AIR QUALITY ASSESSMENT
95 GREAT SOUTHERN ROAD
BARGO NSW

Precise Planning

9 February 2017

Job Number 15040427

Prepared by
Todoroski Air Sciences Pty Ltd
Suite 2B, 14 Glen Street
Eastwood, NSW 2122
Phone: (02) 9874 2123
Fax: (02) 9874 2125
Email: info@airsciences.com.au

Air Quality Assessment
95 Great Southern Road, Bargo NSW

Author(s):	Aleks Todoroski	Philip Henschke
Position:	Director	Atmospheric Physicist

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1 INTRODUCTION

Todoroski Air Sciences has prepared this air quality assessment for the proposed rezoning of subject land at 95 Great Southern Road Bargo, NSW (hereafter referred to as the Project).

The purpose of this report is to assist in determining existing and proposed air quality constraints affecting the subject site, as well as outlining potential general mitigation measures and identifying assessment requirements at the development application stage.

This assessment investigates the nature of potential sources of air pollutants within an approximate 2.5 kilometre (km) radius of the Project site which may have the potential to affect the future rezoning and development of the subject land.

1.1 Study objectives

The objectives of the study include:

- To determine whether any existing or approved nearby land uses adversely impact, or have the potential to adversely impact, the subject site in relation to air quality (and if so, to what extent);
- To determine whether the use of the site for residential purposes would adversely impact the effective functioning of any existing or approved nearby land use in relation to air quality (and if so, to what extent);
- To outline appropriate general mitigation measures that may be considered appropriate (if any) at the development application stage; and,
- To specify specific further assessments to be undertaken (if any) at the development application stage.

2 PROJECT BACKGROUND

The proposed rezoning of the Project would include:

- R2 Low Density residential with 700m^2 minimum lot size;
- R5 Large Lot residential with 2,000m^2 minimum lot size; and,
- R5 Large Lot residential with 5,000m^2 minimum lot size.

An environmental conservation zone is allocated on the eastern half of the site. An indicative plan for the proposed rezoning is shown in **Figure 2-1**.

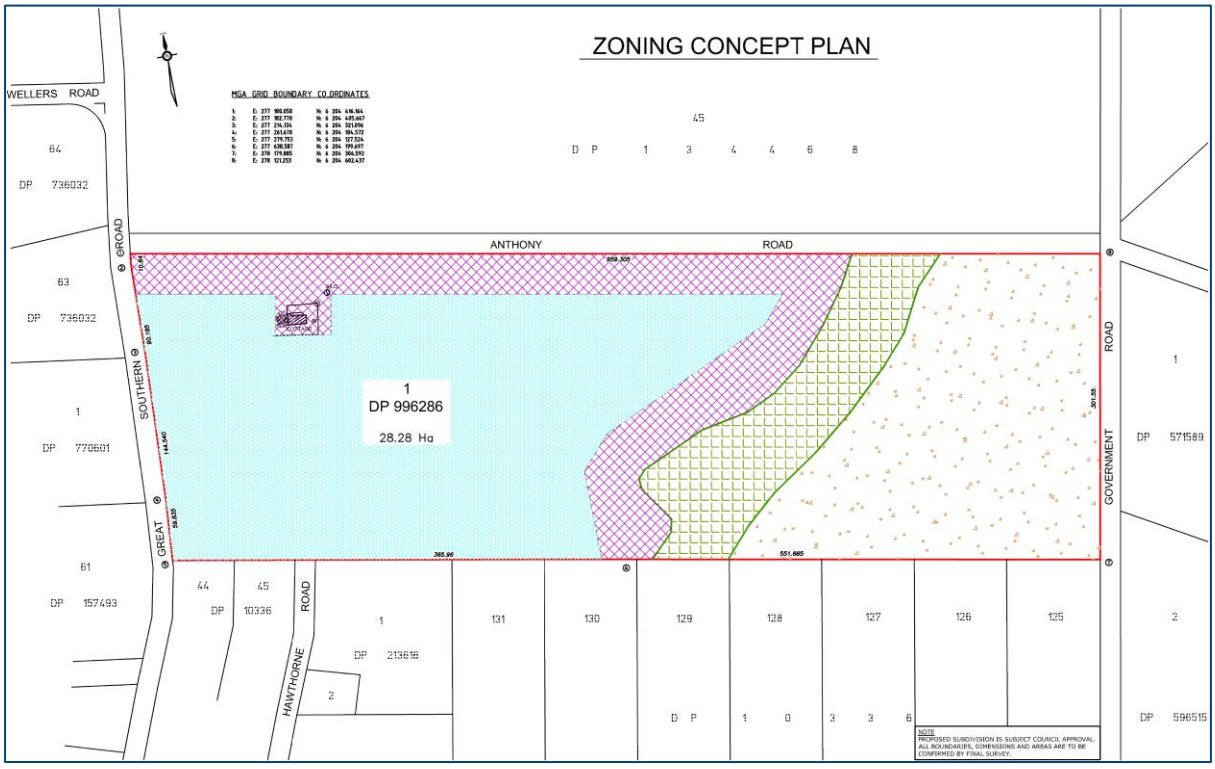


Figure 2-1: Indicative plan for the Project

3 PROJECT SETTING

The Project site is located approximately 1.2km north-northeast of Bargo and 32km northeast of Wollongong. The Project site covers an area of approximately 28 hectares (ha) and comprises a vacant lot with the exception of a depot located in the southwest corner (see **Figure 3-1**).

The site is bounded by Great Southern Road to the west, Government Road to the east, rural residential lots to the south and rural lots to the north. An unmade Crown road separates the northern boundary of the subject land and rural lots to the north. The surrounding land use is predominantly comprised of low density residential developments with rural properties for various agricultural activities. To the west and southwest of the site, separated by the Main South Railway Line, is higher density residential land. To the north of the site is the Tahmoor Underground Coal Mine.

A number of potential odour sources have been identified in the area surrounding the Project site. These locations include chicken and turkey broiler farms, an approved waste management centre site and an underground coal mining operation.

Figure 3-2 presents the terrain features surrounding the Project site. The area is characterised by predominantly flat terrain, with river valleys to the west and east of the Project area.

Figure 3-1: Project location

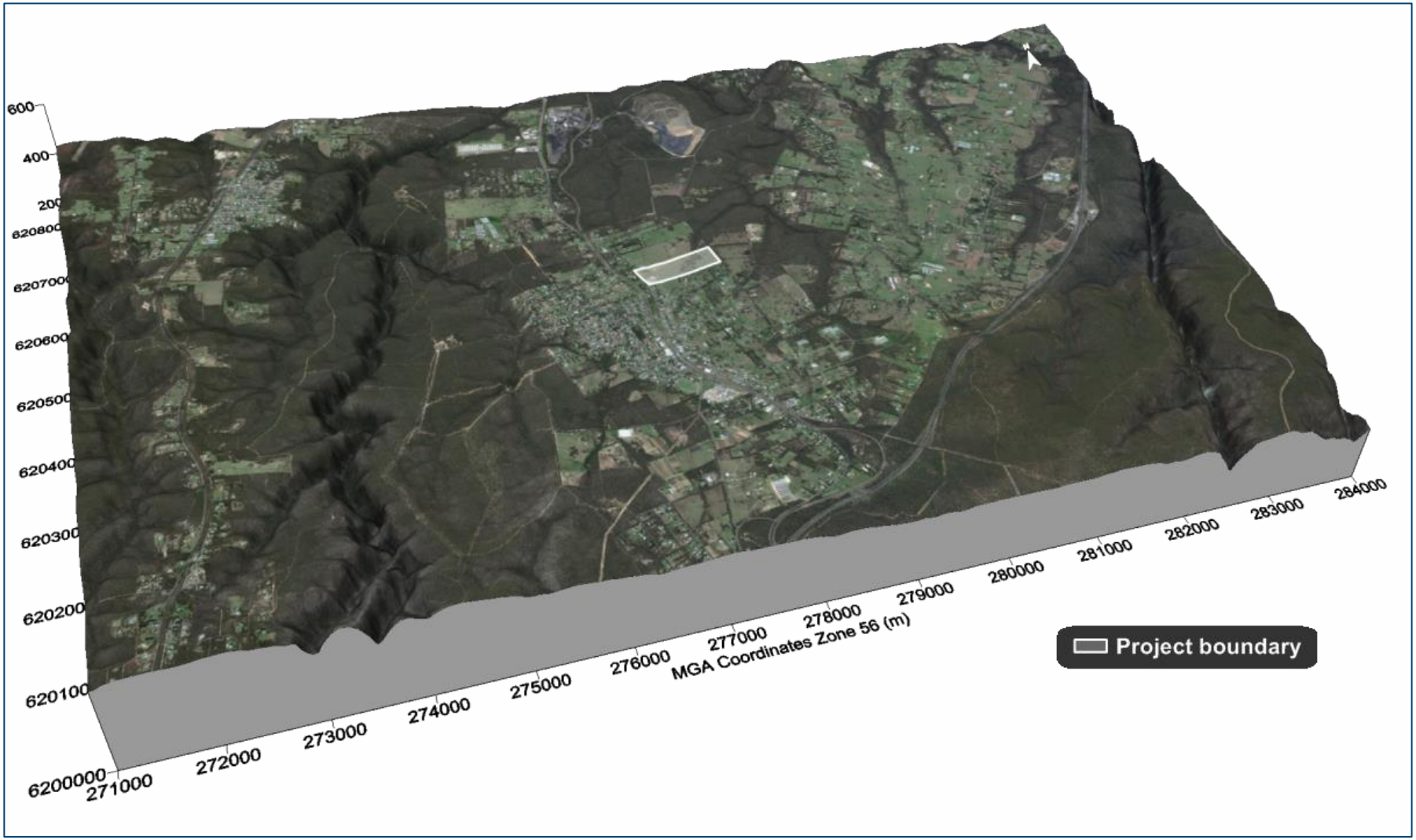


Figure 3-2: Representative visualisation of topography in the area surrounding the Project site

4 EXISTING ENVIRONMENT

The potential for air quality impacts at the Project location will be influenced by local climatic and meteorological conditions, which affect how pollutants travel and disperse from their source.

A review of the existing environmental conditions surrounding the Project site was conducted to characterise these conditions.

4.1 Local meteorology

Long-term climatic data from the Bureau of Meteorology (BoM) weather station at Camden Airport Automatic Weather Station (AWS) (Site No. 068192) have been used to characterise the local climate in the proximity of the Project. The Camden Airport AWS station is located approximately 28km north-northeast of the Project.

Table 4-1 and **Figure 4-1** present a summary of data from Camden Airport AWS collected over an approximate 33 to 40 year period for the various parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 29.5°C and July is the coldest month with a mean minimum temperature of 3.0°C.

Rainfall peaks during the summer and declines during winter. February is the wettest month with an average rainfall of 98.9mm over 4.8 days and July is the driest month with an average rainfall of 37.2mm over 2.9 days.

Humidity levels exhibit variability over the day and some and seasonal flux across the year, with mean 9am humidity levels ranging from 64% in October to 82% in June and mean 3pm humidity levels vary from 43% in August and to 53% in June.

Wind speeds during the warmer months tend to have a greater spread between the 9am and 3pm conditions compared to the colder months. Mean 9am wind speeds range from 5.4km/h in May to 9.3km/h in October and mean 3pm wind speeds range from 12.5km/h in May to 18.5km/h in December.

Table 4-1: Monthly Climate statistics summary - Camden Airport AWS

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature												
Mean max. temperature (°C)	29.5	28.5	26.8	23.8	20.6	17.7	17.3	19.1	22.0	24.2	26.2	28.4
Mean min. temperature (°C)	16.8	16.8	14.8	11.0	7.0	4.5	3.0	3.9	6.8	9.9	12.9	15.2
Rainfall												
Rainfall (mm)	77.8	98.9	88.1	66.8	56.4	60.8	37.2	41.4	39.1	63.2	77.3	57.0
Mean No. of rain days (≥1mm)	4.7	4.8	4.5	4.1	3.5	3.4	2.9	2.9	3.1	4.2	4.6	4.2
9am conditions												
Mean temperature (°C)	21.6	20.9	19.6	16.9	13.0	9.6	8.6	10.7	14.6	17.7	18.7	20.9
Mean relative humidity (%)	72	78	77	77	81	82	81	73	66	64	69	68
Mean wind speed (km/h)	6.5	5.5	6.0	6.3	5.4	5.9	5.8	7.9	9.0	9.3	8.0	7.9
3pm conditions												
Mean temperature (°C)	27.7	26.9	25.4	22.5	19.3	16.5	16.0	17.7	20.3	22.4	24.3	26.8
Mean relative humidity (%)	49	52	52	52	52	53	50	43	44	47	50	46
Mean wind speed (km/h)	17.2	15.5	15.0	13.8	12.5	13.9	14.6	16.8	18.1	17.7	17.7	18.5

Source: **Bureau of Meteorology, 2015**

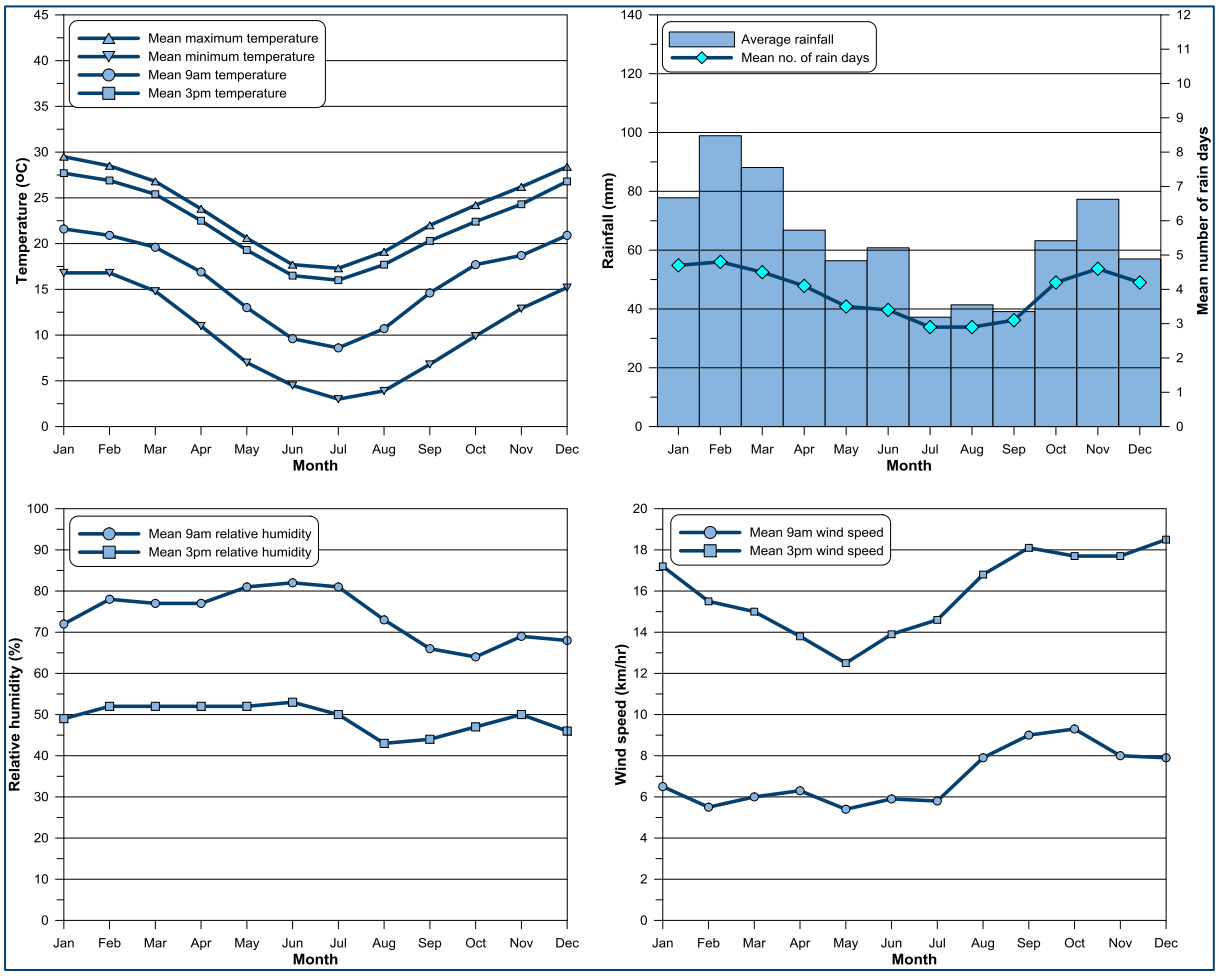


Figure 4-1: Monthly climate statistics summary - Camden Airport AWS

Figure 4-2 to **Figure 4-6** present the annual and seasonal windroses for Camden Airport AWS from 2010 to 2014 respectively. The windroses indicate similar wind distribution patterns, as expected due to the effects of the prevailing wind and the local terrain features. On an annual basis, winds from the north and south are most frequent with a portion of relatively stronger winds originating from the west and southwest quadrant.

In summer, winds from the north, south and east are most dominant with an increasing portion of winds from the east-northeast. During autumn, winds from the south ranging to the west appear most distinct. The winter distribution is typically dominated by winds from the west and southwest quadrant. The wind distribution pattern in spring generally reflects the annual pattern with varied winds dominated by winds from the north and south.

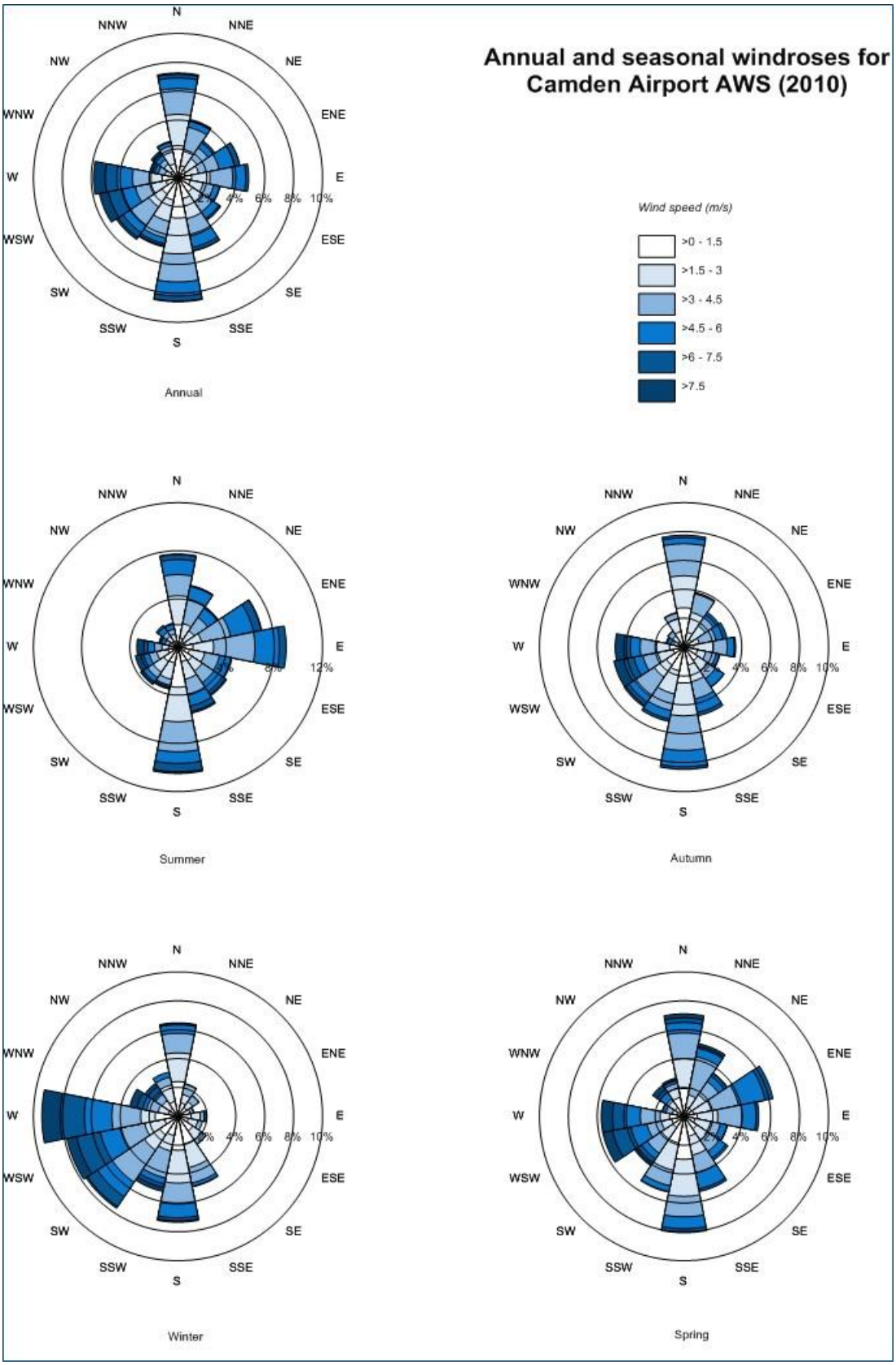


Figure 4-2: Annual and seasonal windroses – Camden Airport AWS (2010)

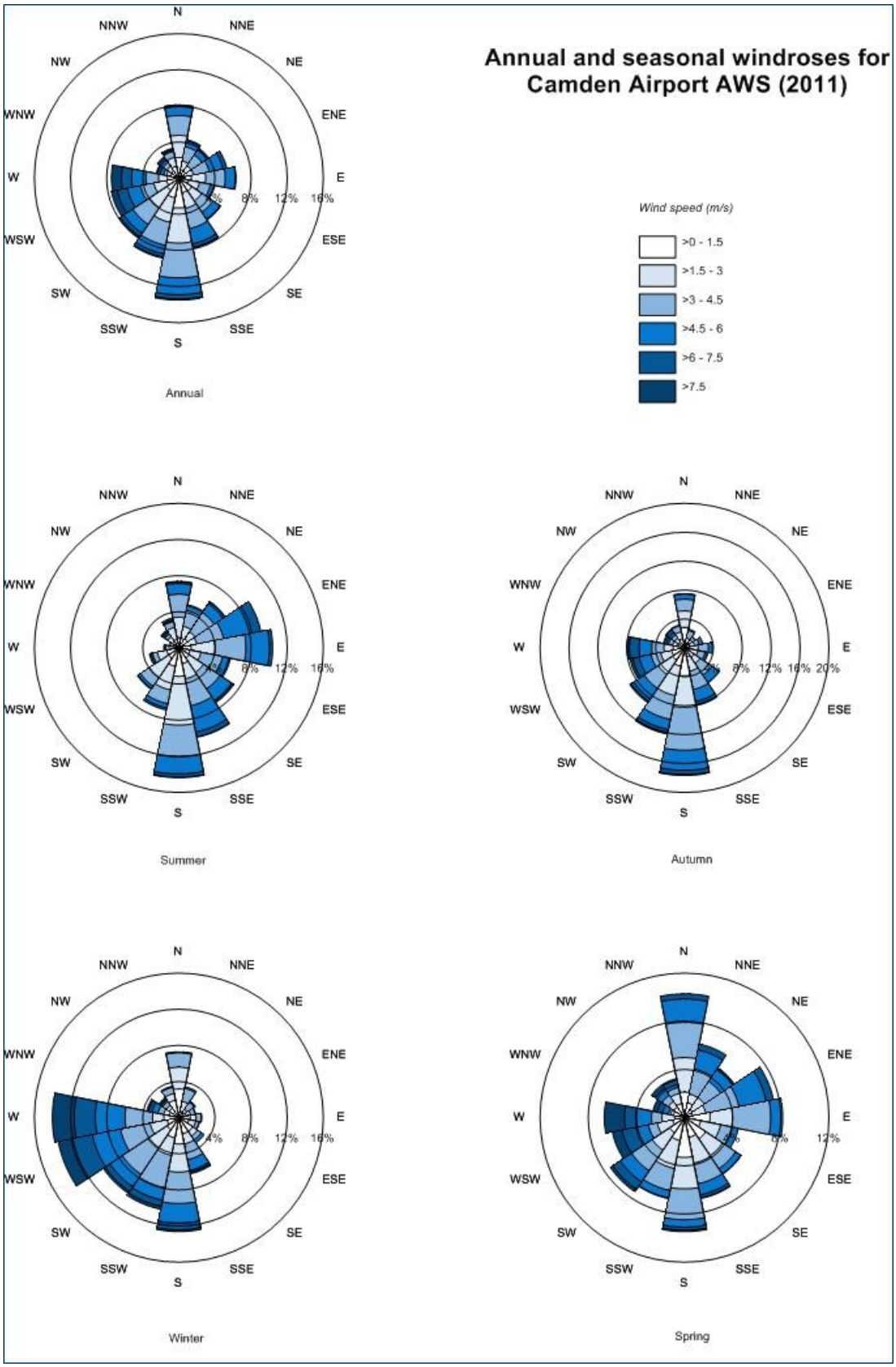


Figure 4-3: Annual and seasonal windroses – Camden Airport AWS (2011)

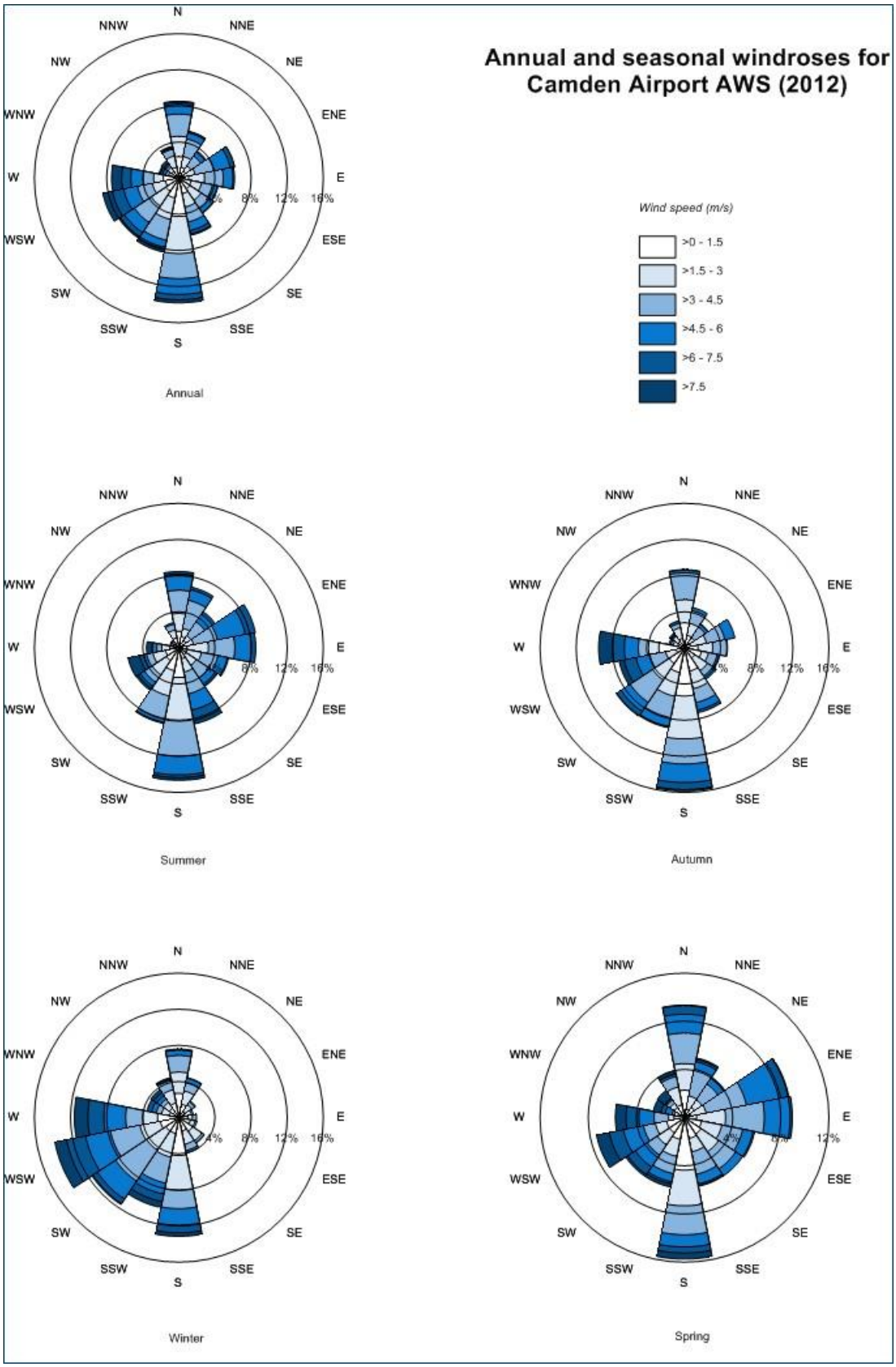


Figure 4-4: Annual and seasonal windroses – Camden Airport AWS (2012)

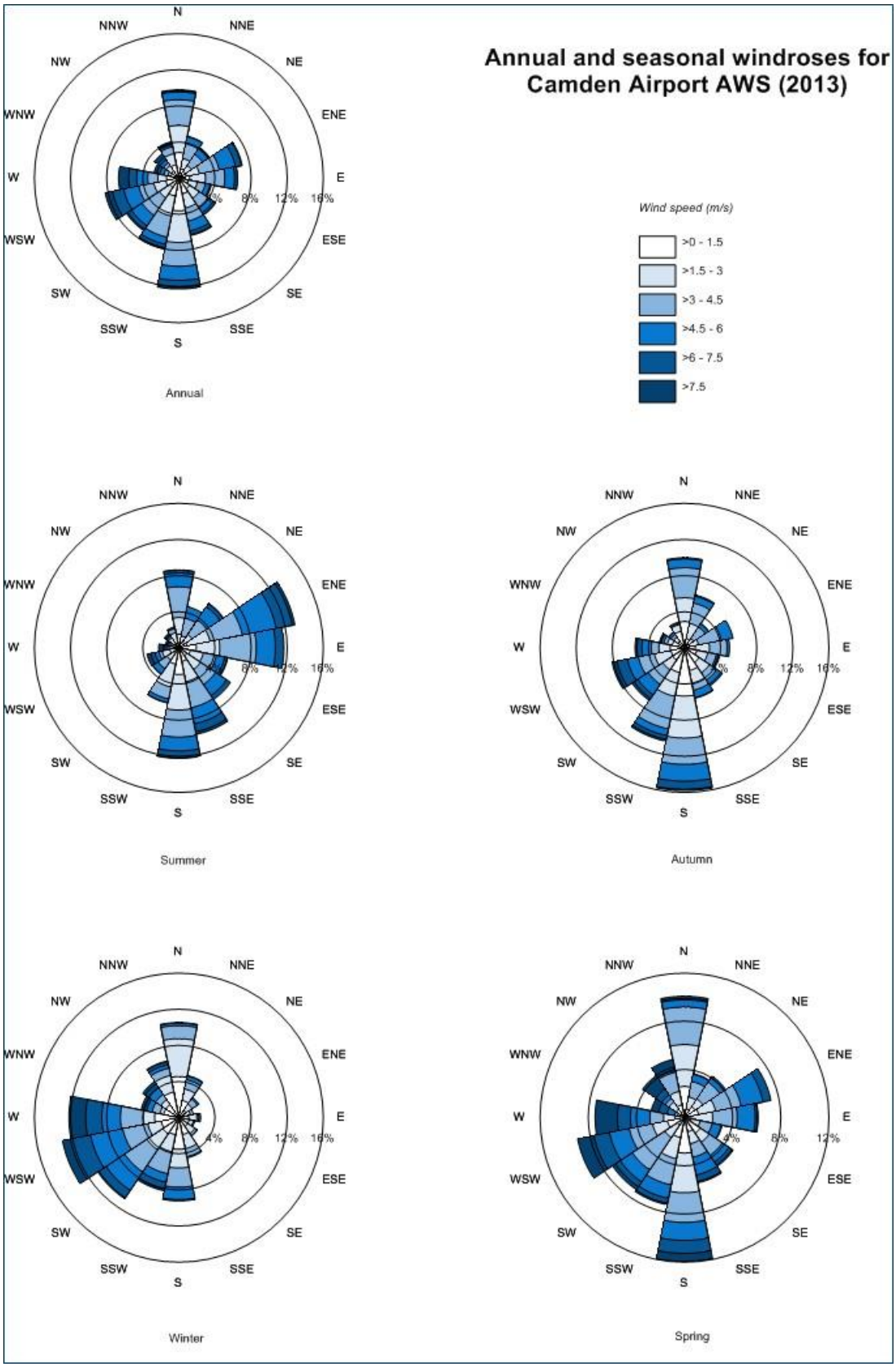


Figure 4-5: Annual and seasonal windroses – Camden Airport AWS (2013)

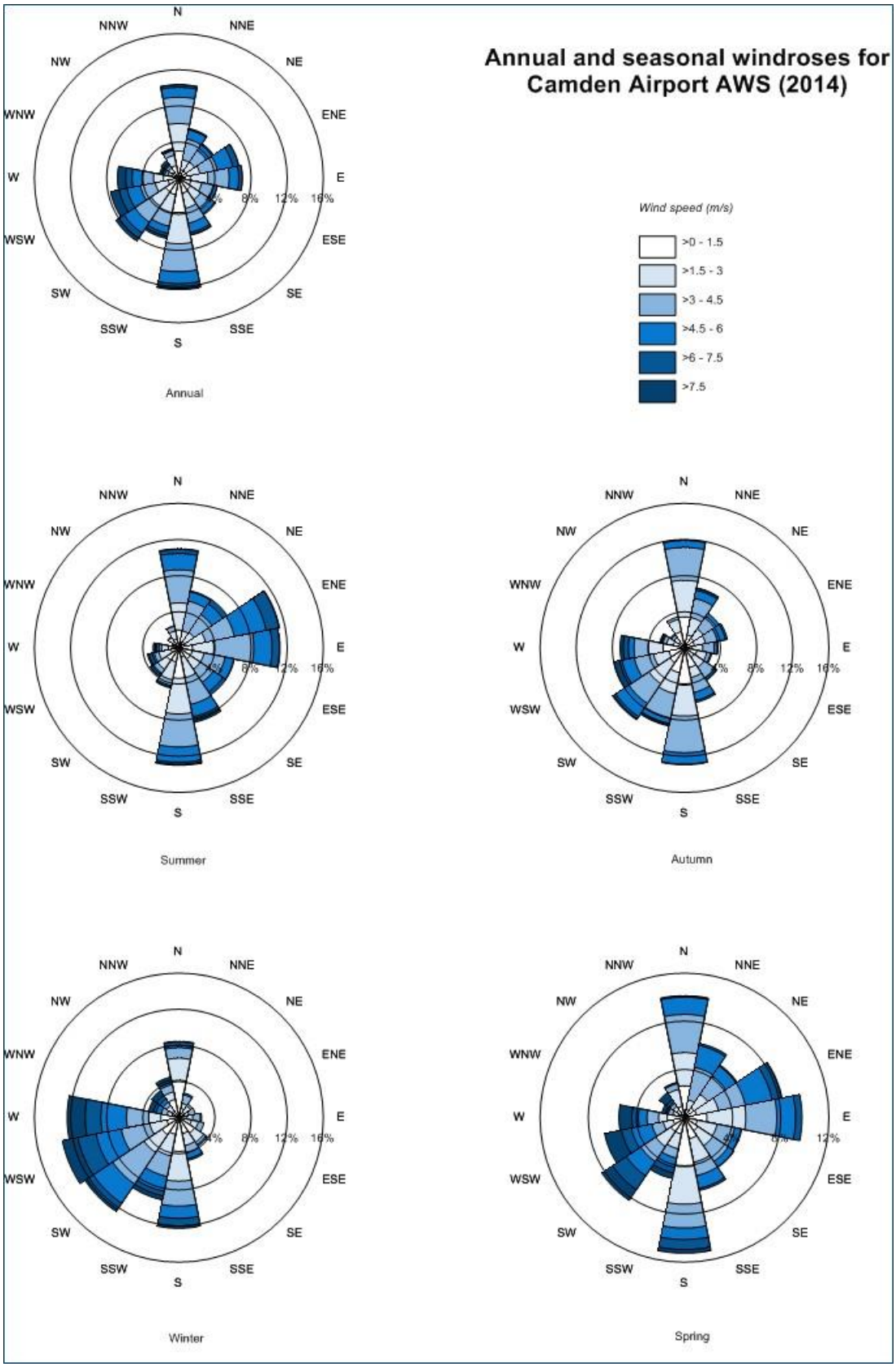


Figure 4-6: Annual and seasonal windroses – Camden Airport AWS (2014)

4.2 Ambient Air Quality

The main sources of particulate matter in the wider area include active mining, agricultural activities, emissions from local anthropogenic activities such as motor vehicle exhaust and domestic wood heaters, urban activity and various other commercial and industrial activities. Particulate matter emissions would also arise in varying degrees from extraordinary natural events in the form of bushfires and dust storms.

This section reviews the available ambient air quality monitoring data collected from various monitoring locations in the vicinity of the Project. **Figure 4-7** shows the approximate location of each of the monitoring stations reviewed in this assessment.

The air quality monitoring stations reviewed in this section include data from the nearby Tahmoor Underground Coal Mine and NSW Environment Protection Agency (EPA) stations. The type of air quality monitors reviewed in this section include High Volume Air Samplers (HVAS), a Tapered Element Oscillating Microbalance (TEOMs) and a Nephelometer measuring ambient PM_{10} and dust deposition gauges for measuring the dust fallout.

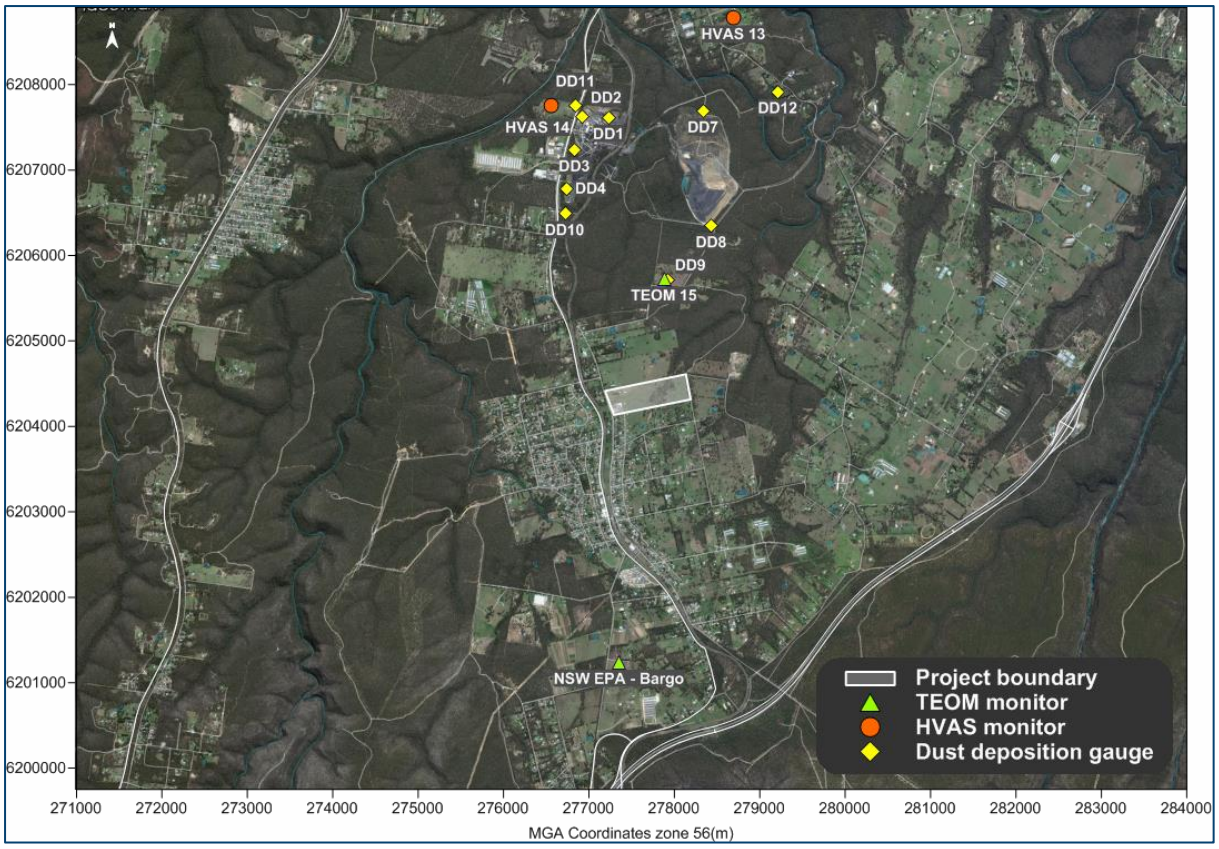


Figure 4-7: Monitoring locations

4.2.1 PM_{10} monitoring

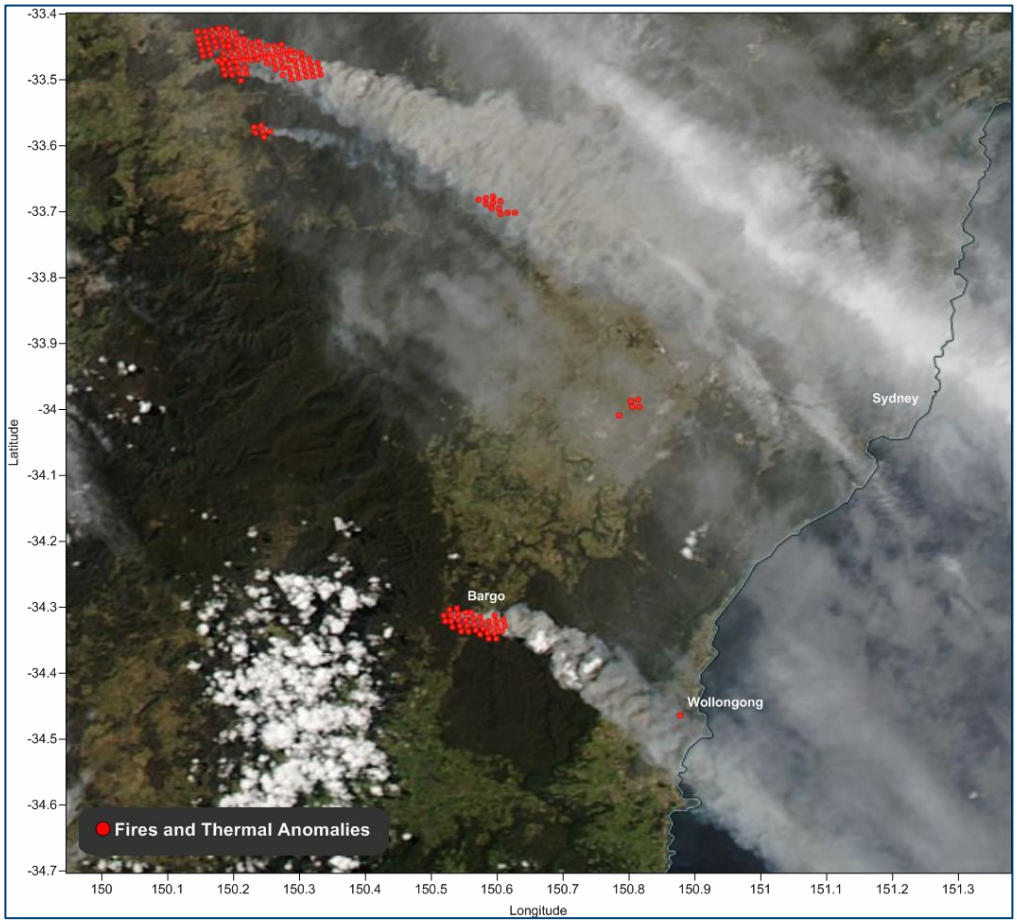
A summary of the available data from 2010 to 2014 at the NSW EPA Bargo monitoring station is presented in **Table 4-2**. Measured 24-hour average concentrations are presented graphically in **Figure 4-9**.

A review of the data in **Table 4-2** indicates that the annual average PM_{10} concentrations recorded at the Bargo monitoring station were well below the relevant criterion of 30µg/m^3 for all years reviewed and indicates that air quality can be considered generally good.

The recorded maximum 24-hour average PM_{10} concentrations were found on occasion to exceed the relevant criterion of 50µg/m^3 at times during the review period. Most notable is the recorded maximum 24-hour average on 17 October 2013 with a level of 208.9µg/m^3. A large-scale bushfire event occurring nearby is identified as the likely contributor to this measurement, **Figure 4-8** presents satellite imagery which clearly indicates the fire event and distinct smoke plumes affecting the area.

Table 4-2: Summary of PM_{10} levels from NSW EPA Bargo monitor (µg/m^3)

	Annual Average	Maximum 24-hour average
2010	12.9	34.9
2011	12.9	89.7
2012	14.3	45.2
2013	15.3	208.9
2014	14.5	50.8



Source: **NASA, 2015**

Figure 4-8: Satellite imagery of 17 October 2013

Figure 4-9 shows seasonal variation in PM_{10} levels recorded at the Bargo NSW EPA monitor, with levels typically higher during the warmer months. Bargo has recorded four days above the 24-hour average criterion over the past five years, all of which occur during the months of September and October.

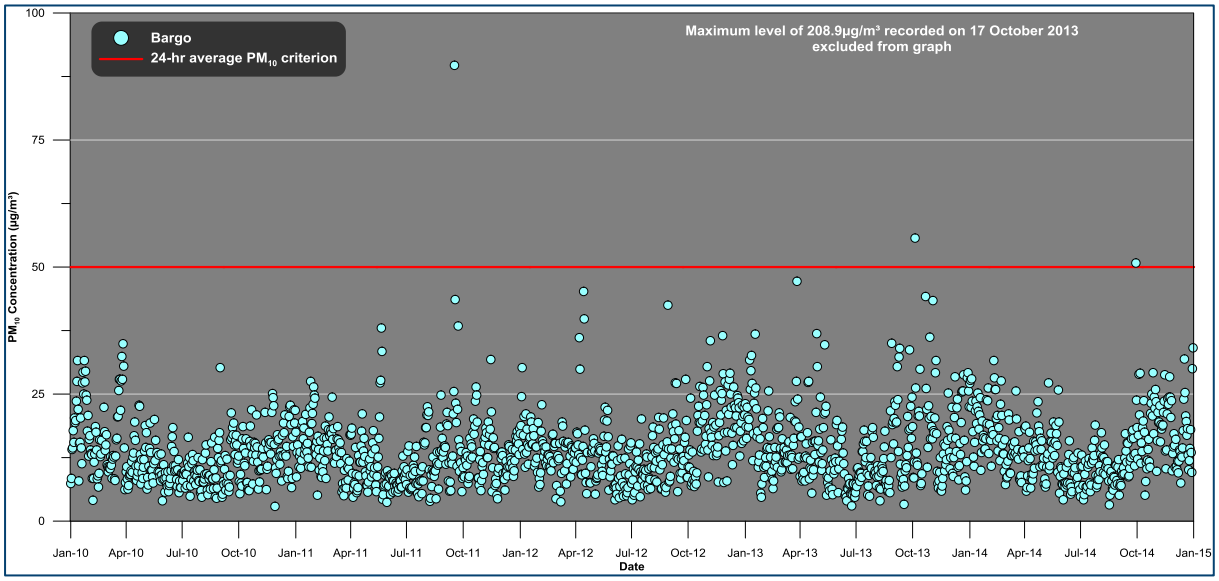
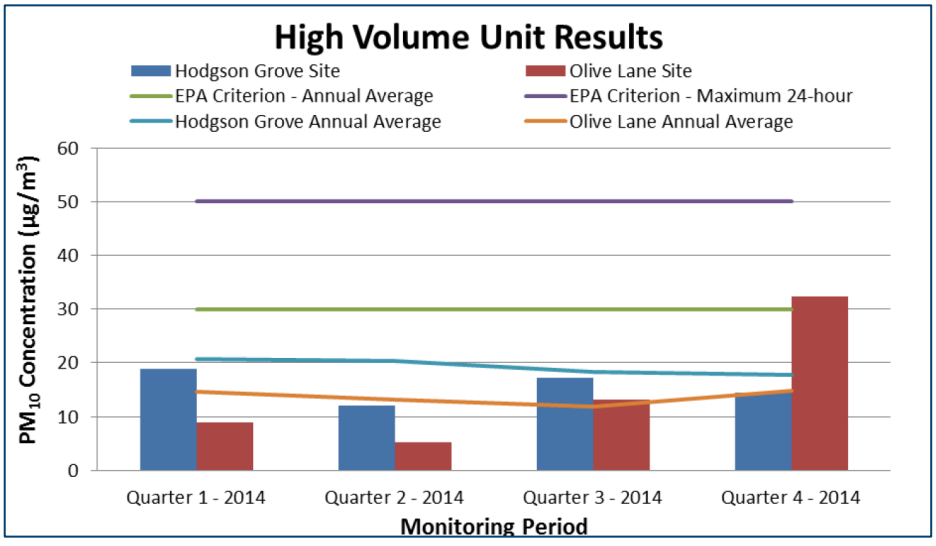


Figure 4-9: 24-hour average PM_{10} levels – NSW EPA Bargo

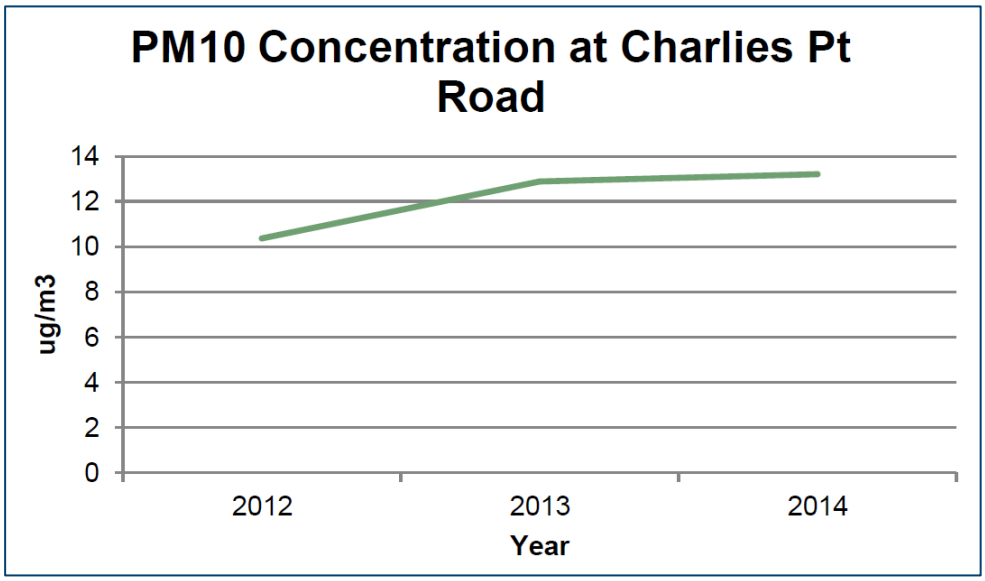
A summary of the available data collected by the Tahmoor Underground coal mine is presented in **Figure 4-10** and **Figure 4-11**. The figure indicates that the annual average PM_{10} concentrations for the monitoring stations were below the relevant criterion of 30µg/m³ during the monitoring periods. (Please note that the quarterly average values shown in the bar chart should not be compared with the annual average criterion, only the blue and orange lines showing the annual average values.)

The recorded levels are well below the relevant criterion and are similar to the NSW EPA Bargo monitoring site, indicating generally good air quality in the area.



Source: **Glencore, 2015**

Figure 4-10: PM_{10} monitoring data completed as per Development Consent for Tahmoor Underground



Source: **Glencore, 2015**

Figure 4-11: TEOM PM_{10} Monitoring data at Charlies Point Road by Tahmoor Underground

4.2.2 Dust deposition monitoring

The location of the dust deposition monitoring sites operated by Tahmoor Underground reviewed in this study is shown in **Figure 4-7**. A summary of the annual average dust deposition levels at each monitor is presented in **Table 4-3**.

All gauges recorded an annual average insoluble solids dust deposition level below the relevant criterion of 4g/m^2/month and in general, the overall air quality in terms of dust deposition is considered good.

Table 4-3: Annual average dust deposition (g/m^2/month)

Station ID	2009/2010	2010/2011	2011/2012	2013	2014
1	1.1	1.0	0.85	0.63	0.92
2	1.3	0.8	0.35	0.5	0.75
3	1.8	1.4	0.95	1.73	2.08
4	1.4	1.1	0.71	0.77	1.04
7	1.9	0.5	0.61	0.74	0.94
8	2.0	1.3	1.85	1.15	1.675
9	-	-	-	0.38	0.68
10	-	-	-	0.88	1.13
11	-	-	-	1.04	0.86
12	-	-	-	2.98	2.32

Source: **Xstrata Coal, 2010**, **Xstrata Coal, 2011**, **Xstrata Coal, 2012a**, **Glencore, 2014** and **Glencore, 2015**

5 POTENTIAL AIR EMISSION SOURCES

A number of operations within an approximate 2.5km radius of the Project site have been identified with the potential to generate significant air pollutants. These operations were identified from available aerial imagery and local business registers.

Operations located greater than 2.5km from any boundary of the Project site are considered unlikely to have any tangible impact on the study area, and are not included in this assessment. **Figure 5-1** presents the location of the identified potential pollution sources relative to the Project site and **Table 5-1** summarises the nature of these potential pollution generating operations.

The operations identified may emit various air pollutants including odour and particulate matter. Other air pollutants, such as air toxics, may arise from some of these operations (e.g. petrol stations) however it is expected that these emissions would be relatively minor and generally limited to the immediate area around the source.

Potentially significant odour emissions would arise from the various poultry operations, the Wollondilly Council landfill site, the proposed Bargo waste transfer station and potentially the ventilation shafts of the Tahmoor Underground Coal Mine. Odour emissions that may originate from the other identified operations are considered insignificant.

The tailings emplacement areas and coal piles associated with the Tahmoor Underground Coal Mine could be a significant source of particulate matter emissions and the proposed waste transfer station may have some limited scope for dust emissions also. Whilst chicken and turkey farms would have some dust emissions, these are not considered likely to be significant.

This investigation therefore focuses on the significant odour and particulate matter emissions associated with the operations identified in **Table 4-3** and the potential for adverse air quality impacts to occur at the Project site from these activities.

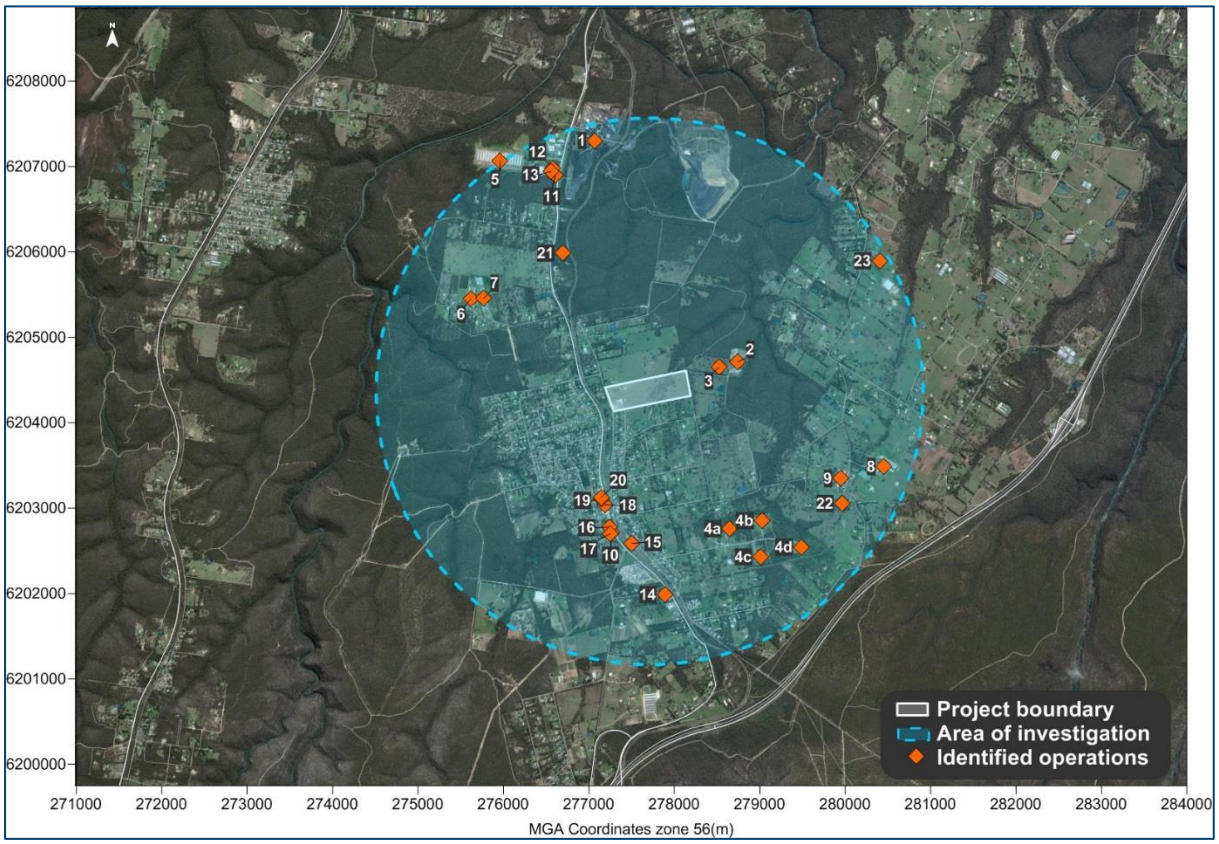


Figure 5-1: Location of identified operations surrounding the Project

Table 5-1: Summary of identified operations surrounding the Project

ID	Name	Address	Type of operation
1	Tahmoor Underground	2995 Remembrance Dr, Bargo	Coal mining
2	Wollondilly Council landfill site	Anthony Rd, Bargo	Landfill
3	Proposed Bargo Waste Transfer Station	25 Government Rd, Bargo	Waste transfer station
4a-d	Ingham's Enterprises	100 Johnston Rd, Bargo	Poultry operation
5	-	3010 Remembrance Dr, Bargo	Poultry operation
6	-	110 Yarran Rd, Bargo	Poultry operation
7	-	90 Yarran Rd, Bargo	Poultry operation
8	-	15 Bidewell Dr, Pheasants Nest	Poultry operation
9	-	420 Arina Rd, Bargo	Poultry operation
10	BP Service Station	116-118 Railside Ave	Petrol Station
11	Shell Service Station	3030 Remembrance Drive, Bargo	Petrol Station
12	Mark's Landscape Supplies	3030 Remembrance Drive, Bargo	Garden/landscape supplier
13	Wreck 1	1/3030 Remembrance Drive, Bargo	Auto Wrecker
14	JJ Performance Smash Repairs	3564 Remembrance Drive	Smash Repairs
15	JMP Automotive Services	4/280 Great Southern Rd	Mechanic
16	Bargo Automotive Care	108 Railside Rd	Mechanic
17	The Local Italian Pizzeria Ristorante	116-118 Railside Ave	Restaurant
18	Golden Palace Restaurant	76 Railside Ave	Restaurant
19	Bargo Charcoal Chicken	5/42 Railside Avenue, Bargo NSW 2574	Restaurant
21	Bargo Quality Meats	Shop 1, 66 Railside Ave	Butcher
22	Bargo Dingo Sanctuary	3105 Remembrance Dr	Wildlife Sanctuary
23	A1 Boarding Kennel & Cattery	450 Arina Rd	Boarding Kennel

6 POTENTIAL ODOUR IMPACTS

The various classes of odour that may impact the site need to be considered separately as it is natural for a person to perceive and respond to say poultry farm odour, coal odour or waste odour in distinctly different ways.

6.1 Poultry operations

6.1.1 Assessment methodology

To assess the potential for odour impacts to occur at the Project site due to the identified poultry operations, a Level 1 odour impact assessment methodology outlined in the *Technical framework Assessment and Management of Odour from Stationary Sources in NSW* (**DEC, 2006a**) and detailed in the *Technical notes Assessment and Management of Odour from Stationary Sources in NSW* (**DEC, 2006b**) was used to determine areas of potential odour impact around each identified source.

The Level 1 assessments are suitable as a screening-level technique to identify the potential area of impact. It is noted that the Level 1 odour impact assessment approach is generally limited as it does not take into account specific local factors or operational factors and thus has a tendency to overestimate the potential area impacted by these operations. However, for the purpose of this investigation, the Level 1 assessment would provide a conservative indication of the potential zone of influence of each operation relative to the Project site.

The number of birds for each of these operations was derived based on the dimensions of each shed and assumes a relatively high stocking density of 15 birds per square metre.

The recommended separation distances for all bird farms included in this assessment are assessed using the broiler farm Level 1 odour assessment methodology, as outlined in the "Technical notes for the Assessment and Management of Odour from Stationary Sources in NSW" (**DEC, 2006b**). Separation distances are calculated using the following equation:

$$\boldsymbol{D = (N)^{0.71} \times S}$$

Where:

N = Number of standard broiler chicken shed units (SBCSU), where 1 SBCSU is equivalent to 22,000 broiler chickens;

D = Separation distance in metres between the closest points of the broiler chicken sheds and the most sensitive receptor or impact location;

S = Composite site factor = S1 x S2 x S3 x S4 x S5. Site factors S1, S2, S3, S4 and S5 relate to shed design, receptor, terrain, vegetation and wind frequency, respectively.

The shed factor (S1) depends on how the shed is ventilated and is determined from factors outlined in **Table 6-1**.

Table 6-1: Shed factor (S1)

Shed Type	Value
Controlled fan ventilation without barriers*	980
Controlled fan ventilation with barriers	690
Natural ventilation	690

Source: **DEC 2006b**

* Barriers – walls, berms and other structures designed to mitigate dust and odour emissions from controlled fan ventilation sheds.

The receptor factor varies depending upon the likely impact area and is determined from factors displayed in **Table 6-2**. The areas surrounding existing poultry farms are moderately populated rural areas. Therefore, accordingly, the receptor factor for this assessment is set to 0.55 for all bird farms.

Table 6-2: Receptor factor (S2)

Receptor Type	Value
Large towns, greater than 2,000 persons	1.05
Medium towns, 500-2,000 persons	0.75
Medium towns, 125-500 persons	0.55
Small towns, 30-125 persons	0.45
Small towns, 10-30 persons	0.35
Single rural residence	0.30
Public area (occasional use)	0.05*

Source: **DEC 2006b**

*. The value for public areas would apply to areas subject to occasional use. Higher values may be appropriate for public areas used frequently or sensitive in nature, such as frequently used halls and recreation areas. These should be assessed individually.

The terrain factor (S3) varies according to topographical features and its capability to disperse odours and is determined from factors outlined in **Table 6-3**. Topographical features projected in **Figure 3-2** portray relatively flat terrain. River valleys are located to the west and east of the Project area, though these features are not deemed to have an effect on odour dispersion. As such, all farms have been assigned flat terrain.

Table 6-3: Terrain factor (S3)

Receptor	Value
Valley drainage zone	2.0
Low relief	1.2
Flat	1.0
Undulating country between broiler chicken farm and receptor	0.9
High relief or significant hills and valleys between broiler chicken farm and receptor	0.7

Source: **DEC 2006b**

The vegetation factor (S4) varies according to vegetation density and is determined from factors outlined in **Table 6-4**.

Table 6-4: Vegetation factor (S4)

Vegetation	Value
Crops only, no tree cover	1.0
Few trees, long grass	0.9
Wooded country	0.7
Heavy timber	0.6
Heavy forest (both upper and lower storey)	0.5

Source: **DEC 2006b**

The wind frequency factor is determined using **Table 6-5**. Local dispersion meteorology has been considered and winds are considered normal.

Table 6-5: Wind frequency factor (S5)

Wind frequency	Value
High frequency towards the receptor (greater than 60%)	1.5
Normal wind conditions	1
Low frequency towards the receptor (less than 5%)	0.7

Source: **DEC 2006b**

6.1.2 Assessment results

There are six poultry operations identified within an approximate 2.5km radius from the Project site. **Table 6-6** provides the Level 1 assessment calculations and calculated separation distance for poultry farms that were included in the assessment.

Table 6-6: Recommended separation distances for poultry operations (Level 1 assessment method)

ID	Est. Total Birds	SBCSU	S1	S2	S3	S4	S5	Separation Distance (m)		Distance from the Project (m)
								radius	+20% radius	
3a	40,500	1.841	690	0.55	1	0.7	1	410	492	1,590
3b	72,225	3.283	690	0.55	1	0.7	1	618	741	1,596
3c	40,500	1.841	690	0.55	1	0.7	1	410	492	2,015
3d	72,225	3.283	690	0.55	1	0.7	1	618	741	2,102
4	352,560	16.025	690	0.55	1	0.6	1	1,632	1,959	2,768
5	123,525	5.615	690	0.55	1	0.7	1	904	1,085	1,800
6	82,800	3.764	690	0.55	1	0.7	1	681	817	1,685
7	127,215	5.783	690	0.55	1	1	1	1,319	1,583	2,304
8	70,380	3.199	690	0.55	1	1	1	867	1,040	1,935

The recommended individual separation (buffer) distances for these poultry farms are visually presented in **Figure 6-1**. The orange circles indicate the recommended buffer distances for individual farms and the yellow circles are the buffer distances with a 20% increase to account for potential interaction of two farms influencing the same area.

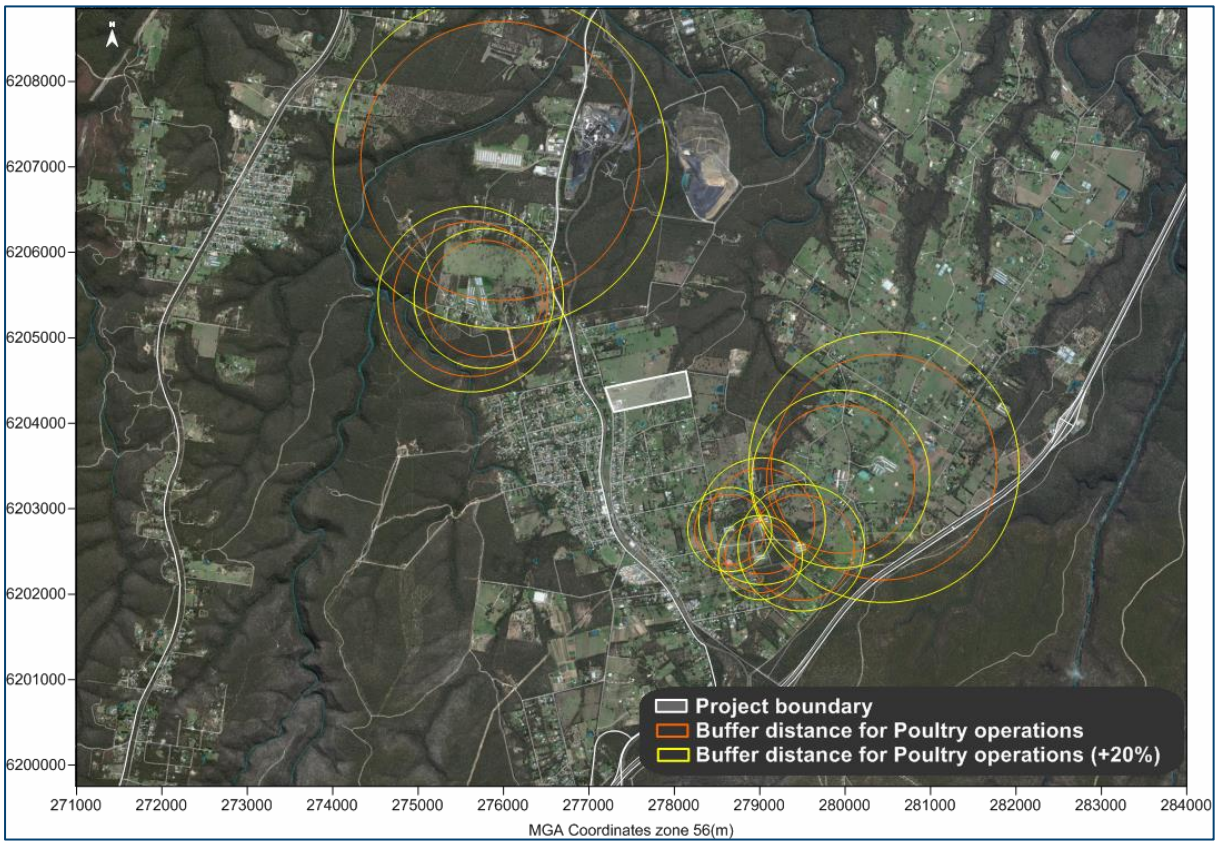


Figure 6-1: Buffer distances for the identified poultry operations

As can be seen from the tabled results and figure, none of the identified poultry farms are close enough to adversely impact the Project area.

6.2 Coal mine operation

The Tahmoor Underground Coal Mine located to the north of the Project area could potentially produce odorous emissions from the mine ventilation air exhausted from the No. 2 Ventilation Shaft located approximately 3.7km to the north-northeast of the Project site.

A review of the Annual Environmental Management Reports for the Tahmoor Underground Coal Mine (**Xstrata Coal, 2010, 2011 & 2012a and Glencore, 2014 & 2015**) indicated that in the past, odour from the No. 2 Ventilation Shaft was an issue resulting in a number of complaints being made in this regard. These odour complaints were investigated and were generally found to be of a minimal nature and localised to the area near the ventilation shaft.

It is understood that the mine continues to improve the dispersion performance from the ventilation shaft to minimise the potential for odour impacts to occur. Given the localised nature of previous odour complaints, and the large separation distance from the ventilation shaft it is reasonable to conclude that there would be no significant potential for odour impacts to occur at the Project site due to the underground coal mine.

6.3 Landfill and waste transfer station operation

The existing Wollondilly Council landfill site and proposed Bargo waste transfer station are located approximately 500m east of the Project site (see **Figure 5-1**), and represent the closest potential odour generating sources to the Project. The proposed waste transfer station could potentially accept a combination of putrescible waste, general household waste, construction/ demolition waste, commercial industrial waste, recyclables and green waste.

A review of the odour impact assessment prepared for the proposed waste transfer station (**AECOM, 2013**) indicated that potential odour-emitting activities would arise from the unloading and handling of putrescible waste prior to transport off-site and from the receival and storage of green waste at the waste transfer station as well as the Wollondilly Council landfill site.

To determine whether odour levels at the Project site associated with the existing Wollondilly Council landfill site and the proposed waste transfer station would be within acceptable levels, air dispersion modelling using the CALPUFF model was used to predict the potential impacts. Odour sources and associated emission rates for the facilities were obtained directly from the odour impact assessment for the proposed waste transfer station (**AECOM, 2013**). It is expected that the appropriate mitigation and management measures would be applied at both sites to ensure the potential for adverse odour impacts would be minimised.

An isopleth diagram of the predicted odour impacts from the existing Wollondilly Council landfill site and the proposed Bargo waste transfer station is presented in **Figure 6-2**. The figure indicates that the predicted level of odour reaching the Project site would be minimal and is in general agreement with the predicted results in the odour impact assessment (**AECOM, 2013**).

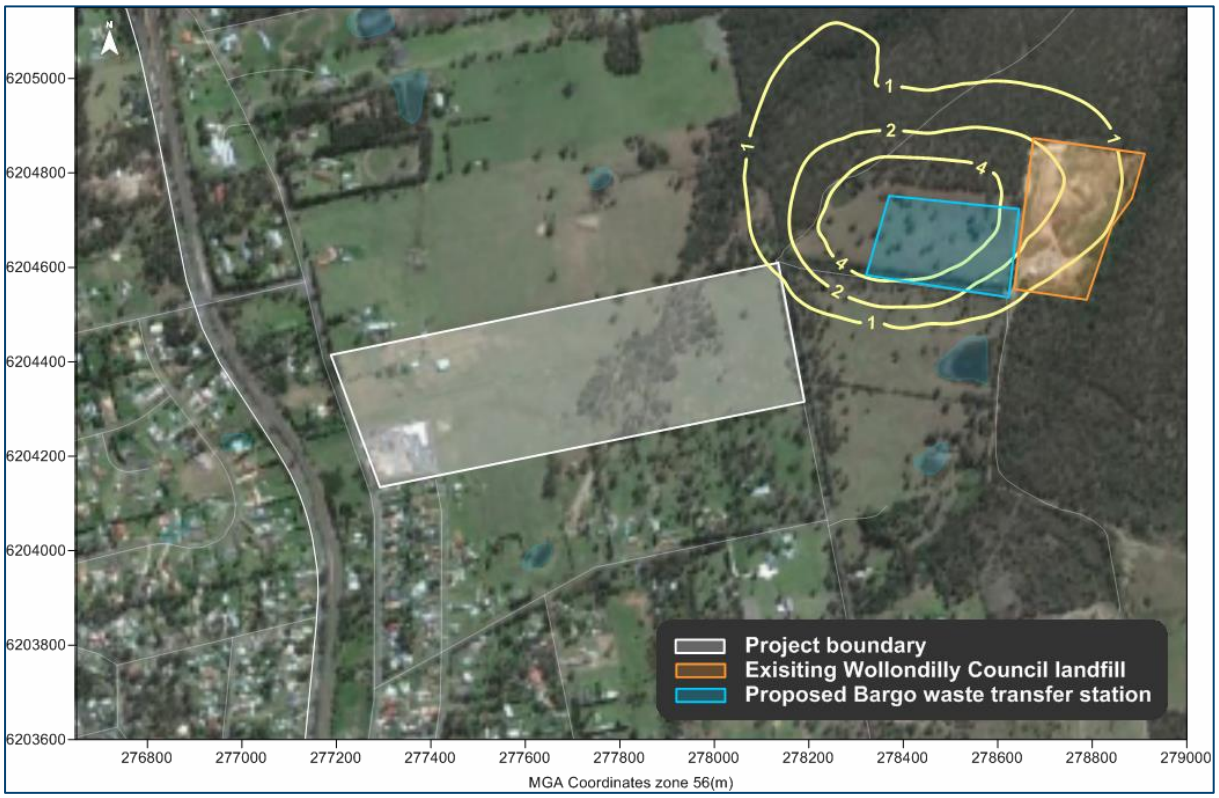


Figure 6-2: Predicted 99th percentile nose-response average ground level odour concentrations – existing Wollondilly Council landfill and proposed Bargo waste transfer station

The figure shows that the site is not impacted by odour levels above the most stringent urban criterion of 2OU.

It should be noted that even where the NSW odour impact criteria are met, this does not mean that some odour would not be detectable at some time. However compliance with the criteria is considered to represent an acceptable level of exposure to odour that would be unlikely to be considered offensive.

6.4 Other operations

The potential odour impacts from the other identified small businesses and operations surrounding the Project site are considered to have potential to emit only minor amounts of odours and would include odorous emissions associated with restaurants, auto wreckers, smash repairs, petrol stations and garden/landscaping suppliers.

These operations are typically small and any odours generated from these operations would be temporary or infrequent compared to other sources considered in detail and assessed in this study. The potential zone of influence of odour emissions from these operations is likely to be less than approximately 200m from the source. These operations are typically located further than 1km from the Project site and, as such, it is unlikely that any noticeable odour emissions from these operations will be detected at the Project site.

7 POTENTIAL PARTICULATE MATTER IMPACTS

7.1 Coal mine operation

The Tahmoor Underground Coal Mine located to the north of the Project area is identified as the largest potential source of particulate matter in the wider area surrounding the Project. Activities occurring at the coal mine that contribute to particulate matter emissions would include wheel generated dust from paved roads, ventilation shaft emissions, bulldozer activity, wind erosion and handling of material.

To determine the potential for adverse particulate matter impacts occurring at the Project site associated with the coal mine, air dispersion modelling using the CALPUFF model has been applied. The amount of particulate matter generated at the coal mine was obtained from the *Tahmoor Colliery – Coal Mine Particulate Matter Control Best Management Practice Determination* (**Xstrata Coal, 2012b**). The total annual dust (TSP) emission rate from the coal mine is estimated at approximately 625,932kg.

An isopleth diagram of the predicted maximum 24-hour average PM_{10} impacts associated with the Tahmoor Underground Coal Mine is presented in **Figure 7-1**. The figure indicates that the predicted 24-hour average PM_{10} concentration reaching the Project site would be minimal and of the order of approximately 4 to 5µg/m^3 across the Project site. The 24-hour average PM_{10} level is the limiting constraint for dust from mining activities. The predicted levels represent 10% of the criterion level of 50µg/m^3, and it is expected that the predicted levels of the other relevant dust metrics would be less significant relative to the applicable criteria.

As the ambient air quality in the general area surrounding the Project is consider generally good (refer to **Section 3.2**) and would include an existing contribution from the Tahmoor Underground Coal Mine it is anticipated that the potential for any cumulative particulate matter impacts on the Project site is low.

The Tahmoor Underground Coal Mine have also lodged a Preliminary Environmental Assessment to support the application for continued operation of the mine with upgrades to existing surface infrastructure and to enable extraction of up to five million tonnes per annum of run of mine coal (**AECOM, 2012**).

The proposed increase to the production rate of the coal mine would likely have some tangible effect on the potential particulate matter impacts at the Project site, however this is not expected to be significant. The mine is required to meet criteria at the residential receptors that are located closer to the mine than the Project site. It is therefore reasonable to expect that the coal mine would implement the appropriate mitigation and management measures to ensure particulate matter emissions from the operation meet the required criteria, and are minimised.

Figure 7-1: Predicted maximum 24-hour average PM_{10} impacts due to the Tahmoor Underground Coal Mine

7.2 Waste transfer station operation

The proposed Bargo waste transfer station is located approximately 500m east of the Project site and represents the closest potential particulate matter generating source to the Project. The main source of particulate matter emissions arising from the proposed waste transfer station would include emissions due to wheel generated dust from paved roads, receiving and handling of material and crushing concrete, bricks and other construction waste. The crushing activity is understood to be infrequent at the site and is expected to occur only on a campaign basis as required.

To determine whether the potential particulate matter impacts on the Project site associated with the proposed waste transfer station would be at acceptable levels, air dispersion modelling using the CALPUFF model was applied. Particulate matter sources and associated emission rates for the facility were obtained directly from the air quality impact assessment (**AECOM, 2013**). It is expected that appropriate mitigation and management measures would be applied at the proposed waste transfer station to ensure the potential for adverse particulate matter impacts is minimised.

An isopleth diagram of the predicted particulate matter impacts from the proposed Bargo waste transfer station is presented in **Figure 7-2**. The figure indicates that the predicted maximum 24-hour average PM_{10} impacts reaching the Project site would be minimal and is in general agreement with the predicted results in the air quality impact assessment (**AECOM, 2013**).

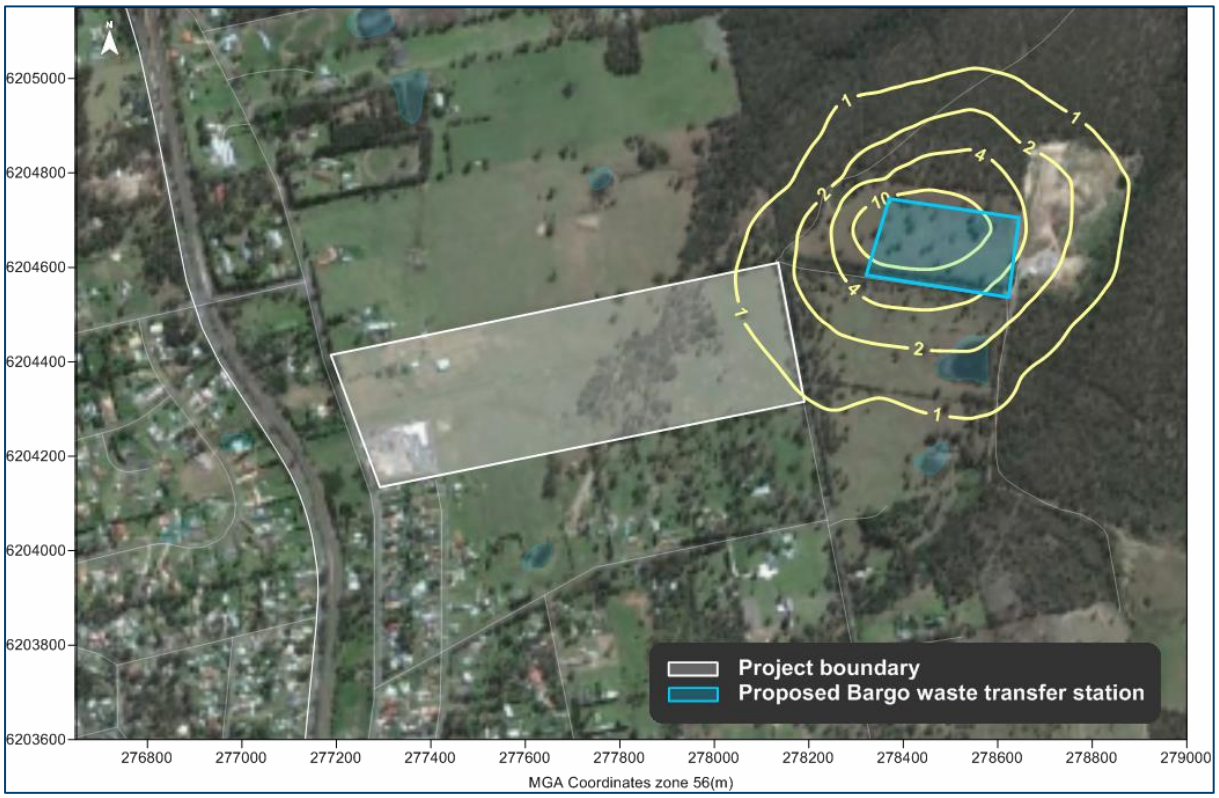


Figure 7-2: Predicted maximum 24-hour average PM_{10} impacts due to the proposed Bargo waste transfer station

The results indicate that the dust emissions from the proposed waste transfer station are unlikely to be significant or discernible above background levels, even with the addition of the potential maximum impacts from the underground coal mine.

7.3 Other operations

The potential particulate matter impacts from the other identified small businesses and operations surrounding the Project site are considered to have potential to emit only minor amounts of particulate matter and would include emissions associated with restaurants, auto wreckers, smash repairs, petrol stations and a garden/landscaping supplier.

These operations are typically small and any dust generated from these operations would be temporary or infrequent compared to other sources considered in detail and assessed in this study. The potential zone of influence of dust emissions from these operations is likely to be less than approximately 200m from the source. These operations are typically located further than 1km from the Project site and, as such, it is unlikely that any noticeable odour emissions from these operations will be detected at the Project site.

7.4 Roadways and motor vehicles

The surrounding roadways and associated motor vehicle use are also a source of particulate matter emissions, arising from the combustion of fuels, brake wear and road surface wear mechanisms. Emissions from roadways include other pollutants such carbon monoxide, nitrogen oxides and various

volatile organic compounds. Each of these pollutants has the capacity to adversely affect health if the concentration is too great over a particular exposure period.

Pollutant levels from roadways are directly proportional to the traffic volume, speed and the variability of the speed. Air pollutant levels are highest adjacent to the road and reduce rapidly with distance from the road.

The potential air emission levels associated with the surrounding roadways are not expected to be significant at the Project as the perceived traffic intensity for the surrounding roadways is relatively low. With consideration of buffer distances between the roadway and the receptor due to areas for gardens, the potential for impacts due to the surrounding roadways is expected to be suitably diminished and hence would be negligible.

8 RECOMMENDATIONS FOR AIR QUALITY

Overall, the assessment indicates that the potential for any adverse air quality impacts at the Project site due to the surrounding identified sources is low and therefore no specific recommendations for air quality mitigation is required.

It is anticipated that surrounding operations and any future developments in the wider area would apply and continue to apply best available measures for managing air emissions to ensure air quality at the Project site is not compromised.

To ensure the potential risk for air quality impacts on residents within the Project area in the future is minimised where possible, some suggested development options are provided below.

- Plan for the least sensitive land uses to be located near to air polluting sources. Compatible land uses include bushland reserves and car parks.
- Orientate large buildings to provide adequate air flow around the building and design buildings to encourage air flow in a particular direction. This can be aided by road orientation and block size and shape. Avoid construction of dead end courtyards or long narrow spaces perpendicular to the prevailing winds where air can lay dormant and stagnate.
- Minimise the formation of urban canyons that reduce dispersion. Having buildings of different heights interspersed with open areas, and setting back the upper stories of multi-level buildings helps to avoid urban canyons.
- Build continuous dense landscaping (bunds and vegetation) around air polluting sources to assist in dispersion from the source, thus reducing the impact on the Project area.
- Consider air conditioning and ventilation, and design buildings so living and work spaces such as bedrooms and offices do not face air polluting sources. Buildings could have non-opening windows on the side of the building facing these sources and could duct cleaner air into the building from the far side, and out to the near side.
- Incorporating an appropriate separation distance between sensitive uses and the road using broad scale site planning principles such as building siting and orientation. The location of living areas, outdoor space and bedrooms and other sensitive uses (such as childcare centres) should be located as far as practicable from the major source of air pollution.

9 SUMMARY AND CONCLUSIONS

This study conducts an investigation and air quality assessment for the proposed rezoning of land at 95 Great Southern Road Bargo, NSW. The study identifies potential sources of air pollutants within approximately 2.5km of the Project site, and has assessed these sources in order to calculate the potential air quality effects upon the proposed future rezoning and development of the Project.

The study identifies a number of poultry operations, an underground coal mining operation and a proposed waste transfer station as the key potential sources of significant air emissions in the area. Qualitative and quantitative assessment of the potential air quality impacts associated with these sources finds that the potential for adverse air quality impacts on the subject land is minimal.

For the poultry operations, a Level 1 odour impact assessment that is in general accordance with the "Technical Framework"" (**DEC, 2006a**) and the associated "Technical Notes" (**DEC, 2006b**) is used to determine a suitable separation distance between the poultry operations and the Project site. The results show that the poultry operations are located far enough away to ensure no adverse air quality impacts would occur.

Odour and particulate matter emissions from the coal mining operation and waste management facilities are also examined in the study, which found that these activities would have a minimal effect on the subject land.

More detailed investigations into potential air quality impacts from the other surrounding businesses are not warranted due to their distance from the Project area and the scale of the air emissions generated from each of these operations.

Overall, the study found that the air quality at the Project site is compatible with residential use, and that no significant adverse air quality impact is likely to occur upon future occupiers of the Project site, or upon the businesses in the area that emit air emissions, as a result of the proposed Project being implemented.

There is no recommendation for any further detailed assessment of air quality for the Project site on the basis of this assessment. Any new future individual developments will require a specific detailed assessment to ensure there are no predicted air quality impacts at the Project site.

10 REFERENCES

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