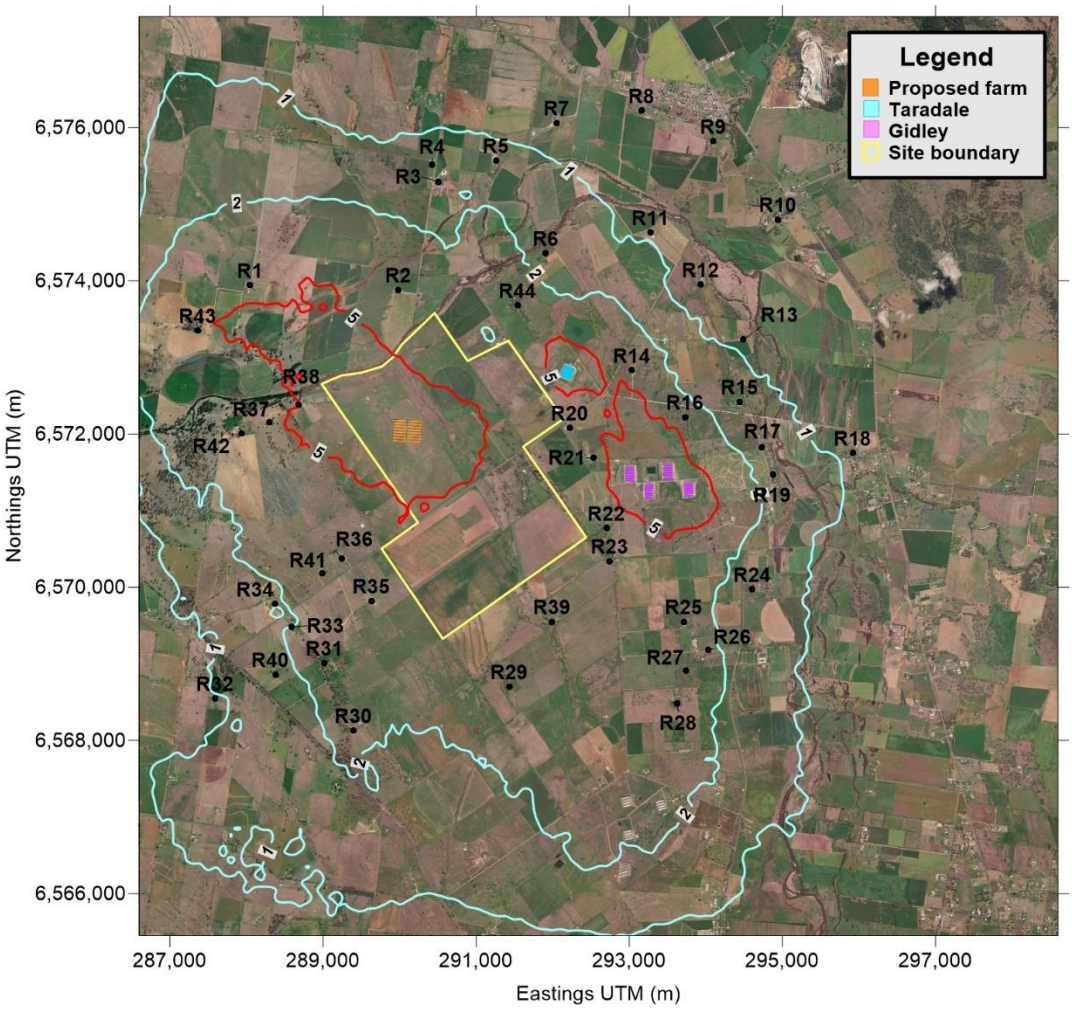

Plate 5 **2023 predicted ground-level concentrations of odour: Proposed 16 shed farm and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

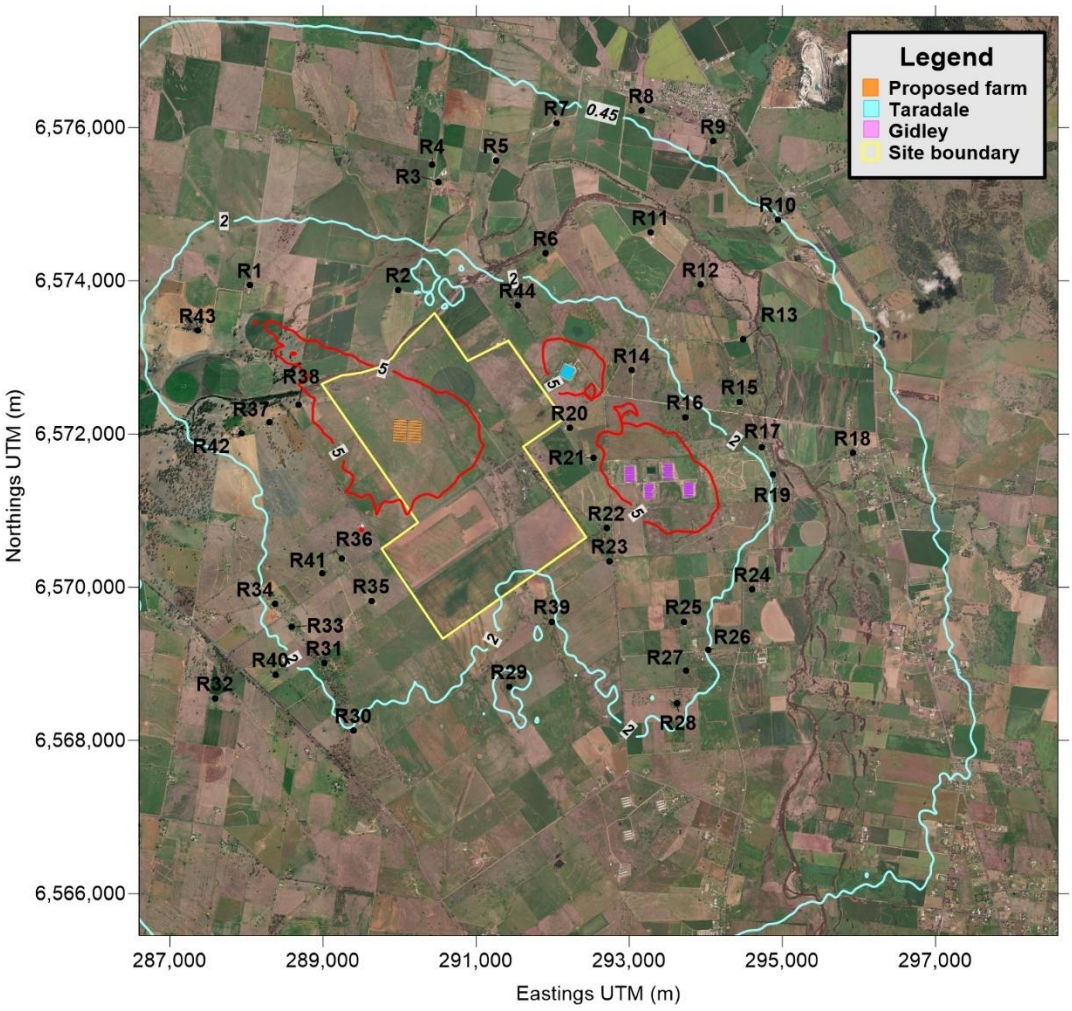

Plate 6 **2019 predicted ground-level concentrations of odour: Proposed 16 shed farm at a k-factor of 1.9 and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

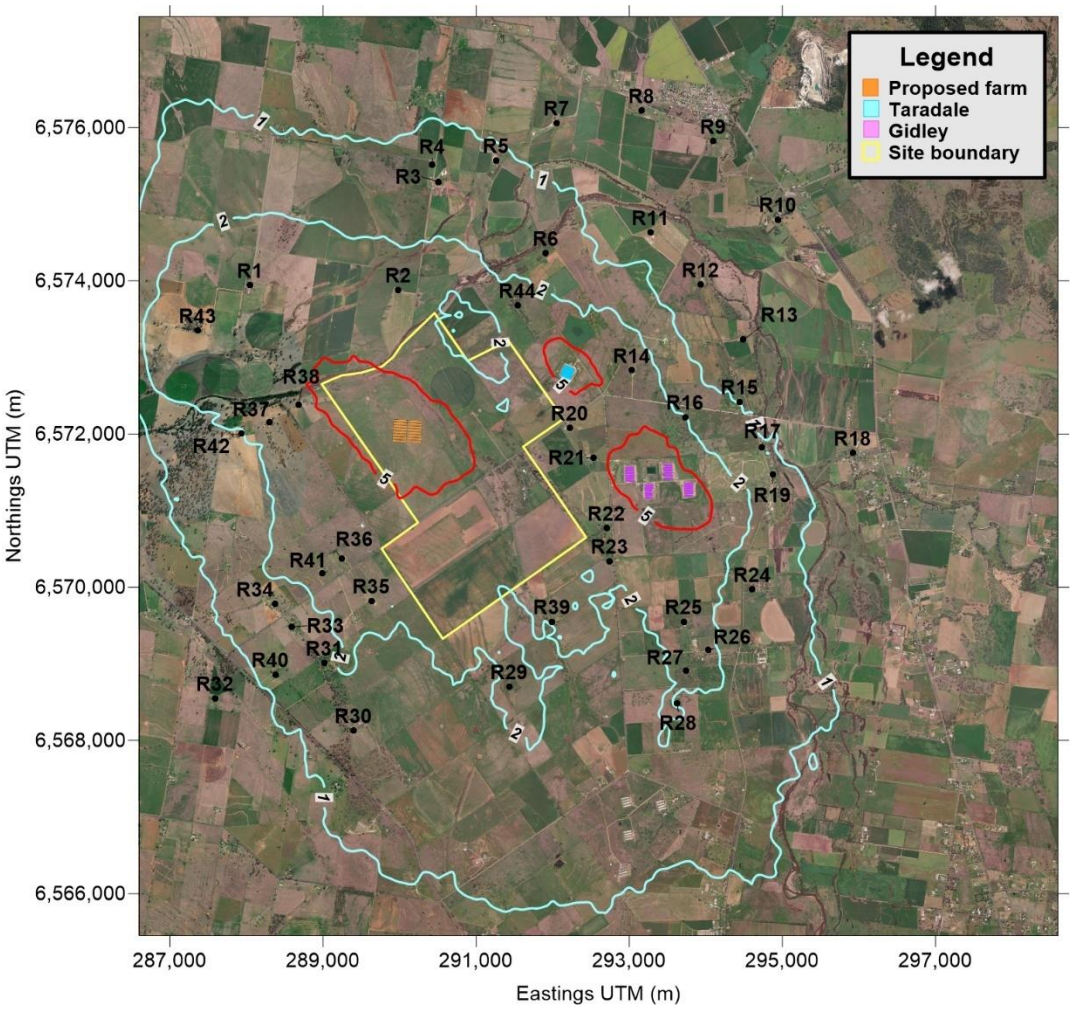

Plate 7 **2020 predicted ground-level concentrations of odour: Proposed 16 shed farm at a k-factor of 1.9 and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

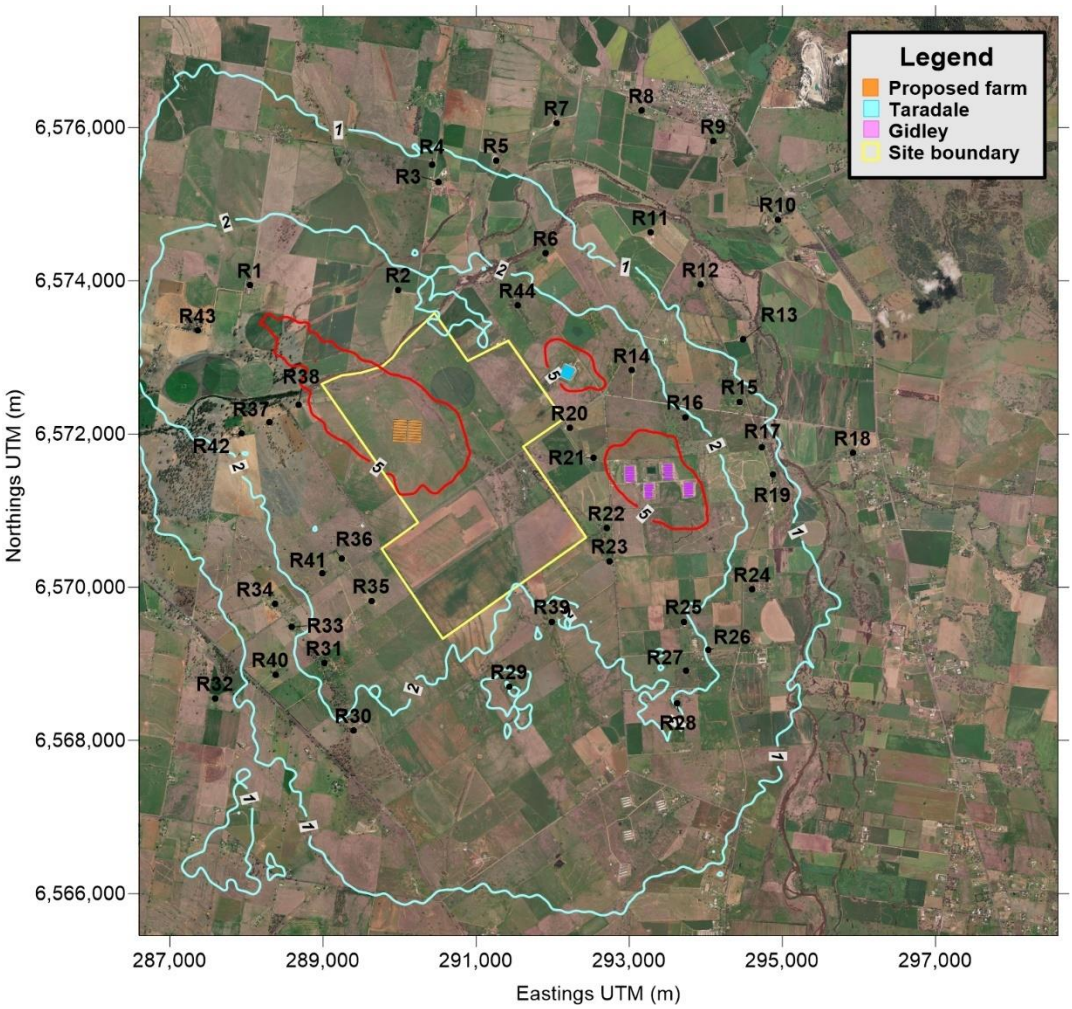

Plate 8 **2021 predicted ground-level concentrations of odour: Proposed 16 shed farm at a k-factor of 1.9 and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

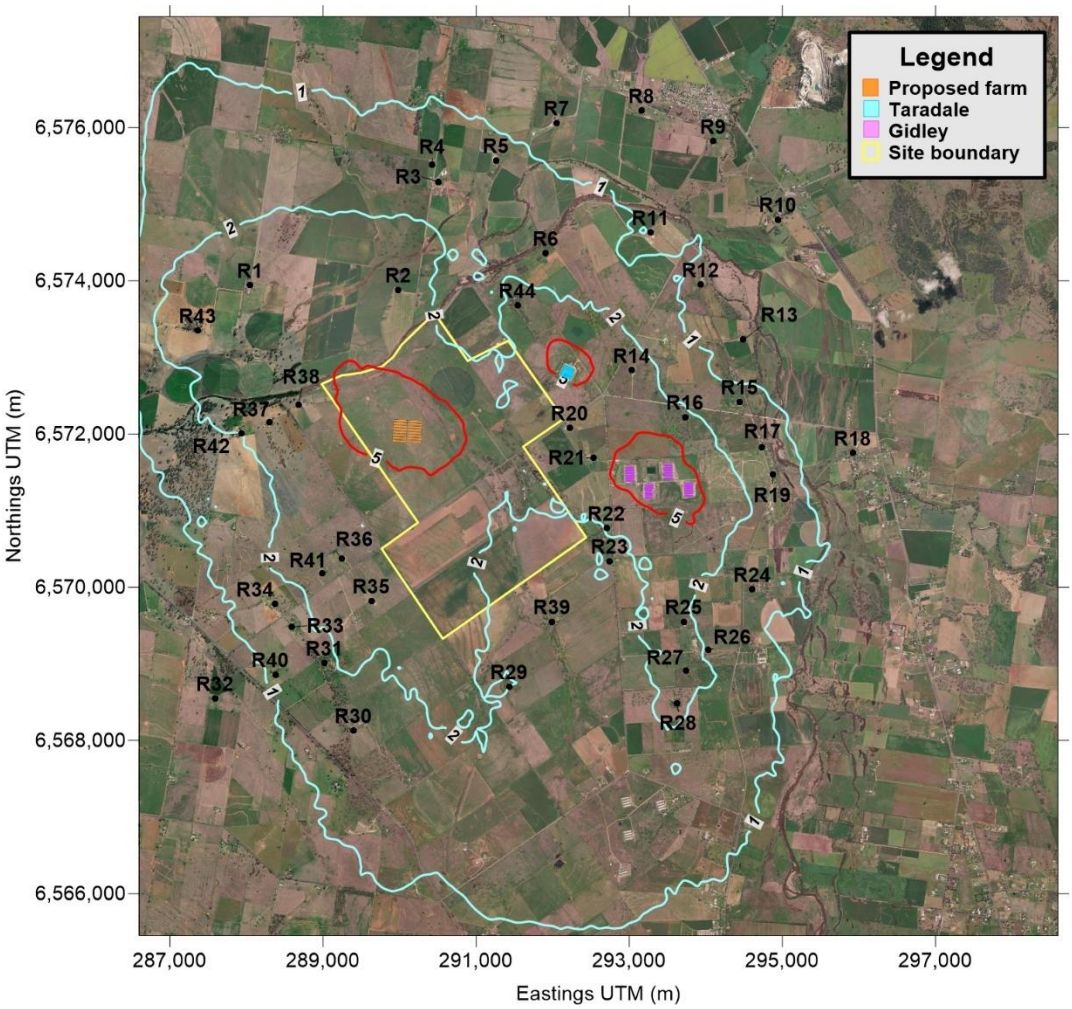

Plate 9 **2022 predicted ground-level concentrations of odour: Proposed 16 shed farm at a k-factor of 1.9 and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

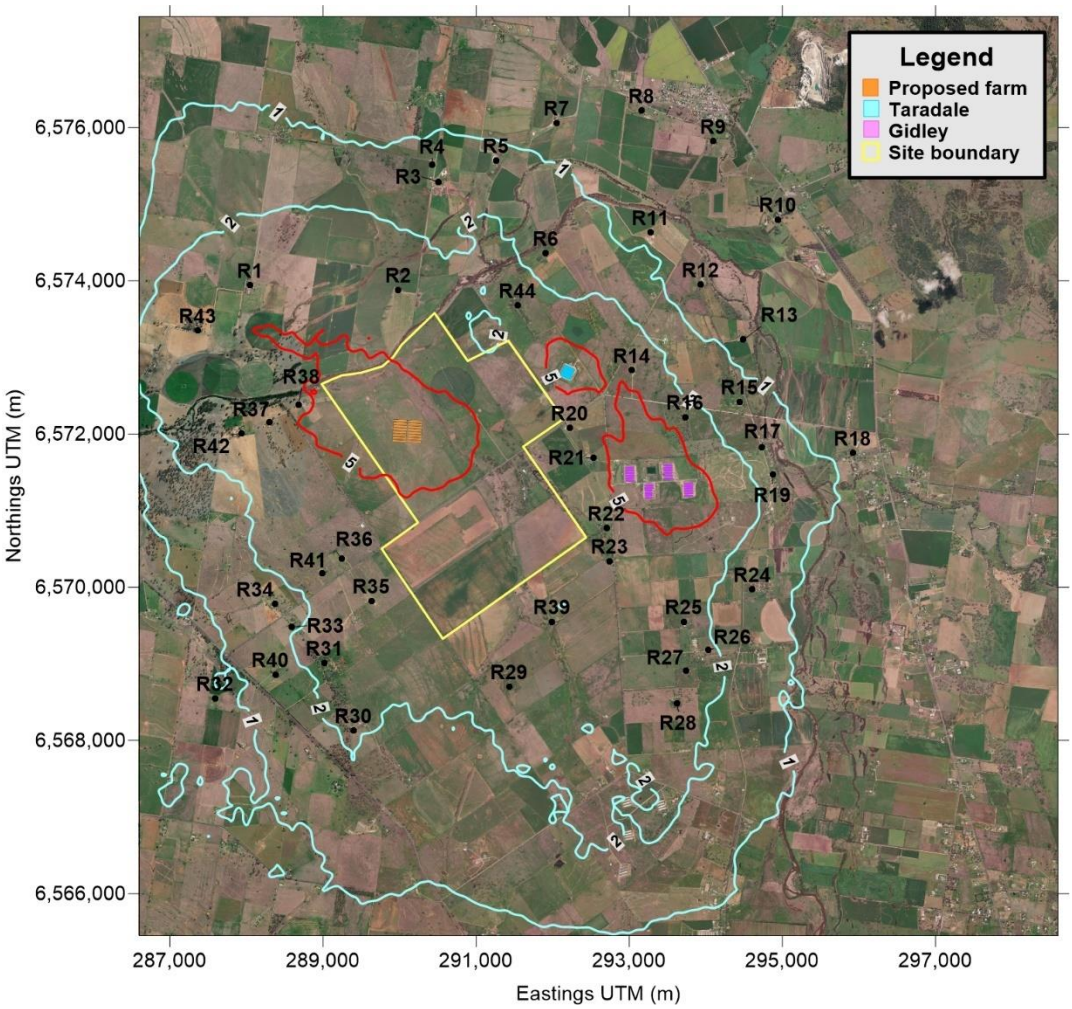

Plate 10 **2023 predicted ground-level concentrations of odour: Proposed 16 shed farm at a k-factor of 1.9 and existing farms at a k-factor of 2.2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Appleby, NSW	Nose response time (1 second average)	CALPUFF	OU
Type:	**Objective:**	**Prepared by:**	**Date:**
99th percentile	5 OU	S.Roysmith	July 2024

APPENDIX A METEOROLOGICAL AND DISPERSION MODELLING METHODOLOGY

A1 Meteorology

The meteorological modelling methodology for the proposed Silverweir development included the following steps:

- TAPM modelling and validation
- CALMET modelling

The following sections describe each step of the meteorological modelling conducted for the proposed Silverweir development. A summary of the meteorological data generated is provided in Section A1.4.

A1.1 TAPM meteorological modelling configuration

TAPM (The Air Pollution Model) was developed by the CSIRO and has been validated by the CSIRO, Katestone and others for many locations in Australia, in south-east Asia and in North America (CSIRO, 2008). Katestone has extensive experience with TAPM for sites throughout Australia and in parts of America, Bangladesh, New Caledonia and Vietnam. The model performs well in simulating regional wind patterns and has proven to be a useful tool for simulating meteorology in locations where monitoring data providing the vertical distribution of meteorological parameters are unavailable.

TAPM is a prognostic meteorological model which predicts the flows important to regional and local scale meteorology, such as sea breezes and terrain-induced flows from the larger-scale meteorology provided by the synoptic analyses. TAPM solves the fundamental fluid dynamics equations to predict meteorology at a mesoscale (20 km to 200 km) and at a local scale (down to a few hundred metres). TAPM includes parameterisations for cloud/rain micro-physical processes, urban/vegetation canopy, soil type and radiative fluxes.

TAPM requires synoptic meteorological information for the region. This information is generated by a global model similar to the large-scale models used to forecast the weather. The data were supplied on a grid resolution of approximately 75km, and at elevations of 100m to 5km above the ground. TAPM uses this synoptic information, along with specific details of the location such as surrounding terrain, land-use, soil moisture content and soil type to simulate the meteorology of a region as well as at a specific location.

TAPM version 4.0.5 was configured with the following parameters:

- Modelling period from 1 January 2019 to 31 December 2023
- 30 x 30 grid point domain with nesting resolutions of 10 km, 3 km, and 1 km
- 25 vertical levels
- Grid centred on latitude -30.96, longitude 150.83.
- Geoscience Australia 9 second DEM terrain data
- TAPM default land cover data edited to be consistent with aerial imagery
- Default options selected for advanced meteorological inputs
- Data assimilation as follows:
    - Data from the Bureau's monitoring station at Tamworth Airport assimilated over two vertical levels with a radius of influence of 15km and a quality factor of 1.

- The Tamworth Airport monitoring station is located approximately 12 km away from the proposed Silverweir development, whilst the nearest local weather data available is located approximately 18 km away, at 271,693 m E, 6,574,645 m S. Given the distance from the local weather station, as well as the reliability and availability of data over the five-year model period, it was determined that the Tamworth Airport data would be the most suitable for assimilation into the model.

A1.2 Comparison of TAPM output with observational data

A1.2.1 Overview

The model validation in this section compares observational data with data derived from running TAPM after assimilating data from the Bureau's monitoring stations at Tamworth Airport. TAPM was run with data assimilation based on methods used in previous meteorological modelling undertaken for D15036-2.

A1.2.2 Validation of TAPM modelling

The following section presents the results of the validation of one of the model years (2020) that was used for the dispersion modelling assessment. The model validation compares the Tamworth Airport observational meteorological data with data extracted from TAPM at the location of the Tamworth Airport weather station.

Figure A1 shows probability density functions that graphically compare statistical distributions of meteorological parameters between the TAPM output and Tamworth Airport observational data. Table A1 presents statistical comparisons of TAPM output (wind speed and temperature) to meteorological data recorded at the Tamworth Airport monitoring station. The TAPM output was extracted from the closest inner grid point to the location of the weather station.

The following statistical measures of model accuracy are presented in the tables:

- The mean bias, which is the mean model prediction minus the mean observed value. Values of the mean bias close to zero show good prediction accuracy.
- The root mean square error (RMSE), which is the standard deviation of the differences between predicted values and observed values. The RMSE is non-negative and values of the RMSE close to zero show good prediction accuracy. The RMSE is given by

$$\mathrm{RMSE} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2}$$

  where N is the number of observations, P_i are the hourly model predictions and O_i are the hourly observations
- The index of agreement (IOA), which takes a value between 0 and 1, with 1 indicating perfect agreement between predictions and observations. The IOA is calculated following a method described in Willmott (1982), using the equation

$$\mathrm{IOA} = 1 - \frac{\sum_{i=1}^{N}(P_i - O_i)^2}{\sum_{i=1}^{N}(|P_i - O_{mean}| + |O_i - O_{mean}|)^2}$$

  where N is the number of observations, P_i are the hourly model predictions, O_i are the hourly observations and O_{mean} is the observed observation mean.

The wind speeds generated by TAPM are within the benchmark ranges for RMSE, index of agreement and bias for the Tamworth Airport station. The probability density functions illustrate good agreement between predicted and observed meteorological data, which is to be expected given the assimilation of data at Tamworth Airport.

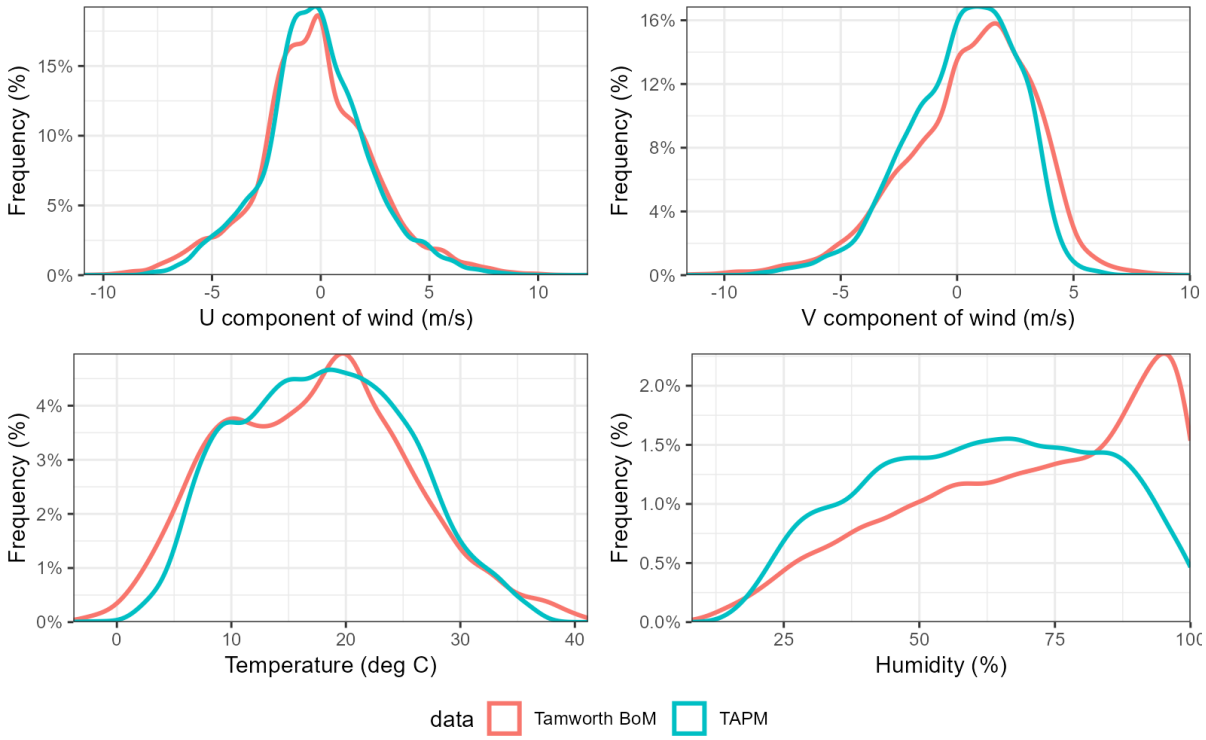

Figure A1 Probability density functions comparing 2020 observational data (red) with TAPM data (blue) at the location of the Tamworth Airport monitoring station

Table A1 A comparison of the observed meteorological data with the TAPM output for 2020 at the location of the Tamworth Airport monitoring station

Statistic	"Good" value	Wind speed			Temperature		
		Benchmark	Observational data	TAPM	Benchmark	Observational data	TAPM
Mean	-	-	3.4	2.9	-	17.3	18
SD	-	-	2	1.7	-	8.1	7.3
Min	-	-	0.0	0.0	-	-3.8	-3.3
Max	-	-	13.8	11.6	-	41.2	37.3
Bias	0	<±0.5 m/s	0.45		<±0.5 °C	0.71	
RMSE	Close to 0	<2 m/s	0.86		-	3.00	
IoA	Close to 1	>0.6	0.95		≥0.8	0.96	

A1.3 CALMET meteorological modelling configuration

CALMET is an advanced non-steady-state diagnostic 3D meteorological model with micro-meteorological modules for overwater and overland boundary layers. The model is the meteorological pre-processor for the CALPUFF modelling system. CALMET is capable of reading hourly meteorological data as data assimilation from multiple

sites within the modelling domain; it can also be initialised with the gridded three-dimensional prognostic output from other meteorological models such as TAPM. This can improve dispersion model output, particularly over complex terrain as the near surface meteorological conditions are calculated for each grid point.

CALMET version 6.5.0 was used to simulate meteorological conditions in the region. The CALMET simulation was initialised with the gridded TAPM 3D wind field data from the 1km grid. CALMET treats the prognostic model output as the initial guess field for the CALMET diagnostic model wind fields. The initial guess field is then adjusted for the kinematic effects of terrain, slope flows, blocking effects and 3D divergence minimisation.

CALMET was configured using default options and parameters, with the following selections:

- Modelling period from 1 January 2019 to 31 December 2023
- 121 x 121 grid point domain with 100 m resolution, nested within the TAPM inner domain
- 12 vertical levels at heights of 20, 60, 100, 150, 200, 250, 350, 500, 800, 1600, 2600 and 4600 metres
- Prognostic wind fields generated by TAPM input as MM5/3D.DAT at surface and upper air for “initial guess” field (no-observations mode)
- Gridded cloud cover from prognostic relative humidity at all levels
- No extrapolation of surface wind observations to upper layers
- Terrain radius of influence of 3 km.

A1.4 CALMET meteorological outputs

The following sections provide a description of the CALMET outputs as utilised in the CALPUFF dispersion modelling for the meteorological parameters that are important for the dispersion of air pollutants in the atmosphere, namely wind speed, wind direction, atmospheric stability, mixing layer height, and temperature. These parameters have been extracted from the TAPM/CALMET dataset at the subject site. The modelled meteorological data can be said to be relatively consistent across the five model years, and thus has been only presented for one model year (2020) as a representative example.

A1.4.1 Wind speed and wind direction

The annual distribution of winds predicted by TAPM/CALMET for 2020 is presented in Figure A2. The seasonal and diurnal distribution of winds is presented in Figure A3 and Figure A4.

Winds across the study area are predominantly light to moderate (averaging 3.3 m/s) and from the southeast through to northwest direction. Winds from the northeast and southwest sector are less frequent.

The seasonal breakdown of winds shows that the predominant southeasterly winds are strongest and most common throughout the year. Winter shows an increased frequency of winds from the northwest.

The diurnal breakdown of winds shows that the strongest winds are predicted during the afternoon (midday to 6pm) when winds are predominantly from the northwest. From 6pm there is a shift towards lighter winds predominantly from the southeast that occur during the night and into the morning.

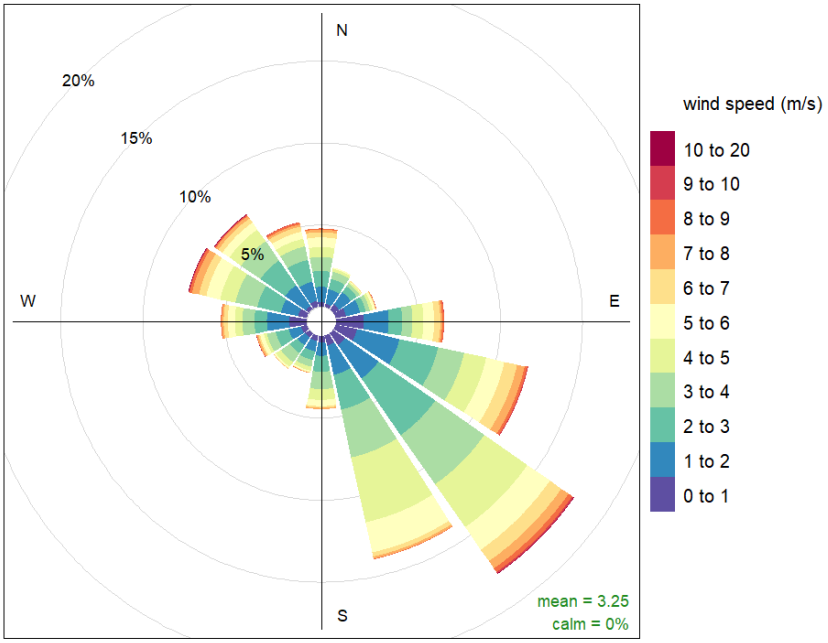

Figure A2 2020 Annual distribution of winds predicted by TAPM/CALMET

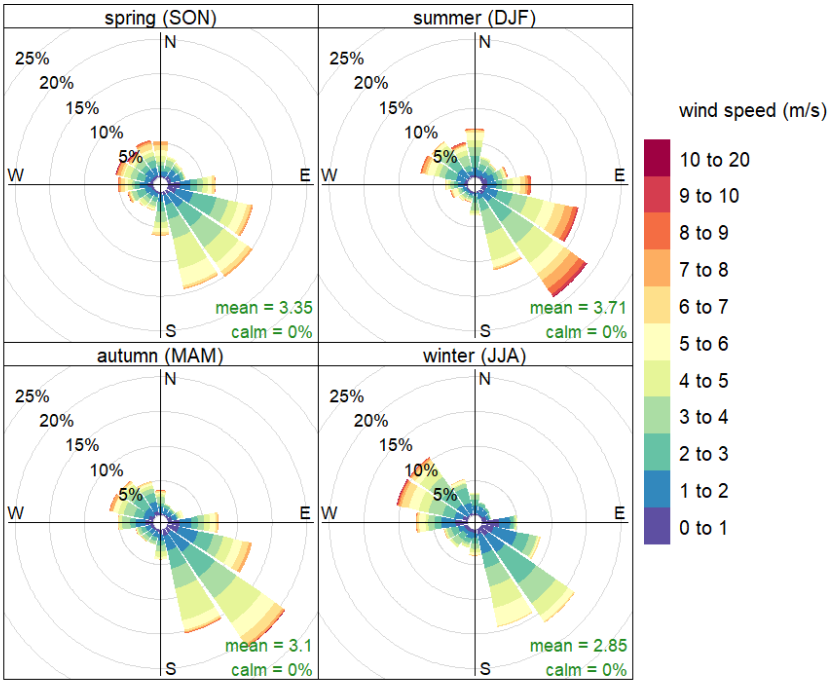

Figure A3 2020 Seasonal distribution of winds predicted by TAPM/CALMET

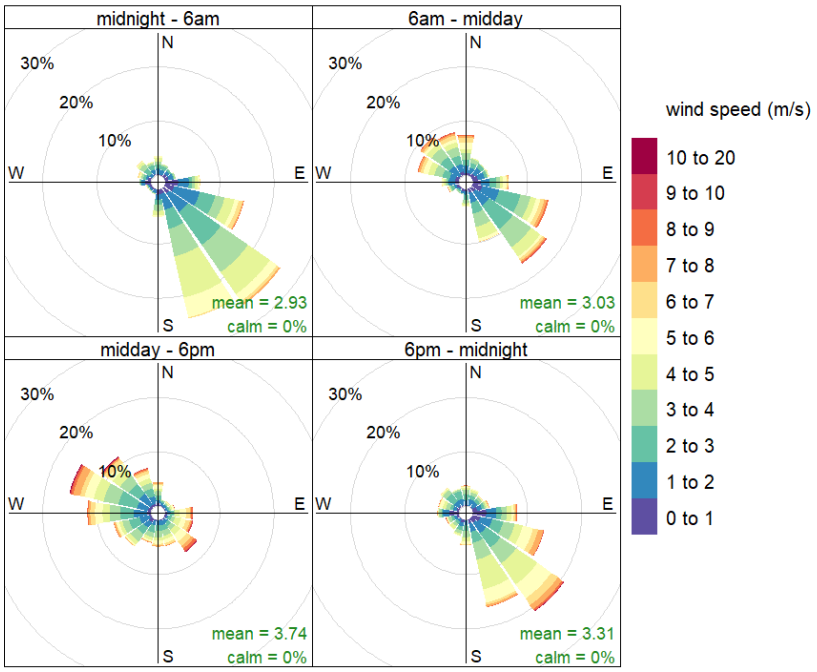

Figure A4 2020 Diurnal distribution of winds predicted by TAPM/CALMET

A1.4.2 Atmospheric stability

Stability classification is a measure of the stability of the atmosphere and can be determined from wind measurements and other atmospheric observations. The stability classes range from A Class, which represents very unstable atmospheric conditions that may typically occur on a sunny day, to F Class, which represents very stable atmospheric conditions that typically occur during light wind conditions at night. Unstable conditions (Classes A to C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for Class D conditions are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface. During the night, the atmospheric conditions are generally stable (often Classes E and F).

Figure A5 shows the distribution of stability classes extracted from the TAPM/CALMET dataset, where Class A represents the most unstable conditions and Class F represents the most stable. Neutral (D class) conditions are present throughout the day, comprising 35.6% of total time. Stable (E class) and very stable (F class) conditions are the next most frequent, comprising 36.7% of total time, and only occur between 5 pm and 7 am.

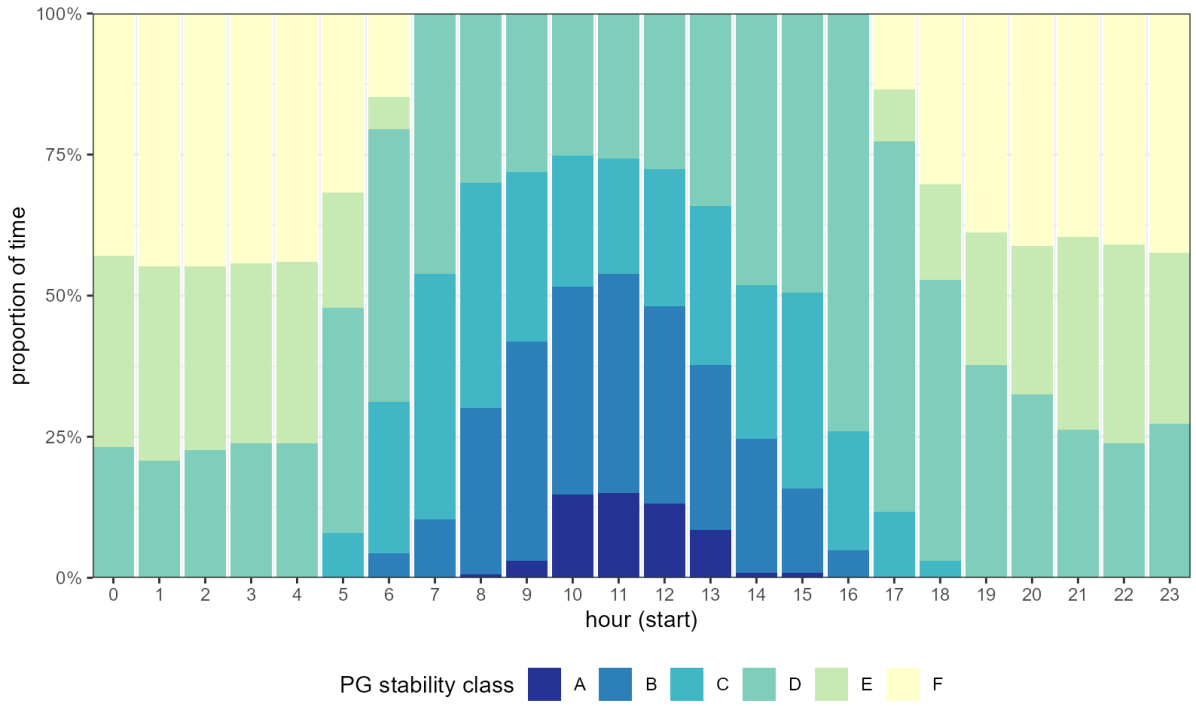

Figure A5 2020 Frequency distribution of atmospheric stability conditions predicted by TAPM/CALMET

A1.4.3 Mixing height

The mixing height defines the height of the mixed atmosphere above the ground (mixed layer), which varies diurnally. Air pollutants released at or near the ground will become dispersed within the mixed layer. During stable atmospheric conditions, the mixing height is often quite low, and dispersion is limited to within this layer. During the day, solar radiation heats the ground and causes the air above it to warm, resulting in convection and an increase to the mixing height. The growth of the mixing height is dependent on how well the warmer air from the ground can mix with the cooler upper-level air and, therefore, depends on meteorological factors such as the intensity of solar radiation and wind speed. Strong winds cause the air to be well mixed, resulting in a high mixing height.

Mixing height information extracted from the TAPM/CALMET dataset are presented as a diurnal frequency (box and whisker) plot in Figure A6. The plot shows that, on average, the mixing height begins to increase around 6am and peaks around 3- 4pm before descending rapidly into the evening.

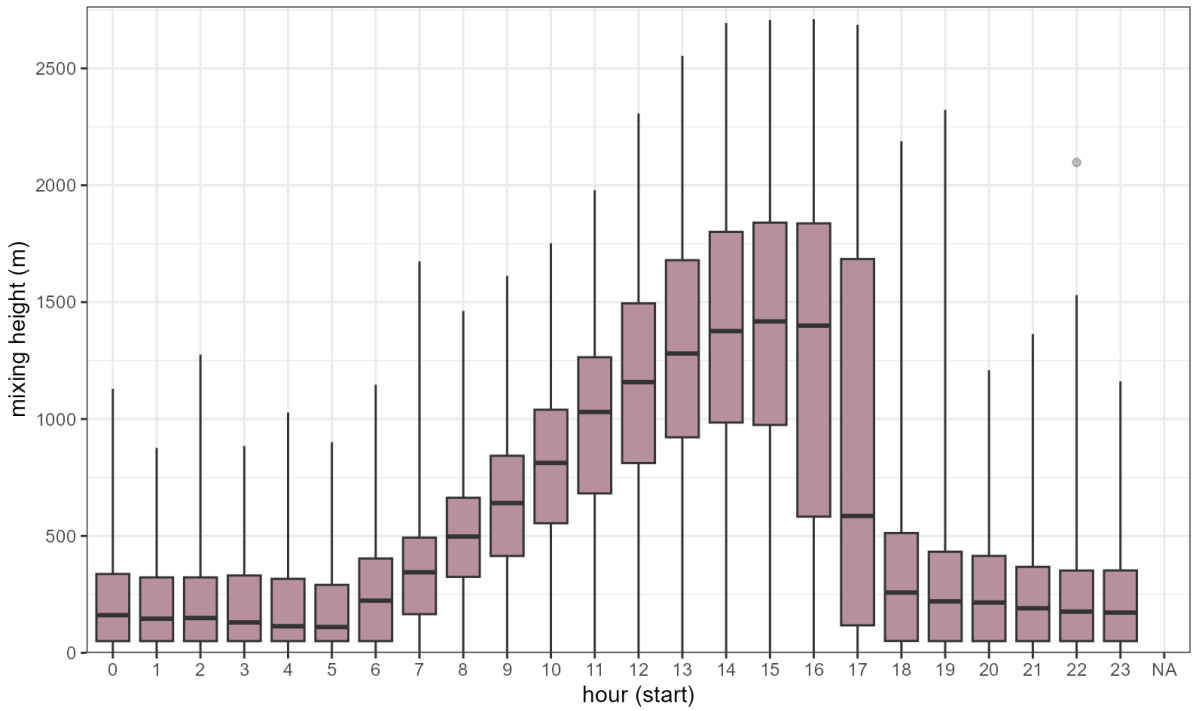

Figure A6 2020 Diurnal profile of mixing height predicted by TAPM/CALMET

A2 Dispersion modelling

CALPUFF simulates the dispersion of air pollutants to predict ground-level concentration and deposition rates across a network of receptors spaced at regular intervals, and at identified discrete locations. CALPUFF is a non-steady-state Lagrangian Gaussian puff model containing parameterisations for complex terrain effects, overwater transport, coastal interaction effects, building downwash, wet and dry removal, and simple chemical transformation. CALPUFF employs the 3D meteorological fields generated from the CALMET model by simulating the effects of time and space varying meteorological conditions on pollutant transport, transformation, and removal.

CALPUFF takes into account the geophysical features of the study area that affect dispersion of pollutants and ground-level concentrations of those pollutants in identified regions of interest. CALPUFF contains algorithms that can resolve near-source effects such as building downwash, transitional plume rise, partial plume penetration, sub-grid scale terrain interactions, as well as the long-range effects of removal, transformation, vertical wind shear, overwater transport and coastal interactions. Emission sources can be characterised as arbitrarily varying point, area, volume and lines or any combination of those sources within the modelling domain.

Key features of CALPUFF used to simulate dispersion:

- Domain area of 121 by 121 grids at 0.1 km spacing, equivalent to the domain defined in CALMET
- 5 years modelled (1 January 2019 to 31 December 2023)
- Gridded 3D hourly-varying meteorological conditions generated by CALMET
- Partial plume path adjustment for terrain modelled
- Dispersion coefficients calculated internally from sigma v and sigma w using micrometeorological variables
- Stack tip downwash, transitional plume rise and PDF used for dispersion under convective conditions

All other options set to default.

APPENDIX B CUMULATIVE DUST ASSESSMENT

B1.1 Predicted background dust concentrations

As discussed in Section 4.3.2, the ambient monitoring data shows exceedances of the 24-hour average $PM_{2.5}$ and PM_{10} impact assessment criterion occasionally. The exceedances are likely the result of smoke caused by extensive unprecedented bushfire events.

The existing Taradale and Gidley farms contribute to dust levels in addition to the ambient monitoring data. This combined data has been used as the background level in the cumulative assessment. This section summarises dust exceedances due to the ambient monitoring data from Tamworth combined with the maximum predicted ground-level concentrations of dust due to the existing farms at sensitive receptors.

A summary of maximum background concentrations of $PM_{2.5}$ are provided in Table B1 and Table B2. A summary of maximum background concentrations of PM_{10} are provided in Table B3 and Table B4.

Table B1 Background 24-hour $PM_{2.5}$

Receptor	Predicted 24-hour concentration of PM2.5 (µg/m^3)					Predicted number of exceedances of 24-hour PM2.5				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R1	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R2	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R3	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R4	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R5	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R6	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R7	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R8	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R9	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R10	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R11	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R12	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R13	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R14	161.5	50.9	19.7	19.7	23.3	34	4	0	0	0
R15	161.5	50.9	19.7	19.7	23.3	34	4	0	0	0
R16	161.5	50.9	19.8	19.8	23.3	34	4	0	0	0
R17	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R18	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R19	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R20	161.4	51.0	19.7	19.7	23.3	34	4	0	0	0
R21	161.5	51.0	19.9	19.9	23.4	34	4	0	0	0
R22	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R23	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R24	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R25	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R26	161.4	50.9	19.8	19.8	23.3	34	4	0	0	0
R27	161.4	50.9	19.8	19.8	23.3	35	4	0	0	0
R28	161.4	50.9	19.8	19.8	23.3	34	4	0	0	0
R29	161.4	50.9	19.9	19.9	23.3	34	4	0	0	0
R30	161.4	50.9	19.9	19.9	23.3	34	4	0	0	0
R31	161.4	50.9	20.0	20.0	23.3	34	4	0	0	0
R32	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0

Receptor	Predicted 24-hour concentration of PM2.5 (µg/m^3)					Predicted number of exceedances of 24-hour PM2.5				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R33	161.4	50.9	19.8	19.8	23.3	34	4	0	0	0
R34	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R35	161.4	50.9	19.9	19.9	23.3	34	4	0	0	0
R36	161.4	50.9	19.9	19.9	23.3	34	4	0	0	0
R37	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R38	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R39	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R40	161.4	50.9	19.8	19.8	23.3	34	4	0	0	0
R41	161.4	50.9	19.9	19.9	23.3	34	4	0	0	0
R42	161.4	50.9	19.7	19.7	23.3	34	4	0	0	0
R43	161.4	50.9	19.6	19.6	23.3	34	4	0	0	0
R44	161.5	50.9	19.6	19.6	23.4	34	4	0	0	0

Table B2 Background Annual $PM_{2.5}$

Receptor	Predicted annual concentration of PM2.5 (µg/m^3)					Predicted number of exceedances of annual PM2.5				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R1	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R2	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0
R3	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0
R4	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R5	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R6	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0
R7	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R8	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R9	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R10	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R11	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R12	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R13	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R14	14.5	7.0	5.2	4.8	6.7	1	0	0	0	0
R15	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R16	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0
R17	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R18	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R19	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R20	14.5	7.0	5.3	4.8	6.7	1	0	0	0	0
R21	14.5	7.0	5.3	4.8	6.7	1	0	0	0	0
R22	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0
R23	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R24	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R25	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0
R26	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R27	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0
R28	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R29	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R30	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R31	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R32	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R33	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0

Receptor	Predicted annual concentration of PM2.5 (µg/m^3)					Predicted number of exceedances of annual PM2.5				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R34	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R35	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R36	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R37	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R38	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R39	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R40	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R41	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R42	14.4	6.9	5.2	4.7	6.6	1	0	0	0	0
R43	14.4	6.9	5.2	4.7	6.7	1	0	0	0	0
R44	14.4	6.9	5.2	4.8	6.7	1	0	0	0	0

Table B3 Background 24-hour PM_{10}

Receptor	Predicted 24-hour concentration of PM_{10} (µg/m^3)					Predicted number of exceedances of 24-hour PM_{10}				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R1	267.7	181.3	36.3	23.5	40.3	50	8	0	0	0
R2	267.7	181.3	36.3	23.8	40.5	50	8	0	0	0
R3	267.7	181.3	36.3	23.6	40.5	50	8	0	0	0
R4	267.7	181.3	36.3	23.5	40.4	50	8	0	0	0
R5	267.8	181.3	36.3	23.5	40.3	50	8	0	0	0
R6	267.8	181.3	36.3	23.5	40.4	50	8	0	0	0
R7	267.8	181.3	36.3	23.5	40.3	50	8	0	0	0
R8	267.8	181.3	36.3	23.5	40.3	50	8	0	0	0
R9	267.8	181.3	36.3	23.5	40.3	50	8	0	0	0
R10	267.8	181.3	36.3	23.5	40.3	50	8	0	0	0
R11	267.8	181.3	36.3	23.5	40.3	50	8	0	0	0
R12	267.8	181.3	36.3	23.5	40.4	50	8	0	0	0
R13	267.8	181.3	36.3	23.6	40.5	50	8	0	0	0
R14	267.9	181.3	36.3	23.7	43.3	50	8	0	0	0
R15	267.9	181.3	36.3	23.8	40.7	50	8	0	0	0
R16	267.9	181.3	36.3	24.1	42.0	50	8	0	0	0
R17	267.9	181.3	36.3	23.6	41.1	50	8	0	0	0
R18	267.7	181.3	36.3	23.5	40.5	50	8	0	0	0
R19	267.8	181.3	36.3	23.7	41.6	50	8	0	0	0
R20	267.8	182.0	36.3	23.9	40.8	50	8	0	0	0
R21	268.1	181.4	36.3	24.5	40.7	50	8	0	0	0
R22	267.7	181.4	36.3	23.9	40.5	50	8	0	0	0
R23	267.7	181.4	36.3	23.9	40.5	50	8	0	0	0
R24	267.7	181.3	36.3	23.7	41.2	50	8	0	0	0
R25	267.7	181.8	36.3	23.9	40.5	50	8	0	0	0
R26	267.7	181.6	36.3	24.0	40.5	50	8	0	0	0
R27	267.7	181.7	36.3	24.3	40.4	50	8	0	0	0
R28	267.7	181.6	36.3	24.2	40.4	50	8	0	0	0
R29	267.7	181.3	36.3	24.4	40.3	50	8	0	0	0
R30	267.7	181.3	36.3	24.7	40.3	50	8	0	0	0
R31	267.7	181.3	36.3	25.0	40.3	50	8	0	0	0
R32	267.7	181.3	36.3	23.8	40.3	50	8	0	0	0
R33	267.7	181.3	36.3	24.2	40.3	50	8	0	0	0
R34	267.7	181.3	36.3	24.0	40.3	50	8	0	0	0

Receptor	Predicted 24-hour concentration of PM_{10} (µg/m³)					Predicted number of exceedances of 24-hour PM_{10}				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R35	267.7	181.3	36.3	24.6	40.3	50	8	0	0	0
R36	267.7	181.3	36.3	24.5	40.3	50	8	0	0	0
R37	267.7	181.3	36.3	23.8	40.4	50	8	0	0	0
R38	267.7	181.3	36.3	23.8	40.5	50	8	0	0	0
R39	267.7	181.4	36.3	24.0	40.4	50	8	0	0	0
R40	267.7	181.3	36.3	24.2	40.3	50	8	0	0	0
R41	267.7	181.3	36.3	24.5	40.3	50	8	0	0	0
R42	267.7	181.3	36.3	23.7	40.4	50	8	0	0	0
R43	267.7	181.3	36.3	23.5	40.4	50	8	0	0	0
R44	267.8	181.3	36.3	23.5	40.8	50	8	0	0	0

Table B4 Background Annual PM_{10}

Receptor	Predicted annual concentration of PM_{10} (µg/m³)					Predicted number of exceedances of annual PM_{10}				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R1	33.8	16.9	12.8	10.7	15.2	1	0	0	0	0
R2	33.8	17.0	12.9	10.7	15.3	1	0	0	0	0
R3	33.8	17.0	12.8	10.7	15.3	1	0	0	0	0
R4	33.8	16.9	12.8	10.7	15.2	1	0	0	0	0
R5	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R6	33.8	17.0	12.8	10.8	15.3	1	0	0	0	0
R7	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R8	33.7	16.9	12.7	10.6	15.2	1	0	0	0	0
R9	33.7	16.9	12.7	10.6	15.2	1	0	0	0	0
R10	33.7	16.9	12.7	10.6	15.2	1	0	0	0	0
R11	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R12	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R13	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R14	34.0	17.2	13.1	11.0	15.6	1	0	0	0	0
R15	33.8	16.9	12.8	10.7	15.2	1	0	0	0	0
R16	33.9	17.1	12.9	10.8	15.4	1	0	0	0	0
R17	33.8	16.9	12.8	10.7	15.2	1	0	0	0	0
R18	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R19	33.8	16.9	12.8	10.7	15.2	1	0	0	0	0
R20	34.1	17.2	13.1	10.9	15.5	1	0	0	0	0
R21	34.1	17.3	13.2	11.0	15.6	1	0	0	0	0
R22	33.9	17.0	12.9	10.8	15.4	1	0	0	0	0
R23	33.8	17.0	12.9	10.7	15.3	1	0	0	0	0
R24	33.8	17.0	12.8	10.7	15.2	1	0	0	0	0
R25	33.8	17.0	12.9	10.7	15.3	1	0	0	0	0
R26	33.8	17.0	12.9	10.7	15.3	1	0	0	0	0
R27	33.8	17.0	12.9	10.7	15.3	1	0	0	0	0
R28	33.8	17.0	12.8	10.7	15.3	1	0	0	0	0
R29	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R30	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R31	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R32	33.7	16.9	12.7	10.6	15.2	1	0	0	0	0
R33	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R34	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R35	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0

Receptor	Predicted annual concentration of PM_{10} (µg/m³)					Predicted number of exceedances of annual PM_{10}				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
R36	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R37	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R38	33.7	16.9	12.8	10.7	15.2	1	0	0	0	0
R39	33.8	16.9	12.8	10.7	15.2	1	0	0	0	0
R40	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R41	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R42	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R43	33.7	16.9	12.8	10.6	15.2	1	0	0	0	0
R44	33.9	17.1	13.0	10.9	15.4	1	0	0	0	0

B1.2 Contemporaneous assessment – R14 summary

Predicted 24-hour maximum ground-level concentrations of $PM_{2.5}$ inclusive of a contemporaneous background showed that one additional day exceeded the relevant impact assessment criteria due to contributions from the proposed Silverweir development.

The additional day of exceedance is predicted to occur on 21 June 2019, when the 24-hour background concentration of $PM_{2.5}$ was 24.97 µg/m³ and the predicted contribution from the proposed Silverweir development was 0.07 µg/m³ for a cumulative concentration of 25.04 µg/m³. Therefore, on this day the background constitutes 99.9% of the air quality criteria.

Table B5 and Table B6 show the results of contemporaneous assessment of predicted 24-hour maximum $PM_{2.5}$ concentrations at R14 in 2019 ordered, respectively, by maximum contribution from the proposed Silverweir development and maximum contribution from ambient background.

Table B5 R14 contemporaneous analysis – Predicted ground-level 24-hour concentrations of $PM_{2.5}$ ordered by contribution from the proposed Silverweir development

Rank	Silverweir concentration	Date of concentration	Background concentration (1)	Cumulative Concentration
	24-hr $PM_{2.5}$ (µg/m³)			
1	1.02	14-Jun-19	16.90	17.92
2	0.55	18-Jun-19	15.12	15.68
3	0.48	06-Jun-19	15.34	15.82
4	0.35	02-Oct-19	8.79	9.14
5	0.22	19-Jun-19	26.98	27.20
6	0.22	16-Jun-19	19.44	19.65
7	0.22	29-Dec-19	35.49	35.71
8	0.19	02-Sep-19	7.77	7.97
9	0.19	29-Jul-19	14.43	14.62
10	0.17	27-Aug-19	11.45	11.62
11	0.16	19-Oct-19	11.16	11.32
12	0.11	10-Nov-19	3.83	3.94
13	0.11	07-Dec-19	12.38	12.49
14	0.11	04-Dec-19	5.49	5.60
15	0.10	30-Mar-19	11.22	11.33
16	0.10	24-Jul-19	13.88	13.97
17	0.10	31-May-19	15.94	16.04

Rank	Silverweir concentration	Date of concentration	Background concentration [1]	Cumulative Concentration
	24-hr $PM_{2.5}$ ($\mu g/m^3$)			
18	0.09	31-Mar-19	9.21	9.30
19	0.09	15-Dec-19	23.88	23.97
20	0.08	30-May-19	6.88	6.96
21	0.08	20-Aug-19	8.94	9.02
22	0.08	25-May-19	12.93	13.01
23	0.07	25-Jul-19	17.65	17.72
24	0.07	27-Jul-19	16.82	16.89
25	0.07	21-Jun-19	24.97	25.04
26	0.07	26-Aug-19	13.14	13.20
27	0.07	24-May-19	10.67	10.73
28	0.06	22-Aug-19	6.51	6.57
29	0.06	15-Jun-19	14.87	14.93
30	0.06	17-Jun-19	15.30	15.36
31	0.06	14-Dec-19	18.26	18.31
32	0.06	28-Apr-19	10.87	10.92
33	0.05	13-Aug-19	16.31	16.36
34	0.05	29-Sep-19	8.76	8.81
35	0.05	30-Oct-19	35.68	35.73

Table note:

[1] Background consists of modelled existing Taradale and Gidley farm contributions, and observed background dust from the NSW DCCEEW's Tamworth air quality monitoring station

Table B6 R14 contemporaneous analysis – Predicted ground-level 24-hour concentrations of $PM_{2.5}$ ordered by background contribution

Rank	Background concentration [1]	Date of concentration	Silverweir concentration	Cumulative Concentration
	24-hr $PM_{2.5}$ ($\mu g/m^3$)			
1	161.46	08-Dec-19	0.01	161.47
2	136.60	17-Dec-19	0	136.60
3	126.23	17-Nov-19	0	126.23
4	119.73	09-Dec-19	<0.01	119.73
5	115.30	18-Nov-19	0	115.30
6	104.56	21-Nov-19	0	104.56
7	100.55	19-Dec-19	0.01	100.56
8	98.91	10-Dec-19	<0.01	98.91
9	98.65	22-Dec-19	<0.01	98.65
10	78.08	20-Dec-19	<0.01	78.08
11	73.60	18-Dec-19	0.01	73.61
12	72.00	21-Dec-19	0.02	72.02
13	67.27	28-Oct-19	<0.01	67.27
14	52.36	29-Oct-19	<0.01	52.37
15	49.74	29-Nov-19	<0.01	49.74

Rank	Background concentration [1]	Date of concentration	Silverweir concentration	Cumulative Concentration
	24-hr $PM_{2.5}$ ($\mu g/m^3$)			
16	48.35	24-Oct-19	<0.01	48.35
17	44.66	20-Nov-19	0	44.66
18	43.52	23-Oct-19	0.03	43.54
19	42.35	28-Nov-19	<0.01	42.35
20	39.35	16-Dec-19	<0.01	39.36
21	37.00	19-Nov-19	0	37.00
22	36.38	22-Oct-19	0.02	36.40
23	35.68	30-Oct-19	0.05	35.73
24	35.61	23-Dec-19	0.02	35.63
25	35.49	29-Dec-19	0.22	35.71
26	35.04	24-Dec-19	<0.01	35.05
27	34.54	01-Nov-19	0	34.54
28	33.93	27-Nov-19	<0.01	33.93
29	31.11	24-Nov-19	<0.01	31.11
30	29.61	25-Nov-19	<0.01	29.61
31	27.68	12-Dec-19	0.04	27.72
32	26.98	19-Jun-19	0.22	27.20
33	26.51	25-Oct-19	0	26.51
34	25.69	13-Dec-19	0.01	25.70
35	24.97	21-Jun-19	0.07	25.04

Table note:

[1] Background consists of modelled existing Taradale and Gidley farm contributions, and observed background dust from the NSW DCCEEW's Tamworth air quality monitoring station